RESEARCH CENTER
Nancy - Grand Est

FIELD

Activity Report 2019

Section Contracts and Grants with Industry

Edition: 2020-03-21

CAMUS Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

8.1.1. Caldera

Participants: Cédric Bastoul, Vincent Loechner.

Duration : 2016 - 2019

Caldera (www.caldera.com) is a company specialized in software development for wide image processing. The goal of this collaboration is the development of a parallel and scalable image processing pipeline for industrial printing. The project started in September 2016 and it includes the industrial thesis (CIFRE) of Paul Godard, defended in Dec. 2019.

CARAMBA Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

- Together with the PESTO team, we had a contract with the Docapost company, the purpose of which is to improve their e-voting solution by adding some verifiability properties and switching to elliptic curve cryptography.
- Together with the PESTO team, we have a contract with the Idemia company about e-voting.

8.2. Bilateral Grants with Industry

- A 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.
- A contract with Thales (Thales Communication & Security, Gennevilliers, 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.

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.

MOCQUA Team (section vide)

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 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.
- 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.
- IDEMIA signed a 2-year contract in January 2019, with Pesto and Caramba. The goal is to design a voting protocol adapted to the elections they plan to organize, in various countries. This includes the use of smartcard, yet without having to trust them. Once designed, the protocol will be formally analysed with the tools developed in the team such as ProVerif or Tamarin.

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.

VERIDIS Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

8.1.1. Logic4Business

The Max Planck Institute for Informatics (MPI-INF) and Logic 4 Business GmbH (L4B) have signed a cooperation contract. Its subject is the application of automated reasoning methods to product complexity management, in particular in the car industry. MPI-INF is providing software and know-how, L4B is providing real-world challenges.

SPHINX Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

Since September 2019, X. Antoine has been the co-advisor (with C. Geuzaine from Liège university) of two PhD theses, which are funded respectively by Siemens and Thales (CIFRE contracts).The aim of the first thesis is the numerical simulation by domain decomposition methods of aeroacoustic problems; the aim of the second one is the HPC simulation by domain decomposition methods of electromagnetic problems.

Zhanhao Liu works on a PhD thesis funded by Saint Gobain Recherche about the use of statistical methods for the effective control of industrial plants.

TOSCA Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

- M. Bossy is the Coordinator of the POPART Industrial partnership project at UCA-JEDI on the modeling of fibre transport in turbulent flows. This partnership is granted by EDF and by UCA, and in collaboration with CEMEF (J. Bec and S. Allende).
- 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.

BIGS Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. 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 lead 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, 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 2019, 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 the mechanism of crack propagation under different conditions. BIGS models crack propagation with Piecewise Deterministic Markov Processes (PDMP).

CAPSID Project-Team (section vide)

MIMESIS Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

- **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.
- **Marion surgical**: we have continued our interactions with the start-up Marion Surgical based in Canada through the transfer of our technology related to the simulation of needle insertion.

NEUROSYS Project-Team (section vide)

TONUS Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

We collaborate with EDF Chatou in the context of L. Quibel PhD. The objective is to design new Equations Of States (EOS) for the simulation of multiphase flows. The EOScannot 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.
We are involved in a common project with the company AxesSim in Strasbourg. The objective is to help to the development of a commercial software for the numerical simulation of electromagnetic phenomena. The applications are directed towards antenna design and electromagnetic compatibility. This project was partly supported by DGA through "RAPID" funds. A CIFRE PhD has started in AxesSim on the same kinds of subjects in March 2015 (Bruno Weber). The new project is devoted to the use of runtime system in order to optimize DG solvers applied to electromagnetism [33]. The resulting software will be applied to the numerical simulation of connected devices for clothes or medicine. The project is supported by the "Banque Publique d'Investissement" (BPI) and coordinated by the Thales company.

COAST Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

8.1.1. Open Group

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

Company: Open Group

Dates: 2017-2020

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.

