RESEARCH CENTER

FIELD

Activity Report 2018

Section Contracts and Grants with Industry

Edition: 2019-03-07

ABS Project-Team (section vide)

ACUMES Project-Team (section vide)

AGORA Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

- We have contracted a first bilateral contract with Total (2018-2019) where we work with the laboratory LQA of Total on the design and the test of autonomous low cost air quality sensors. The Lora-based developed platform is currently deployed et evaluated by LQA.
- We have contracted bilateral cooperation with Rtone, an SME focusing on the connected objects area. This collaboration is associated with the CIFRE PhD grant for Alexis Duque, on the subject of Visible Light Communication.
- We have contracted bilateral cooperation with industrial and academic partners in the context of the PSPC Fed4PMR project (2015-2019). In this context, we are working on the design of new professional mobile radio solutions, compatible with 4G and 5G standards. This collaboration funds the PhD thesis of Jad Oueis, the PhD thesis of Romain Pujol, and a part of the PhD thesis of Abderrahman Ben Khalifa.

8.2. Bilateral Grants with Industry

- Common Laboratory Inria/Nokia Bell Labs - ADR Network Information Theory.
  Agora is part of the ADR Network Information Theory of the common laboratory Inria/Nokia Bell Labs.
- Spie - INSA Lyon IoT Chaire.
  Agora is involved in the SPIE INSA Lyon IoT Chaire, launched in November 2016. The IoT Chaire partially funds the PhD thesis of Abderrahman Ben Khalifa. The PhD thesis work of Alexis Duque and Amjed Belkhiri are also contributing in this structure.
- Volvo - INSA Lyon Chaire.
  Agora is involved in the Volvo Chaire at INSA Lyon, on the area of autonomous electrical distribution vehicle in urban environments. Razvan Stanica is a member in the steering committee of this structure.

AIRSEA Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

A 2-year contract with Mercator-Ocean on the thematic "The AGRIF software in the NEMO European ocean model": see 5.1

Contract with IFPEN (Institut Français du pétrole et des énergies nouvelles), for the supervision of a PhD (Adrien Hirvoas). Research subject: Development of a data assimilation method for the calibration and continuous update of wind turbines digital twins

The Chair OQUAIDO – for "Optimisation et QUAntification d'Incertitudes pour les Données Onéreuses" in French – is the chair in applied mathematics held at Mines Saint-Étienne (France). It aims at gathering academical and technological partners to work on problems involving costly-to-evaluate numerical simulators for uncertainty quantification, optimization and inverse problems. This Chair, created in January 2016, is the continuation of the projects DICE and ReDICE which respectively covered the periods 2006-2009 and 2011-2015. Reda El Amri's PhD thesis is funded by OQUAIDO.

A 3-year contract (from June 2016 to June 2019) named ALBATROSS with Mercator-Ocean on the topic « Interaction océan, vagues, atmosphère à haute résolution » (PI: F. Lemarié).

ALICE Project-Team (section vide)

ALMAnaCH Team

7. Bilateral Contracts and Grants with Industry

7.1. Industrial Collaborations

- **Verbatim Analysis**: this Inria start-up was co-created in 2009 by BS. It uses some of ALMAnaCH's free NLP software (SxPipe) as well as a data mining solution co-developed by BS, VERA, for processing employee surveys with a focus on answers to open-ended questions.
- **opensquare** A new Inria startup, opensquare, was co-created in December 2016 by BS with 2 senior specialists in HR consulting. opensquare designs, carries out and analyses employee surveys and offers HR consulting based on these results. It uses a new employee survey analysis tool, *enqi*, which is still under development.
- **Facebook**: A collaboration on text simplification ("français Facile À Lire et à Comprendre", FALC) is ongoing with Facebook's Parisian FAIR laboratory. In particular, a co-supervised (CIFRE) PhD thesis started in 2018 in collaboration with UNAPEI, the largest French federation of associations defending and supporting people with special needs and their families. This collaboration is expected to pave the way for a larger initiative involving (at least) these three partners as well as the relevant ministries.
- **Bluenove**: A contract with this company has been signed, which defines the framework of our collaboration on the integration of NLP tools (e.g. chatbot-related modules) within Bluenove's plateform Assembl, dedicated to online citizen debating forums. It involves a total of 24 months of fixed-term contracts (12 months for a post-doc, currently working on the project, and 12 months for a research engineer, which is still to be recruited).
- **Science Miner**: ALMAnaCH (previously ALPAGE) has been collaborating since 2014 years with this company founded by Patrice Lopez, a specialist in machine learning techniques and initiator of the GROBID and NERD (now entity-fishing) suites. Patrice Lopez provides scientific support on the corresponding software components in the context of the Parthenos, EHRI and Iperion projects, as well as in the context of the Inria anHALytics initiative, aiming at providing a scholarly dashboard on the scientific papers available from the HAL national publication repository.
- **Hyperlex** A collaboration was initiated in 2018 on NLP for legal documents, involving especially EVdLC.
- ALMAnaCH members led a proposal for the creation of an ANR LabCom with Fortia Financial Solutions, a company specialized in *Financial Technology*, namely the analysis of financial documents from investment funds. The proposal has been rejected. Meanwhile, this project is currently being extended toward a FUI with Systran, the market leader in specialized machine translation systems, and the BNP as industrial partner. The funding requested will cross the 3 millions euros bar.
- ALMAnaCH members have recently initiated discussions with other companies (Louis Vuitton, Suez...), so that additional collaborations might start in the near future. They have also presented their work to companies interested in knowing more about the activities of Inria Paris in AI and NLP.

ALPINES Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

- Contract with Total, February 2015 - August 2018, that funds the PhD thesis of Hussam Al Daas on enlarged Krylov subspace methods for oil reservoir and seismic imaging applications. Supervisor L. Grigori.
- Contract with IFPen, February 2016 - April 2019, that funds the Phd thesis of Zakariae Jorti on adaptive preconditioners using a posteriori error estimators. Supervisor L. Grigori.
- Contract with IFPen, October 2016 - October 2019, that funds the Phd thesis of Julien Coulet on the virtual element method (VEM). Supervisor F. Nataf and V. Girault.
- Contract with Total, February - September 2018, that funded an internship on Helmholtz domain decomposition solvers for multiple right hand sides. Supervisor F. Nataf.

ANGE Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

- A contract (2016-2018) has been made (130.000 euros) with SAUR, IAV (Institut d'Aménagement de la Vilaine) and Agence de l'eau Loire-Bretagne in collaboration with SciWorks Technologies. It deals with the modelling and the simulation of chlorides entry in the Vilaine reservoir.
- A part of the ANR project Hyflo-Eflu relies on a collaboration with the company "HydroTube Energie". It comprises the recruitment of a young engineer (J. Ledoux) and regular meetings with industrial (Bordeaux) and academic partners (Nantes). See below for more details about the scientific content of this project.
- A part of the ANR project ESTIMAIR includes the SME NUMTECH for a commercial deployment of the project results. (Bordeaux) and academic partners (Nantes). See below for more details about the scientific content of this project.
- J. Sainte-Marie, C. Guichard, Y. Penel, J. Salomon are part of an agreement between Institut Carnot SMILES (Sorbonne Univ., Thomas Boiveau) and the corporation GTT about the improvement of a modeling tool for gas flows in the isolation spaces of LNG tanks

8.2. Bilateral Grants with Industry

P. Quémar's PhD thesis is funded by EDF (CIFRE). His PhD is entitled "3D numerical simulations of environmental hydrolics: application to Telemac".

ANTIQUE Project-Team (section vide)

AOSTE2 Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

The IFPEN grant which started on December 2014 and ended on February 2018, provides full support for the PhD thesis of Salah Eddine Saidi. The thesis concerns the automatic parallelization and scheduling approaches for co-simulation of numerical models on multi-core processors. The goal of the first research topic is to propose multi-core scheduling solutions for the co-simulation in order to accelerate its execution. The second research topic aims at proposing multi-core scheduling solutions in order to enable the execution of co-simulation under real-time constraints in the context of Hardware-in-the-Loop validation.

ARAMIS Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Grants with Industry

8.1.1. Carthera

Participants: Stéphane Epelbaum [Correspondant], Alexandre Carpentier, Anne Bertrand, Marie Odile Habert.

Project title: Open label phase 1/2 study evaluating the safety and usefulness of transient opening of the blood-brain barrier using low intensity pulsed ultrasounds generated by the implantable device SONOCLOUD in patients with mild Alzheimer's disease

Started in 2016

Amount: 400 K€

Coordinator: Stéphane Epelbaum

Other partners: UPMC, AP-HP

Abstract: This project aims at opening the blood brain barrier (BBB) in 10 mild Alzheimer's disease patients in order to improve the clearance of beta-amyloid and tau deposits in their brain as suggested in mice models of the disease. This first in man study will evaluate the safety and efficacy of an implanted device, SONOCLOUD, to open the BBB 7 times in each participant. Efficacy will be evaluated on the ability of the method to decrease the amyloid load evidenced by AV45 Positron Emission Tomography (PET), increase the brain metabolism analyzed by Fluorodeoxyglucose PET and improve cognition. If successful, this study will pave the way for future trials in which drugs can be used in addition to BBB opening to maximize their effect.

ARIC Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

Bosch (Germany) ordered from us some support for implementing complex numerical algorithms (participants: Claude-Pierre Jeannerod and Jean-Michel Muller).

8.2. Bilateral Grants with Industry

- Miruna Rosca and Radu Titiu are employees of BitDefender. Their PhD's are supervised by Damien Stehlé and Benoît Libert, respectively. Miruna Rosca works on the foundations of lattice-based cryptography, and Radu Titiu works on pseudo-random functions and functional encryption.
- Adel Hamdi is doing is PhD with Orange Labs and is supervised by Fabien Laguillaumie. He is working on advanced encryption protocols for the cloud.

AROMATH Project-Team (section vide)

ATHENA Project-Team (section vide)

AUCTUS Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral contract with AIO, motion analysis issues

In partnership with the SME AIO, we are co-developing a Numii product (presented at CES 2018, 2019) capable of associating a score based on ergonomic indices with a gesture. The work focused on the software architecture, different given fusion filter, task classification, and on the gesture evaluation indices. Models and algorithms are generic for different types of sensors.

8.2. Bilateral contract with VINCI Energies

A contract has been signed with VINCI Energies for a study entitled: "Pré-étude pour la conception d'un système d'assistance aux opérateurs du bâtiment". The objective was to carry out an ergonomic analysis of the work station for operators working in the building construction domain. Operators such as electricians or plumbers were typically concerned. They indeed have to work regularly on an elevated deck with arms above shoulders, which is a well-known cause of musculoskeletal disorders. Different solutions have been proposed and investigated. A specific exoskeleton was finally chosen and its performance and acceptability are currently evaluated by VINCI Energies. This study has been performed with the help of a student named Virginie Roupenel through an internship that was funded by CEGELEC, a partner from VINCI Energies. Remarkably, the student used the system that we developed for real time analysis of operator moves.

8.3. Bilateral contract with AIO, ergonomic issues

AIO was working on a project called Kombos (now called NUMII). The objective of the project is to design an automatic system that analyses operator moves in real time and determines ergonomic scores, which are then sent to a server and stored in a database. One of the main problems was to find a strategy to decompose a sequence of moves in elementary moves that could be automatically assessed according to standard ergonomic scores. After discussion, AIO decided to contract with us (under the direction of Jean-Marc Salotti) a study on ergonomic issues. They provided a short video of an operator manipulating tubes and they requested an ergonomic analysis in order to determine the best decomposition of the operator's activity into elementary movements. We subcontracted ergonomic studies to ERSYA, a company that is specialized in that domain and added our expertise on human system interactions to provide technical complements.

8.4. Bilateral contract with Orange

The Orange company is lacking feedback for the customers interacting with the website and the chat bot dedicated to customer assistance. In order to better understand the sentiment, feelings and satisfaction of the customer, Orange and us agreed on a research work carried out by a PhD student under the direction of Jean-Marc Salotti. Nicolas Simonazzi has been recruited and he started his PhD work in May 2018. He already performed a state of the art on chat bots, sentiment analysis and online assistance tools. He is currently designing an experiment with a simplified chat bot with the objective of testing emotional changes and observing changing behaviors.

8.5. Bilateral contract with CATIE

A bilateral contract has been signed with CATIE (Centre Aquitain des Technologies de l'Information et de l'Electronique) for the study of the links between electric consumption and human systems interactions in buildings of the tertiary sector. The study started in September 2017 and is carried out under the supervision of Jean-Marc Salotti. A large amount of data has been collected (electric consumption, temperature, human presence, etc.) and is currently analyzed. The objective is to help predicting energy consumption in the following days for different parts of the buildings.

AVALON Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

8.1.1. IFPEN

We have a collaboration with IFPEN (http://ifpenergiesnouvelles.com/). IFPEN develops numerical codes to solve PDE with specific adaption of the preconditioning step to fit the requirement of their problems. With a PhD student (Adrien Roussel) we have studied the parallel implementation of multi-level decomposition domains on many-core architecture and KNL processor.

8.1.2. Nokia Bell Labs

AVALON has been actively collaborating with Nokia, formerly Alcatel-Lucent Bell Labs, in the framework of the Nokia/Alcatel-Lucent Inria Joint Laboratory. We was involved in the following Research Actions (Actions de Recherche (ADR) in French) of this laboratory. ADR Nokia Bell Labs /Inria: Procedural Generation of Networks for Security Research & Experimentations. The objective of this project is to address such challenge. We aim at devising a new way where researchers can communicate in a comprehensive and accurate way the experimentation set-up used in their work. The main objective would be to research and develop the procedural generation of credible network topologies and test beds resembling real operational infrastructures of various kinds (e.g. classical ICT, virtualized Cloud or SDN based, SCADA infrastructures etc.), as a method of creating data algorithmically as opposed to manually. This work is done with a postdoc position: Cyril Seguin.

8.2. Bilateral Grants with Industry

8.2.1. Orange

We have a collaboration with Orange. This collaboration is sealed through a CIFRE Phd grant. The research of the Phd student (Arthur Chevalier) focuses on placement and compliance aspects of software licenses in a Cloud architecture. Today, the use of software is regulated by licenses, whether they are free, paid for and with or without access to its sources. The number of licenses required for specific software can be calculated with several metrics, each defined by the software vendor. Our goal is to propose a deployment algorithm that takes into account different metrics.

AVIZ Project-Team (section vide)

BEAGLE Project-Team (section vide)

BIGS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

Bruno Scherrer has done some consulting for EDF. This was a skill transfer activity involving training and consulting on the theory and algorithms for reinforcement learning, for the Research & Development team of EDF conducted by Lorenzo Audibert. This R&D team wants to apply reinforcement learning to several EDF problems: optimizing maintenance of uranium rods in the cores of nuclear power plants, optimizing the control of dam, optimization of load profiles for a network of electric vehicles. Bruno Scherrer's role was to give them the basics of reinforcement learning theory, and help them to use the algorithms of the literature. It was a one-shot action, running in 2018, and contractualized via a "framework agreement" Inria-EDF. This contract brings in approximately 12,000 euros to BIGS team (among which 2,000 for mission expenses).

R. Azaïs, A. Gégout-Petit, F. Greciet collaborated with SAFRAN Aircraft Engines (through a 2016-2019 contract). SAFRAN Aircraft Engines designs and products Aircraft Engines. For the design of pieces, they have to understand mechanism of crack propagation under different conditions. It appeals to BIGS for modeling crack propagation with Piecewise Deterministic Markov Processes (PDMP).

BIOCORE Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

BioEnTech: the collaboration with the BioEnTech start-up is aiming at developing new functionalities for ODIN in order to improve the advanced monitoring and control of industrial anaerobic digesters.

Inalve: with the Inalve start-up we develop a breakthrough process that we patented, in which microalgae grow within a moving biofilm. The objective of the collaboration is to optimize the process by enhancing productivity, while reducing environmental footprint.

8.2. Bilateral Grants with Industry

Exactcure: in the collaboration with the start-up Exactcure (Nice), the goal of the project is to study pharmacokinetic models. Exactcure funded the M2 internship of J.B. Excoffier.

BIOVISION Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. Could hardware solutions coming from the automotive industry be useful in the context of low vision?

Participants: Josselin Gautier, Nicolas Chleq [Inria, SED], Pierre Kornprobst, Frédéric Dosière [Bosch Visiontec (Sophia Antipolis, France)], David Coupé [Bosch Visiontec (Sophia Antipolis, France)]

Duration: August 2017 to March 2018

Thanks to a partnership with Bosch Visiontec (Sophia Antipolis, France), we have investigated how hardware solutions coming from the automotive industry (RENESAS Starter-Kit RCar H3) could be used to design real-time vision-aid-systems based on augmented reality. We focused on the detection and enhancement of faces. We analysed the performance of a selection of enhancement algorithms and optimised them taking into consideration the hardware limitations.

Based on the same ideas, a working prototype has also been developed using a Fove 0 head-mounted display and tested with three patients with central vision loss (see Sec.6.1.1).

BONSAI Project-Team (section vide)

BONUS Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

Our current industrial contracts and granted projects are completely at the heart of the BONUS project. They are summarized in the following.

- *Beckman & Coulter (2015-2018, California, USA)*: the goal of this contract is the strategic and operational planning of large medical laboratories (Phd of S. Faramarzi-Oghani). More exactly, the focus is put on the multi-objective modeling and solving of large (e.g. dozens of thousands of medical test tubes to be analyzed) strategic, tactical and operational problems such as the layout design, machine selection and confguration, assignment and scheduling. The project deals also with the coupling between optimization and simulation for performance assessment.
- *EDF (2015-2019, Paris)*: this project deals with demand-side management in smart grids with EDF, a major electrical power player in France. The Energy Management System (EMS) in the home receives the market and system signals and controls the loads, Heating, Ventilation and Air Conditioning systems (HVAC), storages and local generation units according to the user preferences. A large number of home users and appliances and several conflicting objectives have to be considered.
- *ONERA & CNES (2016-2020, Paris)*: the focus of this project with major European players in vehicle aerospace is put on the design of aerospace vehicles, a high-dimensional expensive multidisciplinary problem. Such problem needs the use of the research lines of BONUS to be tackled effectively and efficiently. Two jointly supervised Phd students (J. Pelamatti and A. Hebbal) are involved in this project.
- *In contact with EXOTEC (2018-2019, Lille)*: This project deals with the optimization of logistics flows of robots. More exactly, the problem consists in efficient complex scheduling without collision of thousands of missions realized by a fleet of dozens of robots and several operators in a 3D logistics warehouse.

CAGE Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

A bilateral contract with CNES funded the PhD thesis of Antoine Olivier, who defended in October 2018.

CAGIRE Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

- EDF: "Advanced modelling of heat transfer for industrial configurations with or without accounting of the solid wall", contract associated to the PhD thesis of Gaëtan Mangeon
- EDF: "Hybrid RANS/LES modelling for unsteady loadings in turbulent flows", contract associated to the PhD thesis of Vladimir Duffal
- IFPEN: "3D simulation of non-reactive internal aerodynamics of spark-ignition engines using an hybrid RANS/LES method", contract associated to the PhD thesis of Hassan Al Afailal
- PSA: "Turbulence modelling in the mixed and natural convection regimes in the context of automotive applications", contract associated to the PhD thesis of Saad Jameel.

8.2. Bilateral Grants with Industry

- EDF (Cifre PhD grant): "Advanced modelling of heat transfer for industrial configurations with or without accounting of the solid wall", PhD student: Gaëtan Mangeon
- EDF (Cifre PhD grant): "Hybrid RANS/LES modelling for unsteady loadings in turbulent flows", PhD student: Vladimir Duffal
- IFPEN (PhD grant): "3D simulation of non-reactive internal aerodynamics of spark-ignition engines using an hybrid RANS/LES method", PhD sutdent: Hassan Al Afailal
- PSA (Cifre PhD grant): "Turbulence modelling in the mixed and natural convection regimes in the context of automotive applications", PhD student: Saad Jameel.
- Dassault Aviation (Cifre PhD grant): "Amélioration des modèles pour la turbulence. Applications à la prédiction des écoulements aérodynamiques.", PhD student: Gustave Sporschill.

CAIRN Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

Collaboration with Huawei Technologies, Sophia Antipolis: In the context of Image Signal Processing (ISP), the project aims at building a proof of concept of an environment able to automatically optimize the precision of every operator (fixed-point or floating-point arithmetic) in a complex, multi-kernel algorithm and find the best tradeoff between cost/power and image quality.

CAMIN Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

- collaboration contract with FEETME (http://www.feetme.fr) company.
- collaboration contract with Innopsys (https://www.innopsys.com/en) company.
- collaboration contract with ISIDU (https://isidu.eu/) company.
- collaboration contract with Berkelbike (https://berkelbike.com) company.

7.2. Bilateral Grants with Industry

- collaboration contract with NEURORESP (http://neuroresp.com/) company (CIFRE PhD thesis).
- collaboration contract with SubseaTech (https://www.subsea-tech.com/) company, CIFRE PhD thesis about the on-the-fly optimization of actuators steering for underwater vehicles.

CAMUS Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

8.1.1. Caldera

Vincent Loechner and Cédric Bastoul are involved in a collaboration with the Caldera company (http://www.caldera.com), specialized in software development for wide image processing. The goal of this collaboration is the development of parallel and scalable image processing pipeline for industrial printing. The project started in September 2016 and involves a contract established between the ICube laboratory and the Caldera company. It also includes the funding of the industrial thesis (CIFRE) of Paul Godard (started in September 2016) on the topic of the collaboration, under the supervision of Vincent Loechner and Cédric Bastoul.

CAPSID Project-Team (section vide)

CARAMBA Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

- We have training and consulting activities with the French Ministry of Defense.
- Together with the PESTO team, we have a contract with the Docapost company, the purpose of which is to impove their e-voting solution by adding some verifiability properties and switching to elliptic curve cryptography.
- In this contract handled in collaboration with the University of Bristol and the PESTO team, the goal is to audit and prove security properties of a new e-voting protocol called CHVote, to be used in a few cantons of Switzerland.

8.2. Bilateral Grants with Industry

- This contract with Orange Gardens at Chatillon-Montrouge is dedicated to the supervision of Sandra Rasoamiaramanana's PhD thesis about security in the white box context. The co-supervisor for Orange Gardens is Gilles Macario-rat.
- This contract with Thales (Thales Communication & Security, Genneviliers, subsidiary of Thales Group) is dedicated to the supervision of Simon Masson's PhD thesis about elliptic curves for bilinear and post-quantum cryptography. The co-supervisor for Thales is Olivier Bernard.

CARDAMOM Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

- BGS IT&E, Flash flood simulations with a coupled model, Coordinator: M. Ricchiuto, 32 keuros total (2 consulting contracts from 2016 to 2019)
- THALES/16-12035, Activity around the numerical certification of debris codes, Coordinator: P.M. Congedo, 23 Keuros ;
- ArianeGroup, Activity around techniques for computing low-probabilities, Coordinator: P.M. Congedo, 20 Keuros ;
- CEA-CESTA, Coordinator: P.M. Congedo, 40 Keuros ;

CARMEN Project-Team (section vide)

CASCADE Project-Team (section vide)

CASH Team (section vide)

CASTOR Project-Team (section vide)

CEDAR Project-Team (section vide)

CELTIQUE Project-Team (section vide)

Chroma Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

8.1.1. VOLVO-Renault Trucks Group (2016-2019)

Participants: Olivier Simonin, Jilles Dibangoye, Guillaume Bono, Mohamad Hobballah, Laetitia Matignon.

This collaboration has been built inside the INSA-VOLVO Chair, led by Prof. Didier Remond (INSA). In this context, the Chair funds the PhD Thesis of Guillaume Bono (2016-19) in Chroma. The objective is to study how machine learning techniques can deal with optimization of goods distribution using a fleet of autonomous vehicles. In the following of the first results, VOLVO proposed to extend our collaboration by funding a Post-doc position concerning good distribution with platoons of autonomous vehicles. This is the Post-Doc of Mohamad Hobballah, started on February 2018.

8.1.2. Toyota Motor Europe (2006 - 2018)

Participants: Christian Laugier, David Sierra González, Özgür Erkent, Jilles Dibangoye, Christian Wolf.

The contract with Toyota Motors Europe is a joint collaboration involving Toyota Motors Europe, Inria and ProbaYes. It follows a first successful short term collaboration with Toyota in 2005. This contract aims at developing innovative technologies in the context of automotive safety. The idea is to improve road safety in driving situations by equipping vehicles with the technology to model on the fly the dynamic environment, to sense and identify potentially dangerous traffic participants or road obstacles, and to evaluate the collision risk. The sensing is performed using sensors commonly used in automotive applications such as cameras and lidar.

This collaboration has been extended in 2018 for 4 years (period 2018-2021) and Toyota provides us with an experimental vehicle Lexus equipped with various sensing and control capabilities. Several additional connected technical contracts have also been signed, and an exploitation licence for the *CMCDOT* software has been bought by Toyota in 2018.

8.2. Bilateral Grants with Industry

8.2.1. Renault (2015 - 2018)

Participants: Mathieu Barbier, Christian Laugier, Olivier Simonin.

