RESEARCH CENTER
Paris

FIELD

Activity Report 2019

Section Contracts and Grants with Industry

Edition: 2020-03-21

ALMANACH Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

Ongoing contracts:

Verbatim Analysis Verbatim Analysis is an Inria start-up co-created in 2009 by Benoît Sagot. It uses some of ALMAnaCH's free NLP software (SxPipe) as well as a data mining solution co-developed by Benoît Sagot, VERA, for processing employee surveys with a focus on answers to open-ended questions.

opensquare was co-created in December 2016 by Benoît Sagot with 2 senior specialists of HR (human resources) consulting. It is dedicated to designing, carrying out and analysing employee surveys as well as HR consulting based on these results. It uses a new employee survey analysis tool, *enqi*, which is still under development. This tool being co-owned by opensquare and Inria, both parties have signed a Software Licence Agreement in exchange for a yearly fee paid by opensquare to ALMAnaCH based on its turnover. Benoît Sagot currently contributes to opensquare, under the "Concours scientifique" scheme.

Facebook A collaboration on text simplification ("français Facile À Lire et à Comprendre", FALC) is ongoing with Facebook's Parisian FAIR laboratory. It involves a co-supervised (CIFRE) PhD thesis in collaboration with UNAPEI, the largest French federation of associations defending and supporting people with special needs and their families. This collaboration, is part of a larger initiative called Cap'FALC involving (at least) these three partners as well as the relevant ministries. Funding received as a consequence of the CIFRE PhD thesis: 60,000 euros

Bluenove A contract with this company has been signed in 2018, which initiated a collaboration for the integration of NLP tools within Bluenove's platform Assembl, dedicated to online employee and citizen debating forums. It involved 12 months of fixed-term contracts (a post-doc, who worked at ALMAnaCH in 2018-2019). Funding received: 77,137 euros

Active collaborations without a contract:

Science Miner ALMAnaCH (following ALPAGE) has collaborated since 2014 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 for 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 to provide a scholarly dashboard on scientific papers available from the HAL national publication repository.

Software Heritage , whose goal is to collect and preserve software in source code form. ALMAnaCH's collaboration with Software Heritage, on large-scale programming language identification, also involves Qwant, who provided some funding to Software Heritage.

Fortia Financial Solutions ALMAnaCH members led a proposal for the creation of an ANR LabCom with this French FinTech company on the analysis of (raw, PDF) financial documents from investment funds. The proposal was rejected, but future collaboration is still planned.

Hyperlex A collaboration was initiated in 2018 on NLP and information extraction from raw legal documents (mostly PDF format), involving especially Éric de La Clergerie, who is now a part-time employee of the company.

Ongoing discussions that should/could be formalised in the form of a contract in 2020:

Winespace : information extraction from wine descriptions to develop a wine recommendation system

Newsbridge : automatic extraction of short summaries of filmed events (e.g. sport events) based on social media coverage analysis

INPI : Patent classification

Cour de cassation (in the context of the LabIA): retrieval of relevant jurisprudence

DGCCRF (in the context of the LabIA): automatic identification of illicit clauses in B-to-C commercial contracts

ALPINES Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

- 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.

ANGE Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

- A contract between Institut Carnot SMILES and the corporation GTT involving (Jacques Sainte-Marie, Cindy Guichard, Yohan Penel and Julien Salomon) of 78 k€ has been approved. The aim is to improve the numerical modelling tool to simulate gas flows in the insulation spaces of LNG tankers. A Ph. D. thesis should start next year on that topic.

8.2. Bilateral Grants with Industry

- The ANR project Hyflo-Eflu relies on a collaboration with the company "HydroTube Energie", that ended in December has given rise to deep collaboration with Hydotube Energy.
- The ANR project Firecaster supports the Ph. D. Thesis of F. Allaire on the developpment of a fire decision support system at the national scale to estimate upcoming fire risk. The collaborations are CERFACS and CNRM (recherche de Météo-France).
- The ANR project Cense supports the Ph. D. Thesis of A. Lesieur on the developpment of a new methodology for the production of more realistic noise maps. The industrial collaborations include:
  - Bouygues Énergies & Services
  - Wi6Labs
  - Bruitparif (association)

  We refer to
  https://cense.ifsttar.fr/partenaires/entreprises-privees/

  https://cense.ifsttar.fr/partenaires/associations/

  for more details.