RESIST Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Grants with Industry

- Thales (Palaiseau, France):
  - CIFRE PhD (Pierre-Olivier Brissaud, supervised by Isabelle Chrisment and Jérôme François)
  - Encrypted network traffic analysis (HTTP2 over TLS)
- Orange Labs (Issy-Les-Moulineaux, France):
  - CIFRE PhD (Paul Chaignon, supervised by Olivier Festor and Jérôme François)
  - Software Datapaths for Multi-Tenant Packet Processing
- Orange Labs (Issy-Les-Moulineaux, France):
  - CIFRE PhD (Matthews Jose, supervised by Olivier Festor and Jérôme François)
  - Complex arithmetic operation for in-network computing using hardware dataplanes
- 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

ALICE Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

- *Company:* Polygonal Design
  Duration: 01/02/2018 – 01/08/2020
  Participants: Bruno Lévy and Laurent Alonso
  Amount: 38k euros
  Abstract: The goal of this project is to provide a scientific and technical expertise to Polygonal Design. In particular this concerns the Unfold3d software, developed and marketed by the company. This software is built based on our algorithms developed in 2002–2006.

LARSEN Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Grants with Industry

8.1.1. Cifre with Diatelic Pharmagest

Participants: François Charpillet, Yassine El Khadiri.

We have a long term collaboration with Diatelic compagny which is a start-up created among other by François Charpillet in 2002. Currently we have a collaboration through a Cifre PhD whose the objective is to work on daily activity recognition for monitoring elderly people at home. The work will be included in a product that will be launched next year (carelib solution).

8.1.2. Cifre with PSA

Participants: François Charpillet, Julien Uzzan.

This work is done in collaboration with François Aioun, Thomas Hannagan and Franck Guillemard from PSA.

The subject of the thesis is : « Reinforcement learning for the autonomous vehicle in urban-like environments ». This PhD started in January on the Vélizy site where he stayed for 3 months and the he moved to Inria Nancy in the LARSEN team and we started working on applications of deep reinforcement learning algorithms for autonomous vehicles. The first one was a decision-making problem for autonomous driving on highways using the Deep Q-Networks algorithm. The aim was to build a controler outputing high level decisions (like changing to left/right lane, braking…) to navigate on highways and interacting with many other actors. Even though the results were convicing for simple simulations like a basic overtaking or just following a leader car, the performances on the general case were lackluster, so this is still an ongoing work. The other application we worked on later this year is a longitudinal control application. The aim was to create a controller able to drive behind a leader, but this time, the controller is low-level, meaning that it has to output direct commands, like an acceleration. More recently, we have been testing a idea meant to enhance the performances of the deep reinforcement learning algorithm by adding noise to the observations during training in order to obtain a safer and more cautious controller.

8.1.3. Cifre with SAFRAN

Participants: François Charpillet, Nicolas Gauville, Christophe Guettier.

The thesis began on May 6, 2019 after a "prethesis" of 6 month and is related to the Furious Project. The objective is to propose new Coordination mechanisms for a group of autonomous robotic evolving in an unknown environment for search and rescue (Robot Search and Rescue). The thesis is a continuation of a previous work made during the Cartomatic project which won in 2012 the French robotics contest Defi CAROTTE organized by the General Delegation for Armaments (DGA) and French National Research Agency (ANR).

8.1.4. Cifre iFollow

Participants: Francis Colas, Jérôme Truc, Cédric Pradalier, Nirmal Giftsun.

Cédric Pradalier is co-supervisor at GeorgiaTech Lorraine and Nirmal Giftsun 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.

This year, Jérôme Truc set up a simulated warehouse environment modeled on an actual warehouse from a logistic partner of iFollow. In this environment, he tested and compared several behaviors for a cart robot helping an order picker.

For personal reasons, Jérôme Truc had to resign from his PhD in July 2019.

MAGRIT Team (section vide)

MFX Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

8.1.1. Partnership with AddUp

- Company: AddUp.
- Duration: Started in 2019.
- Participants: Sylvain Lefebvre.
- Abstract: AddUp (https://www.addupsolutions.com/en/) is a French manufacturer of metal 3D printers for high-end industrial applications. We announced during FormNext 2019 (November) a partnership towards the creation of new software technologies.

8.1.2. Partnership with Black[Foundry]

- Company: Black[Foundry].
- Duration: January to June 2019.
- Participants: Samuel Hornus, Adrien Tétar.
- Abstract: Black[Foundry] is a company in Paris that specializes in font design. Inria signed a contract with the company to fund an internship on font rasterization on the GPU. An intern, Adrien Tétar, joined our team from January to June, and then spent 3 more weeks at the company offices in Paris. He was supervised by Samuel Hornus and Nicolas Rougier (Inria Bordeaux).