This contract was linked to the PhD Thesis of Mathieu Barbier (Cifre Thesis). The objective is to develop technologies for collaborative driving as part of a Driving Assistance Systems for improving car safety in road intersections. Both vehicle perception and communications are considered in the scope of this study. Some additional short-term contracts (about 3 months) and an evaluation license for the team *CMCDOT* software have also been signed during this period. *We are on the process of signing a new PhD research agreement for the period 2019 – 2021, with objective to address the open problem of emergency obstacle avoidance in complex traffic situations (for ADAS or AD applications).*

8.2.2. IRT Nanoelec – Security of Autonomous Vehicles project (2018 - 2020)

Participants: Christian Laugier, Lukas Rummelhard, Jerome Lussereau, Jean-Alix David, Thomas Genevois, Nicolas Turro [SED].

Security of Autonomous Vehicles is a project supported by ANR in the scope of the program PULSE of IRT Nanoelec. The objective of this project is to integrate, develop and promote technological bricks of context capture, for the safety of the autonomous vehicle. Building on *Embedded Bayesian Perception for Dynamic Environment*, Bayesian data fusion and filtering technologies from sets of heterogeneous sensors, these bricks make it possible to secure the movements of vehicles, but also provide them with an enriched and useful representation for autonomy functions themselves. In this context, various demonstrators embedding those technology bricks are developed in cooperation with industrial partners.

8.2.3. FUI Tornado (2017 – 2020)

Participants: Rabbia Asghar, Anne Spalanzani, Christian Laugier, Olivier Simonin.

The project Tornado is coordinated by Renault. The academic partners of the project are Inria Grenoble-Rhône Alpes, UTC, Institut Pascal, University of Pau, IFSTTAR. The industrial and application partners are Renault, Easymile, Neavia, Exoskills, 4D-Virtualiz, MBPC and Rambouillet Territoires. The objective of the project is to demonstrate the feasibility of a mobility service systems operating in the commercial zone of Rambouillet and on some public roads located in its vicinity. Several autonomous cars (Autonomous Renault Zoe). The *IRT Nanoelec* is also involved in the project as a subcontractor, for testing the perception, decision-making, navigation and controls components developed in the project.

8.2.4. FUI STAR (2018 – 2021)

Participants: Andres Gomez Hernandez, Olivier Simonin, Christian Laugier.

The Project STAR is coordinated by IVECO. The academic partners of the projects are Inria Grenoble-Rhône, IFSTTAR, ISAE-Supaéro. The industrial and application partners are IVECO, Easymile, Transpolis, Transdev and Sector Groupe. The goal of the project is to build an autonomous bus that will operate on a safe from other vehicle lane but not from pedestrian. Inria is involved in helping design situation awarness perception, specialy in special case like docking at the bus stop and handling dynamicity of any obstacle. The *IRT Nanoelec* is also involved in the project as a subcontractor, for testing the perception, decision-making, navigation and controls components developed in the project.

CIDRE Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

- **HP (2013-2019): Embedded Systems Security** We aim at researching and prototyping low-level intrusion detection mechanisms in embedded system software. This involves mechanisms in continuation of previous work realized by our team as well as investigating new techniques more directly tied to specific HP device architectures. Our main objective is to monitor low-level software (firmware, OS kernels, hypervisors) thanks to a dedicated external co-processor. Ronny Chevalier is doing is PhD in the context of this project. Being under NDA, details about this research program cannot be provided.

7.2. Bilateral Grants with Industry

- **ANSSI: Security of Low-level Components** Thomas Letan has started his PhD thesis in the context of a contract between CentraleSupelec and the French National Computer Security Agency (ANSSI). His work consists in using formal methods to specify hardware/software security mechanisms and to verify that they correctly enforce some security policies.
- **DGA: Visualization for security events monitoring** Damien Crémilleux has started his PhD thesis in October 2015 in the context of a cooperation with DGA-MI. The subject of the PhD is to define relevant representations to allow front-line security operators to monitors systems from a security perspective. A first proposal was made that led to a tool, VEGAS, that allows to monitor large quantities of alerts in real time and to dispatch these alerts in a relevant way to security analysts.
- **DGA: Intrusion Detection in Distributed Applications** David Lanoé has started his PhD thesis in October 2016 in the context of a cooperation with DGA-MI. His work is focussing on the construction of behavioral models (during a learning phase) and their use to detect intrusions during an execution of the modelled distributed application.
- **DGA: Protection against fuzzing attack** Aurelien Palisse has started his PhD in October 2015 in the context of a cooperation with DGA-MI. The subject of the PhD is to propose a detection mechanism and a mitigation procedure to counter ransomware attacks. He designed a low cost Windows driver that use a Markov chain as a model for an anomaly detection system. The technology has been patented by both Inria and DGA.
- **Idemia: Hardware Security for Embeded Devices** Kevin Bukasa has started his PhD in January 2016 in a bilateral contract between Inria and Idemia. He explored fault injection attacks using EM probes on two different kind of devices: microcontroller (representing IoT) and SoC (representing Smart phone). He demonstrated the vulnerability of both architectures on this kind of attack. On IoT device he has developped an attack allowing to take a full control on the device. He discovered also new fault attacks never described in the litterature.
- **Idemia: Protection against fuzzing attack** Leopold Ouairy has started his PhD in October 2017 in a bilateral contract between Inria and Idemia. The context is related with security testing of Java applications to avoid fuzzing attack. The approach is based on AI to design automatically a model use for the oracle. He used machine learning to serach in a corpus of applicatons methods having the same semantics. Then in a second step, after convertir the source code into a vector he compute a similarity value which is related with absence of conditions evaluation.

- **Ministry of Defence: Visualisation for the characterization of security events** Laetitia Leichtnam has started his PhD thesis in November 2016 in the context of a contract between CentraleSupelec and the French Ministry of Defence. His work consists in presenting events appearing in heterogeneous logs as a dependency graph between the lines of logs. This permits to the administrator to investigate easily the logs to discover the different steps that has performed an attack in the supervised system.
- **Ministry of Defence: Characterization of an attacker** Aïmad Berady has started his PhD thesis in November 2018 in the context of a contract between CentraleSupelec and the French Ministry of Defence. His work is to highlight the characteristics of an attacker performing a targeted and long-term attack on an information system.
- **Nokia: Risk-aware security policies adaptation in modern communication infrastructures** Pernelle Mensah was hired in January 2016 on this CIFRE funding in order to work on unexplored aspects of information security, and in particular response strategies to complex attacks, in the context of cloud computing architectures. The use case proposed by our industrial partner is a multi-tenant cloud computing platform involving software-defined networking in order to provide further flexibility and responsiveness in architecture management. The topic of the thesis is to adapt and improve the current risk-aware reactive response tools, based on attack graphs and adaptive security policies, to this specific environment, taking into account the heterogeneity of actors, platforms, policies and remediation options.
- **Orange LAb's: Storage and query in a massive distributed graph for the web of things** Cyprien Gottstein has started his PhD thesis in October 2018 in the context of a collaboration between Inria and Orange (I/O Lab). In this thesis, we consider storage and query problems that arise when massive distributed graphs are used to represent the web of things. In particular, access to the data and partitioning of the graph are studied to propose efficient geographical services.
- **Thales: Privacy and Secure Multi-party Computation** Aurélien Dupin has started his PhD thesis in January 2016 within the context of a CIFRE contract with Thales. His PhD subject concerns secure multi-party computation. Secure two-party computation provides a way for two parties to compute a function, that depends on the two parties' inputs, while keeping them private. Known since the 1980s, Yao's garbled circuits appear to be a general solution to this problem, in the semi-honest model. Decades of optimizations have made this tool a very practical solution. However, it is well known that a malicious adversary could modify a garbled circuit before submitting it. Many protocols, mostly based on cut-&-choose, have been proposed to secure Yao's garbled circuits in the presence of malicious adversaries. Nevertheless, how much an adversary can modify a circuit and make it still executable have not been studied. In the context of his PhD, Aurélien Dupin is interested by such a question.
- **Thales: Combining Attack Specification and Dynamic Learning from traces for correlation rule generation** Charles Xosanavongsa has started his PhD thesis in December 2016 in the context of a CIFRE with Thales. His work will focus on the construction of correlation rules. In previous work on correlation rule generation, the usual approach is static. It always relies on the description of the supervised system using a knowledge base of the system. The use of correlation trees is an appealing solution because it allows to have a precise description of the attacks and can handle any kind of IDS. But in practice, the behavior of each IDS is quite difficult to predict, in particular for anomaly based IDS. To manage automatically the correlation rules (and adapt them if necessary), we plan to analyze synthetic traces containing both anomaly based and misused based IDS alerts resulting from an attack.

Coast Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. Contrat Open Group 2017-2020

Participants: Claudia-Lavinia Ignat, François Charoy [contact], Gérald Oster, Olivier Perrin, Anis Ahmed Nacer.

The objective of the project is to propose and validate a model of service composition for middleware services for software as a service architecture. The composition must take into account middleware service quality attributes and service plan in order to optimise the operational cost while ensuring a level of quality of service.

COATI Project-Team (section vide)

COFFEE Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

- Contract with Andra financing the two year postdoctoral position of Joubine Aghili (october 2017 - september 2019) and dealing with the simulation of compositional liquid gas Darcy flows in highly heterogeneous porous medium with network of fractures using Discrete Fracture Matrix models (DFM). It is applied to the simulation of the desaturation of the nuclear waste storage in the neighbourhood of the galleries. Supervision Roland Masson and Konstantin Brenner from LJAD-Inria, Jean-Raynald de Dreuzy from Geosciences Rennes and Laurent Trenty from Andra.

COMETE Project-Team (section vide)

COML Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Grants with Industry

- Google Faculty Award - 100K€
- Facebook AI Research Grant - 350K€

COMMANDS Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

Contract with Safety Line: support of an Ilab and of a Cifre PhD. Toolbox Bocop is a component of the commercial service OptiClimb used by several airplane companies.

CONVECS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Grants with Industry

7.1.1. Orange Labs

Participants: Umar Ozeer, Gwen Salaün.

Umar Ozeer is supported by a PhD grant (from November 2016 to November 2019) from Orange Labs (Grenoble) on detecting and repairing failures of data-centric applications distributed in the cloud and the IoT (see § 6.5.1), under the supervision of Loïc Letondeur (Orange Labs), Gwen Salaün (CONVECS), François Gaël Ottogalli (Orange Labs), and Jean-Marc Vincent (POLARIS project-team).

7.1.2. Nokia Bell Labs

Participants: Radu Mateescu, Ajay Muroor Nadumane, Gwen Salaün.

Ajay Muroor Nadumane is supported by a PhD grant (from October 2017 to October 2020) from Nokia Bell Labs (Nozay) on IoT service composition supported by formal methods, under the supervision of Gwen Salaün (CONVECS), Radu Mateescu (CONVECS), Ludovic Noirie, and Michel Le Pallec (Nokia Bell Labs).

CORSE Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

- CORSE is involved in a contract with Atos/Bull which objective is the objective is to optimize the energy consumption of HPC applications on large scale plateforms.

8.2. Bilateral Grants with Industry

- ES3CAP is a bilateral grant with Kalray. CORSE is involved in the optimisation of machine learning algorithms for many-core architectures.

CQFD Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. Naval Group

Participants: Huilong Zhang, Jonatha Anselmi, François Dufour, Dann Laneuville.

The increasing complexity of warfare submarine missions has led Naval Group to study new tactical help functions for underwater combat management systems. In this context, the objective is to find optimal trajectories according to the current mission type by taking into account sensors, environment and surrounding targets. This problem has been modeled as a discrete-time Markov decision process with finite horizon. A quantization technique has been applied to discretize the problem in order to get a finite MDP for which standard methods such as the dynamic and/or the linear programming approaches can be applied. Different kind of scenarios have been considered and studied.

7.1.2. Thales Optronique

Participants: Benoîte de Saporta, François Dufour, Tiffany Cerchi.

Maintenance, optimization, fleet of industrial equipements The topic of this collaboration with Université de Montpellier and Thales Optronique is the application of Markov decision processes to the maintenance optimization of a fleet of industrial equipments.

7.1.3. Lyre: ADEQWAT project

Participants: François Dufour, Alexandre Genadot, Jérôme Saracco.

Stochastic modelling, Optimization. This project has just started in November 2017. The topic of this collaboration with Lyre, l'Agence de l'eau Adour-Garonne and ENSEGID is the modeling of the uncertainties in the Water demand adequacy in a context of global climate change. A PhD thesis (2018-2021) is part of this project.

CTRL-A Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

Our cooperation with CEA (an EPIC, industrial and commercial public institution) concerns the LETI/LIST DACLE laboratory at Grenoble Minatec; it is bilateral, involving the CEA PhD grant of Adja Sylla (finished end of january 2018), to work with F. Pacull and M. Louvel on high-level programming on top of a rule-based middleware (See Sections 6.1.3 and 6.2.2.1).

7.2. Bilateral Grants with Industry

7.2.1. Orange

We have a cooperation with Orange labs, around a CIFRE PhD grant, on the topic of autonomic device management (see Section 6.2.2.2). This activity is part of the Inria/Orange joint laboratory.

7.2.2. Nokia / Bell labs

We are starting a research action with Nokia / Bell labs, around a post-doctorate, co-advised with project-team Dyonisos at Inria Rennes, on the topic of the integration of FPGA-based accelerators in network nodes, and their reconfiguration management in coordination with higher level Software Defined Networks management. This activity is part of the Inria/ Nokia / Bell labs joint laboratory, and is in cooperation with the Dyonisos EPI at Inria Rennes Bretagne Atlantique (Yassine Hadjhadj), and the post-doctorate topic of Quang Pham Tran Anh.

DANTE Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. GranData

Participants: Márton Karsai [correspondant], Éric Fleury.

Founded in 2012, Grandata is a Palo Alto-based company that leverages advanced research in Human Dynamics (the application of « big data » to social relationships and human behaviour) to identify market trends and predict customer actions. Leading telecom and financial services firms are using Grandata's Social Universe product to transform « big data » into impressive business results.

The DANTE team and Grandata started to collaborate in 2014 on the analysis of large datasets provided by the company. The aim of the collaboration is to gain better understanding about the dynamical patterns of human interactions, mobility, and the socio-economic structure of the society. This collaboration was very successful over the years, leading to several publications within the PhD thesis of Yannick Leo. Currently the collaboration is supported by the MOTIF Stic-AmSud project (2018-2020) (coordinated by Márton Karsai) which allows to meet frequently with the company. Recent projects within this collaboration are focusing on socioeconomic inference using remote sensing techniques.

DATAMOVE Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

- **BULL-ATOS SE (2016-2019)**. Two PhD grants (Michael Mercier and Adrien Faure). Job and resource management algorithms.
- **CEA DAM (2016-2018)**. PhD grant support contract (PhD of Estelle Dirand, funded by CEA). In situ analysis for Molecular Simulations.

DATASHAPE Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

- Collaboration with Sysnav, a French SME with world leading expertise in navigation and geopositioning in extreme environments, on TDA, geometric approaches and machine learning for the analysis of movements of pedestrians and patients equipped with inetial sensors (CIFRE PhD of Bertrand Beaufils).
- Research collaboration with Fujitsu on the development of new TDA methods and tools for Machine learning and Artificial Intelligence (started in Dec 2017).

8.2. Bilateral Grants with Industry

- DATASHAPE and Sysnav have been selected for the ANR/DGA Challenge MALIN (funding: 700 kEuros) on pedestrian motion reconstruction in severe environments (without GPS access).

DATASPHERE Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Grants with Industry

The PhD Thesis of Colin Gerard is funded through a contract with DGA (Ministry of Defense).

DEDUCTEAM Project-Team (section vide)

DEFI Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

- A CIFRE PhD thesis started in December 2015 with Safran Tech. The student is Mrs Perle Geoffroy who is working on "topology optimization by the homogenization method in the context of additive manufacturing".
- A CIFRE PhD thesis started in April 2017 with Safran Tech. The student is M. Florian Feppon who is working on "topology optimization for a coupled thermal-fluid-structure system".
- A CIFRE PhD thesis started in October 2017 with Renault. The student is Mrs Lalaina Rakotondrainibe who is working on "topology optimization of connections between mechanical parts".
- A CIFRE PhD thesis started November 2017 with EDF. The student is H. Girardon who is working on "level set method for eddy current non destructive testting".
- A CIFRE PhD thesis started May 2017 with ArianeGroup. The student is M. Mickael Rivier who is working on "Optimization under uncertainty methods for expensive computer codes".
- A CIFRE PhD thesis started November 2018 with CEA CESTA. The student is M. Paul Novello who is working on "Deep Learning for atmospheric reentry".

8.2. Bilateral Grants with Industry

- The SOFIA project (SOlutions pour la Fabrication Industrielle Additive métallique) started in the summer of 2016. Its purpose is to make research in the field of metallic additive manufacturing. The industrial partners include Michelin, FMAS, ESI, Safran and others. The academic partners are different laboratories of CNRS, including CMAP at Ecole Polytechnique. The project is funded for 6 years by BPI (Banque Publique d'Investissement).
- G. Allaire is participating to the TOP project at IRT SystemX which started in February 2017. It is concerned with the development of a topology optimization platform with industrial partners (Renault, Safran, Airbus, ESI).
- FUI project Saxsize. This three years project started in October 2015 and extended till April 2019 and it involves Xenocs (coordinator), Inria (DEFI), Pyxalis, LNE, Cordouan and CEA. It is a followup of Nanolytix where a focus is put on SAXS quantifications of dense nanoparticle solutions.
- Contract with THALES, Activity around the numerical certification of debris codes, Coordinator: P.M. Congedo.
- Contract with ArianeGroup, Activity around techniques for Uncertainty Quantification, Coordinator: P.M. Congedo.

DEFROST Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

TDR group is a robotics integrator specialized on optimizing production chains, usually multiplexing robots to perform several activities. Hence, their interest in graspers and the time invested in this activity has been growing within the last years. To improve this aspect, we have been developing together a concept of "universal grasper", based on soft robotics technology and capable of grasping an object with an arbitrary shape, and partially misplaced or misoriented. The prototype developed complies with the specifications and allows for scalability, with flexibility between grasping force and shape tolerance, and the ability for replacing objects without the need of an external vision system. Relying in SOFA for physical simulation, we have validated a prototype, and realize it. An industrial version of the prototype has been realized this year. It will be commercialized next year.

DELYS Team

6. Bilateral Contracts and Grants with Industry

6.1. Bilateral Contracts with Industry

DELYS has a CIFRE contract with Scality SA:

- Dimitrios Vasilas is advised by Marc Shapiro and Brad King. He works on secondary indexing in large-scale storage systems under weak consistency.

DELYS has two CIFRE contracts with Magency SA:

- Damien Carver is advised by Julien Sopena and Sébatien Monnet. He works on designing kernel-level mechanisms that automatically give more memory to the most active containers.
- Lyes Hamidouche is advised by Pierre Sens and Sébatien Monnet. He works on efficient data dissemination among a large number of mobile devices. He defended his thesis in April 2018.

DELYS has two contracts with Orange within the I/O Lab joint laboratory:

- Guillaume Fraysse is advised by Jonathan Lejeune, Julien Sopena, and Pierre Sens. He works on distributed resources allocation in virtual network environments.
- Jonathan Sid-Otmane is advised by Marc Shapiro. He studies the applications of distributed databases to the needs of the telco industry in the context of 5G.

DIANA Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. SAFRAN

Participants: Damien Saucez.

We have a bilateral contract covering 2017 and 2018 with Safran Electrical and Power in order to build a network simulator specialised for aeronautical networks.

7.2. Bilateral Grants with Industry

7.2.1. QWANT

Participants: Arnaud Legout.

The PIA ANSWER project is led by the QWANT search engine and the Inria Sophia Antipolis Méditerranée research center. This proposal is the winner of the "Grand Challenges du Numérique" (BPI) and aims to develop the new version of the search engine http://www.qwant.com with radical innovations in terms of search criteria, indexed content and privacy of users. In the context of this project, we got with Nataliia Bielova from the INDES project-team a funding for a 3 years Ph.D. working on Web tracking technologies and privacy protection.

DIONYSOS Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Cifre contract on Personalization for Cognitive Autonomic Networks in 5G

Participant: César Viho.

This is a Cifre contract (2017-2019) including a PhD thesis supervision (PhD of Illyyne Saffar), done with Nokia, on the proposition to use machine learning and data analytics to transform user and network data into actionable knowledge which in turn can be automatically exploited by Autonomic Networking approaches for cognitive self management of the 5G network.

8.2. Cifre contract on Device-Assisted Distributed Machine-Learning on Many Cores

Participants: Corentin Hardy, Bruno Sericola.

This is a Cifre contract including a PhD thesis supervision (PhD of Corentin Hardy), done with Technicolor. The starting point of this thesis is to consider the possibility to deploy machine-learning algorithms over many cores, but out of the datacenter, on the devices (home-gateways) deployed by Technicolor in users' homes. In this device-assisted view, an initial processing step in the device may significantly reduce the burden on the datacenter back-end. Problems are numerous (power consumption, CPU power, network bandwidth and latency), but costs for the operator can be lowered and scale may bring some new level in data processing.

8.3. Cifre contract on Throughput Prediction in Mobile Networks

Participant: Yann Busnel.

This is a Cifre contract (2015-2018) including a PhD thesis supervision (PhD of Alassane Samba), done with Orange, on cooperation in statistical approaches for the prediction of throughput without history. Throughput has a strong impact on user experience in cellular networks. The ability to predict the throughput of a connection, before it starts, bring new possibilities, particularly to the Internet service providers. They could adapt contents to the quality of service really reachable by users, in order to enhance their experience.

8.4. Cifre contract on Mobile SDN architecture

Participants: Yassine Hadjadj-Aoul, César Viho.

This is a Cifre contract (2015-2018) including a PhD thesis supervision (PhD of Imad Alawe), done with TDF, on the proposition of a scalable SDN-based mobile network architectures for the future 5G network.

8.5. Bilateral Contract with Industry: ALSTOM-Inria Common Lab

Participants: Bruno Tuffin, Gerardo Rubino.

Bruno Tuffin is the co-director of ALSTOM-Inria common Lab.

The group currently manages a project with ALSTOM on system availability simulation taking into account logistic constraints. Current ALSTOM Transport and Power contracts, especially service-level agreements, impose stringent system availability objectives. Non-adherence to the required performance levels often leads to penalties, and it is therefore critical to assess the corresponding risks already at a tender stage. The challenge is to achieve accurate results in a reasonable amount of time. Monte Carlo simulation provides estimates of the quantities it is desired to predict (e.g., availability). Since we deal with rare events, variance reduction techniques, specifically Importance Sampling (IS) here, is used. The goal of the project is to establish the feasibility of IS for solving problems relevant to ALSTOM and to develop the corresponding mathematical tools.

8.6. DVD2C

Participant: Yassine Hadjadj-Aoul.

We participated to the 3-year (January 2015 – June 2018) FUI Project DVD2C, which aims to virtualize CDN through the Cloud and Network Function Virtualization concept. DVD2C is leaded by Orange labs., and the partners are two SMEs (Viotech and Resonate) and two academics (our team and Télécom Paris Sud).

8.7. Bilateral Contract with Industry: Nokia Bell Labs

Participants: Yassine Hadjadj-Aoul, Gerardo Rubino.

Gerardo Rubino is the coordinator of the research action “Analytics and machine learning”, with Nokia Bell Labs. The objective is to carry out common research on an integrated framework for 5G, programmable networks, IoT and clouds that aims at statically and dynamically managing and optimizing the 5G infrastructure using, in particular, machine learning techniques.

DISCO Project-Team (section vide)

DIVERSE Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. ADR Nokia

- Coordinator: Inria
- Dates: 2017-2021
- Abstract: The goal of this project is to integrate chaos engineering principles to IoT Services frameworks to improve the robustness of the software-defined network services using this approach, to explore the concept of equivalence for software-defined network services, and to propose an approach to constantly alter the attack surface of the network services.

7.1.2. BCOM

- Coordinator: UR1
- Dates: 2018-2024
- Abstract: The purpose of the Falcon project is to investigate how to improve the resale of available resources in private clouds to third parties. In this context, the collaboration with DiverSE mainly aims to work on efficient techniques for the design of consumption models and resource consumption forecasting models. These models are then used as a knowledge base in a classical autonomous loop.

7.1.3. GLOSE

- Partners: Inria/CNRS/Safran
- Dates: 2017-2021
- Abstract: The GLOSE project develops new techniques for heterogeneous modeling and simulation in the context of systems engineering. It aims to provide formal and operational tools and methods to formalize the behavioral semantics of the various modeling languages used at system-level. These semantics will be used to extract behavioral language interfaces supporting the definition of coordination patterns. These patterns, in turn, can systematically be used to drive the coordination of any model conforming to these languages. The project is structured according to the following tasks: concurrent xDSML engineering, coordination of discrete models, and coordination of discrete/continuous models. The project is funded in the context of the network DESIR, and supported by the GEMOC initiative.

7.1.4. OneShotSoftware

- Partners: Inria/Orange
- Dates: 2017-2019
- Abstract: The OSS project investigates an extreme version of moving target defense where a slightly different version of the application is deployed each time it is used (e.g., for crypto functions or payment services). We investigate the analysis, synthesis and transformation techniques to support diversification at five locations of a software construction pipeline, which once combined yield up to billions of variants. We also evaluate the support of diversification as a first class property in DevOps.

7.1.5. Agileo

- Partners: Inria/Agileo
- Dates: 2017-2018

- Abstract: In this project we mainly design a systematic mapping study on modeling for Industry 4.0 in order to share a common scientific roadmap.

7.1.6. Obeo

- Partners: Inria/Obo
- Dates: 2017-2020
- Abstract: Web engineering for domain-specific modeling languages, Fabien Coulon's PhD Cifre project.