8.3. Other collaborations with Industry

- On the public operational side, ANGE team works with IRSN and its Modelling Bureau environmental transfers for the study of consequences of accidents (BMCA). This collaboration led to Bao Le's thesis. For more details, we refer to

  https://www.irsn.fr/FR/Larecherche/Organisation/equipes/radioprotection-homme/BMCA/Pages/bureau-modelisation-transferts-environnement-etude-consequences-accidents.aspx
- On the corporate side, ANGE collaborates with NUMTECH for pollution modelling. We mention also the long term collaboration with Ambiciti- co-founded by V. Mallet. In particular, the newspaper Ouest-France uses Ambiciti's air quality forecasts since the summer, so with the algorithms that come from ANGE.

  https://www.ouest-france.fr/meteo/
- Y. Penel obtained a partial support from EDF for the organisation of the project SGN-Num at CEMRACS 2019.

ANTIQUE Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

8.1.1. Follow up to the AnaStaSec project

Title: Analyse de propriété de sécurité

Type: Research contracts funded by AirBus France

Duration: March 2019 - August 2018 and November 2019 - March 2020

Inria contact: Jérôme Feret

Abstract: An emerging structure in our information processing-based society is the notion of trusted complex systems interacting via heterogeneous networks with an open, mostly untrusted world. This view characterises a wide variety of systems ranging from the information system of a company to the connected components of a private house, all of which have to be connected with the outside.

The goal of these constracts is to analyse an application that is used to filter messages from higher-level security regions to lower-level ones in trusted complex systems. This application shall check that messages are well-formed and that they match with existing requests. Moreover, so as to limit potential flows of information, one shall prove that the internal state of buffers are reset between the processing of each packet.

To certify these properties, the front-end of ASTRÉE has been upgraded with new directives to specify the properties of interest, and the analysis has been tuned to improve the analysis : 1) ghost variables are used to record the value of buffers between each packet processing so that already existing relational domains can prove that they are restored to the correct value, and 2) data-partitioning strategies have been implemented to separate the different modes of usage.

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.

CAGE Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

Contract CIFRE with ArianeGroup (les Mureaux), 2019–2021, funding the thesis of A. Nayet. Participants : M. Cerf (ArianeGroup), E. Trélat (coordinator).

CAMBIUM Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. The Caml Consortium

Participant: Damien Doligez.

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.

Damien Doligez chairs the Caml Consortium.

The Consortium currently has 9 member companies:

- Aesthetic Integration
- Citrix
- Docker
- Esterel Technologies
- Facebook
- Jane Street
- LexiFi
- Microsoft
- SimCorp

The Caml Consortium is being gradually phased out. In the future, we would like to replace it entirely with the OCaml Software Foundation, discussed below.

7.2. Bilateral Grants with Industry

7.2.1. The OCaml Software Foundation

Participants: Damien Doligez, Xavier Leroy.

The OCaml Software Foundation (OCSF),[0] established in 2018 under the umbrella of the Inria Foundation, aims to promote, protect, and advance the OCaml programming language and its ecosystem, and to support and facilitate the growth of a diverse and international community of OCaml users.

Damien Doligez and Xavier Leroy serve as advisors on the foundation's Executive Committee.

We receive substantial basic funding from the OCaml Software Foundation in order to support research activity related to OCaml.

