



RESEARCH CENTER
Nancy - Grand Est

FIELD

Activity Report 2017

Section Contracts and Grants with Industry

Edition: 2018-02-19

ALGORITHMICS, PROGRAMMING, SOFTWARE AND ARCHITECTURE

1. CAMUS Team	4
2. CARAMBA Project-Team	5
3. CARTE Team	6
4. GAMBLE Project-Team	7
5. PESTO Project-Team	8
6. VERIDIS Project-Team	9

APPLIED MATHEMATICS, COMPUTATION AND SIMULATION

7. SPHINX Project-Team	10
8. TOSCA Project-Team	11

DIGITAL HEALTH, BIOLOGY AND EARTH

9. BIGS Project-Team	12
10. CAPSID Project-Team (section vide)	13
11. MIMESIS Team	14
12. NEUROSYS Project-Team (section vide)	15
13. TONUS Team	16

NETWORKS, SYSTEMS AND SERVICES, DISTRIBUTED COMPUTING

14. COAST Project-Team	17
15. MADYNES Team	18

PERCEPTION, COGNITION AND INTERACTION

16. ALICE Project-Team	19
17. LARSEN Project-Team	20
18. MAGRIT Project-Team	21
19. MULTISPEECH Project-Team	22
20. ORPAILLEUR Project-Team (section vide)	23
21. SEMAGRAMME Project-Team (section vide)	24

CAMUS Team

8. Bilateral Contracts and Grants with Industry

8.1. NANO 2017/PSAIC

The CAMUS team is taking part of the NANO 2017 national research program and its sub-project PSAIC (Performance and Size Auto-tuning thru Iterative Compilation) with the company STMicroelectronics, which started in January 2015. Since the release of our automatic speculative parallelization framework Apollo, we have been working on an extension making Apollo usable as a advanced program profiling tool. We are currently working in extending Apollo to the memoization of the memory behavior for loops that are invoked several times.

8.2. Caldera

Vincent Loechner and Cédric Bastoul are involved in a collaboration with the French company Caldera (<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. This contract 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.

CARAMBA Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Training and Consulting with French Ministry of Defense

We have training and consulting activities with the French Ministry of Defense.

8.2. Consulting with Docapost

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

8.3. Consulting with Canton of Geneva

In this contract the goal is to audit and prove security properties of a new e-voting protocol to be used in a few cantons of Switzerland.

8.4. Research Contract with Orange

This contract with Orange Gardens at Chatillon-Montrouge is dedicated to the supervision of Sandra Rasoamiramanana's PhD thesis about security in the white box context.

8.5. FUI Industrial Partnership on Lightweight Cryptography

This contract, called PACLIDO, is an FUI project with many companies dedicated to the definition of new lightweight cryptographic primitives for the IoT.

CARTE Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Grants with Industry

- PRCE ANR SoftQPro has Atos-Bull as a partner.
- ITEA 3 Quantex involves several industrial partners: Siemens, KPN, Atos-Bull.

GAMBLE Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

A two-years licence and cooperation agreement was signed on April 1st, 2016 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 VEGAS and OURAGAN (Paris), and it is coordinated by Fabrice Rouillier (OURAGAN).

F. Rouillier and VEGAS 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.

PESTO Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Scytl - Electronic Voting Systems

Participants: Véronique Cortier, Mathieu Turuani.

Since 2014, a collaboration agreement has been signed between Loria and Scytl, a Spanish company who is proposing solutions for the organization of on-line elections, including legally binding elections, in several countries. In this context, Scytl has signed a contract in 2016 with the Pesto team as well as the University of Birmingham (David Galindo) to design a formal proof of both verifiability and privacy of the protocol developed by Scytl, for a deployment in Switzerland. The result of the analysis will be presented at the conference EuroS&P'18 [23].

8.2. Canton of Geneva - Electronic Voting Systems

Participants: Véronique Cortier, Mathieu Turuani.

The canton of Geneva has 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.

8.3. Docapost - Electronic Voting Systems

Participant: Véronique Cortier.

Docapost has 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.

VERIDIS Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Modeling a Distributed File System

Participant: Stephan Merz.

In a bilateral contract with Huawei R&D, we continued our work on modeling and verifying protocols underlying the Ceph distributed file system [66] in TLA⁺. We also provided email support to Huawei engineers who use TLA⁺ for modeling the systems they develop.

8.2. Modeling a Distributed Development Process

Participant: Christoph Weidenbach.