7.1.7. OKWind

- Partners: UR1/OKWind
- Dates: 2017-2020
- Abstract: Models@runtime to improve self-consumption of renewable energies, Alexandre Rio's PhD Cifre project. .

7.1.8. Orange

- Partners: UR1/Orange
- Dates: 2016-2019
- Abstract: Security level modelling of user interface, Youssou Ndiaye's PhD Cifre project. .

7.1.9. Keolis

- Partners: UR1/Keolis
- Dates: 2018-2021
- Abstract: Urban mobility: machine learning for building simulators using large amounts of data, Gauthier LYAN's PhD Cifre project. .

7.1.10. FaberNovel

- Partners: UR1/FaberNovel
- Dates: 2018-2021
- Abstract: Abstractions for linked data and the programmable web, Antoine Cheron's PhD Cifre project. .

DRACULA Project-Team (section vide)

DYLISS Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Grants with Industry

8.1.1. SANOFI: co-supervised phD

Participants: Emmanuelle Becker, Olivier Dameron, Anne Siegel, Méline Wery.

This collaboration project is focused on the implementation of an integrative analysis framework based on semantic web technologies and reasoning in the framework of scleroderma pathology. **CIFRE co-supervised Grant: Ph.D. funding. 2017-2020**

DYOGENE Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. CRE with Huawei

18-month contract titled “Mathematical Modeling of 5G Ultra Dense Wireless Networks” between Inria represented by B. Blaszczyszyn (PI) and F. Baccelli, and Huawei comes to an end in December 2018. It aimed at investigating obstacle-based shadowing fields in the spatial models of cellular networks and efficient scheduling policies. Paul Keeler was hired by Inria as a research engineer thanks to this contract. The publication [39] is one of the deliverable of this contract.

7.2. CIFRE with Nokia

Contract with Nokia started in 2015 for the co-advising by B. Blaszczyszyn of a PhD student of Nokia, Dalia-Georgiana Herculea came to an end in December 2018. Dalia-Georgiana Herculea has successfully defended her PhD Thesis in November 2018.

7.3. CIFRE with Orange

Contract with Orange started in 2017 and continued in 2018 for the co-advising by B. Blaszczyszyn of a PhD student of Orange, Quentin Le Gall.

EASE Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

Project: SIMHet

Partner: YoGoKo

Coordinator: JM. Bonnin

Starting: Nov 2015 - Ending: October 2018

Abstract: The SIMHet project is performed in partnership with YoGoKo, a start-up that develops innovative communication solutions for cooperative intelligent transport systems. The SIMHet project aims to develop a decision making mechanism that would be integrated in the ISO/ETSI ITS communication architecture. It will allow mobile devices or mobile routers to choose the best network interface for each embedded application/flow. For example, in a vehicular environment this mechanism could manage global (Internet) and local connections for each on board device/application, in order to ensure that applications and services are always best connected. Aware that "best" concept is context-dependent, such a decision making mechanism should take into account requirements from different actors (e.g., applications, user, network administrators) and contextual information. One of the difficulties is to take advantage of the knowledge the system could have about near future connectivity. In the vehicular context such information about the movement and the availability of network resources is available. If taking into account the future makes the decision making more complex, this could allow a better usage of network resources when they are available. Once current solutions in the market are based on very simple decisions (use WiFi if available and 3G elsewhere), this smart mechanism will give competitive advantage for YoGoKo over its competitors.

7.2. Bilateral Grants with Industry

OKWIND

Coordinator: Y. Maurel

Starting: April 2017 - Ending: April 2020

Abstract: OKWind [0] is a company specialized in local production of renewable energy. This project, with Inria DiverSE and EASE teams, aims at building a system that optimizes the use of different sources of renewable energy, choosing the most suitable source for the current demand and anticipating future needs, so as to favor the consumption of locally produced electricity. The system must be able to model clients' activities. It must also trigger actions (local consumption vs. local storage). The final goal is to use " locally produced" energy in a smarter way and to tend towards a self-consumption optimum. This contract funds Alexandre Rio's PhD grant.

Orange Labs

Coordinator: JM. Bonnin

Starting: Jan 2016 - Ending: Jan 2019

[0] http://www.okwind.fr/

Abstract: The objective of this thesis is to propose a new management architecture for optimizing the upstream bandwidth allocation in PON while acting only on manageable parameters to allow the involvement of self-decision elements into the network. To achieve this, classification techniques based on machine learning approaches are used to analyze the behavior of PON users and specify their upstream data transmission tendency. A dynamic adjustment of some SLA parameters is then performed to maximize the overall customers' satisfaction with the network. The proposed architecture comes with two major contributions. First, it can be directly and easily integrated in the PON management system without a need to modify the resources allocation mechanism itself in the equipment. Second, as it focuses only on manageable parameters, the proposed approach gives us the opportunity to apply the autonomic and cognitive paradigm in order to enrich the network with self-decision capabilities that leave the task of the dynamic reconfiguration of the SLA parameters to the network itself with the minimum of direct human intervention. This contract funds Nejm Frigui's PhD grant, co-supersized with Tayeb Lemlouma (IRISA OCIF team).

ECUADOR Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

- Ecuador and Lemma have a bilateral contract to share the results of Stephen Wornom, Lemma engineer provided to Inria and hosted by Inria under a Inria-Lemma contract.

ELAN Team (section vide)

EPIONE Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. Microsoft Research

Microsoft Research is funding through the Inria-Microsoft joint lab the projects "4D Cardiac MR Images"[0] and "Medilearn"[0] which aim at analyzing large databases of cardiac images to help the diagnosis of cardiac diseases and planning of therapy. This project involves A. Crimisi from MSR and partially funds the PhDs of Pawel Mlynarski.

7.1.2. Spin-off company Therapixel

Therapixel[0] is a spin-off of the Asclepios (Inria Sophia Antipolis) and Parietal (Inria Saclay) project teams founded in 2013. Therapixel makes surgical information systems. It relies on depth sensing, advanced software processing and innovative user interfaces to provide touchless control of the computer. This technology allows for a direct control of the computer, which sterility constraints made impractical in the past. In 2015, Therapixel obtained the CE marking of its product on touchless visualization of medical images.

7.1.3. Spin-off company inHEART

inHEART[0] is a spin-off of the Asclepios team and IHU Liryc founded in 2017. inHEART provides a service to generate detailed anatomical and structural meshes from medical images, that can be used during ablation interventions. inHEART received 2 awards, one from Aquitaine region and one i-LAB from the BPI.

7.1.4. Siemens HealthCare

Siemens Healthcare, Medical Imaging Technologies, Princeton, NJ (U.S.A). is funding the PhD work of Julian Krebs which aims at developing robust medical image registration methods

7.1.5. Median Technologies

Median technologies, Sophia Antipolis (FR) funded the 5 months gap year internship of Souhaiel Riahi and the 6 months Master 2 level internship of Nour Ediine al Orjany, co-advised by Xavier Pennec and Hervé Delingette on the characterization of hepatic lesions and fibrosis in CT image using machine learning methods

[0] http://www.msr-inria.fr/projects/4d-cardiac-mr-images
[0] http://www.msr-inria.fr/projects/medilearn
[0] http://www.therapixel.com/
[0] http://www.inheart.fr/

ERABLE Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Grants with Industry

7.1.1. Spock

- Title: characterization of hoSt-gut microbiota interactions and identification of key Players based on a unified reference for standardized quantitative metagenOmics and metaboliC analysis frameworK
- Industrial Partner: MaatPharma (Person responsible: Lilia Boucinha).
- ERABLE participants: Marie-France Sagot (ERABLE coordinator and PhD main supervisor with Susana Vinga from IST, Lisbon, Portugal, as PhD co-supervisor), Marianne Borderes (beneficiary of the PhD scholarship in MaatPharma).
- Type: ANR Technology (2018-2021).
- Web page: http://team.inria.fr/erable/en/projects/#anr-technology-spock.

EVA Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

Participants: Pascale Minet, Ines Khoufi, Zied Soua.

In the framework of the CNES Launchers Research and Technology program, Inria and CNEs co-funded a study dealing with wireless sensor networks in a spatial environment. More precisely, this study deals with the improvement and performance evaluation of a solution of wireless sensor networksbased on the IEEE 802.15.4e standard of TSCH (Time Slotted Channel Hopping), operating in a spatial environment.

In space launch vehicles, a NASA study shows that the mass per channel of 0.45 kg for a wiring approach can be reduced to 0.09 kg for a wireless approach.8 A question arises: which wireless technology is able to meet the requirements of space launch vehicles in terms of latency, throughput and robustness. The IEEE 802.15.4e amendment has been designed to meet such requirements. More specifically, the Time Slotted Channel Hopping (TSCH) mode of the IEEE 802.15.4e standard that has been designed for industrial automation, process control and equipment monitoring, appears very promising for space launch vehicles. More precisely, the study for CNES deals with:

- Building an IEEE 802.15.4e TSCH network: see [11] the Acta Astronautica 2018 publication.
- Scheduling transmissions in an IEEE 802.15.4e TSCH network.
- Adapting the schedule to traffic or topology changes.

This study ended in July 2018 with very satisfying results.

8.2. Bilateral Grants with Industry

Participants: Thomas Watteyne, Felipe Moran.

Felipe Moran was awarded a 6-month EDF fellowship to conduct a 6-month internship around low-power wireless networking in extrement industrial environments. Details are confidential.

EX-SITU Project-Team (section vide)

FACTAS Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. Contract CNES-Inria-XLIM

This contract (reference Inria: 11282) accompanies the PhD of David Martinez and focuses on the development of efficient techniques for the design of matching network tailored for frequency varying loads. Applications of the latter to the design output multiplexers occurring in space applications will be considered.

7.1.2. Contract Inria-SKAVENJI

This is a scientific consulting activity for the start-up company SKAVENJI. The latter develops an innovative and communicative device to facilitate the production and home consumption of small amounts of energy, produced by one or more local sources of renewable energy. Our contribution consisted in designing a simple controller improving the energy efficiency of the energy production while minimizing the number of charge and discharge cycles of the associated battery. The retained control strategy was based on consumption and production profiles.

FLOWERS Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

8.1.1. Autonomous Driving Commuter Car

Participants: David Filliat [correspondant], Emmanuel Battesti.

We developed planning algorithms for a autonomous electric car for Renault SAS in the continuation of the previous ADCC project. We improved our planning algorithm in order to go toward navigation on open roads, in particular with the ability to reach higher speed than previously possible, deal with more road intersection case (roundabouts), and with multiple lane roads (overtake, insertion...).

8.2. Bilateral Grants with Industry

8.2.1. Adaptive device for disease awareness and treatment adherence of asthma in children

Participants: Manuel Lopes [correspondant], Alexandra Delmas, Pierre-Yves Oudeyer.

Financing of the CIFRE PhD grant of Alexandra Delmas by Itwell with the goal of developing a tool for self-learning for patients to improve their compliance to treatment.

8.2.2. Perception Techniques and Sensor Fusion for Level 4 Autonomous Vehicles

Participants: David Filliat [correspondant], Vyshakh Palli-Thazha.

Financing of the CIFRE PhD grant of Vyshakh Palli-Thazha by Renault.

8.2.3. Incremental Methods of Deep Learning for detection and classification in an robotics environment

Participants: David Filliat [correspondant], Timothée Lesort.

Financing of the CIFRE PhD grant of Timothée Lesort by Thales.

8.2.4. Exploration of reinforcement learning algorithms for drone visual perception and control

Participants: David Filliat [correspondant], Florence Carton.

Financing of the CIFRE PhD grant of Florence Carton by CEA.

8.2.5. Incremental learning for sensori-motor control

Participants: David Filliat [correspondant], Hugo Caselles Dupré.

Financing of the CIFRE PhD grant of Hugo Caselles-Dupré by Softbank Robotics.

8.2.6. Curiosity-driven Learning Algorithms for Exploration of Video Game Environments

Participant: Pierre-Yves Oudeyer [correspondant].

Financing of a postdoc grant for a 2 year project with Ubisoft and Région Aquitaine.

8.2.7. Intrinsically Motivated Exploration for Lifelong Deep Reinforcement Learning in the Malmo Environment

Participants: Pierre-Yves Oudeyer [correspondant], Remy Portelas.

Financing of the PhD grant of Rémy Portelas by Microsoft Research.

FLUMINANCE Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. Contract ITGA

Participants: Dominique Heitz, Etienne Mémin.

duration 36 months. This partnership between Inria, Irstea and ITGA funds the PhD of Romain Schuster. The goal of this PhD is to design new image-based flow measurement methods for the study of industrial fluid flows. Those techniques will be used in particular to calibrate industrial fume hood.

7.1.2. Contract CSTB

Participants: Mohamed Yacine Ben Ali, Dominique Heitz, Etienne Mémin.

duration 36 months. This partnership between Inria, Irstea and CSTB funds the PhD of Yacine Ben Ali. This PhD aims to design new data assimilation scheme for Reynolds Average Simulation (RANS) of flows involved in wind engineering and buildings construction. The goal pursued here consists to couple RANS models and surface pressure data in order to define data driven models with accurate turbulent parameterization.

FOCUS Project-Team (section vide)

FUN Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

- Sencrop
  Participants: Brandon Foubert, Nathalie Mitton [correspondant].

  This collaboration aims to develop a complete multi-technology bilateral wireless communication stack for agriculture sensor networks.
- Enedis and NooliTic
  Participants: Ibrahim Amadou, Nathalie Mitton [correspondant].

  This collaboration aims to investigate a novel localization approach based on wireless propagations. It is a tri-partite contract between our Inria team, the SME NooliTic and Enedis.

GAIA Team

8. Bilateral Contracts and Grants with Industry

8.1. Safran Electronics & Defense

Within the CIFRE PhD thesis (2014-2018) [15], we have studied new robust stabilization techniques for gyrostabilized systems with unfixed model parameters (e.g. modes, masses, stiffness of springs, damper magnitudes). Parameters of their models indeed slowly change with the temperature, fatigue, etc., yielding time-consuming re-computations of robust controllers. Moreover, the possibility to quickly know robustness indicators (e.g. margins) and explicit robust controllers in terms of the model parameters can highly speed up the design of a project. Finally, closed-form solutions for robust controllers in terms of the model parameters are the first steps towards the development of adaptive robust controllers which can be embedded in gyrostabilized platforms since no optimization algorithms are then required for a real-time implementation and only the parameters have to be estimated from time to time to re-compute the robust controller (based on a basic arithmetic). To do that, we have introduced algebraic methods and computer algebra techniques to initiate a new approach entitled *parametric robust control*. For mor details, see [15] and [98], [100], [99]. This new approach will be further developed in the future since it opens both theoretical and practical interesting questions. In particular, the new PhD thesis of Grace in GAIA aims to study the underlying mathematical problem from both a theoretical and an implementation perspectives.

8.2. Ellcie Healthy

A new collaboration with Ellcie Healthy, a company based in Nice began in October 2017. It involves the analyze of signals coming from optical sensors installed in glasses. With Denis Efimov, the first studies obtained were very promising. This collaboration was formalized with the signature of a first contract in March 2018. The first objective of this project was to design algorithms for intelligent filtering of data coming from infrared sensors, especially for light-related disturbances. Discussions are currently underway for the submission of new joint projects.

GALEN-POST Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

PhD Contract with General Electric Healthcare
Project title: Minimally invasive assessement of coronary disease
Duration: 2018-2021
Leader: Hugues Talbot

PhD Contract with General Electric Healthcare
Project title: Optimization methods for breast tomosynthesis
Duration: 2017-2020
Leader: J.-C. Pesquet

PhD Contract with IFP Energies nouvelles
Project title: Graph-based learning from integrated multi-omics and multi-species data
Duration: 2019-2022
Leader: F. Malliaros and J.-C. Pesquet

GPU grant from NVIDIA
NVIDIA's Academic Programs Team is dedicated to empowering and collaborating with professors and researchers at universities worldwide. For a research project on compressing CNNs input, Edouard Oyallon received a TitanXP from NVIDIA.

GALLINETTE Project-Team (section vide)

GALLIUM Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

8.1.1. The Caml Consortium

Participants: Damien Doligez [**contact**], Xavier Leroy, Michel Mauny, Didier Rémy.

The Caml Consortium is a formal structure where industrial and academic users of OCaml can support the development of the language and associated tools, express their specific needs, and contribute to the long-term stability of OCaml. Membership fees are used to fund specific developments targeted towards industrial users. Members of the Consortium automatically benefit from very liberal licensing conditions on the OCaml system, allowing for instance the OCaml compiler to be embedded within proprietary applications.

The Consortium currently has 15 member companies:

- Aesthetic Integration
- Ahrefs
- Be Sport
- Bloomberg
- CEA
- Citrix
- Docker
- Esterel Technologies
- Facebook
- Jane Street
- Kernelyze LLC
- LexiFi
- Microsoft
- OCamlPro
- SimCorp

For a complete description of this structure, please refer to https://ocaml.org/consortium/index.html.

The Caml Consortium is being gradually phased out. In the future, it should be entirely replaced by the OCaml Foundation, described next (§8.1.2).

8.1.2. The OCaml Foundation

Participant: Michel Mauny.

In June 2018, Michel Mauny created the OCaml Software Foundation (OCSF), a structure sheltered by the Inria Foundation. The OCSF now has a few patrons. With the help of Yann Régis-Gianas, it is running the Learn-OCaml project, which aims at developing the usage of OCaml in higher education. A paper that presents the project has been accepted for publication at JFLA 2019 [20]. The OCaml Software Foundation and the Learn-OCaml project have been presented at the 2018 OCaml workshop.

The OCaml Software Foundation is expecting more patrons at the beginning of 2019, and shall organize meetings where donors discuss and produce suggestions for actions of general interest to be funded.

GAMBLE Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

- Company: WATERLOO MAPLE INC
  Duration: 2 years
  Participants: GAMBLE and OURAGAN Inria teams
  Abstract: A two-years licence and cooperation agreement was signed on April 1st, 2018 between WATERLOO MAPLE INC., Ontario, Canada (represented by Laurent Bernardin, its Executive Vice President Products and Solutions) and Inria. On the Inria side, this contract involves the teams GAMBLE and OURAGAN (Paris), and it is coordinated by Fabrice Rouillier (OURAGAN).

  F. Rouillier and GAMBLE are the developers of the ISOTOP software for the computation of topology of curves. One objective of the contract is to transfer a version of ISOTOP to WATERLOO MAPLE INC.
- Company: GEOMETRYFACTORY
  Duration: permanent
  Participants: Inria and GEOMETRYFACTORY
  Abstract: CGAL packages developed in GAMBLE are commercialized by GEOMETRYFACTORY.

GAMMA3 Project-Team

6. Bilateral Contracts and Grants with Industry

6.1. Bilateral Contracts with Industry

- Boeing
- Safran Tech

6.2. Bilateral Grants with Industry

- Projet RAPID DGA

GANG Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

8.1.1. Collaboration with Nokia Bell Labs

Gang has a strong collaboration with Bell Labs (Nokia). We notably collaborate with Fabien Mathieu who is a former member of GANG and Élie de Panafieu. An ADR (joint research action) is dedicated to distributed learning.

This collaboration is developed inside the Alcatel-Lucent and Inria joint research lab.

GENSCALE Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

8.1.1. Processing in memory

Participants: Charles Deltel, Dominique Lavenier.

The UPMEM company is currently developing new memory devices with embedded computing power (http://www.upmem.com/). GenScale investigates how bioinformatics algorithms can benefit from these new types of memory. In 2018 we parallelized the detection of short variants (see new results section).

8.1.2. Tank milk analysis

Participants: Dominique Lavenier, Jacques Nicolas.

The Seenergi company has developed a biotechnology protocol to detect cow mastitis directly by analyzing the milk of the tanks. Cows are first genotyped. Since cows with mastitis produce a high level of lymphocytes, a DNA milk analysis can point out infested cows. Currently, DNA chips are used to support this analysis. We are currently investigating the possibility to use sequencing technologies in order to both reduce cost analysis and to extend the detection to larger herds.

8.2. Bilateral Grants with Industry

8.2.1. Rapsodyn project

Participants: Dominique Lavenier, Claire Lemaitre, Sebastien Letort, Pierre Peterlongo, Gwendal Virlet.

RAPSODYN is a long term project funded by the IA ANR French program (Investissement d'Avenir) and several field seed companies, such as Biogemma, Limagrain and Euralis (http://www.rapsodyn.fr/). The objective is the optimization of the rapeseed oil content and yield under low nitrogen input. GenScale is involved in the bioinformatics work package, in collaboration with Biogemma's bioinformatics team, to elaborate advanced tools dedicated to polymorphism detection and analysis.

GEOSTAT Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

Preparation of the InnovationLab with I2S company, official starting scheduled after 1st 2019 COPIL in January 2019.

GRACE Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. Nokia

Participants: Daniel Augot, Nicholas Coxon, Françoise Levy-Dit-Vehel.

Phase 2 has been finished, while a new phase, phase 3, has been negociated between Inria and Nokia. Grace finished his work on fast algorithms for polynomials over fields of small caracteristic, wth application to coding theory, multiplicity codes and private information retrieval. The new phase will fund a project on rank-metric codes for security and privacy in cloud storage (in collaboration with Gilles Zémor, Uni. Bordeaux).

GRAPHDECO Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

- Valentin Deschaintre has a CIFRE PhD fellowship on Material Acquisition using Machine Learning, in collaboration with Optis - Ansys, a company specialized in material acquisition and rendering.
- As part of a long standing collaboration with Adobe, Theo Thonnat interned with Sylvain Paris (Boston), Julien Philip works with Michael Gharbi (San Francisco) and J. Delanoy with Aaron Hertzmann (San Francisco).
- Adrien Bousseau and Bastien Wailly worked with the InriaTech engineers to implement a sketch recognition engine in the context of a collaboration with the start-up EpicNPoc.

GRAPHIK Project-Team (section vide)

HEPHAISTOS Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

8.1.1. Symbolic tools for modeling and simulation

Participant: Yves Papegay.

This activity is the main part of a long-term ongoing collaboration with Airbus whose goal is to directly translate the conceptual work of aeronautics engineers into digital simulators to accelerate aircraft design.

An extensive modeling and simulation platform - MOSELA - has been designed which includes a dedicated modeling language for the description of aircraft dynamics models in term of formulae and algorithms, and a symbolic compiler producing as target an efficient numerical simulation code ready to be plugged into a flight simulator, as well as a formatted documentation compliant with industrial requirements of corporate memory.

Technology demonstrated by our prototype has been transferred : final version of our modeling and simulation environment has been delivered to Airbus in November 2012 and developer level know-how has been transferred in 2013 to a software company in charge of its industrialization and maintenance.

Since 2014, we are working on several enhancements and extension of functionalities, namely to enhance the performances and the numerical quality of the generated C simulation code, ease the integration of our environment into the airbus toolbox, help improving the robustness of the environment and the documentation.

HIEPACS Project-Team (section vide)

HYBRID Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

8.1.1. Mensia Technologies

Participants: Anatole Lécuyer, Jussi Tapio Lindgren.

Mensia Technologies is an Inria start-up company created in November 2012 as a spin-off of Hybrid team. Mensia is focused on wellness and healthcare applications emerging from the BCI and Neurofeedback technologies. The Mensia startup benefit from the team's expertise and of valuable and proprietary BCI research results. Mensia is based in Rennes and Paris. Anatole Lécuyer and Yann Renard (former Inria expert engineer who designed the OpenViBE software architecture and was involved in team projects for 5 years) are co-founders of Mensia Technologies.

The on-going contract between Hybrid and Mensia started in November 2013 and supports the transfer of several softwares designed by Hybrid team (eg, OpenViBE and StateFinder) related to our BCI activity to Mensia Technologies for medical and multimedia applications of Mensia.

8.2. Bilateral Grants with Industry

8.2.1. Technicolor

Participants: Antoine Costes, Anatole Lécuyer, Ferran Argelaguet.

This grant started in December 2015. It supported Antoine Costes's CIFRE PhD program with Technicolor company on "Haptic Texturing".

8.2.2. Realyz

Participants: Guillaume Cortes, Anatole Lécuyer.

This grant started in December 2015. It supported Guillaume Cortes's CIFRE PhD program with Realyz company on "Improving tracking in VR".

8.2.3. VINCI Construction

Participants: Anne-Solène Dris-Kerdreux, Bruno Arnaldi, Valérie Gouranton.

This grant started in November 2015. It supported Anne-Solene Dris-Kerdreux's CIFRE PhD program with Vinci company on "Training in VR for construction applications".

8.2.4. Orange Labs

Participants: Guillaume Bataille, Bruno Arnaldi, Valérie Gouranton.

This grant started in October 2017. It supports Guillaume Bataille's PhD program with Orange Labs company on "Natural Interactions with IoT using VR/AR".

HYCOMES Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. Glose: Globalisation for Systems Engineering

Participants: Benoît Caillaud, Benoît Vernay.

Glose is a bilateral collaboration between Inria and Safran Tech., the corporate research entity of Safran Group. It started late 2017 for a duration of 44 months. Three Inria teams are involved in this collaboration: Diverse (Inria Rennes), Hycomes and Kairos (Inria Sophia-Antipolis). The scope of the collaboration is systems engineering and co-simulation.