[0] http://ocaml-sf.org/

7.2.2. Funding from Nomadic Labs

Nomadic Labs, a Paris-based company, has implemented the Tezos blockchain and cryptocurrency entirely in OCaml. This year, Nomadic Labs and Inria have signed a framework agreement ("contrat-cadre") that allows Nomadic Labs to fund multiple research efforts carried out by Inria groups. Within this framework, we have received three 3-year grants:

- "Évolution d'OCaml". This grant is intended to fund a number of improvements to OCaml, including the addition of new features and a possible re-design of the OCaml type-checker. This grant has allowed us to fund Jacques Garrigue's visit (10 months) and to hire Gabriel Radanne on a Starting Research Position (3 years).
- "Maintenance d'OCaml". This grant is intended to fund the day-to-day maintenance of OCaml as well as the considerable work involved in managing the release cycle. This grant has allowed us to hire Florian Angeletti as an engineer for 3 years.
- "Multicore OCaml". This grant is intended to encourage research work on Multicore OCaml within our team. This grant has allowed us to fund Glen Mével's PhD thesis (3 years).

7.2.3. Funding from the Microsoft-Inria joint lab

Funding from the Microsoft-Inria joint lab has allowed us to hire Ioannis Filippidis on a Starting Research Position (until March 2020) to work on the TLAPS system.

CASCADE Project-Team (section vide)

COML Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Grants with Industry

- **Facebook AI Research Grant** (2019, PI: E. Dupoux, 350K€) - Unrestricted Gift - The aim is to help the development of machine learning tools geared towards the psycholinguistic research community.
- **Google Research Award** (2019, PI E. Dunbar, 37K€) - Unrestricted Gift - Develop a first version of a universal synthesizer which can be tuned to specific dialects with sparse data.

COMMEDIA Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

8.1.1. Notocord Systems

Participants: Damiano Lombardi, Fabien Raphel.

This work is devoted to the investigation on new approaches and efficient algorithms in the context of safety pharmacology and the analysis of biological signals.

8.1.2. Casis

Participants: Mocia Agbalessi, Miguel Ángel Fernández Varela, Damiano Lombardi.

This work is devoted to the combination of 4D-MRI data and fluid-structure interaction models of blood flow to asses indicators of aneurysm rupture.

DELYS Project-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 three 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.
- José Alves Esteves Jurandir is advised by Pierre Sens. He works on network slice placement stategies.

DYOGENE Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

8.1.1. CRE with Orange

Two year contract titled *Taking into account the "massive MIMO" in the assessment of QoS and the dimensioning of 5G cellular networks* between Inria and Orange Labs started 2018. It is a part of a long-term collaboration between TREC/DYOGENE, represented by B. Błaszczyszyn and Orange Labs, represented by M. K. Karray on the development of analytic tools and methods allowing one to capture macroscopic relation between antennas roll-out, frequency allocation, volume of traffic carried on the network and quality of service parameters such as the average and the variation of bandwidth available to end users. This work addresses crucial technical and economical issues related to the operator core business, particularly related to the current evolution of the cellular network technology (4G⇒5G). The developed solutions are implemented by Orange Labs in the internal toolbox *CapRadio* (see 6.1.1) and used by the Direction of Regulatory Affairs of Orange.

8.1.2. Contract with EDF

Collaborative research in the area of demand dispatch of flexible loads. PI : A. Busic.

8.1.3. CIFRE with Orange

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

EVA Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Grants with Industry

Participants: Razanne Abu Aisheh, Mina Rady, Thomas Watteyne.

Razanne Abu Aisheh is doing her PhD under a CIFRE agreement between Inria and Nokia Bell Labs. Mina Rady is doing his PhD under a CIFRE agreement between Inria and Orange Labs.

GANG Project-Team (section vide)

GANG Project-Team (section vide)

KOPERNIC Team (section vide)

MAMBA Project-Team (section vide)

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.

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
- 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.

8.2. Grants with Industry

Chair X-ENPC-SU-Société Générale "Financial Risks" of the Risk fondation : A. Alfonsi, B. Jourdain, B. Lapeyre

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 2018-2019.