On the basis of a bilateral contract with L4B (Logic 4 Business), we studied models for a distributed development process of a leading German car manufacturer.

SPHINX Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Grants with Industry

From February 2018, T. Chambrion will be the advisor of Ayoub Lasri for a PhD thesis (CIFRE label pending) on the stabilization of the Mosel river funded by *Voies Navigables de France*. This thesis is part of an international cooperation with BAW (the German counterpart of VNF, based in Karlsruhe) and Universität Stuttgart started in November 2017.

TOSCA Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

- M. Deaconu is involved in a bilateral contract with Venathec. She is supervising, with E. Vincent (EPI Multispeech), the Ph.D. thesis of B. Dumortier on the acoustic control of wind farms noise.

8.2. Bilateral Grants 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 TER project from the PGMO (FMJH) granted with the SME METIGATE, on the statistical description of coupled regional temperatures. D. Talay also participates to this project.
- M. Bossy is the Coordinator of the SPARE projet at UCA-JEDI on Monte Carlo approaches for the simulation of particles transport in a flow, with EDF and Observatoire de la Côte d'Azur.
- M. Bossy is the Coordinator of the POPART Industrial partnership projet at UCA-JEDI on the modeling of fiber transport in turbulent flow. This partnership is granted by EDF and by UCA, and in collaboration with Observatoire de la Côte d'Azur.

BIGS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. *Bilateral Contracts with Industry*

7.1.1.1. *Transgene 1. (2016-2017)*

Participants: A. Gégout-Petit, A. Muller-Gueudin, Y. Shi

Transgene (Euronext: TNG), part of Institut Mérieux, is a publicly traded French biopharmaceutical company focused on discovering and developing targeted immunotherapies for the treatment of cancer and infectious diseases. B. Bastien, head of the biostatistics team appeals to BIGS to select covariates among genomics, proteomics expressions linked to the success of a treatment of the lung cancer. This subject was the purpose of the master thesis of Y. Shi and a paper on the subject is in preparation.

7.1.1.2. *Transgene 2. (2016-2017)*

Participants: T. Bastogne, L. Batista, P. Vallois

Transgene (Euronext: TNG), part of Institut Mérieux, is a publicly traded French biopharmaceutical company focused on discovering and developing targeted immunotherapies for the treatment of cancer and infectious diseases. B. Bastien, head of the biostatistics team appeals to BIGS to model data collected in vivo for growth tumor and to measure the effect of the treatment on the dynamics of the tumor.

7.1.1.3. *SAFRAN Aircraft Engines (2016-2019)*

Participants: R. Azaïs, A. Gégout-Petit, F. Greciet

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). It is the subject of F. Greciet PhD, granted by ANRT. F. Greciet presented her work during a Fédération Charles Hermite Journey on November the 23th. She was laureat of "Mathématiques, oxygene du monde numérique" poster challenge [52].

7.1.1.4. *CYBERNANO (2014-2017)*

Participants: T. Bastogne, L. Batista, P. Guyot

Cybernano is a start-up founded in 2013 by one BIGS member: T. Bastogne. Cybernano develops computational services to analyze high-content data in cell biology for applications in oncology, cardiotoxicity and virology. After the end of his PhD (2017), L. Batista became chief technical officer of Cybernano. A EuroStars project proposal was submitted in Sep. 2017 in which Cybernano will be the leader and BIGS a scientific partner (Eurostars is a H2020 programme that supports research-performing small and medium enterprises).

CAPSID Project-Team (section vide)

MIMESIS Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

MIMESIS has active bilateral collaborations with following industrial partners:

InSimo: A startup providing biomedical simulation software which are able to reproduce the behavior of organs, tissues and surgical procedures in a realistic and interactive way. Created in January 2013 as a spin-off forces by former members of team SHACRA (the predecessor of MIMESIS). Currently, we collaborate on simulations of eye surgery as well as on preparation of projects aiming at validation of algorithms and codes of simulation framework SOFA.

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. A new CIFRE Ph.D. will start on 01/01/2018 focusing on fusion of multisensor data in the context of intra-operative navigation of catheters.

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.

Renumics: A German startup focusing on automation of computer aided engineering (CAE) using artificial intelligence in general and machine learning techniques in particular. In close collaboration with SOFA Consortium, MIMESIS is involved in preparation of projects aiming at validation of SOFA.

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.

NEUROSYS Project-Team (section vide)

TONUS Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Grants with Industry

We are involved in the PhD direction 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.