The simulation of system-level models requires synchronizing, at simulation-time, physical models with software models. These models are developed and maintained by different stakeholders: physics engineers, control engineers and software engineers. Models designed by physics engineers are either detailed 3D finite-elements models, with partial differential equations (PDEs), or finite-dimension 0D models (obtained by model reduction techniques, or by empirical knowledge) expressed in modeling languages such as Simulink (with ordinary differential equations, or ODEs), Modelica (with differential algebraic equations, or DAEs), or directly as a C code embedding both the differential equations and its discretization scheme. Coupling together heterogeneous models and programs, so that they can be co-simulated, is not only a technological challenge, but more importantly raises several deep and difficult questions: Can we trust simulations? What about their reproducibility? Will it be possible to simulate large systems with hundreds to thousands of component models?

Co-simulation requires that models are provided with interfaces, specifying static and dynamic properties about the model and its expected environments. Interfaces are required to define how each model may synchronize and communicate, and how the model should be used. For instance, an interface should define (i) which variables are inputs, which are outputs, (ii) their data types, physical units, and sampling periods, but also (iii) the environmental assumptions under which the model is valid, and (iv) the causal dependencies between input and output variables and for continuous-time models, (v) the stiffness of the model, often expressed as a time-varying Jacobian matrix.

Formally, an interface is an abstraction of a model's behavior. A typical example of interface formalism for 0D continuous-time models is the FMI standard. Co-simulation also requires that a model of the system architecture is provided. This architectural model specifies how components are interconnected, how they communicate and how computations are scheduled. This is not limited to the topology of the architecture, and should also specify how components interact. For instance, variables in continuous-time models may have different data-types and physical units. Conversion may be required when continuous-time models are plugged together. Another fine example is the coupling of a 3D finite-element model to a 0D model: effort and flow fields computed in the 3D model must be averaged in a scalar value, before it can be sent to the 0D model, and conversely, scalar values computed by the 0D model must be distributed as a (vector) field along a boundary manifold of the 3D model. For discrete-time models (eg., software), components may communicate in many ways (shared variables, message passing, ...), and computations can be time- or event-triggered. All these features are captured as data-/behavior-coordination patterns, as exemplified by the GEMOC initiative [0].

[0] http://gemoc.org

In the Glose project, we propose to formalize the behavioral semantics of several modeling languages used at system-level. These semantics will be used to extract behavioral language interfaces supporting the definition of coordination patterns. These patterns, in turn, can systematically be used to drive the coordination of any model conforming to these languages. The co-simulation of a system-level architecture consists in an orchestration of hundreds to thousands of components. This orchestration is achieved by a master algorithm, in charge of triggering the communication and computation steps of each component. It takes into account the components' interfaces, and the data-/behavior-coordination patterns found in the system architecture model. Because simulation scalability is a major issue, the scheduling policy computed by the master algorithm should be optimal. Parallel or distributed simulations may even be required. This implies that the master algorithm should be hierarchical and possibly distributed.

I4S Project-Team

6. Bilateral Contracts and Grants with Industry

6.1. Bilateral Contracts with Industry

6.1.1. Contract with SNCF: DEMETER

Participants: Vincent Le Cam, Quentin Bossard, Mathieu Le Pen.

IFSTTAR's engineers Arthur Bouche and Laurent Lemarchand are contributing to this project.

DEMETER is one of the major projects for I4S in terms of strategy, scientific and technological impact.

DEMETER is a meta project whose global objective is the validation of the contribution of the Internet of Things (IOT) applied to the health monitoring of railway items. SNCF and IFSTTAR have signed a roadmap for safety relevant items, where wireless monitoring and smart algorithms could bring strong improvements to SNCF in terms of real-time maintenance or predictive maintenance. Those items are, amongst others:

- Crossing engine motor monitoring
- Needle motor monitoring
- Axel counter monitoring
- Train detection pedal monitoring

In each case, a prototype of a specific wireless and smart sensor is designed (that may or may not use PEGASE 2 platform), installed along railway lines in service and data are transmitted wirelessly to the cloud supervisor at IFSTTAR for evaluation in SHM algorithms.

In particular, during 2017 SNCF and IFSTTAR have performed the following common projects:

- finalization of the TRAIN PEDAL DETECTION instrumentation with smart sensors using new wireless and industrial IOT protocoles: LoRa and Sigfox. A specific pedal is now subject of in situ test led by SNCF
- axel counter monitoring has been the major R&D subject of 2017: 2 entire and specific smart sensors have been designed, programmed and installed at Chevilly specific SNCF testbench (e.g. with real train passages). Specific algorithms (such as PID and Pattern Recognition) have been modeled and programmed into PEGASE2 platform for these new sensors.

For the future, new projects related to

- water-level monitoring around railways has been setup
- ballast vibration monitoring of railways has been setup
- "unshunting of electrical lines at train passage" detection around railways

have been initiated with SNCF R&D department.

6.1.2. Contracts with SDEL-CC (VINCI Group)

Participants: Vincent Le Cam, Mathieu Le Pen.

This work was done in collaboration with Laurent Lemarchand, and Arthur Bouche at IFSTTAR, SII, Nantes.

Following a 2016 contract, a new contract was signed in 2017 until end 2018, with the company SDEL-CC, a 100% affiliate of the VINCI Group, Energy department. The project exploits the unique time stamp capacity of the PEGASE 2 platform up to 50 nanoseconds, independently of distances in the network of PEGASE2 nodes. The synchronization capacity is employed to design a sensor prototype based on PEGASE 2 to time-stamp the current wave after a lightning impact on a high-voltage line. By knowing the exact time, the wave can be seen at each extremity of the electrical line to localize accurately the lightning impact point.

During 2017, a real high-voltage electrical line has been instrumented: at each end of the line, 2 sensors have been set up and data are sent in real time to a cloud platform. Furthermore, the software of the platform was optimized: at the embedded level (i.e. on PEGASE 2 wireless system) with new algorithms to correct time synchronization up to some 10 nanoseconds, at the cloud level with a specific QT C++ Interface to display results (i.e. lightning localization on electrical line) and to transform raw data into ComTrade standard representation.

Discussions are ongoing with SDEL-CC to transform the prototype into a future product.

IBIS Project-Team (section vide)

ILDA Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

- Tecknowmetrix (TKM): ANRT/CIFRE PhD (Hugo Romat), 3 years, started June 2016.

IMAGINE Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

We have on going contract with EDF R & D Saclay (Raphael Marc) on "Shape analysis of mechanical assemblies and their components". This has funded the work of Harold Vilmar until August 2018. The project has been renewed for 2019 and is funding the development of the AANALYSIS software (Jean-Claude Léon).

8.2. Bilateral Grants with Industry

We have an ongoing CIFRE PhD contract with PSA on the topic of aesthetic shape modeling in immersive virtual reality environments, which is funding the PhD of Youna Le Vaou.

INDES Project-Team

6. Bilateral Contracts and Grants with Industry

6.1. Bilateral Grants with Industry

The ANSWER project (Advanced aNd Secured Web Experience and seaRch) is lead by the QWANT search engine and the Inria Sophia Antipolis Méditerranée research center. This proposal is the winner of the "Grand Challenges du Numérique" (BPI) and aims to develop the new version of the search engine http://www.qwant.com with radical innovations in terms of search criteria, indexed content and privacy of users. The project started on January 1, 2018. In the context of this project, we got

- with Arnaud Legout from the DIANA project-team a funding for a 3 years Ph.D. student to work on Web tracking technologies and privacy protection. Imane Fouad was hired to work on this project.
- a funding for 18 months Postdoc to work on Web application security. Yoonseok Ko was hired to work on this project as a postdoc.

INFINE-POST Team

6. Bilateral Contracts and Grants with Industry

6.1. Bilateral Contracts with Industry

6.1.1. Fujitsu (RunMyProcess):

Participants: Emmanuel Baccelli, Francisco Acosta.

In 2018 we have worked with Fujitsu RIOT enhancements to demonstrate dynamic application software loading and execution on top of RIOT running on Arduino-like hardware, managed remotely from Fujitsu's RMP Cloud component. The results of this work were published in several conferences in 2018, and a prototype was demonstrated.

6.1.2. Thalès:

Participant: Cedric Adjih.

In 2018, studies were made with Thalès (TRT) on IoT systems.

6.1.3. GranData:

Participants: Guangshuo Chen, Adriano Di Luzio, Aline Carneiro Viana.

Since June 2014, we have a collaboration with GranData (http://grandata.com/), Buenos Aires, Argentina on traffic vs mobility modeling of smartphone users. GranData is a small company that integrates first-party and telco partner data to understand key market trends, to predict customer behavior, and to deliver business results. For the time being, the collaboration with Grandata has generated knowledge transfer. From both directions, (1) from myself to GranData, I have being transferring my knowledge in modeling and analysing human behavior in terms of mobility, encounters, and content demand, (2) from them to myself, they have advising me on issues related to machine learning and statistical methods to be used. It describes **an industrial partner's collaboration having the outcomes of our works impacting their products** (e.g., GranData data mining algorithms can be improved based on the better understanding on mobility and content consumption of mobile users) **or research/business decisions** (e.g., proved strong correlations between mobility and data traffic consumption can open new perspectives of services to telecom operators, i.e., clients of GranData).

Part of the thesis of Guangshuo Chen (endend April 2018) and of Eduardo Mucelli (ended in 2015) on data traffic analysis used telco traces provided by GranData.

INOCS Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

Fluxys (2016-2018). Study of optimization problems arising in the management of gas networks.

HappyChic (2018). Study and implementation of optimization methods for problems arising in the warehouse management context.

Keolis (2018). Study and implementation of optimization methods for problems arising in the management of mediation officers in public transportation.

Utocat (2018). Study optimization problems arising in the blockchain.

8.2. Bilateral Grants with Industry

Design and Pricing of Electricity Services in a Competitive Environment within the Gaspard Monge Research Program (PGMO) funded by the Fondation Mathématiques Jacques Hadamard. EDF is the industrial partner (2015-2018).

Robust Energy Offering under Market Equilibrium Constraints within the Gaspard Monge Research Program (PGMO) funded by the Fondation Mathématiques Jacques Hadamard. EDF is the industrial partner (2017-2019).

8.3. Inria Innovation Lab

COLINOCS is an Inria Innovation Lab between Colisweb, a start-up company addressing last-mile delivery and INOCS, which was created at the end of 2016. This collaboration roots back to 2015, when a bilateral contract was devoted to optimization problems arising in courier scheduling. The main objective of this Innovation Lab is to model and solve optimization problems related to revenue management, transport mutualization, a better visibility on their activities for the couriers. See also: https://www.inria.fr/centre/lille/actualites/inria-innovation-lab-colinocs-entre-colisweb-et-l-equipe-inocs.

KAIROS Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

8.1.1. Safran: Desir/Glose

Participants: Julien Deantoni, Giovanni Liboni, Robert de Simone.

We participate to the bilateral collaborative program Desir, put up by Safran to work with selected academic partners. We share the Glose project started in this program with HyComes, and DiverSE Inria project teams. Technically, the goal of this project is to elaborate on the (under development) Safran's system engineering method to make it simulable at different steps of the development, possibly early in the design process and possibly mixing models at different maturity level. This project is strongly connected to results depicted in Section 7.6 .

8.1.2. IRT Saint-Exupery ATIPPIC

Participants: Paul Bouche, Amin Oueslati, Robert de Simone, Julien Deantoni.

In an attempt to build an extension of IRT Saint-Exupery from Occitanie to PACA region, the Thales Alenia Space company promoted the ATIPPIC project, to build the computing digital electronic structure of micro-satellites on ordinary, "COTS" processors. The project was accepted for 30 months, funds two temporary research engineers working under our own supervision, while exchanging extensively with the rest of the ATIPPIC project, which is actually hosted by Inria. The technical content of our contributions is described in Section 7.5 and 7.7 .

8.1.3. Renault Software Lab

Participants: Frédéric Mallet, Marie-Agnès Peraldi-Frati, Robert de Simone.

We have just started, at the end of 2018, a collaboration with Renault Software Labs on the definition of rules for ensuring safe maneuvers in autonomous vehicles. The rules express conditions from the environments, safety rules to preserve the integrity of the vehicles, driving legislation rules, local rules from the authorities. The rules must be updated dynamically when the vehicle evolves and are used to monitor at run-time the behavior of the ADAS. While the ADAS contains several algorithms relying on machine learning, the monitoring system must be predictive and rules must guarantee formally that the system does not cause any accident. So it can be seen as a way to build trustworthy monitoring of learning algorithms. A CIFRE PhD will start at the beginning of 2019.

8.1.4. Accenture Labs, Sophia

Participant: Luigi Liquori.

We started in 2018 a collaboration with Accenture Labs, Sophia on the following topics:

- Smart Contract languages for permissioned blockchains. We saw in the recent years the development of different platforms that focuses on the so-called private (or permissioned) blockchain(s) and digital ledgers. Almost the totality of private blockchain(s) present their own implementation of Smart Contract. Between public and private blockchains we are observing a wide variety of different languages with different capabilities and limitations. Both public and private blockchain often lack maturity and a formal semantic as they have been under pressure of the sudden and rapid explosion of blockchain popularity. A CIFRE PhD will start in 2019.
- Oracles in Smart Contract for IoT and and CPS. Oracles are third party services which are not part of the blockchain consensus mechanism. The main challenge with oracles is that people need to trust these sources of information. Whether a website or a sensor, the source of information needs to be trustworthy. The main challenges for oracles are dealing with small computation power, mobility, security and dealing with time. A CIFRE PhD is planned to start in 2019.

KERDATA Project-Team

6. Bilateral Contracts and Grants with Industry

6.1. Bilateral Contracts with Industry

6.1.1. Total: In situ Visualization with Damaris (2017-2018)

Participants: Hadi Salimi, Matthieu Dorier, Gabriel Antoniu, Luc Bougé.

The goal of this expertise contract is to 1) disseminate the usage of Damaris for engineers at Total; 2) to realize a feasibility study for the usage of Damaris for in situ analysis of data for Total's HPC reservoir simulations.

6.1.2. Huawei: HIRP Low-Latency Storage for Stream Data (2017–2018)

Participants: Alexandru Costan, Ovidiu-Cristian Marcu, Gabriel Antoniu.

The goal of this project is to explore the plausible paths towards a dedicated storage solution for low-latency stream storage. Such a solution should provide on the one hand traditional storage functionality and on the other hand stream-like performance (i.e., low-latency I/O access to items and ranges of items).

We have investigated the main requirements and challenges, evaluated the different design choices (e.g., a standalone component vs. an extension of an existing Big Data solution like HDFS) and proposed a new converged architecture for smart storage.

LACODAM Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

- **AdvisorSLA 2018 - Inria**
  Participants: E. Bourrand, L. Galárraga, E. Fromont, A. Termier
  Contract amount: 7,5k€
  Context. AdvisorSLA is a French company headquartered in Cesson-Sévigné, a city located in the outskirts of Rennes in Brittany. The company is specialized in software solutions for network monitoring. For this purpose, the company relies on techniques of network metrology. AdvisorSLA's customers are carriers and telecommunications/data service providers that require to monitor the performance of their communication infrastructure as well as their QoE (quality of service). Network monitoring is of tremendous value for service providers because it is their primary tool for proper network maintenance. By continuously measuring the state of the network, monitoring solutions detect events (e.g., an overloaded router) that may degrade the network's operation and the quality of the services running on top of it (e.g., video transmission could become choppy). When a monitoring solution detects a potentially problematic sequence of events, it triggers an alarm so that the network manager can take actions. Those actions can be preventive or corrective. Some statistics gathered by the company show that only 40% of the triggered alarms are conclusive, that is, they manage to signal a well-understood problem that requires an action from the network manager. This means that the remaining 60% are presumably false alarms. While false alarms do not hinder network operation, they do incur an important cost in terms of human resources.
  Objective. We propose to characterize conclusive and false alarms. This will be achieved by designing automatic methods to "learn" the conditions that most likely precede the fire of each type of alarm, and therefore predict whether the alarm will be conclusive or not. This can help adjust existing monitoring solutions in order to improve their accuracy. Besides, it can help network managers automatically trace the causes of a problem in the network. The aforementioned problem has an inherent temporal nature: we need to learn which events occur before an alarm and in which order. Moreover, metrology models take into account the measurements of different components and variables of the network such as latency and packet loss. For these two reasons, we resort to the field of multivariate time sequences and time series. The fact that we know the "symptoms" of an alarm and whether it is conclusive or not, allows for the application of supervised machine learning and pattern mining methods.
  Additional remarks. This is a pre-doctoral contract signed with AdvisorSLA to start the work for the PhD of E. Bourrand (Thèse CIFRE) while the corresponding administrative formalities are completed.
- **ATERMES 2018-2021 - Univ Rennes 1**
  Participants: H. Zhang, E. Fromont
  Contract amount: 45k€
  Context. ATERMES is an international mid-sized company, based in Montigny-le-Bretonneux with a strong expertise in high technology and system integration from the upstream design to the long-life maintenance cycle. It has recently developed a new product, called BARIERTM ("Beacon Autonomous Reconnaissance Identification and Evaluation Response"), which provides operational and tactical solutions for mastering borders and areas. Once in place, the system allows for a continuous night and day surveillance mission with a small crew in the most unexpected rugged terrain. BARIER™ is expected to find ready application for temporary strategic site protection or ill-defined border regions in mountainous or remote terrain where fixed surveillance modes are impracticable or overly expensive to deploy.

Objective. The project aims at providing a deep learning architecture and algorithms able to detect anomalies (mainly the presence of people or animals) from multimodal data. The data are considered "multimodal" because information about the same phenomenon can be acquired from different types of detectors, at different conditions, in multiple experiments, etc. Among possible sources of data available, ATERMES provides Doppler Radar, active-pixel sensor data (CMOS), different kind of infra-red data, the border context etc. The problem can be either supervised (if label of objects to detect are provided) or unsupervised (if only times series coming from the different sensors are available). Both the multimodal aspect and the anomaly detection one are difficult but interesting topics for which there exist few available works (that take both into account) in deep learning.

- **PSA - Inria**
  Participants: E. Fromont, A. Termier, L. Rozé, G. Martin
  Contract amount: 15k€
  Context. Peugeot-Citroën (PSA) group aims at improving the management of its car sharing service. To optimize its fleet and the availability of the cars throughout the city, PSA needs to analyze the trajectory of its cars.
  Objective. The aim of the internship is (1) to survey the existing methods to tackle the aforementioned need faced by PSA and (2) to also investigate how the techniques developed in LACODAM (e.g., emerging pattern mining) could be serve this purpose. A framework, consisting of three main modules, has been developped. We describe the modules in the following.
  - A town modelisation module with clustering. Similar towns are clustered in order to reuse information from one town in other towns.
  - A travel prediction module with basic statistics.
  - A reallocation strategy module (choices on how to relocate cars so that the most requested areas are always served). The aim of this module is to be able to test different strategies.

  Additional remarks. This is a pre-doctoral contract to start the work for the PhD of G. Martin (Thèse CIFRE) while the corresponding administrative formalities are completed.

LARSEN Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Cifre Diatelic-Pharmagest

Participants: François Charpillet, Yassine El Khadiri, Cedric Rose, Gabriel Corona.

Cedric Rose and Gabriel Corona are from Diatelic.

The ageing of the population and the increase in life expectancy will confront modern societies with an unprecedented demographic transformation. The placement of older people in a nursing home (EPHAD) is often only a choice of reason and can be rather poorly experienced by people. One answer to this societal problem is the development of Smart home technologies that facilitate elderly to stay in their homes longer than they can do today. This new collaboration with Diatelic a subsidiary of the Pharmagest group is supported through a PhD thesis (Cifre) which started in June 2017. The objective is to enhance the CareLib solution developed by Diatelic and Larsen Team through a previous collaboration (Satelor project). The Carelib offer is a solution, consisting of

- a connected box (with touch screen),
- a 3D sensor (capable (1)to measure characteristics of the gait such as the speed and step length, (2) to identify Activities of Daily Life and (3) to detect emergency situation such as Fall),
- universal sensors (motion, ...) installed in each part of the housing.

The objective of the PhD program is to provides personalized follow-up by learning life habits, the main objective being to track the Activities of Daily Life (ADL) and detect emergency situations needing external interventions (E.G fall detection). This year we have developed an algorithm capable to detect sleep-wake cycles using only motion sensors. The approach is based on bayesian inference. The algorithms have been evaluated using publicly available dataset and Diatelic's own dataset.

8.2. Cifre iFollow

Participants: Francis Colas, Jérôme Truc, Cédric Pradalier, Susana Sanchez Restrepo.

Cédric Pradalier is co-supervisor at GeorgiaTech Lorraine and Susana Sanchez Restrepo is at iFollow.

iFollow is a startup, located in Paris area, providing solutions for shopping carts. Their first market of interest is logistics, wherein they develop robots for alleviating the workload of order pickers. Their second, longer-term, target is retail, with the development of intelligent shopping carts to help persons with disabilities.

The aim of this Cifre program is to endow the robots with more intelligent behaviors. In warehouses, the aim will be to improve the autonomy of the robots to better assist the pickers, leveraging the knowledge of the current order being prepared. In supermarket, the shopping carts should learn to properly interact with other carts and people while positioning themselves to better serve its current user.

The PhD thesis of Jérôme Truc has started in September with bibliography work on human detection and pose estimation, as well as socially acceptable motion planning.

LEMON Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

LEMON has been collaborating for a while with Olivier Boutron (La Tour du Valat) and we had a specific contract in 2018 to adapt our software SW2D to specificities of Camargue lakes and lagoons. This has lead to a common paper.

LFANT Project-Team (section vide)

LIFEWARE Project-Team (section vide)

LINKMEDIA Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. Few shot learning for object recognition in aerial images (CIFRE PhD)

Participants: Yannis Avrithis, Yann Lifchitz.

Duration: 3 years, started in March 2018
Partner: Safran

This is a CIFRE PhD thesis project aiming to study architectures and learning techniques most suitable for object recognition from few samples and to validate these approaches on multiple recognition tasks and use-cases related to aerial images.

7.1.2. Incremental dynamic construction of knowledge bases from text mining (CIFRE PhD)

Participants: Guillaume Gravier, Pascale Sébillot, Cyrielle Mallart.

Duration: 3 years, started in Dec. 2018
Partner: Ouest France

In the context of a newspaper, the thesis explores the combination of text mining and knowledge representation techniques to assist the extraction, interpretation and validation of valuable pieces of information from the journal's content so as to incrementally build a full-scale knowledge base. This thesis is in close relation with the iCODA Inria Project Lab, with direct contribution to the project's results.

7.1.3. Embedding heterogeneous data for directory search (CIFRE PhD)

Participants: Guillaume Gravier, Vincent Claveau, François Torregrossa.

Duration: 3 years, started in Dec. 2018
Partner: SoLocal

The thesis aims at learning how to jointly exploit heterogeneous sources of information (e.g., names, activity sector, user profiles, queries, etc.) in the design of neural network embeddings for information retrieval and language understanding. Applications cover natural language query analysis and personalized information retrieval in Pagesjaunes' directory.

7.1.4. Active learning on adaptive representations for object detection in high-resolution imaging (CIFRE PhD)

Participants: Ewa Kijak, Mathieu Laroze.

Duration: 3 years, started in Jun. 2016
Partner: Wipsea

Wipsea is a Rennaise startup, created in 2013 whose core business is image analysis for ecology. WIPSEA helps biologists, Unmanned Aerial Vehicle (UAV) companies and environmental consultants to automatically process automatically captured pictures by proposing image-processing algorithms that detect and characterize all kinds of animals such as dugongs, whales, elephants, and orangutans... The main objective of the thesis is to develop a detection method to optimize the interaction between the expert and the system in order to converge as quickly as possible to an object detection solution adapted to a given task.

LINKS Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Grants with Industry

Posos. A. Lemay is directing an internship of a master student (*projet de fin d'étude*) in cooperation with the POSOS company from Amiens. The goal of this collaboration is to work on efficient schema for a large pharmaceutical Knowledge Base.

Strapdata. C. Paperman is actively collaborating with the Strapdata company on efficient distributed graph database using an Apache novel technology to query distributed graph *Gremlin* that could benefit of the main product of Strapdata: Elassandra as a *database backend*.

LOKI Team (section vide)

M3DISIM Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

- Contract with start-up 3c-industry for quantitative imaging of their printed product (1.5keuros)
- Contract with L'Oreal for the development of an experimental set-up (29.8keuros)

MAGIQUE-3D Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Contracts with TOTAL

- Depth Imaging Partnership (DIP)

  Period: 2014 May - 2019 April , Management: Inria Bordeaux Sud-Ouest, Amount: 120000 euros/year.

- Approximations hybrides par éléments finis discontinus pour l'élasto-acoustique

  Period: 2016 November - 2018 October, Management: Inria Bordeaux Sud-Ouest, Amount: 165000 euros.

- FWI (Full Waveform Inversion) dans le domaine temporel utilisant des méthodes numériques hybrides pour la caractérisation de milieux élasto-acoustiques. Period: 2017 October - 2020 December , Management: Inria Bordeaux Sud-Ouest, Amount: 180000 euros.

- Utilisation d'images 3D DRP à différentes échelles et résolutions pour vérifier l'applicabilité des problèmes acoustiques Period: 2017 November - 2019 October, Management: Inria Bordeaux Sud-Ouest, Amount: 170000 euros.

- Petrophysics in pre-salt carbonate rocks

  Period: 2017 December - 2019 November, Management: Inria Bordeaux Sud-Ouest, Amount: 190000 euros.

MAGNET Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Coreference resolution

Along a collaboration with Orange, we developed a Natural Language Processing library for co-reference resolution. The library is based on a previous work (CorTeX) and was extended in several ways. It handles the French language, it includes new features based on vectorial representations of words (word embeddings) and it is more scalable. PASCAL DENIS is the local PI at Inria of this project.