MOKAPLAN Project-Team (section vide)

OURAGAN Project-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.
- In 2019, a contract was signed with the company *Safran Tech*. Its goal is to bring our scientific expertise on mathematical and algorithmic aspects on certain problems studied in gearbox vibration analysis. Gear fault diagnosis is an important issue in aeronautics industry since a damage in a gearbox, which is not detected in time, can have dramatic effects on the safety of a plane. Since the vibrations of a spur gear can be modeled as a product of two periodic functions related to the gearbox kinematic, [92] has proposed to recover each function from the global signal by means of an optimal reconstruction problem which, by means of Fourier analysis, yields a Frobenius norm minimization problem for structured matrices. The goal of the collaboration is to use symbolic-numeric to study this problem.

PARKAS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. Collaboration with Airbus

Our work on multi-clock Lustre programs is funded by a contract with Airbus.

7.2. Bilateral Grants with Industry

7.2.1. Google Research Fellowship: DWARF unwinding

Francesco Zappa Nardelli benefits from a Google Research Fellowship to pursue the work on DWARF unwinding, about 50k euros.

PI.R2 Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

Theo Zimmermann will start a research engineer position in January 2020 to continue his research and development work about improving the Software Engineering practices of the development of Coq, especially to continue the improvement of the collaborative development processes and of its ecosystem. This position is funded by the Inria-NomadicLabs grant.

POLSYS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Technological Transfer

The group have had a continuous commitment into industrial transfer as well as a strong involvement into standardization bodies.

Industrial transfer. This activity is related to our long-standing activity in post-quantum cryptography. The transfer started at the beginning of the current evaluation period and culminated this year with the creation of a new spin-off, called CRYPTONEXT SECURITY[0], from Inria Paris and Sorbonne Université. The goal of CRYPTONEXT SECURITY is to propose security products that are resistant against the quantum computers. Its business model is based on B2B and targeted customers are Fortune 500 companies.

The activity has been partially founded and supervised by SATT-LUTECH who is specialized 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, University Panthéon-Assas, Paris Sorbonne University and National School of Industrial Creation). Typically, SATT-LUTECH has funded the post-quantum experiment described in the dedicated Section. The impact of such experiment can be partially measured by the press released covering out the test [0] (La Recherche, l'Usine Nouvelle, L'Informaticien).

As a preliminary step for launching the spin-off, two members of the team (J.-C. Faugère and L. Perret) followed two entrepreneurship programs for creating innovative companies : HEC Challenge plus [0] (1 week of courses by month, 9 months) and Deep Tech Founders [0] (3 months, 2 sessions by weeks). This was a necessary, but significant effort, before launching CRYPTONEXT in which the two members will work full-time from now on.

Post-quantum standardization. Besides the NIST PQC standardization process, we are involved in the on-going world effort for standardizing post-quantum cryptography. More precisely, the European Telecommunications Standards Institute (ETSI) has a strong standardization activity on post-quantum cryptography. ETSI is a EU standardization body with a worldwide scope. We are an active member of ETSI regarding post-quantum cryptography. In particular, we are the rapporteur of a technical document on post-quantum cryptosystems. The goal of our involvement is to bring our scientific expertise to define trustworthy post-quantum public-key standards; that are going to be the basis of our digital economy within $10/15$ years.

We are also involved in the Cloud Security Alliance (CSA). This is a large non-profit organization (80.000 member worldwide) whose main goal is to promote the best practices with the secure usage of cloud computing. CSA has a group dedicated to quantum-safe security. The group is ideation catalyzer for promoting the transition of companies to a quantum-safe security. In particular, the group has a significant educational activity in order to increase awareness regarding the quantum risk and the techniques to mitigate this risk. We are co-chairing this group and participated to several white papers. The group is probably now the main channel for promoting quantum-safe security. Standardization is a long-term effort.