COAST Project-Team

6. Bilateral Contracts and Grants with Industry

6.1. Bilateral Contracts with Industry

6.1.1. *Industrial funding Groupe Open (2016–2019)*

Groupe Open is a leading french company specialised in digital services and operations. The goal of the project is to propose an industrial composition model for APIs that takes into account the new constraints imposed by this new way to distribute and operate software. It will be based on a formal API contract along with trust and reputation attributes in order to allow consumers to anticipate risks regarding the quality and the safety of services. A PhD student is under recruitment for this project. Coast funding : 237,000 €

6.2. Bilateral Grants with Industry

6.2.1. *CIFRE Grant with Bonitasoft*

Participants: François Charoy, Samir Youcef, Guillaume Rosinosky.

Bonitasoft is a leading software company in the domain of open source Business Process Management Systems. The objective of this grant is to help Bonitasoft to support effective elastic BPM operation in the Cloud by leveraging the business knowledge, the process models and the execution history of process instances and correlate them with cloud resource consumption. Guillaume Rosinosky has been recruited as a PhD Student to work on this project. We will define models that will be validated based on a detailed analysis of existing use cases that we have started to collect from Bonitasoft and its clients.

MADYNES Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

- Xilopix (Epinal, France):
 - Pay-per-use contract for the use of Grid'5000
 - Support contract for their use of Grid'5000 (define experimental requirements and plans)

8.2. Bilateral Grants with Industry

- CIFRE, Thales TRT (Paris, France):
 - CIFRE PhD (Florian Greff, supervised by Ye-Qiong Song and Laurent Ciarletta)
 - Dynamic reconfiguration and graceful degradation of distributed real-time applications over mesh networks
- CIFRE, Thales (Palaiseau, France):
 - CIFRE PhD (Pierre-Olivier Brissaud, supervised by Isabelle Chrisment and Jérôme François)
 - Anomaly detection in encrypted network traffic
- CIFRE, Orange Labs (Issy-Les-Moulineaux, France):
 - CIFRE PhD (Maxime Compastie, supervised by Olivier Festor and Rémi Badonnel)
 - Software-Defined Security for Distributed Cloud Infrastructures
- CIFRE, Orange Labs (Issy-Les-Moulineaux, France):
 - CIFRE PhD (Paul Chaignon, supervised by Olivier Festor and Jérôme François)
 - Monitoring of Software-Defined Networks
- CIFRE, Xilopix (Epinal, France):
 - CIFRE PhD (Abdulqawi Saif, supervised by Ye-Qiong Song and Lucas Nussbaum)
 - Open Science for the scalability of a new generation search technology
- CIFRE, Cynapsys Technologies (Paris, France):
 - CIFRE PhD (Haftay Gebreslasie Abreha, supervised by Michael Rusinowitch, Adel Bouhoula and Abdelkader Lahmadi)
 - Compressed and Verifiable Filtering Rules in Software-defined Networking

ALICE Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

We developed a collaboration with a local company regarding additive manufacturing technologies. This contract allowed us to host two interns (Mélanie Siret and Jimmy Etienne), both supervised by Sylvain Lefebvre. The topic is confidential.

LARSEN Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Cifre Diatelic-Pharmagest

Participants: François Charpillat, 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 provide 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.

MAGRIT Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

The partnership with GE Healthcare started in 1993. In the past few years, it bore on the supervision of CIFRE PhD fellows on the topic of using a multi-modal framework and augmented reality in interventional neuroradiology. The PhD thesis of Charlotte Delmas started in April 2013 and ended in November 2017 and was supervised by M.-O. Berger and E. Kerrien. In her work, C. Delmas developed methods to reconstruct the micro-tools in 3D from fluoroscopy imaging. This will help clinical gesture by providing the physician with a better understanding of the relative positions of the tools and of the pathology.

MULTISPEECH Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

8.1.1. 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 targetting difficult scenarios involving several simultaneous speakers.

8.1.2. 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.

8.1.3. Studio Maia

Company: Studio Maia SARL (France)

Other partners: Imaging Factory

Duration: Jul 2017 – Dec 2018

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.

8.1.4. Samsung

Company: Samsung Electronics Co., Ltd (South Korea)

Duration: Jan – Nov 2017

Participants: Aditya Nugraha, Romain Serizel, Emmanuel Vincent

Abstract: This project aimed to transfer a modified version of dnnsep for hands-free voice command applications. We changed the type of multichannel filter used and modified the software so that it runs online in real time.

ORPAILLEUR Project-Team (section vide)

SEMAGRAMME Project-Team (section vide)