8.2. Privacy preserving data mining for Mobility Data

JAN RAMON is the local PI at Inria for the ADEME-MUST project (Méthodologie d'exploitation des données d'usage des véhicules et d'identification de nouveaux services pour les usagers et les territoires). We study machine learning and data mining methods for knowledge discovery from mobility data, which are time-stamped signals collected from cars, for example, GPS locations, accelerations and fuel consumption. We aim to discover knowledge that helps us to address important questions in the transportation system such as road safety, traffic congestion, parking, ride-sharing, pollution and energy consumption. As the mobility data contains a lot of personal information, for instance, driving styles and locations of the users, we hence also study methods that allow the users to keep their personal data and only exchange part of them to collaboratively derive the knowledge.

The project has four partners, including, Xee company, CEREMA, i-Trans and Inria. The Xee company is responsible for recruiting drivers and collecting the data. CEREMA and i-Trans function as domain experts who help us to form the questions and verify the analytical results. MAGNET is responsible for developing and applying data mining methods for analyzing the data. The developed methods and the discovered knowledge from the project will be transferred to Metropole Lille and ADEME.

8.3. Predictive justice

Claim assistance is a French company that develops assistance for conflict resolution. The main service is RefundMyTicket [0]. In the general project of partial automation of analysis of complains, we have provided consulting and supervision. The general approach was to be able to analyze, parse and reason on legal texts. We have developed strategies based on natural language processing in the specific domain of legal texts. Techniques include learning representation and structured prediction among others.

[0] https://www.refundmyticket.net

MAGRIT Project-Team (section vide)

MAMBA Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

Contract with Orange labs (2016-2018) for Veronica Quintuna's PhD. See Reference [2].

MANAO Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

8.1.1. CIFRE PhD contract with Thermo Fisher Scientific (2014-2018)

Participants: D. Murray & X. Granier
For this project, we aim at providing expressive rendering techniques for volumes.

8.1.2. CIFRE PhD contract with Imaging Optics (2017-2020)

Participants: C. Herzog & X. Granier
For this project, we aim at developing 3 dimensions X-rays imaging techniques for medical applications.

MARELLE Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

Together with IMDEA Madrid (Spain), INESC TEC (Portugal), the Catholic University of Louvain (Belgium), Google, and Ecole Polytechnique, with have a contract with Amazon Web Services. The financial return for Marelle is 67kEuros.

MATHERIALS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Contracts and grants with Industry

Many research activities of the project-team are conducted in close collaboration with private or public companies: CEA, SANOFI, EDF. The project-team is also supported by the Office of Naval Research and the European Office of Aerospace Research and Development, for multiscale simulations of random materials. All these contracts are operated at and administrated by the École des Ponts.

MATHNEURO Team (section vide)

MATHRISK Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

- Consortium PREMIA, Natixis - Inria
- Consortium PREMIA, Crédit Agricole Corporate Investment Bank (CA - CIB) - Inria
- Chair X-ENPC-UPMC-Société Générale "Financial Risks" of the Risk fondation : A. Alfonsi, B. Jourdain, B. Lapeyre
- AXA Joint Research Initiative on Numerical methods for the ALM, from September 2017 to August 2020. PhD grant of Adel Cherchali, Supervisor: A. Alfonsi.
- CIFRE agreement Milliman company/Ecole des Ponts (http://fr.milliman.com),

  PhD thesis of Sophian Mehalla (started November 2017) on "Interest rate risk modeling for insurance companies", Supervisor: Bernard Lapeyre.
- Collaboration with IRT Systemx

  PhD grant of Adrien Touboul (started November 2017) on "Uncertainty computation in a graph of physical simulations", Supervisors: Bernard Lapeyre and Julien Reygner.

MAVERICK Project-Team (section vide)

MCTAO Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contract with Industry

A bilateral research contract between the company CGG and the team took place in 2018. Duration: 6 months.

8.2. Bilateral Grant with Industry

A grant “PEPS AMIES”, title: “Conception d’un électrostimulateur intelligent”, has been obtained, co-financed by AMIES and SEGULA. PI: Bernard Bonnard. Start: December 2018. Duration: two years.
A grant PEPS UCA MSI (Maison de la Simulation de l’Innovation) on "Effet des résonances sur la moyennisation en contrôle optimal appliqué à la mécanique spatiale" with Inria and Thales Alenia Space (Cannes). PI: J.-B. Caillau Start: January 2018. Duration: six months

MEMPHIS Project-Team (section vide)

MEPHYSTO-POST Team (section vide)

MEXICO Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

Our cooperation with industry took place in the context of a multi-lateral SystemX project, see below.

MFX Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

In 2018 we had several discussions and collaborations with industrial partners, one leading to an active R&D collaboration contract. All are confidential.

MIMESIS Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

- **Altran:** A global leader in innovation and high-tech engineering consulting, Altran accompanies supports its clients in the creation and development of their new products and services. We have a common history of successful collaboration via CIFRE Ph.D. thesis of Rosalie Plantefève.
- **Siemens:** A global leader in healthcare industry. Via IHU, we collaborate with Siemens in the context of the IHU project CIOS Alpha Fusion dealing with augmentation of the intra-operative image provided by a fluoroscopic imaging modality with pre-operative data.
- **Naviworks:** A South Korean company specialized in ICT convergence simulation/IoT smart controlling. We collaborate on simulation and visualization in the context of interventional radiology.

MIMETIC Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

8.1.1. BPI-PCR Robo-KII

Participant: Armel Crétual [contact].

This contract has started in February 2017 and ended in October 2018. In M2S, it involved two permanent members of MimeTic team, Armel Crétual and Franck Multon, and two engineers, Antoine Marin (18 months grant) and Brice Bouvier (10 months grant).

This project was a collaboration between BA Healthcare and M2S lab. It aimed at developing a robotics platform to allow physicians to start gait rehabilitation as soon as possible, even before patients are able to maintain upright posture alone. The usual way to perform such rehab sessions is to make the patient walk on a treadmill benefiting from a harness to prevent patient from falling. The two main limits of this approach are that:

- only straightforward at constant speed gaits are feasible whereas falling risks are much higher when modifying speed or turning
- walking on a treadmill when motor abilities are very affected can be challenging and can generate strong apprehension.

In a previous project, Robo-K, ended in september 2016, BA Healthcare has developed a first prototype of a mobile robot which strongly modified the approach: the harness is mobile and follows the patient displacement. In this way, the patient walks on the ground at his/her desired speed and the physician can include curved trajectories in the rehab process.

The main novelty of Robo-KII project was to implement a biofeeedback system onto the robotics platform to reinforce rehab sessions. Closely working with physicians from two PMR services, CHU Rennes and Kerpape center, we tested several parameters of the feedback to be given to the patients. In particular, in a clinical pre-test, we focused on the temporal aspect, i.e. providing the feedback at each gait cycle or only after one rehab exercise (up to 20 steps) to avoid dual tasks situation as patients in this early stage after stroke usually also suffer from cognitive issues.

8.1.2. Unity - Cinecast

Participants: Marc Christie [contact], Quentin Galvane.

Cinecast is a research collaboration between Unity and Inria Rennes. The collaboration is focused on automated cinematography and automated editing technologies for creating video casts of 3D game sessions. The project has started in July 2018 for one year, and with a budget of 45kE. The challenge consists in specializing the general editing techniques proposed in our Automated Editing paper (AAAI 2015), reducing the knowledge of the editing algorithm from the full sequence to only 3 seconds. A first demonstration of the results was presented at the Unite 2018 event in Los Angeles.

8.1.3. SolidAnim - Solidtrack

Participants: Marc Christie [contact], Xi Wang.

In the scope of the ANR project LabCom, the purpose of this research collaboration is to develop SLAM technologies which are robust to changes in the lighting conditions. The collaboration started in October 2018, with a budget of 180kE for a duration of three years. The budget is mostly dedicated to hiring PhD student Xi Wang. The work is a co-supervision with Eric Marchand (from Rainbow team).

8.1.4. Cifre Faurecia - Monitoring de l'efficience gestuelle d'opérateurs sur postes de travail

Participants: Franck Multon [contact], Georges Dumont, Charles Pontonnier, Olfa Haj Mahmoud.

This Cifre contract has started in September 2018 for three years and is funding the PhD thesis of Olfa Haj Mamhoud. It consists in designing new methods based on depth cameras to monitor the activity of workers in production lines, compute the potential risk of musculoskeletal disorders, and efficiency compared to reference workers. It raises several fundamental questions, such as adapting previous methods to assess the risk of musculoskeletal disorders, as they generally rely on static poses whereas the worker is performing motion. Based on previous works in the team (previous Cifre PhD thesis of Pierre Plantard) we will provide 30Hz motion capture of the worker, that will enable us to evaluate various time-dependent assessment methods.

We will also explore how to estimate joint forces based and torques on such noisy and low-sampling motion data. We will then define a new assessment method based on these forces and torques.

The Cifre contracts funds the PhD salary and 30K€ per year for the supervision and management of the PhD thesis.

8.2. Bilateral Grants with Industry

8.2.1. Bilateral contract with Technicolor

Participant: Marc Christie.

Bilateral contract with Technicolor on empowering drones with cinematographics knowledge. Participants: Philippe Guillotel, Julien Fleureau, Quentin Galvane. Amount 25kE. Duration 24 months.

MIMOVE Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Grants with Industry

"Application Performance Bottleneck Detection", Comcast Gift to R. Teixeira 2018.

MINGUS Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

Contract with RAVEL (01/09/2018-31/08/2019, budget 15000 euros) : P. Chartier, M. Lemou and F. Méhats initiated a collaboration with the startup RAVEL on a one-year basis (with possible renewal at the end of the year). The objective is to study the mathematical fondations of artificial intelligence and in particular machine learning algorithms for data anonymized though homomorphic encryption.

Contract with CaiLabs (20/12/2018-20/06/2019, budget 8774 euros) : E. Faou initiated a collaboration with the startup CaiLabs on a six-months basis (with possible renewal at the end of the contract). The collaboration between CaiLabs and MINGuS aims at modelling optical devices allowing the recognition of simple objects. The structure of the devices combines quantum propagation phenomena, reflection mirrors and frequency absorbers and possesses a deep neural networks structure.

MISTIS Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

CIFRE PhD with SCHNEIDER (2015-2018). F. Forbes and S. Girard are the advisors of a CIFRE PhD (T. Rahier) with Schneider Electric. The other advisor is S. Marié from Schneider Electric. The goal is to develop specific data mining techniques able to merge and to take advantage of both structured and unstructured (meta)data collected by a wide variety of Schneider Electric sensors to improve the quality of insights that can be produced. The total financial support for MISTIS is of 165 keuros.

PhD contract with EDF (2016-2018). S. Girard is the advisor of a PhD (A. Clément) with EDF. The goal is to investigate sensitivity analysis and extrapolation limits in extreme-value theory with application to extreme weather events. The financial support for MISTIS is of 140 keuros.

Contract with VALEO. S. Girard and Pascal Dkengne Sielenou are involved in a study with Valeo to assess the relevance of extreme-value theory in the calibration of sensors for autonomous cars. The financial support for MISTIS is of 100 keuros.

Contract with Andritz. F. Forbes and C. Braillon (SED) are involved in a study with Andritz to elaborate metrics based on image analysis to assess the quality of nonwaven tissues. The financial support for MISTIS is of 15 keuros.

MNEMOSYNE Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

8.1.1. Contract with Algotech

Participants: Frédéric Alexandre, Ikram Chraibi Kaadoud, Nicolas Rougier, Thierry Viéville.

Algotech is a SME working in the domain of CADD software edition for electrical circuit diagram interpretation and design. Its activity is interesting for our team because they are also interested in the design, by learning, of perception (for diagram identification) and action aspects of loops (for diagram genesis) with the specificity of working at a small scale, considering the variety of items to be manipulated. This is consequently a very interesting benchmark for transfering our bio-inspired models to the domain of classical machine learning. Particularly, during the PhD of Ikram Chraibi Kaadoud (defended this year), we have worked on the extraction of implicit knowledge, from the learning of sequences, extracted from diagrams.

8.1.2. Contract with CEA Cesta

Participants: Frédéric Alexandre, Guillaume Padiolleau.

In the context of the PhD of Guillaume Padiolleau, we are working with the CEA on possible interactions between model-based and model-free approaches of reinforcement learning, based on cognitive consideration. Particularly, to decrease the complexity of exploration of a large data space in model-free approaches, we aim at considering introducing a priori knowledge coming from a model and we also propose to consider motivation as another way to orient the search in the learning space. This is applied in the robotic domain to manipulations by a robotic arm.

8.1.3. Contract with Ubisoft

Participants: Frédéric Alexandre, Pramod Kaushik.

Together with the Inria Project-team Flowers, we are working with the video game editor Ubisoft to define original bio-inspired learning methods, to qualify the behavior of human players observed during runs of games. Such learning algorithms will be specifically considered in the PhD of Pramod Kaushik.

MOCQUA Team (section vide)

MODAL Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts: SEMENCES DE FRANCE

Sophie Dabo-Niang has a contract with the enterprise SEMENCES DE FRANCE, concerning the realisation of a statistical software.

8.2. Bilateral Contracts: Arcelor-Mittal

Participants: Christophe Biernacki, Vincent Vandewalle.

Arcelor-Mittal is a leader company in steel industry. This contract (which began in 2016 and finished in 2018) aims at optimizing predictive maintenance from mixed data (continuous, categorical, functional) provided by multiple sensors disseminated in steel production lines. Several thousands of sensors are simultaneously involved in this study, most of them providing functional (chronological) values.

It is a joint work with Quentin Grimonprez and Vincent Kubicki (InriaTech engineers).

8.3. Bilateral Contracts: Alstom

Participants: Christophe Biernacki, Benjamin Guedj.

Alstom is a world leader company in integrated transport systems. This contract aims at optimizing predictive maintenance from free text annotations provided by maintenance people. The proposal consists in using co-clustering as a way for grouping both maintenance operations and words describing them.

It is a joint work with Etienne Goffinet (InriaTech engineer).

8.4. Bilateral Contracts: Decathlon

Participant: Christophe Biernacki.

Decathlon is a leading sports retailer.

It is a joint work with Etienne Goffinet (InriaTech engineer). The purpose was to propose a innovative method for sales forecast by using complex data they have (mixed data, chronological series, etc.).

MOEX Project-Team (section vide)

MOKAPLAN Project-Team (section vide)

MONC Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

Research contract between the pharmaceutical company Roche and the MONC team.

MORPHEME Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

General Electric Healthcare: a 36 months (from feb. 2016 to jan. 2019) companion contract for the Cifre thesis of E. Poulain.

Bayer, Lyon: a 36 months (from aug. 2018 to jul. 2021) companion contract for the Cifre thesis of S. Laroui.

MORPHEO Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

A collaboration with the French Start up Holooh started in 2017 and was pursued in 2018. Holooh aims at producing high quality holograms for VR and AR applications, especially for the fashion and music domains. Holooh's objective is to set up a multi-camera studio in Paris for that purpose. Edmond Boyer is involved in the collaboration.

8.2. Bilateral Grants with Industry

The Morpheo Inria team and Microsoft research set up a collaboration on the capture and modelling of moving shapes using multiple videos. Two PhD proposals will be part of this collaboration with the objective to make contributions on 4D Modeling. The PhDs will take place at Inria Grenoble Rhône-Alpes and will involve regular visits and stays at Microsoft in Redmond (USA) and Cambridge (UK). At Microsoft, Steve Sullivan, Andrew Fitzgibbon and Marta Wilczkowiak will be participating to the project.

MOSAIC Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

Participants: Frédéric Boudon [External Collaborator], Christophe Godin.

We started a collaboration with A.M.R. a start-up whose aim is to develop a web application to create social networks for project management. This application makes use of plant representations at different levels for which the expertize of the Mosaic group was required. In 2018, we hosted two internships during 6 months in co-supervision with Guillaume Asselot (founder of A.M.R.) to work on plant models for the web application. Guillaume Asselot is seeking to raise new funds to pursue the collaboration in the coming years.

MULTISPEECH Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

8.1.1. Dolby

Company: Dolby (Spain)

Duration: Sep – Dec 2018

Participants: Antoine Liutkus (Inria Zenith), Emmanuel Vincent

Abstract: This contract aims to evaluate the feasibility of state-of-the-art source separation technology and related technologies for four use cases, and to identify those which could be commercially exploited, possibly after a follow-up R&D phase.

8.1.2. Honda Research Intitute Japan (first contract)

Company: Honda Research Intitute Japan (Japan)

Duration: Feb – Mar 2018

Participants: Aditya Nugraha, Romain Serizel, Emmanuel Vincent

Abstract: This contract targets collaborative research on multichannel speech and audio processing and eventual software licensing in order to enable voice-based communication in challenging noisy and reverberant conditions in which current hands-free voice-based interfaces perform poorly.

8.1.3. Honda Research Intitute Japan (second contract)

Company: Honda Research Intitute Japan (Japan)

Duration: Aug 2018 – Mar 2019

Participants: Nancy Bertin (CNRS - IRISA), Antoine Deleforge, Diego Di Carlo

Abstract: This is a follow-up contract, which also targets collaborative research on multichannel speech and audio processing and eventual software licensing in order to enable voice-based communication in challenging noisy and reverberant conditions in which current hands-free voice-based interfaces perform poorly.

8.1.4. Studio Maia

Company: Studio Maia SARL (France)

Other partners: Imaging Factory

Duration: Jul 2017 – March 2019

Participants: Yassine Boudi, Vincent Colotte, Mathieu Hu, Emmanuel Vincent

Abstract: This Inria Innovation Lab aims to develop a software suite for voice processing in the multimedia creation chain. The software is aimed at sound engineers and it will rely on the team's expertise in speech enhancement, robust speech and speaker recognition, and speech synthesis.

8.2. Bilateral Grants with Industry

8.2.1. Orange

Company: Orange SA (France)

Duration: Nov 2016 – Nov 2019

Participants: Laureline Perotin, Romain Serizel, Emmanuel Vincent

Abstract: This CIFRE contract funds the PhD thesis of Laureline Perotin with Orange Labs. Our goal is to develop deep learning based speaker localization and speech enhancement algorithms for robust hands-free voice command. We are especially targeting difficult scenarios involving several simultaneous speakers.

8.2.2. Invoxia

Company: Invoxia SAS (France)

Duration: Mar 2017 – Mar 2020

Participants: Guillaume Carbajal, Romain Serizel, Emmanuel Vincent

Abstract: This CIFRE contract funds the PhD thesis of Guillaume Carbajal. Our goal is to design a unified end-to-end deep learning based speech enhancement system that integrates all steps in the current speech enhancement chain (acoustic echo cancellation and suppression, dereverberation, and denoising) for improved hands-free voice communication.

8.2.3. Ministère des Armées

Company: Ministère des Armées (France)

Duration: Sep 2018 – Aug 2021

Participants: Raphaël Duroselle, Denis Jouvet, Irina Illina

Abstract: This contract corresponds to the PhD thesis of Raphaël Duroselle on the application of deep learning techniques for domain adaptation in speech processing.

8.2.4. Facebook

Company: Facebook AI Research (France)

Duration: Nov 2018 – Nov 2021

Participants: Adrien Dufraux, Emmanuel Vincent

Abstract: This CIFRE contract funds the PhD thesis of Adrien Dufraux. Our goal is to explore cost-effective weakly supervised learning approaches, as an alternative to fully supervised or fully unsupervised learning for automatic speech recognition.

MYRIADS Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Grants with Industry

8.1.1. Thales Research and Technology (2016-2018)

Participants: Baptiste Goupille-Lescar, Christine Morin, Nikos Parlavantzas.

Our collaboration with Thales Research and Technology focuses on the development of distributed Cyber-Physical Systems, such as those developed by Thales to monitor and react to changing physical environments. These systems need to be highly adaptable in order to cope with the dynamism and diversity of their operating environments. Notably, they require distributed, parallel architectures that support dynamic sets of applications, not known in advance, while providing strong QoS guarantees. The objective of this collaboration is to explore adaptive resource management mechanisms for such systems that can adapt to changes in the requirements and in the availability of resources. This contract funds Baptiste Goupille-Lescar's PhD grant.

NACHOS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. Numerical study of light absorption in a photovoltaic glass

Participants: Alexis Gobé, Badre Kerzabi [Sunpartner Technologies, Rousset], Stéphane Lanteri.

Sunpartner Technologies is a company in the field of novel technologies for a sustainable environment, which develops innovative photovoltaic solutions dedicated to the connected object, building and transport markets. In particular, the company is designing devices using solar energy to improve the autonomy of connected objects such as smartphones. Supartner Technologies also offers glass modules that can be integrated on the screen of a watch or a smart e-reader, for example. These glass modules are transparent and integrate photovoltaic cells to recover solar energy in order to recharge the batteries. In all these products, nanostructuring of constituent materials is an exploited strategy to maximize the absorption of sunlight. In addition to measurement, the simulation of the interaction between light and nanostructured matter is an important ingredient in the implementation of this strategy. As an extension of the simulation, the optimization of nanostructuring makes it possible to explore many solutions before the design stage. In the context of this partnership that has started this year, we aim at adapting and applying a DGTD solver from the DIOGENeS software suite to characterize and further optimize the nanostructuring of a photovoltaic glass.

NANO-D Project-Team (section vide)

NECS Project-Team (section vide)

Neo Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

NEO members are involved in the

- Inria-Nokia Bell Labs joint laboratory: the joint laboratory consists of five ADRs (Action de Recherche/Research Action) in its third phase (starting October 2017). NEO members participate in one ADR "Distributed Learning and Control for Network Analysis" (see §8.1.1).
- Inria-QWANT joint laboratory "Smart search is privacy" (see §8.1.2);
- Inria-Orange Labs joint laboratory (see §8.1.3).

8.1.1. ADR Nokia on the topic "Distributed Learning and Control for Network Analysis" (October 2017 – September 2021)

Participants: Eitan Altman, Konstantin Avrachenkov, Mandar Datar, Maximilien Dreveton, Alain Jean-Marie.

- Contractor: Nokia Bell Labs (http://www.bell-labs.com)
- Collaborator: Gérard Burnside

Over the last few years, research in computer science has shifted focus to machine learning methods for the analysis of increasingly large amounts of user data. As the research community has sought to optimize the methods for sparse data and high-dimensional data, more recently new problems have emerged, particularly from a networking perspective that had remained in the periphery.

The technical program of this ADR consists of three parts: Distributed machine learning, Multiobjective optimisation as a lexicographic problem, and Use cases / Applications. We address the challenges related to the first part by developing distributed optimization tools that reduce communication overhead, improve the rate of convergence and are scalable. Graph-theoretic tools including spectral analysis, graph partitioning and clustering will be developed. Further, stochastic approximation methods and D-iterations or their combinations will be applied in designing fast online unsupervised, supervised and semi-supervised learning methods.

8.1.2. Qwant contract on "Asynchronous on-line computation of centrality measures" (15 December 2017 – 14 May 2020)

Participants: Nicolas Allegra, Konstantin Avrachenkov.

- Contractor: Qwant
- Collaborator: Sylvain Peyronnet

We shall study asynchronously distributed methods for network centrality computation. The asynchronous distributed methods are very useful because they allow efficient and flexible use of computational resources on the one hand (e.g., using a cluster or a cloud) and on the other hand they allow quick local update of centrality measures without the need to recompute them from scratch.

8.1.3. Orange CIFRE on the topic "Self-organizing features in the virtual 5G radio access network" (November 2017 – October 2020)

Participants: Eitan Altman, Marie Masson.

- Contractor: Orange Labs (https://orange.jobs/site/en-innovation-rd/)
- Collaborator: Zwi Altman

The considerable extent of the complexity of 5G networks and their operation is in contrast with the increasing demands in terms of simplicity and efficiency. This antagonism highlights the critical importance of network management. Self-Organizing Networks (SON), which cover self-configuration, self-optimization and self-repair, play a central role for 5G Radio Access Network (RAN).

This CIFRE thesis aims at innovating in the field of managing 5G RAN, with a special focus on the features of the SON-5G. Three objectives are identified: a) develop self-organizing features (SON in 5G-RAN), b) develop cognitive managing mechanisms for the SON-5G features developed, and c) demonstrate how do the self-organizing mechanisms fit in the virtual RAN (vRAN).

8.1.4. Huawei CIFRE on the topic "Scalable Online Algorithms for SDN controllers" (June 2016 – May 2019)

Participants: Zaid Allybokus, Konstantin Avrachenkov.

- Contractor: Huawei Technologies (http://www.huawei.com/en/about-huawei/research-development)
- Collaborators: Jérémie Leguay

Software-Defined Networking (SDN) technologies have radically transformed network architectures. They provide programmable data planes that can be configured from a remote controller platform.

The objective of this CIFRE thesis is to provide fundamental answers on how powerful SDN controller platforms could solve large online flow problems to optimize networks in real-time and in a distributed or semi-distributed fashion. We use methods from both optimization and dynamic programming.

NEUROSYS Project-Team (section vide)

NON-A POST Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

A transfer contract with Ellcie Healthy on intelligent filtering of measurements in smart eyeglasses.

NUMED Project-Team (section vide)

ORPAILLEUR Project-Team (section vide)

OURAGAN Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

The objective of our Agrement with WATERLOO MAPLE INC. is to promote software developments to which we actively contribute.