MULTISPEECH Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

8.1.1. 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: We developed a software suite for voice processing in the multimedia creation chain. The software was designed for sound engineers, and relied on the team's expertise in speech enhancement, robust speech and speaker recognition, and speech synthesis.

8.1.2. Honda Research Institute Japan

Company: Honda Research Institute Japan (Japan)

Duration: Aug 2018 – Mar 2019

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

Abstract: This was a follow-up contract targeting 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. Dassault and Thalès - Man Machine Teaming Initiative

Company: Dassault and Thalès (France)

Duration: Apr 2019 - Sept 2020

Participants: Irène Illina, Dominique Fohr, Ismael Bada, Stephane Level

Abstract: The primary goal of the project is to develop a new approach that allows coupling speech enhancement with semantic analysis for improving speech recognition robustness.

8.2. Bilateral Grants with Industry

8.2.1. Orange

Company: Orange SA (France)

Duration: Nov 2016 – Oct 2019

Participants: Lauréline Perotin, Romain Serizel, Emmanuel Vincent

Abstract: This CIFRE contract funded the PhD thesis of Lauréline Perotin. Our goal was to develop deep learning based speaker localization and speech enhancement algorithms for robust hands-free voice command. We were especially targeting difficult scenarios involving several simultaneous speakers.

8.2.2. Invoxia

Company: Invoxia SAS (France)

Duration: Mar 2017 – Apr 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, Irène 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.

ORPAILLEUR Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

8.1.1. AGREV-3

Participant: Jean-François Mari.

The AGREV 3 project (for "Agriculture Environment Vittel") is part of "Agrivair" –a subsidiary of Nestlé Waters– in actions to protect the natural resources of natural mineral water. We used ARPEnTAge to mine survey data about the Vittel-Contrexéville territory, which is suspected of groundwater quality risks [8]. This allowed us to locate regions having the same behavior. In addition, this provided a more contrasted simulation by eliminating the influence of stable zones (forests, permanent grasslands) and a more precise definition of a "neutral" model.

8.1.2. Hydreos

Participants: Nicolas Dante, Jean-François Mari, Amedeo Napoli.

Hydreos is a state organization, so-called "Pôle de compétitivité", aimed at monitoring and evaluating the quality of water and its delivery (http://www.hydreos.fr/fr). Actually, data about water resources rely on many agronomic variables, including land use successions. The data to be analyzed are obtained by surveys or by satellite images and describe the land use at the level of the agricultural parcel. Then there is a search for detecting changes in land use and for correlating these changes to groundwater quality. Accordingly, one main challenge in our participation in Hydreos is to process and analyze space-time data for reaching a better understanding of the changes in the organization of a territory. The systems ARPEnTAge and CarottAge are used in this context, especially by agronomists of INRA (ASTER Mirecourt http://www6.nancy.inra.fr/sad-aster).

On other aspects, we tested new deep graph convolutional learning over data provided by the SEDIF "Syndicat des eaux d'Île-de-France" to predict the likelihood of water leaks in a network of pipes and compared it with a master thesis where spatial point process techniques were used (master thesis of Nicolas Dante, M2 IMSD Nancy).

8.1.3. The Smart Knowledge Discovery Project

Participants: Laureline Nevin, Amedeo Napoli.

The SKD project for "Smart Knowledge Discovery" aims at analyzing complex industrial data for troubleshooting and decision making, and is funded by "Grand Est Region". We are working on exploratory knowledge discovery with the Vize company, which is based in Nancy and specialized in visualization-based data mining. The data which are under study are provided by the Arcelor-Mittal Steel Company and are related to the monitoring of rolling mills. Data are complex time series and the problem is related to a so-called "predictive maintenance", or how to anticipate problems in the furnaces and avoid their stop. In this way, one main objective of SKD is to combine sequence mining and visualization tools for recognizing temperature problems in the furnaces, and thus preventing the occurrences of defects in the outputs of the rolling mills.

SEMAGRAMME Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Industry Partner

As a follow-up to a Cifre PhD thesis [34] on the use of Abstract Categorial Grammars in an industrial context, the team worked on a common road-map with the Yseop company and proposed common master internships as a first step towards formalizing the partnership.

After a master internship supervised by Bruno Guillaume, a discussion opened on the use of Abstract Categorial Grammars in the industrial context. C&S - Communication and Systems - has tool specifications that need to be verified, which can be achieved through semantic representation. A Cifre PhD thesis is currently being prepared for early 2020.