[0] https://cryptonext-security.com/
[0] https://www-polsys.lip6.fr/Links/index.html
[0] http://entrepreneurship-center.hec.edu/learn-program/hec-challenge-plus/
[0] https://deeptechfounders.com/

PROSECCO Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Grants with Industry

8.1.1. Evolution, Semantics, and Engineering of the F Verification System*

Grant from Nomadic Labs - Inria

PIs: Catalin Hritcu and Exequiel Rivas

Duration: March 2019 - April 2023

Abstract: While the F* verification system shows great promise in practice, many challenging conceptual problems remain to be solved, many of which can directly inform the further evolution and design of the language. Moreover, many engineering challenges remain in order to build a truly usable verification system. This proposal promises to help address this by focusing on the following 5 main topics: (1) *Generalizing Dijkstra monads*, i.e., a program verification technique for arbitrary monadic effects; (2) *Relational reasoning in F**: devising scalable verification techniques for properties of multiple program executions (e.g., confidentiality, noninterference) or of multiple programs (e.g., program equivalence); (3) *Making F*'s effect system more flexible*, by supporting tractable forms of effect polymorphism and allowing some of the effects of a computation to be hidden if they do not impact the observable behavior; (4) Working out more of the *F* semantics and metatheory*; (5) Solving the *engineering challenges* of building a usable verification system.

QUANTIC Project-Team (section vide)

REO Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

Participants: Lazaros Papamanolis, Irene Vignon-Clementel [local coordinator].

Contract with ESIEE (H. Talbot, L. Najman) for collaboration with the Heartflow company.

RITS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. 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.

SECRET Project-Team (section vide)

SERENA Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

One new two-part contract with EDF accompanying the PhD thesis of Idrissa Niakh.

One new two-part contract with CEA accompanying the postdoc of Guillaume Delay.

One new two-part contract with IFP Energies Nouvelles accompanying the PhD thesis of Joëlle Ferzly.

Three-part contract Inria–EDF–Sciworks Technologies (2017–2020) on "Form-L for the formalization of constraints of complex systems". SERENA representants are François Clément, Sébastien Furic and Pierre Weis.

AMIES contract with ITASCA, January 10, 2019 - March 10, 2020. SERENA representants are François Clément, Sébastien Furic, Florent Hédin, Michel Kern, Géraldine Pichot.

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: fondation AXA, "Mécénat scientifique", optimisation & machine learning.

VALDA Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

Juliette Achddou's PhD research is set up as a CIFRE contract and supervision agreement between her employer, the Numberly company, and École normale supérieure.

We are in the process of finalizing a contract with Neo4j, the leading company in the field of graph databases, to work towards the creation of a new standard for graph languages called GQL, building on Neo4j's Cypher query language. On this, we do not start from scratch. In a joint effort between the Neo4j's Cypher group and the Edinburgh database group led by Leonid Libkin, a formal specification of the core querying and update features of Cypher was produced. Starting in 2020, Libkin will chair a working group on the formal semantics of GQL. In addition to Valda, it will involve researchers from Edinburgh, Santiago, Warsaw, and other universities in Paris (Marne-la-Vallee and Paris-Diderot). The project is supported by a grant from Neo4j.

WHISPER Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

- Orange Labs, 2019-2021, 30 000 euros. The purpose of this contract is to design application-specific proxies so as to speed up network services. The PhD of Yoann Ghigoff is supported by a CIFRE fellowship as part of this contract.
- Thales Research, 2016-2019, 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.
- DGA-Inria, 2019-2021, 60 000 euros. The purpose of this PhD grant is to develop a high-performance, certified packet processing system. The PhD of Pierre Nigron is supported by this grant.

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.

As part of this project, we have already identified frequency scaling and the “fork/wait” paradigm as a source of inefficiency in modern multicore machines. These first results were published in the PLOS workshop that is held together with SOSP. The diagnosis of the problem was possible thanks to the *SchedLog and* SchedDisplay tools that we developed as part of this project.

WILLOW 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: Yana Hasson, Ivan Laptev, Jean Ponce, Josef Sivic, Dimitri Zhukov, Cordelia Schmid [Inria Thoth].

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: 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.