On the one hand, WMI provides man power, software licenses, technical support (development, documentation and testing) for an inclusion of our developments in their commercial products. On the other hand, OURAGAN offers perpetual licenses for the use of the concerned source code.

As past results of this agreement one can cite our C-Library *RS* for the computations of the real solutions zero-dimensional systems or also our collaborative development around the Maple package *DV* for solving parametric systems of equations.

For this term, the agreement covers algorithms developed in areas including but not limited to: 1) solving of systems of polynomial equations, 2) validated numerical polynomial root finding, 3) computational geometry, 4) curves and surfaces topology, 5) parametric algebraic systems, 6) cylindrical algebraic decompositions, 7) robotics applications.

In particular, it covers our collaborative work with some of our partners, especially the Gamble Project-Team - Inria Nancy Grand Est.

PACAP Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Grants with Industry

8.1.1. Intel research grant INTEL2016-11174

Participants: Niloofar Charmchi, Kleovoulos Kalaitzidis, Pierre Michaud, André Seznec.

Intel is supporting the research of the PACAP project-team on “Design tradeoffs for extreme cores”.

PANAMA Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

8.1.1. Contract with 5th dimension on "dynamic separation of localized sound sources"

A first phase of this contract, in collaboration with InriaTech, involved porting in C++ a subset of our source localization library Multichannel BSS Locate. A second phase will involve further investigations on the interplay between localization and separation, using the FASST library, with support from LABEX AMIES.

8.1.2. Contract with Honda on "multichannel speech and audio processing"

This is a follow-up contract, which targets collaborative research on multichannel speech and audio processing and eventual software licensing in order to enable voice-based communication in challenging noisy and reverberant conditions in which current hands-free voice-based interfaces perform poorly.

8.2. Bilateral Grants with Industry

8.2.1. CIFRE contract with Technicolor R&I France on Very large scale visual comparison

Participants: Rémi Gribonval, Himalaya Jain.

Duration: 3 years (2015-2018)

Research axis: 3.1.2

Partners: Technicolor R&I France; Inria-Rennes

Funding: Technicolor R&I France; ANRT

The grand goal of this thesis was to design, analyze and test new tools to allow large-scale comparison of high-dimensional visual signatures. Leveraging state of the art visual descriptors, the objective is to obtain new compact codes for visual representations, exploiting sparsity and learning, so that they can be stored and compared in an efficient, yet meaningful, way.

8.2.2. CIFRE contract with Facebook Artificial Intelligence Research, Paris on Deep neural networks for large scale learning

Participants: Rémi Gribonval, Pierre Stock.

Duration: 3 years (2018-2021)

Research axis: 3.1.2

Partners: Facebook Artificial Intelligence Research, Paris; Inria-Rennes

Funding: Facebook Artificial Intelligence Research, Paris; ANRT

The overall objective of this thesis is to design, analyze and test large scale machine learning algorithms with applications to computer vision and natural language processing. A major challenge is to design compression techniques able to replace complex and deep neural networks with much more compact ones while preserving the capacity of the initial network to achieve the targeted task. An avenue primarily envisioned to achieve this goal is to rely on structured linear layers.

PARIETAL Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

In 2018, a CIFRE PhD thesis was launched with the Canadian company Interaxon https://choosemuse.com. This contract supports the PhD thesis of Hubert Banville.

PARKAS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

Polly Labs contract with ARM, 2015-2019, with the participation of Qualcomm, Xilinx and Facebook (human resources, consulting services and and hiring former PARKAS members).

7.2. Bilateral Grants with Industry

In 2018 Francesco Zappa Nardelli was awarded a Google Research Fellowship to pursue the work on DWARF unwinding, about 50k euros.

PARSIFAL Project-Team (section vide)

PERCEPTION Project-Team (section vide)

PERVASIVE Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

Pervasive has a contract with Orange Labs, Meylan, for supervision of the doctoral research of Julien Cumin for Learning daily routines by observing activity in a smart home

Members of the Pervasive interaction team are work with Orange Labs on techniques for observing activity and learning routines in a smart home. Activity is observed by monitoring use of electrical appliances and Communications media (Telephone, Television, Internet). Activities are described using Bayesian Situation Modeling techniques demonstrated in earlier projects. A log of daily activities is used to discover daily routines expressed as temporal sequences of contexts, where each context is expressed as a network of situations. Experiments will be performed using the Smart home living lab that has been constructed as part of the EquipEx Amiqual4home.

8.1.1. Toutilo project

Participants: Stan Borkoswki, Dominique Vaufreydaz, Joelle Coutaz, James Crowley, Giovanni Balestrieri, Anthony Chavoutier
Partners: Inria, Touti Terre

Touti Terre is a pioneer startup in the use of agricultural robotics for market gardening, developing innovative solutions to make working the land easier and farms sustainable. The Toutirobo-2 Inria innovation lab proposes the design of on overall IT solution for their cobot solution: the Toutilo robot. This project aims at providing significant time and productivity gains for its users. Thanks to the support of the experimentation and prototyping platform Amiqual4Home, members of the Pervasive team contribute to this project on several innovation topics: farm and vehicle management, autonomous guidance, navigation and planning, and interaction systems adapted to farm jobs. boisi

8.1.2. IRT Silver Economy

Participants: James Crowley, Maxime Belgodere

Partners: CEA, Schneider Electric.

Members of the Pervasive Interaction team are working with the CEA and Schneider Electric to develop environmental sensors that can detect when a hospital patient or elderly person has fallen and is unable to get up. The project uses an infrared Bolometric image sensor to observe human activity. Image processing and fall detection logic are to be performed by an embedded image processor on board.

PESTO Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

We have several contracts with industrial partners interested in the design of electronic voting systems:

- Since 2014, a collaboration agreement has been signed between Pesto and Scytl, a Spanish company which proposes solutions for the organization of on-line elections, including legally binding elections, in several countries. In this context, a first contract has been signed in 2016 to design a formal proof of both verifiability and privacy of the protocol developed by Scytl, for a deployment in Switzerland. In 2018, a new contract has been signed to adapt the previous security proof to the new protocol proposed by Scytl, in order to achieve universal verifiability.
- The canton of Geneva signed a contract in October 2017 with Pesto and Caramba, as well as Manifold Security (Bogdan Warinschi and David Bernhard) to design a formal and cryptographic proof of individual and universal verifiability of the protocol developed by the canton of Geneva, for a deployment in Switzerland.
- Docapost signed a 18-month contract in September 2017, with Pesto and Caramba, to enhance the voting solution of Docapost, in particular with respect to verifiability.

8.2. Bilateral Grants with Industry

A CIFRE contract with Numeryx has started with the Resist research group at Inria Nancy and Pesto, to develop algorithms for optimizing sets of filtering rules in Software Defined Networks.

PETRUS Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

8.1.1. OwnCare II-Lab (Jul 2017 - Dec 2020)

Partners: PETRUS (Inria-UVSQ), Hippocad (SME)
End 2016, the Yvelines district lauched a public call for tender to deploy an industrial solution aiming at covering the whole distinct (10.000 patients). The Hippocad company, in partnership with Inria, won this call for tender with a solution called DomYcile in May 2017 and the project was launched in July 2017. DomYcile is based on a home box combining the PlugDB hardware/software technology developed by the Petus team and a communication layer based on SigFox. Hippocad and Petrus then decided to launch a joint II-Lab (Inria Innovation Lab) named OwnCare. The objective is threefold: (1) build an industrial solution based on PlugDB and deploy it in the Yvelines district in the short-term, (2) use this Yvelines testbed to improve the solution and try to deploy it at the national/international level in the medium-term and (3) design flexible/secure/mobile personal medical folder solutions targeting individual uses rather than professional uses in the long-term. The DomYcile project with the Yvelines district has started in July 2017 and the II-Lab was officially created in January 2018.

8.2. Bilateral Grants with Industry

8.2.1. Cozy Cloud CIFRE - Tran Van contract (Oct 2014 -Feb 2018)

Partners: Cozy Cloud, PETRUS
Following a bilateral contract with Cozy Cloud (a French startup providing a personal Cloud platform), the CIFRE PhD thesis of Paul Tran Van capitalized on the Cozy-PlugDB platform to devise new access and usage control models to exchange data among devices of the same user (devices may have different levels of trustworthiness) and among different users thanks to a user-friendly sharing model [14].

8.2.2. Cozy Cloud CIFRE - Loudet contract (Apr 2016 - Apr 2019)

Partners: Cozy Cloud, PETRUS
In relation with the bilateral contract mentioned above, a second CIFRE PhD thesis has been started by Julien Loudet. The objective is to allow for a secure execution of distributed queries on a set of personal clouds associated to users, depending on social links, user's localization or user's profile. The general idea is to build secure indexes, distributed on the users' personal clouds and to devise a secure execution protocol revealing solely the query result to the querier. Such highly distributed secure queries potentially enable new (social) applications fed by user's personal data which could be developed on the Cozy-PlugDB platform.

PHOENIX-POST Team (section vide)

PI.R2 Project-Team (section vide)

PLEIADE Team (section vide)

POEMS-POST Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

- Contract and CIFRE PhD with EDF on *the FEM-BEM coupling for soil-structure interactions*
  Participants: M. Bonnet, S. Chaillat, Z. Adnani
  Start: 11/2014. End: 02/2018. Administrator: CNRS
- Contract and CIFRE PhD with Airbus on *time-harmonic acoustic scattering in a vortical flow*
  Participants: P. Joly, J.-F. Mercier, A. Bensalah
  Start: 10/2014, End: 04/2018. Administrator: ENSTA
- Contract and CIFRE PhD with Naval Group on *modelling the fluid-structure coupling caused by a far-field underwater explosion*
  Participants: M. Bonnet, S. Chaillat, D. Mavaleix-Marchessoux
  Start: 11/2017. End: 10/2020. Administrator: CNRS
- Contract and CIFRE PhD with Naval Group on *flow noise prediction*
  Participants: J-F Mercier, S. Cotté, N. Trafny
  Start: 04/2018. End: 03/2021. Administrator: ENSTA

POLARIS Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

- Bilateral contrat with Enedis (Linky-Lab), Post-doctoral position for 18th months (Mouhcine Mendil).
- ULTRON, bilateral contract with Huawei over 18 months, supporting two postdoctoral researchers, Amélie Heliou and Luigi Vigneri.
- Inria/Orange Labs Laboratory. Polaris is involved in this partnership with Orange Labs by supervising two PhD students in the context of this common laboratory.
- Cifre contract with Schneider Electric. The PhD thesis of Benoit Vinot (supervised by Nicolas Gast and Florent Cadoux (G2Elab)) is supported by this collaboration.

POLSYS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Grants with Industry

Until the mid 2000's, multivariate cryptography was developing very rapidly, producing many interesting and versatile public-key schemes. However, many of them were soon successfully cryptanalysed (a lot have been done in this group). As a consequence, the confidence in multivariate cryptography cryptosystems declined. It seems that there have emerged new important reasons for renewal of the interest in a new generation of multivariate schemes. In the past two years, the algorithms for solving the Discrete Logarithm Problem over small characteristic fields underwent an extraordinary development. This clearly illustrates the risk to not consider alternatives to classical assumptions based on number theory. In parallel, two of the most important standardization bodies in the world, NIST and ETSI have recently started initiatives for developing cryptographic standards not based on number theory, with a particular focus on primitives resistant to quantum algorithms. An objective here is then to focus on the design of multivariate schemes.

The team is involved in the industrial transfer of post-quantum cryptography. The maturation project, called HFEBOOST, is supervised by SATT-LUTECH.

SATT-LUTECH specializes in the processing and transfer of technologies from research laboratories of its shareholders: Inria, CNRS, University of Technology of Compiègne National Museum of Natural History, Institute Curie, Université Panthéon-Assas, Paris Sorbonne University and National School of Industrial Creation).

The team has recently developed, in partnership with a mobile application development company (WASSA), an Android app for smartphones (Samsung S5 type) that uses multivariate cryptography. The application has been tested mid-November in a series of experiments supervised by DGA and French Ministry of Defense. The experiment gathered a total of hundred participants from various operational units. This is a first milestone in the maturation project whose goal is to create a start-up.

7.2. Public Contracts

CEA LETI / DSYS / CESTI

In smart card domain, the emanations of a component during a cryptographic computation may compromise the information that is directly or not linked to the secret keys. The most part of the side channel attacks are based on statistical tools that exploit relations between the handled data and the signals. However these methods do not take advantage of all the signal information. The goal is to study the existing algorithms in pattern and speech recognition and to apply them to signals related to cryptographic computations. The objective will be to improve the attacks efficiency and resolve more complex problems.

- CIFRE Contract with ST Micro electronics that funds the PhD thesis of Simon Landry on "Threshold Implementations Against Side Channel Analysis". Supervisor Emmanuel Prouff.

POTIOC Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Grants with Industry

Ullo:

Duration: 2017-2019

Local coordinator: Martin Hachet

Following our work with the Introspectibles (Teegi, TOBE, Inner Garden), we are currently working with the ULLO company to bring these new interfaces to healthcare centers.

PRIVATICS Project-Team (section vide)

PROSECCO Project-Team (section vide)

QUANTIC Project-Team (section vide)

RAINBOW Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

8.1.1. Robocortex

Participants: Fabien Spindler, François Chaumette.

no Inria Rennes 11369, duration: 20 months.

This contract with the Inria Robocortex start up in Sophia-Antipolis ended in May 2018. It is devoted to provide our expertise in visual tracking for an application specified by Dassault Aviation.

8.1.2. ABB

Participants: Souriya Trinh, Fabien Spindler, François Chaumette.

no Inria Rennes 12597, duration: 8 months.

This contract with ABB in Barcelona started in September 2017. It is devoted to provide our expertise in visual tracking and visual servoing for an industrial application.

8.1.3. IRT b<>com

Participants: Hadrien Gurnel, Fabien Spindler, Alexandre Krupa.

no Inria Rennes 11774, duration: 36 months.

This contract started in October 2016 and concerns the leasing to IRT b<>com of two modules of the Rainbow medical robotic platform. Each module is rent 40 days during a 3-year period in the context of the IRT b<>com NeedleWare project (see Section 9.1.6).

8.2. Bilateral Grants with Industry

8.2.1. Pôle Saint Hélier

Participants: Louise Devigne, Marie Babel.

no Insa Rennes 2015/0890, duration: 36 months.

This project started in November 2015 and supports Louise Devigne PhD about wheelchair navigation assistance. The idea is first to design a low-cost indoor / outdoor efficient obstacle avoidance system that respects the user intention, and does not alter user perception. The second objective is to take advantage of the proposed assistive tool to enhance the user Quality of Experience by means of biofeedback as well as the understanding of the evolution of the pathology.

8.2.2. Technicolor

Participants: Salma Jiddi, Eric Marchand.

no Univ. Rennes 1 15CC310-02D, duration: 36 months.

This project funded by Technicolor started in October 2015. It supports Salma Jiddi's Ph.D. about augmented reality (see Section 7.1.4).

8.2.3. Realyz

Participant: Eric Marchand.

no Inria Rennes 10822, duration: 36 months.

This project funded by Realyz started in October 2015. It is achieved in cooperation with Anatole Lécuyer from Hybrid group at Irisa and Inria Rennes-Bretagne Atlantique to support Guillaume Cortes Ph.D. about motion tracking in virtual reality.

RANDOPT Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

- Contract with the company Storengy partially funding the PhD thesis of Cheikh Touré (2017 - 2020)
- Contract with Thales in the context of the CIFRE PhD thesis of Konstantinos Varelas (2017 - 2020)

RAPSODI Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

C. Cancès supervised the PhD thesis of N. Peton at IFPEn from October 15, 2015 to October 12, 2018. The bilateral contract enters the framework-agreement between Inria and IFPEn.

REALOPT Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

We have an on-going contract with SNCF on scheduling of rolling-stock. The PhD thesis of Mohamed Benkirane is part of this contract.

Following the PhD thesis of Rodolphe Griset, our collaboration with EDF continues through a four months contract whose goal is to investigate the possibility of developing an operational prototype (called Fenix) for strategic planning of nuclear plant outages. Two scientific questions are raised. The first one concerns the new mechanisms of management of the power capacity market on the French power grid. The second one is about a new model of the stock variation during a refueling operation, which requires information of several previous production campaigns.

We also have a new contract with RTE to develop strategies inspired from stochastic gradient methods to speed-up Benders' decomposition.

REO Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

8.1.1. Philips Research

Participants: Miguel Ángel Fernández Varela, Jean-Frédéric Gerbeau, Alexandre This.

CIFRE convention and contract with Philips Research for the PhD thesis of Alexandre This (January 2016 - December 2018) on fusion data/simulation for the assessment of mitral regurgitation.

8.1.2. Kephalios & Epygon

Participants: Gautier Bureau, Miguel Ángel Fernández Varela, Jean-Frédéric Gerbeau, Ludovic Boilevin-Kayl, Marina Vidrascu.

REO is an academic partner of the industrial project MIVANA, dedicated to the development of new technologies for mitral valve treatment. It is led by the start-up company Kephalios, with the participation of the start-up company Epygon, by the company MDB Texinov and the research institute IFTH. In this framework, REO has two bilateral contracts with Kephalios and Epygon on the modeling and simulation of two medical devices for mitral valve repair.

8.1.3. Instem/NOTOCORD

Participants: Muriel Boulakia, Damiano Lombardi, Jean-Frédéric Gerbeau, Fabien Raphel.

REO partners with the software company NOTOCORD. The collaboration started in 2013 the framework of the LabCom “cardioXcomp”. In 2016, the ANR funding came to an end, and NOTOCORD was acquired by the company Instem. Our collaboration with Instem/NOTOCORD continues as a bilateral partnership with the purpose of developing the software cardioXcomp dedicated to the safety pharmacology industry. This project is also supported by a grant by AMIES (Agency for Interaction in Mathematics with Business and Society).

8.1.4. ESIEE-Heartflow

Participant: Irene Vignon Clementel.

Research contract with ESIEE-Heartflow on coronary tree modeling.

RESIST Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

- RED ALERT LABS (Paris, France)
  - Verification of the security requirements of an IoT device (a connected doorbell) using the SCUBA tool suite.
  - An extension of SCUBA (see 6.6) is developed to verify the security requirements provided in Common Criteria format by the industrial partner. The verification uses the information of the Security Knowledge Bases (SKB) built by the SCUBA tool suite.

8.2. Bilateral Grants with Industry

- Thales (Palaiseau, France):
  - CIFRE PhD (Pierre-Olivier Brissaud, supervised by Isabelle Chrisment and Jérôme François)
  - Anomaly detection in encrypted network traffic
- Orange Labs (Issy-Les-Moulineaux, France):
  - CIFRE PhD (Maxime Compastie, supervised by Olivier Festor and Rémi Badonnel)
  - Software-Defined Security for Distributed Cloud Infrastructures
- Orange Labs (Issy-Les-Moulineaux, France):
  - CIFRE PhD (Paul Chaignon, supervised by Olivier Festor and Jérôme François)
  - Monitoring of Software-Defined Networks
- Xilopix then Qwant (Épinal, France):
  - CIFRE PhD (Abdulqawi Saif, supervised by Ye-Qiong Song and Lucas Nussbaum)
  - Open Science for the scalability of a new generation search technology
- Numeryx Technologies (Paris, France):
  - CIFRE PhD (Ahmad Abboud, supervised by Michael Rusinowitch, Abdelkader Lahmadi and Adel Bouhoula)
  - Compressed and Verifiable Filtering Rules in Software-defined Networking

RITS Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

Valeo Group: a very strong partnership is under reinforcement between Valeo and Inria. Several bilateral contracts were signed to conduct joint works on Driving Assistance, some of which Valeo is funding. This joint research includes:

- The PhD thesis of Pierre de Beaucorps under the framework of Valeo project "Daring"
- A CIFRE like PhD thesis is ongoing between Valeo and Inria (Maximilian JARITZ), dealing with multisensor processing and learning techniques for free navigable road detection.
- Valeo is currently a major financing partner of the "GAT" international Chaire/JointLab in which Inria is a partner. The other partners are: UC Berkeley, Shanghai Jiao-Tong University, EPFL, IFSTTAR, MPSA (Peugeot-Citroën) and SAFRAN.
- Technology transfer is also a major collaboration topic between RITS and Valeo as well as the development of a road automated prototype.
- Finally, Inria and Valeo are partners of the PIA French project CAMPUS (Connected Automated Mobility Platform for Urban Sustainability) including SAFRAN, Invia and Gemalto. The aim of the project is the development of autonomous vehicles and the realization of two canonical uses-cases on highways and urban like environments.

Renault Group: Collaboration between Renault and RITS re-started in 2016. Different research teams in Renault are now working separately with RITS on different topics.

- A CIFRE like PhD thesis is ongoing between Renault and Inria (Farouk GHALLABI) The thesis deals with the accurate localization of an autonomous vehicle on a highway using mainly on-board low-cost perception sensors.
- Another CIFRE PhD thesis is ongoing since November 2017 (Imane MAHTOUT).

AKKA Technologies: Collaboration with AKKA since 2012 (for the Link & Go prototype).

- Inria and AKKA Technologies are partners in the VALET projects (ANR projects).
- A CIFRE PhD thesis (Luis ROLDAO) dealing with 3D-environment modeling for autonomous vehicles begun in October 2017.

RMOD Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

8.1.1. BlockChain

Participants: Henrique Rocha, Marcus Denker, Stéphane Ducasse
From 2016, ongoing.

We started a new collaboration with a local startup (UTOCAT) about tools and languages in the context of Blockchain systems. The collaboration started with a 2 month exploration phase involving an engineer at Inria Tech. A postdoc started in 2017.

8.1.2. Pharo Consortium

Participants: Esteban Lorenzano, Clément Béra, Marcus Denker, Stéphane Ducasse
From 2012, ongoing.

The Pharo Consortium was founded in 2012 and is growing constantly. By the end 2018, it has 32 company members, 17 academic partners. Inria supports the consortium with one full time engineer starting in 2011. In 2018, the Pharo Consortium joined InriaSoft.

More at http://consortium.pharo.org.

8.2. Bilateral Grants with Industry

8.2.1. Thales CIFRE

Participants: Brice Govin, Anne Etien, Nicolas Anquetil, Stéphane Ducasse
From 2015, ongoing.

We are working on large industrial project rearchitecturization. PhD in progress: Brice Govin, *Support to implement a rejuvenated software architecture in legacy software*. CIFRE Thales started Jan 2015.

8.2.2. Remodularization of Architecture

Participants: Nicolas Anquetil, Santiago Bragagnolo Stéphane Ducasse, Anne Etien, Benoît Verhaeghe
From 2017, ongoing.

We started a new collaboration with the software editor Berger Levrault about software architecture remodularization. The collaboration started with an end study project exploring the architecture used in the company in order to later migrate from GWT to Angular JS since GWT will not be backward supported anymore in the next versions. An internship and a PhD CIFRE thesis will start in 2018.

ROMA Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

- In 2018, in the context of the MUMPS consortium (http://mumps-consortium.org), we worked in close collaboration with Toulouse INP to:
  - sign or renew membership contracts with AIRBUS, FFT-MSC, and SHELL, on top of the ongoing contracts with EDF, ALTAIR, Michelin, LSTC, Siemens, ESI Group, Total, SAFRAN, LBNL,
  - organize point-to-point meetings with several members,
  - provide technical support and scientific advice to members,
  - provide experimental releases to members in advance,
  - organize the fourth consortium committee meeting, at SAFRAN (Saclay).

  Three engineers have been funded by the membership fees in 2018, for software engineering and software development, performance study and tuning on modern architectures, business development, management of the consortium, and organization of the future of the consortium. Half a year of a PhD student was also funded by the membership fees (see Section 9.1). On top of their membership, an additional contract was finalized with Michelin to study a new functionality and understand how to best exploit MUMPS recent features in their computing environment.

SECRET Project-Team (section vide)

SELECT Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Contract with NEXTER

Participants: Gilles Celeux, Florence Ducros, Patrick Pamphile.

SELECT has a contract with Nexter regarding modeling the reliability of vehicles.

SEMAGRAMME Project-Team (section vide)

SEQUEL Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

8.1.1. Lelivrescolaire.fr

- contract with http://Lelivrescolaire.fr; PI: Michal Valko

  Title: Sequential Machine Learning for Adaptive Educational Systems

  Duration: Mar. 2018 – Feb. 2021

  Abstract: Adaptive educational content are technologies which adapt to the difficulties encountered by students. With the rise of digital content in schools, the mass of data coming from education enables but also ask for machine learning methods. Since 2010, Lelivrescolaire.fr has been developing some learning materials for teachers and students through collaborative creation process. For instance, during the school year 2015/2016, students has achieved more than 8 000 000 exercises on its homework platform Afterclasse.fr. Our approach would be based on sequential machine learning: the algorithm learns to recommend some exercises which adapt to students gradually as they answer.
  Participants: Julien Seznec, Michal Valko.

8.1.2. Sidexa

- contract with "Sidexa"; PI: Philippe Preux

  Title: vision applied to the segmentation and recognition of cars and car related documents.

  Duration: 6 months

  Abstract: this is a follow-up to the successful contract realized in 2017 with Sidexa. We studied multi-class supervised classification problems in order to classify documents related to a car, and also to identify various characteristics of a car, such as its color, its make, its type.

  This work is done with an InriaTech engineer.
  Participant: Philippe Preux.

8.1.3. Renault

- contract with Renault; PI: Philippe Preux

  Title: Control of an autonomous vehicle

  Duration: 3 years (12/2017–11/2020)

  Abstract: This contract comes along the CIFRE grant on the same topic. This work is done in collaboration with the NON-A team-project.
  Participants: Édouard Leurent, Odalric Maillard, Philippe Preux.

8.1.4. Critéo

- contract with "Criteo"; PI: Philippe Preux

  Title: Computational advertizing

  Duration: 3 years (12/2017–11/2020)

  Abstract: This contract comes along the CIFRE grant on the same topic. The goal is to investigate reinforcement learning and deep learning on the problem of ad selection on the Internet.
  Participants: Philippe Preux, Kiewan Villatel.

8.1.5. Orange Labs

- contract with “Orange Labs”; PI: Olivier Pietquin

  Title: Inter User Transfer in dialogue systems

  Duration: 3 years

  Abstract: This contract comes along the CIFRE grant on the same topic. The research aims at developing new algorithms to learn fast adaptation strategies for dialogue systems when a new user starts using them while we collected data from previous interactions with other users. Especially, it addresses the cold-start problem encountered when a new user faces the system, before samples can be collected to optimize the interaction strategy.
  Participants: Merwan Barlier, Nicolas Carrara, Olivier Pietquin.

8.1.6. 55

- contract with “55”; PI: Jérémie Mary

  Title: Novel Learning and Exploration-Exploitation Methods for Effective Recommender Systems

  Duration: Oct. 2015 – Sep. 2018

  Abstract: This contract comes along the CIFRE grant on the same topic. In this Ph.D. thesis we intend to deal with this problem by developing novel and more sophisticated recommendation strategies in which the collection of data and the improvement of the performance are considered as a unique process, where the trade-off between the quality of the data and the performance of the recommendation strategy is optimized over time. This work also consider tensor methods (one layer of the tensor can be the time) with the goal to scale them at RS level.

  The PhD was defended in Fall 2018.
  Participants: Jérémie Mary, Romain Warlop.

8.1.7. AB-Tasty

- Thompson Sampling for A/B/C Testing with Delayed Conversions; PI: Émilie Kaufmann

  Duration: 1 month

  Abstract: We investigated the use of Thompson Sampling as well as other state-of-the-art methods for the stochastic MAB problem in the context of delayed feedback. We provided theoretical justification for a method developed by AB Tasty, and proposed some variants of it, as well as a comparison with existing methods from the literature.
  Participant: Émilie Kaufmann.

SERENA Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

Three two-part contracts with EDF accompanying the PhD theses of Amina Benaceur, Nicolas Pignet, and Riccardo Milani.

Two two-part contract with CEA accompanying the PhD thesis of Frédéric Marazzato and the postdoc of Guillaume Delay.

Three-part contract Inria–EDF–Sciworks Technologies (from April 2017) on "Form-L for the formalization of constraints of complex systems". SERENA representants are Sébastien Furic and Pierre Weis.

AMIES NEF-PEPS1 (Dec. 2018–Feb. 2020) Collaboration with the joint laboratory LabCom fractory (ITASCA, Géosciences Rennes). SERENA representants are F. Clément, Sébastien Furic, Florent Hédin, M. Kern and G. Pichot (Coordinator).

Two-part contract with IFP Energies Nouvelles for co-supervision of the post-doc of G. Mallik.

SERPICO Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral grants with industry

8.1.1. Fourmentin-Guilbert Foundation: Macromolecule detection in cryo-electron tomograms

Participants: Emmanuel Moebel, Charles Kervrann.

Collaborators: Damien Larivière (Fourmentin-Guilbert Foundation).

A three-year contract was established with Fondation Fourmentin-Guilbert to partly support the PhD thesis of Emmanuel Moebel. The Fondation Fourmentin-Guilbert strives for building a virtual E. coli bacteria. Information about the position of macromolecules within the cell is necessary to achieve such a 3D molecularly-detailed model. The Fondation Fourmentin-Guilbert supports cutting-edge *in-situ* cryo-electron tomography combined with image processing at the Max-Planck Institute of Biochemistry to map the spatial distribution of the ribosomes, and obtain structural information on the complexes they form *in-situ* with cofactors and other ribosomes. The objective of the project is to explore novel methods from the field of 3D shape retrieval for identifying and counting macromolecules within a tomogram. This project is also supported by Région Bretagne.

8.1.2. DGA contract on motion saliency analysis

Participants: Léo Maczyta, Patrick Bouthemy

Funding: DGA (National Defense Agency) (Oct 2017 - Sept 2020)

Collaborators:

This project funded by the DGA (Ministry of defense) concerns the PhD thesis (co-funding) carried out by Léo Maczyta. The goal is to develop motion saliency methods along three axes: temporal motion saliency detection, saliency map estimation, trajectory-based saliency detection.

SIERRA Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

Microsoft Research: “Structured Large-Scale Machine Learning”. Machine learning is now ubiquitous in industry, science, engineering, and personal life. While early successes were obtained by applying off-the-shelf techniques, there are two main challenges faced by machine learning in the “big data” era: structure and scale. The project proposes to explore three axes, from theoretical, algorithmic and practical perspectives: (1) large-scale convex optimization, (2) large-scale combinatorial optimization and (3) sequential decision making for structured data. The project involves two Inria sites (Paris and Grenoble) and four MSR sites (Cambridge, New England, Redmond, New York). Project website: http://www.msr-inria.fr/projects/structured-large-scale-machine-learning/.

8.2. Bilateral Grants with Industry

- Alexandre d’Aspremont, Francis Bach, Martin Jaggi (EPFL): Google Focused award.
- Francis Bach: Gift from Facebook AI Research.
- Alexandre d’Aspremont: AXA, "mécénat scientifique, chaire Havas-Dauphine", machine learning.

SIMSMART Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts or Grants with Industry (Private Sector)

1. **Scalian Alyotech**, through the CIFRE PhD project of Gabriel Jouan, dedicated to weather forecast corrections.
2. **Naval Group Research**, through the CIFRE PhD project of Audrey Cuillery dedicated to Bayesian tracking.
3. **Eau du Ponant**, through the R&D project MEDISA (https://www.eauduponant.fr/fr/actualite/lancement-du-projet-de-rd-medisa) on water industry.

7.2. Bilateral Contracts or Grants with Industry (Public Sector)

1. **CEA LETI** on indoor navigation (particle filtering) through the CEA PhD grant of Kersane Zoubert–Ousseni.
2. **EURAMED** (a Euro-Mediterranean Cooperation Initiative, which aims to develop an Internet-based, multi-parametric electronic platform for optimum design of desalination plants, supplied by Renewable Energy Sources (RES). PI: E. Koutroulis (GREECE).

SIROCCO Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

8.1.1. CIFRE contract with Technicolor on light fields editing

Participants: Christine Guillemot, Matthieu Hog.

- Title : Light fields editing
- Research axis : 7.1.1
- Partners : Technicolor (N. Sabater), Inria-Rennes.
- Funding : Technicolor, ANRT.
- Period : Oct.2015-Sept.2018.

Editing is quite common with classical imaging. Now, if we want light-field cameras to be in the future as common as traditional cameras, this functionality should also be enabled with light-fields. The goal of the PhD thesis is to develop methods for light-field editing, and in 2018 we have extended our concept of super-rays initially introduced for static light fields to video light fields (see Section 7.1.1). Super-rays group rays within and across views, emitted by the same set of 3D points in the space. A method for dynamic tracking of super-rays with scene flow estimation has been developed. We have further explored a novel way, using recurrent neural networks and in particular long short term memory (LSTM) networks, to solve the problem of view synthesis (see Section 7.3.1).

8.1.2. CIFRE contract with Technicolor on light fields compressed representation

Participants: Christine Guillemot, Fatma Hawary.

- Title : Light fields compressed representation
- Research axis : 7.2.2
- Partners : Technicolor (G. Boisson), Inria-Rennes.
- Funding : Technicolor, ANRT.
- Period : Feb.2016-Jan.2019.

The goal of this PhD thesis is to study reconstruction algorithms from compressed measurements. The goal is to apply these algorithms to scalable compression of light fields. Methods of sparse light field recovery have been developed, based on the assumption of sparsity in the Fourier domain, and using orthogonality constraint in the Fourier transform domain. The method has been further improved by introducing a refinement of the basis functions with non integer frequencies.

8.1.3. CIFRE contract with Technicolor on cloud-based image compression

Participants: Jean Begaint, Christine Guillemot.

- Title : Cloud-based image compression
- Research axis : 7.2.6
- Partners : Technicolor (Ph. Guillotel, F. Galpin), Inria-Rennes.
- Funding : Technicolor, ANRT.
- Period : Nov.2015-Oct.2018.

The goal of this Cifre contract is to develop a novel image compression scheme exploiting similarity between images in a cloud. A region-based geometric and photometric alignment algorithm has been developed and validated for still image compression with an inter-coding set-up using similar images in the cloud as reference frames. This model has been further validated in the context of temporal prediction in a video compression scheme (see Section 7.2.6). Neural network based frame interpolation techniques have also been investigated, showing promising performance gains compared to the state of the art.

8.1.4. DGA contract on deep learning for image compression

Participants: Thierry Dumas, Christine Guillemot, Aline Roumy.

- Title : Deep learning for image compression
- Research axis : 7.2.5
- *Partners*: Inria-Rennes (Sirocco team)
- *Funding*: DGA/Ministry of defense
- Period : Oct.2015-Sept.2018.

This project funded by the DGA/Ministry of Defense concerns the PhD thesis of T. Dumas. The goal was to study deep learning architectures for image compression. Autoencoders have been studied to jointly learn transforms and quantizers with rate-distortion optimization criteria. A set of neural network architectures called Prediction Neural Networks Set (PNNS), based on both fully-connected and convolutional neural networks, has also been developed for intra image prediction (see Section 7.2.5).

SISTM Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Contracts and Grants with Industry

Implication in research for the development of Ebola vaccine has lead to several indirect contracts with industry:

- The EBOVAC1, EBOVAC2 and EBOVAC3 project, collaboration with Janssen from Johnson et Johnson.
- The Prevac trial vaccine trial leads to collaboration with Merck and Janssen. The purpose of this study is to evaluate the safety and immunogenicity of three vaccine strategies that may prevent Ebola virus disease (EVD) events in children and adults. Participants will receive either the Ad26.ZEBOV (rHAd26) vaccine with a MVA-BN-Filo (MVA) boost, or the rVSVΔG-ZEBOV-GP (rVSV) vaccine with or without boosting, or placebo. The Prevac-UP project is set as a continuation of Prevac trial in the same framework.

SOCRATE Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Grants with Industry

7.1.1. Research Contract with Atlantic 2016-2018

Socrate (Guillaume Villemaud, Florin Hutu, Guillaume Salagnac and Tanguy Risset) are collborating with Atlantic to prototype guided wireless communications in ventilation ducts with low energy consumption. The project will lead to a shift to wireless communications in HVAC ducts.

7.1.2. Research Contract with SigFox 2015-2018

Socrate explored the performance of UNB networks with an emphasis on robust signal processing techniques (PhD defended on Dec 2018).

7.1.3. Research Contract with Orange 2016-2018

Socrate explored in this partnership the theoretical limits of IoT access networks by combining information theory and stochastic geometry.

7.1.4. Research Contract with Nokia 2017-2021

Socrate contributes to two research actions in the Nokia Bell Labs - Inria common lab. The first ADR is on Network Information Theory devoted to to the modeling of IoT networks, and which relies on our academic work in the ANR Arburst. We collaborate with Agora, Infine and Eva teams.

The second ADR is on machine learning for wireless networks. Our contribution is on designing new PHY layer protocols with machine learning, with an experimental assessment of these techniques on FIT/CorteXlab.

7.1.5. Research Contract with Bosch 2018

In collaboration with Aric, Socrate worked with Bosch on the impementation of some elementary functions in an embedded context.

SPADES Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

- Inria and Orange Labs have established in 2015 a joint virtual research laboratory, called I/O LAB. We have been heavily involved in the creation of the laboratory and are actively involved in its operation (Jean-Bernard Stefani is one of the two co-directors of the lab). I/O LAB focuses on the network virtualization and cloudification. As part of the work of I/O LAB, we have cooperated with Orange Lab, as part of a cooperative research contract funded by Orange, on defining architectural principles and frameworks for network cloud infrastructures encompassing control and management of computing, storage and network resources.
- With Daimler (subcontracting via iUTBS): We have proposed, in collaboration with TU Braunschweig, an extension of the LET paradigm [50], called *System-level LET, to accommodate the specific needs of the design process in the automotive industry, in which the network structure must be made explicit in the LET program.*

7.2. Bilateral Grants with Industry

With Thales: Early performance assessment for evolving and variable cyber-physical systems. This CIFRE grant funds the PhD of Christophe Prévot.

With Orange: Programming IoT and sofware defined radio with dynamic dataflow models of computation. This CIFRE grant funds the PhD of Arash Shafiei.

SPECFUN Project-Team (section vide)

SPHINX Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Grants with Industry

From April 2018, Th. Chambrion is the advisor of a thesis, which is funded by Saint Gobain Research (CIFRE contract). The aim of this thesis is to improve the cast process used in the Saint Gobain pipes factory of Pont-à -Mousson. Complex physical processes (centrifugation of multi-phasic flows with variable viscosity) prevent a physical based modeling approach. Using a statistical modeling of the plant, we aim to obtain efficient control laws and a significative cost reduction.

SPIRALS Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. ip-label

Participant: Romain Rouvoy [correspondant].

A software exploitation license of the APISENSE® crowd-sensing platform has been sold to the ip-label company. They use this platform as a solution to monitor the quality of the GSM signal in the wild. The objective is to provide developers and stakeholders with a feedback on the quality of experience of GSM connection depending on their location.

8.2. Scalair

Participants: Yahya Al-Dhuraibi, Philippe Merle [correspondant].

This collaboration (2015–18) aims at proposing a framework to deal with elasticity in cloud computing environments. This framework must cover all kinds of resources, IaaS, PaaS, SaaS, must provide a solution for interoperability between different clouds and virtualization technologies, and must enable the specification and composition of reactive and predictive strategies.

This collaboration is conducted in the context of the PhD thesis of Yahya Al-Dhuraibi defended in December 2018.

8.3. Davidson

Participants: Romain Rouvoy [correspondant], Lionel Seinturier.

This collaboration (2017–20) aims at proposing new solutions for optimizing the energy footprint of ICT software infrastructures. We want to be able to measure and assess the energy footprint of ICT systems while preserving various quality of service parameters, such as performance and security. We aim at proposing a testbed for assessing the energy footprint of various programming languages. This testbed will also incorporate frameworks for web and mobile programming. Finally, we want to be able to issue recommendations to developers in order to assist them in improving the energy footprint of their programs. This collaboration will take advantage of the POWERAPI software library.

The PhD of Mohammed Chakib Belgaid takes place in the context of this collaboration.

8.4. Orange Labs #1

Participants: Philippe Merle [correspondant], Lionel Seinturier.

This collaboration (2017–18) aims at defining a computational model for software infrastructures layered on top of virtualized and interconnected cloud resources. This computational model will provide application programming and management facilities to distributed applications and services. This computational model will define a pivot model that will enable the interoperability of various existing and future standards for cloud systems such as OCCI and TOSCA. This pivot model will be defined with the Alloy specification language [54]. This collaboration takes advantage of the expertise that we are developing since several years on reconfigurable component-based software systems [66], on cloud systems [60], and on the Alloy specification language [58].

This collaboration with Orange Labs is a joint project with Jean-Bernard Stefani from the Spades Inria project-team.

8.5. Orange Labs #2

Participants: Zakaria Ournani, Romain Rouvoy [correspondant], Lionel Seinturier.

This collaboration (2018–21) aims at proposing new solutions for modeling the energy efficiency of software systems and to design and implement new methods for measuring and reducing the energy consumption of software systems at development time. We especially target software systems deployed on cloud environments.

The CIFRE PhD of Zakaria Ournani takes place in the context of this collaboration.

8.6. Amaris

Participants: Sacha Brisset, Romain Rouvoy [correspondant], Lionel Seinturier.

This collaboration (2018–21) aims at proposing new solutions for automatically spotting and fixing recurrent user experience issues in web applications. We are interested in developing an autonomic framework that learns and classifies the behaviors and figures out causality links between data such as web GUI events, support tickets and user feedback, source version management events (e.g. recent commits). The ultimate objective is to implement an AI-powered recommendation system to guide the maintenance and even to automatically predict and solve user issues.

The CIFRE PhD of Sacha Brisset takes place in the context of this collaboration.

STACK Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

Participants: Adrien Lebre [Contact point], Ronan-Alexandre Cherrueau, Marie Delavergne, Alexandre Van Kempen.

During 2017, we agreed with Orange Labs (Lannion) to conduct a dedicated study on the evaluation of AMQP message bus alternatives within the OpenStack ecosystem. This bilateral contract ("Contrat de Recherche Externalisé") officially started in Sept 2017 for one year. With the allocated budget (100K), we hired a new research engineer, Alexandre Van Kempen. Alexandre Van Kempen works with Ronan-Alexandre Cherrueau (Temporary Resarch Engineer, hired in the context of the MERCURY InriHub) and Matthieu Simonin (Permanent Research Engineer from the Rennes Bretagne Atlantique Center) on conducting this analysis. In addition to extending the EnOS framework previously presented, they are performing several experiments with the support of the OpenStack open-source community (in particulat RedHat). The goal of the study is to identify major drawbacks of the default RabbitMQ solution with respect to the Fog/Edge requirements and evaluate whether some alternatives are available in the open-source ecosytem.

STARS Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

- *Toyota:* (Action Recognition System): This project runs from the 1st of August 2013 up to 2019. It aimed at detecting critical situations in the daily life of older adults living home alone. The system is intended to work with a Partner Robot (to send real-time information to the robot) to better interact with the older adult. The funding was 106 Keuros for the 1st period and more for the following years.
- *Gemalto:* This contract is a CIFRE PhD grant and runs from September 2018 until September 2021 within the French national initiative SafeCity. The main goal is to analyze faces and events in the invisible spectrum (i.e., low energy infrared waves, as well as ultraviolet waves). In this context models will be developed to efficiently extract identity, as well as event - information. These models will be employed in a school environment, with a goal of pseudo-anonymized identification, as well as event-detection. Expected challenges have to do with limited colorimetry and lower contrasts.
- *BluManta:* This contract is a CIFRE PhD grant and runs from August 2018 to August 2021. The aim is to develop an end-to-end 3D face analysis model, involving a unified deep neural network in charge of (a) creating a depth map, (b) extracting embeddings, (c) embeddings similarity estimation. This model will be targeted for high accuracy in tasks such as face authentication.
- *Kontron:* This contract is a CIFRE PhD grant and runs from April 2018 until April 2021 to embed CNN based people tracker within a video-camera.
- *ESI:* This contract is a CIFRE PhD grant and runs from September 2018 until March 2022 to develop a novel Re-Identification algorithm which can be easily set-up with low interaction.

STEEP Project-Team (section vide)

STORM Project-Team (section vide)

SUMO Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

8.1.1. Nokia Bell Labs - ADR SAPIENS

Several researchers of SUMO are involved in the joint research lab of Nokia Bell Labs France and Inria. We participate in the common research team SAPIENS (Smart Automated and Programmable Infrastructures for End-to-end Networks and Services), previously named "Softwarization of Everything." This team involves several other Inria teams : Convecs, Diverse and Spades. SUMO focuses on the management of reconfigurable systems, both at the edge (IoT based applications) and in the core (e.g. virtualized IMS systems). In particular, we focus on control and diagnosis issues for such systems. Two PhD students are involved in the project. Erij Elmajed (2nd year), on the topic of Diagnosis of virtualized and reconfigurable systems supervised by Éric Fabre and Armen Aghasaryan (Nokia Bell Labs). Abdul Majith (to start in January 2019) on Controller Synthesis of Adaptive Systems, supervised by Hervé Marchand, Ocan Sankur, and Dinh Thai Bui (Nokia Bell Labs).

8.1.2. Orange Labs

SUMO is participating in IOLab, the common lab of Orange Labs and Inria, dedicated to the design and management of Software Defined Networks. Our activities concern the diagnosis of malfunctions in virtualized multi-tenant networks. This collaboration supports one Cifre PhD student, Sihem Cherrared (2nd year), supervised by Eric Fabre, Gregor Goessler (Inria team Spades in Grenoble) and Sofiane Imadali (Orange Labs).

8.1.3. Alstom Transport - P22

Joint Alstom-Inria research lab: Several researchers of SUMO are involved in the joint research lab of Alstom and Inria, in a common research team called P22. On Alstom side, this joint research team involves researchers of the ATS division (Automatic Train Supervision). The objective of this joint team is to evaluate regulation policies of urban train systems, to assess their robustness to perturbations and failures, to design more efficient regulation policies and finally to provide decision support for human regulators. The project started in march 2014. A second phase of the project started in 2016, for a duration of three years. This covers in particular the CIFRE PhD of Karim Kecir.

8.1.4. Mitsubishi Electric Research Center Europe (MERCE)

Several researchers of SUMO are involved in a collaboration with the formal verification team of MERCE on model checking of real-time systems. The members of the formal verification team at MERCE work on different aspects of formal verification and participate to academic collaborations.

The SUMO team and MERCE have jointly supervised an M1 internship (Ludovic Landuré), and are supervising a Cifre PhD student (Emily Clement) funded by MERCE, started this fall. Reiya Noguchi, a member of MERCE will be hosted by the SUMO team in 2019.

TADAAM Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Grants with Industry

8.1.1. Intel

INTEL granted $30k and provided information about future many-core platforms and memory architectures to ease the design and development of the HWLOC software with early support for next generation hardware.

8.1.2. Bull/Atos

Bull/ATOS granted the CIFRE PhD thesis on Nicolas Denoyelle on advanced memory hierarchies and new topologies.

8.1.3. EDF

With Yvan Fournier from EDF R&D we co-advise the PhD thesis of Benjamin Lorendeau under a CIFRE funding.

8.1.4. CEA

CEA/DAM granted the CIFRE PhD thesis of Hugo Taboada on non-blocking MPI collectives.

TAMIS Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

- CISCO (http://www.cisco.com) contract (2017–2022) to work on graph analysis of malware

8.2. Bilateral Grants with Industry

- CISCO (http://www.cisco.com) one grant (2016–2019) to work on semantical analysis of malware
- Thales (https://www.thalesgroup.com) one CIFRE (2016–2019) to work on verification of communication protocols, one grant (2018–2019) to work on learning algorithms
- Oberthur Technologies (http://www.oberthur.com/) one grant (2016–2020) to work on fuzzing and fault injection

TAU Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

TAU will continue TAO policy about technology transfer, accepting any informal meeting following industrial requests for discussion (and we are happy to be too much solicited), and deciding about the follow-up based upon the originality, feasibility and possible impacts of the foreseen research directions, provided they fit our general canvas. This lead to the following 5 on-going CIFRE PhDs, with the corresponding side-contracts with the industrial supervisor, plus 3 other bilateral contracts. In particular, we now have a first "Affiliate" partner, the SME DMH, and hope to further develop in the future this form of transfer. Note that it can also sometimes lead to collaborative projects, as listed in the following sections.

- **CIFRE RTE** 2015-2018 (72 kEuros), with Réseau Transport d'Electricité, related to Benjamin Donnot's CIFRE PhD
  Coordinator: Olivier Teytaud (until May 2016), then Isabelle Guyon, and Antoine Marot (RTE)
  Participants: Benjamin Donnot, Marc Schoenauer
- **Myndblue**, 2017-2018 (1 an, 50kEuros) related to consulting activities with DMH (Digital for Mental Health)[0].
  Coordinator: Aurélien Decelle and Simon Moulieras (DMH)
  Participants: Michèle Sebag
- **Contrat LFI** 2017-2018 (30kEuros), with La Fabrique de l'Industrie, related to quality of life at work (Section 7.3.1).
  Coordinator: Michèle Sebag and Thierry Weil (La Fabrique de l'Industrie)
  Participants: Olivier Goudet, Diviyan Kalainathan
- **POC Renault** 2017-2018 (125 kEuros), *Clusterisation et optimisation de scenarii pour la validation des véhicules autonomes*
  Coordinator: Marc Schoenauer and Philippe Reynaud (Renault)
  Participants: Guillaume Charpiat, Raphaël Jaiswal (engineer), Marc Schoenauer
- **CIFRE Renault** 2017-2020 (45 kEuros), related to Marc Nabhan's CIFRE PhD *Sûreté de fonctionnement d'un véhicule autonome - évaluation des fausses détections au travers d'un profil de mission réduit*
  Coordinator: Marc Schoenauer and Hiba Hage (Renault)
  Participants: Marc Nabhan (PhD), Yves Tourbier (Renault)
- **OPLa** 2017-2018, Organizing Platform Labor (27k euros), funded by Force Ouvrière.
  Coordinator: A.A. Casilli (Telecom ParisTech)
  Participants: Paola Tubaro
- **DiPLab** 2017-2018, Digital Platform Labor (24k euros), funded by MSH Paris-Saclay.
  Coordinators: Paola Tubaro (avec A.A. Casilli, Telecom ParisTech)
- **CIFRE Thalès** 2018-2021 (45 kEuros), with Thales Teresis, related to Nizam Makdoud's CIFRE PhD
  Coordinator: Marc Schoenauer and Jérôme Kodjabatchian
  Participants: Nizam Makdoud
- **CIFRE RTE** 2018-2021 (72 kEuros), with Réseau Transport d'Electricité, related to Balthazar Donon's CIFRE PhD
  Coordinator: Isabelle Guyon and Antoine Marot (RTE)

[0]This "Affiliate" contract has been inspired by the affiliate program of Technion

Participants: Balthazar Donon, Marc Schoenauer

- **CIFRE FAIR** 2018-2021 (45 kEuros), with Facebook AI Research, related to Leonard Blier's CIFRE PhD
  Coordinator: Marc Schoenauer and Yann Olliver (Facebook)
  Participatns: Guillaume Charpiat, Michèle Sebag, Léonard Blier
- **Google Zurich** 2018 (50kEuros), related to the **AutoDL** (see Section 3.4)
  Coordinator: Isabelle Guyon and Olivier Bousquet (Google)
  Participants: Zhengying Liu and Lisheng Sun
- **IFPEN** (Institut Français du Pétrole Energies Nouvelles) 2018-2022 (300 kEuros), to hire an Inria Starting Research Position (PhD + 4-6 years) to work in all topics mentioned in Section 3.2 relevant to IFPEN activity (see also Section 4.2).

TEA Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

8.1.1. Inria – Mitsubishi Electric framework program (2018+)

Title:

Inria principal investigator: Jean-Pierre Talpin, Simon Lunel

International Partner: Mitsubishi Electric R&D Europe (MERCE)

Duration: 2018

Abstract: Following up the fruitfull collaboration of TEA with the formal methods group at MERCE, Inria and Mitsubishi Electric signed a center-wide collaboration agreement, which currently hosts projects with project-teams Sumo and Tea.

8.1.2. Mitsubishi Electric R&D Europe (2015-2018)

Title: Analysis and verification for correct by construction orchestration in automated factories

Inria principal investigator: Jean-Pierre Talpin, Simon Lunel

International Partner: Mitsubishi Electric R&D Europe

Duration: 2015 - 2018

Abstract: The primary goal of our project is to ensure correctness-by-design in cyber-physical systems, i.e., systems that mix software and hardware in a physical environment, e.g., Mitsubishi factory automation lines. We develop a component-based approach in Differential Dynamic Logic allowing to reason about a wide variety of heterogeneous cyber-physical systems. Our work provides tools and methodology to design and prove a system modularly.

THOTH Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. MSR-Inria joint lab: structured large-scale machine learning

Participants: Julien Mairal, Alberto Bietti.

Machine learning is now ubiquitous in industry, science, engineering, and personal life. While early successes were obtained by applying off-the-shelf techniques, there are two main challeges faced by machine learning in the " big data " era : structure and scale. The project proposes to explore three axes, from theoretical, algorithmic and practical perspectives: (1) large-scale convex optimization, (2) large-scale combinatorial optimization and (3) sequential decision making for structured data. The project involves two Inria sites and four MSR sites and started at the end of 2013. Alberto Bietti visited MSR New York in 2018.

8.2. Amazon

Participants: Grégory Rogez, Cordelia Schmid.

We received an Amazon Faculty Research Award in 2018. The objective is 3D human action recognition from monocular RGB videos. The idea is to extend our recent work on human 3D pose estimation to videos and to develop an approach for action recognition based on temporal pose based on appropriate 3D features.

8.3. Intel

Participants: Cordelia Schmid, Karteek Alahari.

The Intel Network on Intelligent Systems in Europe brings together leading researchers in robotics, computer vision, motor control, and machine learning. We are part of this network and have participated in the annual retreat in 2018. Funding will be provided on an annual basis, every year, as long as we are part of the network.

8.4. Facebook

Participants: Cordelia Schmid, Jakob Verbeek, Julien Mairal, Karteek Alahari, Pauline Luc, Alexandre Sablayrolles, Mathilde Caron.

The collaboration started in 2016. The topics include image retrieval with CNN based descriptors, weakly supervised object detection and semantic segmentation, and learning structured models for action recognition in videos. In 2016, Pauline Luc started her PhD funded by a CIFRE grant, jointly supervised by Jakob Verbeek (Inria) and Camille Couprie (Facebook AI Research). THOTH has been selected in 2016 as a recipient for the Facebook GPU Partnership program. In this context Facebook has donated two state-of-the-art servers with 8 GPUs. In 2017, Alexandre Sablayrolles started his CIFRE grant, jointly supervised by Cordelia Schmid, and Herve Jegou and Matthijs Douze at Facebook AI Research. In 2018, Mathilde Caron started as a CIFRE PhD student, jointly supervised by Julien Mairal, and Armand Joulin and Piotr Bojanowski at Facebook AI Research.

8.5. NAVER LABS Europe

Participants: Cordelia Schmid, Karteek Alahari, Julien Mairal, Jakob Verbeek, Vasileios Choutas, Nieves Crasto.

This collaboration started when NAVER LABS Europe was Xerox Research Centre Europe, and has been on-going since October 2009 with two co-supervised CIFRE scholarships (2009–2012, 2011-2014). Starting June 2014 we signed a third collaborative agreement for a duration of three years. The goal is to develop approaches for deep learning based image description and pose estimation in videos. Jakob Verbeek and Diane Larlus (XRCE) jointly supervise a PhD-level intern for a period of 6 months in 2016-2017. XRCE then became Naver in 2017. A one-year research contract on action recognition in videos started in Sep 2017. The approach developed by Vasileios Choutas implements pose-based motion features, which are shown to be complementary to state-of-the-art I3D features. Nieves Crasto's internship in 2018 was jointly supervised by Philippe Weinzaepfel (NAVER LABS), Karteek Alahari and Cordelia Schmid.

TITANE Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Grants with Industry

8.1.1. Google Chrome University Research Programme

Participants: Pierre Alliez, Cédric Portaneri.

We developed a novel approach and software prototype for the compression of 3D models. Our main focus is on progressive compression of surface triangle meshes with color textures, with emphasis on fine grain, genericity and flexible metric. The proposed methodology is to turn the input models into a stream of refinements, in which both mesh and texture refinement details are multiplexed in accordance to rate-distortion principles. Fine grain is achieved through considering all components, local as well as non-local, from both the mesh and its textures: mesh complexity, vertex accuracy, texture definition and accuracy. We leveraged the recent advances on perceptual metrics to improve the visual appearance, and performed joint consolidation and encoding of the models to further optimize the rate-distortion tradeoffs and visual perception.

8.1.2. Dorea technology

Participants: Vincent Vadez, Pierre Alliez [contact].

In collaboration with SME Dorea Technology, our objective is to advance the knowledge on the thermal simulation of satellites, via geometric model reduction. The survival of a satellite is related to the temperature of its components, the variation of which must be controlled within safety intervals. In this context, the thermal simulation of the satellite for its design is crucial to anticipate the reality of its operation. The project started in August 2018, for a total duration of 3 years.

8.1.3. Luxcarta

Participants: Jean-Philippe Bauchet, Florent Lafarge [contact].

The goal of this collaboration is to design automated approaches for producing city models from the last generation of satellites. The models should conform to the level 2 (LOD2) of the popular CityGML format. The project started in October 2016, for a total duration of 3 years.

8.1.4. CNES and Acri-ST

Participants: Onur Tasar, Pierre Alliez, Yuliya Tarabalka [contact].

The aim is to devise efficient representations for satellite images. The project started in October 2017, for a total duration of 3 years.

8.1.5. CSTB

Participants: Hao Fang, Florent Lafarge [contact].

The goal of this recent collaboration is to develop methods for analyzing and exploring scale-spaces into urban 3D data. The project started in March 2016, for a total duration of 3 years.

TOCCATA Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

8.1.1. ProofInUse Joint Laboratory

Participants: Claude Marché [contact], Jean-Christophe Filliâtre, Andrei Paskevich, Guillaume Melquiond, Sylvain Dailler.

The objective of ProofInUse is to provide verification tools, based on mathematical proof, to industry users. These tools are aimed at replacing or complementing the existing test activities, whilst reducing costs.

This laboratory is a joint effort of the Inria project-team Toccata, the AdaCore company which provides development tools for the Ada programming language, and the TrustInSoft company which provides static analysis tools for the C and C++ programming language.

The objective of ProofInUse is thus to significantly increase the capabilities and performances of verification environments proposed by these two companies. It aims at integration of verification techniques at the state-of-the-art of academic research, via the generic environment Why3 for deductive program verification developed by Toccata.

This joint laboratory is a follow-up of the former "LabCom ProofInUse" between Toccata and AdaCore, funded by the ANR programme "Laboratoires communs", from April 2014 to March 2017 http://www.spark-2014.org/proofinuse.

The SME AdaCore is a software publisher specializing in providing software development tools for critical systems. A previous successful collaboration between Toccata and AdaCore enabled *Why3* technology to be put into the heart of the AdaCore-developed SPARK technology.

The SME TrustInSoft is a company whose speciality is the verification of critical software, written in the C or C++ languages. It is interested in integrating the novelties of ProofInUse in its own environment TIS Analyzer.

8.2. Bilateral Grants with Industry

8.2.1. CIFRE contract with TrustInSoft company

Participants: Guillaume Melquiond [contact], Raphaël Rieu-Helft.

Jointly with the thesis of R. Rieu-Helft, supervised in collaboration with the TrustInSoft company, we established a 3-year bilateral collaboration contract, that started in October 2017. The aim is to design methods that make it possible to design an arbitrary-precision integer library that, while competitive with the state-of-the-art library GMP, is formally verified. Not only are GMP's algorithm especially intricate from an arithmetic point of view, but numerous tricks were also used to optimize them. We are using the Why3 programming language to implement the algorithms, we are developing reflection-based procedures to verify them, and we finally extract them as a C library that is binary-compatible with GMP [20] [26].

TONUS Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

We are involved in the PhD supervision of Lucie Quibel in collaboration with EDF Chatou (CIFRE support). The objective is to design new Equations Of States (EOS) for the simulation of multiphase flows. The EOS cannot be chosen arbitrarily if one wants to ensure the stability of the fluid model. We are also interested to apply our palindromic method for computing low-Mach liquid-vapor flows.

TOSCA Project-Team

6. Bilateral Contracts and Grants with Industry

6.1. Bilateral Contracts with Industry

- M. Bossy is member of a MERIC project (MERIC is the marine energy research & innovation center in Chile) on stochastic Lagrangian models to better estimate energy production variability with water turbine, granted with the Lemon Inria Team.
- M. Bossy is the Coordinator of the POPART Industrial partnership project at UCA-JEDI on the modelling of fibre transport in turbulent flow. This partnership is granted by EDF and by UCA, and in collaboration with Observatoire de la Côte d'Azur.

TRIPOP Team

7. Bilateral Contracts and Grants with Industry

7.1. Schneider Electric

This action started in 2001 with my post-doc co–supported by Schneider Electric and CNRS. With some brief interruptions, this action is still active and should further continue. It concerns mainly the simulation and modeling of multi–body systems with contact, friction and impacts with the application for the virtual prototyping of electrical circuit breakers. During these years, various forms of collaborations have been held. Two PhD thesis have been granted by Schneider Electric (D.E. Taha and N. Akhakdar) accompanied with research contracts between Inria and Schneider Electric. Schneider Electric participated also the ANR project Saladyn as a main partner. Without going into deep details of the various actions over the years, the major success of this collaboration is the statistical tolerance analysis of the functional requirements of the circuit breakers with respect to clearance in joints and geometrical tolerances on the parts. Starting from the geometrical descriptions (CAD files) of a mechanism with prescribed tolerances on the manufacturing process, we perform worst-case analysis and Monte–Carlo simulations of the circuit breaker with Siconos and we record the variations in the functional requirements. The difficulty in such simulations are the modeling of contact with friction that models the joints with clearances. The results of these analysis enable Schneider Electric to define the manufacturing precision that has a huge impact of the production cost (Schneider Electric produces several millions of C60-type circuit breaker per year). Note that it is not possible to perform such simulations with the existing software codes of the market. At the beginning, our interlocutor at Schneider Electric was the innovation (R&D) department. Now, we are working and discussing with the business unit, Division Power and Dinnov (M. Abadie, E. Boumediene, X. Herreros) in charge of designing and producing the circuit–breakers. The targeted users are the R&D engineers of Schneider Electric that use simulation tools for designing new models or improving existing circuit breakers. This collaboration continues with new modeling and simulation challenges (flexible parts, multiple impact laws) with the CIFRE PhD of Rami Sayoud.

7.2. STRMTG

We have recently started with STRMTG a research contract about modelling, simulation and control of cable-transport systems. In such systems, the question of the coupling between the nonlinear dynamics of cables and their supports with unilateral contact and friction appears now to be determinant in order to increase the performances of the cableway systems, especially for urban transportation systems.

TROPICAL Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

- Yield management methods applied to the pricing of data trafic in mobile networks. CRE (research contract) with Orange Labs (Orange Labs partner: Mustapha Bouhtou).
- Decentralized mechanisms of operation of power systems: equilibria and efficiency. Collaboration with Nadia Oudjane and Olivier Beaude from EDF-labs, with the PhD work of Paulin Jacquot (CIFRE PhD), supervised by Stéphane Gaubert.
- Stochastic optimization of multiple flexibilities and energies in micro-grids, collaboration with Wim Van Ackooij, from EDF labs, with the PhD work of Maxime Grangereau (CIFRE PhD), supervised by Emmanuel Gobet (CMAP) and cosupervised by Stéphane Gaubert.

TYREX Project-Team (section vide)

VALDA Project-Team (section vide)

VERIDIS Project-Team (section vide)

VISAGES Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

8.1.1. Siemens

In the context of the Neurinfo imaging platform, a master research agreement between Siemens SAS - Healthcare and University of Rennes 1 defines the terms of the collaboration between Siemens, Visages and the Neurinfo platform. Relying on this research agreement contract, Neurinfo has received work in progress (WIP) sequences from Siemens in the form of object code for evaluation in the context of clinical research. The Neurinfo platform has also received source code of selected MRI sequences. As an example, the diffusion sequence code was modified to load arbitrary diffusion gradient waveforms for the FastMicroDiff project led by E. Caruyer. This is crucial in the collaboration since it enables the development of MRI sequences on site. Siemens currently provides research resources through the funding of a PhD student (Cédric Meurée: CIFRE Inria / Siemens grant). The MR Diffusion pulse sequence source code was modified in collaboration with our Siemens clinical scientist as part of our Master Research Agreement, Marc Lapert, in order to play arbitrary gradient waveforms. This was done on the Syngo VB17 software version and again on VE11C (nearly finished).

The PhD of Cédric Meurée is funded by Siemens Healthineers under a CIFRE grant.

WHISPER Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

- Orange Labs, 2016-2018, 120 000 euros. The purpose of this contract is to apply the techniques developed in the context of the PhD of Antoine Blin to the domain of Software Defined Networks where network functions are run using virtual machines on commodity multicore machines.
- Thales Research, 2016-2018, 45 000 euros. The purpose of this contract is to enable the usage of multicore architectures in avionics systems. The PhD of Cédric Courtaud is supported by a CIFRE fellowship as part of this contract.

8.2. Bilateral Grants with Industry

- Oracle, 2018-2019, 100 000 dollars. Operating system schedulers are often a performance bottleneck on multicore architectures because in order to scale, schedulers cannot make optimal decisions and instead have to rely on heuristics. Detecting that performance degradation comes from the scheduler level is extremely difficult because the issue has not been recognized until recently, and with traditional profilers, both the application and the scheduler affect the monitored metrics in the same way.

  The first objective of this project is to produce a profiler that makes it possible to find out whether a bottleneck during application runtime is caused by the application itself, by suboptimal OS scheduler behavior, or by a combination of the two. It will require understanding, analyzing and classifying performance bottlenecks that are caused by schedulers, and devising ways to detect them and to provide enough information for the user to understand the root cause of the issue. Following this, the second objective of this project is to use the profiler to better understand which kinds of workloads suffer from poor scheduling, and to propose new algorithms, heuristics and/or a new scheduler design that will improve the situation. Finally, the third contribution will be a methodology that makes it possible to track scheduling bottlenecks in a specific workload using the profiler, to understand them, and to fix them either at the application or at the scheduler level. We believe that the combination of these three contributions will make it possible to fully harness the power of multicore architectures for any workload.

WIDE Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. CIFRE Technicolor: Distributed troubleshooting of edge-compute functions (2018-2021)

Participant: François Taïani.

This project seeks to explore how recent generations of end-user gateways (or more generally end-user devices) could implement an edge-compute paradigm powered by user-side micro-services. Our vision is that the devices distributed among the homes of end-users will expose (as a service) their computing power and their ability to quickly deploy compute functions in an execution environment. In order for service and application providers to actually use the system and deploy applications, the system must however ensure an appropriate level of reliability, while simultaneously requiring a very low level of maintenance in order to address the typical size and economics of gateway deployments (at least a few tens of million units). Providing a good level of reliability in such a large system at a reasonable cost is unfortunately difficult. To address this challenge, we aim in this thesis to exploit the *natural distribution* of such large-scale user-side device deployments to quickly pinpoint problems and troubleshoot applications experiencing performance degradations.

7.2. Bilateral Grants with Industry

7.2.1. Google Focussed Grant Web Alter Ego (2013-2018)

Participants: George Giakkoupis, François Taïani.

This project addresses the problem of extracting the alter-egos of a Web user, namely profiles of like-minded users who share similar interests, across various Internet applications. The project, in collaboration with the team of Rachid Guerraoui at EPFL, runs until August 2018 and funds the PhD of Olivier Ruas, who is co-supervised by François Taïani and Anne-Marie Kermarrec.

WILLOW Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

8.1.1. MSR-Inria joint lab: Image and video mining for science and humanities (Inria)

Participants: Guilhem Cheron, Ivan Laptev, Maxime Oquab, Jean Ponce, Josef Sivic, Cordelia Schmid [Inria Lear].

This collaborative project brings together the WILLOW and LEAR project-teams with MSR researchers in Cambridge and elsewhere. The concept builds on several ideas articulated in the 2020 Sciencea report, including the importance of data mining and machine learning in computational science. Rather than focusing only on natural sciences, however, we propose here to expand the breadth of e-science to include humanities and social sciences. The project we propose will focus on fundamental computer science research in computer vision and machine learning, and its application to archaeology, cultural heritage preservation, environmental science, and sociology, and it will be validated by collaborations with researchers and practitioners in these fields.

In October 2013 a new agreement has been signed for 2013-2017 with the research focus on automatic understanding of dynamic video content. Recent studies predict that by 2018 video will account for 80-90% of traffic on the Internet. Automatic understanding and interpretation of video content is a key enabling factor for a range of practical applications such as organizing and searching home videos or content aware video advertising. For example, interpreting videos of "making a birthday cake" or "planting a tree" could provide effective means for advertising products in local grocery stores or garden centers. The goal of this project is to perform fundamental computer science research in computer vision and machine learning in order to enhance the current capabilities to automatically understand, search and organize dynamic video content.

In 2018 a new agreement has been signed with a new focus on video understanding for personal assistants. The scientific objectives are to develop models, representations and learning algorithms for (i) automatic understanding of task-driven complex human activities from videos narrated with natural language in order to (ii) give people instructions in a new environment via an augmented reality device such as the Microsoft HoloLens. Besides the clear scientific interest of automatically understanding human activities in video streams, the main high-impact motivation of this project it to develop virtual assistants that may guide a child through simple games to improve his/her manipulation and language skills; help an elderly person to achieve everyday tasks; or facilitate the training of a new worker for highly-specialized machinery maintenance.

8.1.2. Louis Vuitton/ENS chair on artificial intelligence

Participants: Ivan Laptev, Jean Ponce, Josef Sivic.

The scientific chair Louis Vuitton - École normale supérieure in Artificial Intelligence has been created in 2017 and inaugurated on April 12, 2018 by the ENS Director Marc Mézard and the LV CEO Michael Burke. The goal of the chair is to establish a close collaboration between LV and ENS in the area of Artificial Intelligence. The chair enjoys the generous annual contribution of 200K Euros provided by LV in support of research activities in statistical learning and computer vision. In particular, the chair supports the costs of researchers, students, missions, computational resources as well as seminars and meetings, including the two days of meeting annually organized by LV and ENS. During 2018 ENS and LV have organized several joint meetings with the participation of researchers from SIERRA and WILLOW teams. The chair has also supported the hiring of one PhD student at the WILLOW team, missions to conferences and international research labs as well as data collection for research projects.

8.2. Bilateral Grants with Industry

8.2.1. Facebook AI Research Paris: Weakly-supervised interpretation of image and video data (Inria)

Participants: Jean Ponce, Minsu Cho, Ivan Laptev, Josef Sivic.

We will develop in this project (Facebook gift) new models of image and video content, as well as new recognition architectures and algorithms, to address the problem of understanding the visual content of images and videos using weak forms of supervision, such as the fact that multiple images contain instances of the same objects, or the textual information available in television or film scripts.

8.2.2. Google: Learning to annotate videos from movie scripts (Inria)

Participants: Josef Sivic, Ivan Laptev, Jean Ponce.

The goal of this project is to automatically generate annotations of complex dynamic events in video. We wish to deal with events involving multiple people interacting with each other, objects and the scene, for example people at a party in a house. The goal is to generate structured annotations going beyond simple text tags. Examples include entire text sentences describing the video content as well as bounding boxes or segmentations spatially and temporally localizing the described objects and people in video. This is an extremely challenging task due to large intra-class variation of human actions. We propose to learn joint video and text representations enabling such annotation capabilities from feature length movies with coarsely aligned shooting scripts. Building on our previous work in this area, we aim to develop structured representations of video and associated text enabling to reason both spatially and temporally about scenes, objects and people as well as their interactions. Automatic understanding and interpretation of video content is a key-enabling factor for a range of practical applications such as content-aware advertising or search. Novel video and text representations are needed to enable breakthrough in this area.

8.2.3. Google: Structured learning from video and natural language (Inria)

Participants: Simon Lacoste-Julien, Ivan Laptev, Josef Sivic.

People can easily learn how to change a flat tire of a car or assemble an IKEA shelve by observing other people doing the same task, for example, by watching a narrated instruction video. In addition, they can easily perform the same task in a different context, for example, at their home. This involves advanced visual intelligence abilities such as recognition of objects and their function as well as interpreting sequences of human actions that achieve a specific task. However, currently there is no artificial system with a similar cognitive visual competence. The goal of this proposal is to develop models, representations and learning algorithms for automatic understanding of complex human activities from videos narrated with natural language.

WIMMICS Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

8.1.1. Joint Lab Inria - Qwant

Fabien Gandon is director of the joint Lab Inria - Qwant

8.1.2. Intelliquiz Carnot Project

Participants: Oscar Rodríguez Rocha, Catherine Faron Zucker.

Partner: Qwant/GAYAtech.

This project ended in March 2018. It was a joint project with GAYAtech (acquired by Qwant during the project) on the automatic generation of quizzes from the Web of Data. It is a continuation of a former collaborative project with GAYAtech on the recommendation of pedagogical resources based on ontology-based modelling and processing. We developed an approach to generate quizzes from DBpedia and we experimented it on the geographical domain for primary school students.

8.1.2.1. Joint Lab EduMICS

Catherine Faron Zucker is the scientific leader of the EduMICS (Educative Models Interactions Communities with Semantics) joint laboratory (LabCom, 2016-2018) between the Wimmics team and the Educlever company. Adaptive Learning, Social Learning and Linked Open Data and links between them are at the core of this LabCom. The purpose of EduMICS is both to develop research and technologies with the ultimate goal to adapt educational progressions and pedagogical resource recommendation to learner profiles. During the second year of the project, we continued the deployment of Semantic Web technologies within the industrial context of Educlever, showing the added value of Semantic Web modelling enabling ontology-based reasoning on a knowledge graph. To continue our collaboration, we submitted a project proposal to the call for projects *AAP Partenariat d'Innovation et Intelligence Artificielle*; we successfully passed the first phase.

8.1.3. PREMISSE Collaborative Project

Participants: Molka Dhouib, Catherine Faron Zucker, Andrea Tettamanzi.

Partner: SILEX France.

This collaborative project with the SILEX France company started in march 2017, funded by the ANRT (CIFRE PhD) and UCA (post-doc). SILEX France is developing a B2B platform where service providers and consumers upload their service offers or requests in free natural language; the platform is intended to recommend service providers to the applicant, which are likely to fit his/her service request. The aim of this project is to develop a solution to link together service providers and consumers.

8.1.4. Synchronext Collaborative Project

Participants: Raphaël Gazzotti, Catherine Faron Zucker, Fabien Gandon.

Partner: Synchronext.

This project is funded by the ANRT (CIFRE PhD). Synchronext is a startup aiming at developing Semantic Web business solutions. The goal of this project is to develop a NLP and semantic Web based artificial agent for online support in the insurance domain. The objective is to reduce the dropout rate of Internet users on FAQs and to reduce the number of incoming calls and e-mails. This will enable to customer advisers to focus on more difficult questions. As a first step, we are working on automatically categorizing online requests to properly rout them.

8.2. Bilateral Grants with Industry

8.2.1. Accenture

Wimmics received two grants from Accenture to support work on explainable AI. They will fund the PhD of Nicholas Halliwell on that topic.

XPOP Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

Contract with Dassault Systèmes

ZENITH Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. SAFRAN (2018)

Participants: Reza Akbarinia, Florent Masseglia.

SAFRAN and Inria are involved in the DESIR frame-agreement (Florent Masseglia is the scientific contact on "Data Analytics and System Monitoring" topic). In this context, SAFRAN dedicates 80K€ for a joint study of one year on time series indexing. The specific time series to be exploited are those of engine benchmarking with novel characteristics for the team (multiscale and multidimensional).