

*Inria*

RESEARCH CENTER

FIELD

**Applied Mathematics, Computation  
and Simulation**

Activity Report 2019

# **Section Contracts and Grants with Industry**

Edition: 2020-03-21



NUMERICAL SCHEMES AND SIMULATIONS

1. ACUMES Project-Team ..... 5  
2. CAGIRE Project-Team ..... 6  
3. CARDAMOM Project-Team (section vide) ..... 7  
4. DEFI Project-Team ..... 8  
5. ECUADOR Project-Team (section vide) ..... 9  
6. ELAN Project-Team (section vide) ..... 10  
7. GAMMA Project-Team ..... 11  
8. MATHERIALS Project-Team ..... 12  
9. MEMPHIS Project-Team ..... 13  
10. MEPHYSTO Team (section vide) ..... 14  
11. MINGUS Project-Team ..... 15  
12. MOKAPLAN Project-Team (section vide) ..... 16  
13. NACHOS Project-Team ..... 17  
14. NANO-D Team (section vide) ..... 18  
15. POEMS Project-Team ..... 19  
16. RAPSODI Project-Team ..... 20

OPTIMIZATION AND CONTROL OF DYNAMIC SYSTEMS

17. CAGE Project-Team ..... 21  
18. COMMANDS Project-Team (section vide) ..... 22  
19. DISCO Project-Team (section vide) ..... 23  
20. FACTAS Project-Team ..... 24  
21. I4S Project-Team ..... 25  
22. MCTAO Project-Team ..... 26  
23. NECS Team ..... 27  
24. QUANTIC Project-Team (section vide) ..... 28  
25. SPHINX Project-Team ..... 29  
26. TRIPOP Project-Team ..... 30  
27. TROPICAL Project-Team ..... 31  
28. VALSE Project-Team (section vide) ..... 32

OPTIMIZATION, MACHINE LEARNING AND STATISTICAL METHODS

29. BONUS Project-Team ..... 33  
30. CELESTE Project-Team (section vide) ..... 34  
31. GEOSTAT Project-Team ..... 35  
32. INOCS Project-Team ..... 36  
33. MISTIS Project-Team ..... 37  
34. MODAL Project-Team ..... 38  
35. RANDOPT Project-Team ..... 39  
36. REALOPT Project-Team ..... 40  
37. SEQUEL Project-Team ..... 41  
38. SIERRA Project-Team ..... 42

39. TAU Project-Team .....	43
STOCHASTIC APPROACHES	
40. CQFD Project-Team .....	44
41. MATHRISK Project-Team .....	45
42. SIMSMART Project-Team .....	46
43. TOSCA Team .....	47

## **ACUMES Project-Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Bilateral Contracts with Industry**

- **Etic Data** (2019-2020): Acumes has set up a 12 months research and development contract with the company Etic Data on "Predictive modeling and proactive driving of customers behaviour in massive data BtoC context".

## **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 student: 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.

**CARDAMOM Project-Team (section vide)**

## **DEFI Project-Team**

# **6. Bilateral Contracts and Grants with Industry**

## **6.1. Bilateral Contracts with Industry**

- 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 in January 2019 with Safran Tech. The student is M. Martin Bihr who is working on "Optimisation Topologique du couple support/pièce pour la fabrication additive métallique sur lit de poudre".
- 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 testing".
- 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".

## **6.2. 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 ArianeGroup, Activity around techniques for Uncertainty Quantification, Coordinator: P.M. Congedo.
- Contract with CEA, Activity around techniques for numerical error estimation and uncertainty quantification, Coordinator: P.M. Congedo.



**ECUADOR Project-Team (section vide)**

**ELAN Project-Team (section vide)**

## **GAMMA Project-Team**

# **5. Bilateral Contracts and Grants with Industry**

## **5.1. Bilateral Contracts with Industry**

- Boeing
- Safran Tech

## **5.2. Bilateral Grants with Industry**

- Projet RAPID DGA

## **MATERIALS 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.

## **MEMPHIS Project-Team**

# **8. Bilateral Contracts and Grants with Industry**

## **8.1. Bilateral Contracts with Industry: EDF**

40kEuro contract for a study on the development of projection-based reduction strategies for the shallow-water equations, for applications in Hydraulics.

## **8.2. Bilateral Grants with Industry: ANDRA**

36kEuro contract for the development of a projection-based reduced model for a thermo-hydraulic-mechanical (THM) system.

**MEPHYSTO Team (section vide)**

## **MINGUS Project-Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Bilateral Contracts with Industry**

- Contrat with RAVEL (onne year, budget 15000 euros): this is 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.  
Participants: P. Chartier, M. Lemou and F. Méhats.
- Contract with Cailabs (6 months, budget 3000 euros): This collaboration aims at exploring the possibility of deriving new fiber optics devices based on neural networks architecture.  
Participants: P. Chartier, E. Faou, M. Lemou and F. Méhats.

**MOKAPLAN Project-Team (section vide)**



## **NACHOS Project-Team**

# **7. Bilateral Contracts and Grants with Industry**

## **7.1. Bilateral Contracts with Industry**

### **7.1.1. DGTD solver for time-domain electromagnetics with application to geoseismics**

**Participants:** Andreas Atle [TOTAL], Henri Calandra [TOTAL], Karim El Maarouf [TOTAL], Alexis Gobé, Stéphane Lanteri, Michael Sekachev [TOTAL].

This contract with TOTAL CSE (Computational Science and Engineering) division in Houston, Texas, is concerned with the development of a DGTD solver for applications in geoseismics. The R&D division of the EP (Oil, Gas Exploration & Production) branch of TOTAL has been interested in DG type methods since many years. It acquired a know-how on these methods and developed internally software tools integrating DG methods as solvers of the direct problem (forward propagators) in different seismic imaging processes (RTM - Reverse Time Migration, and FWI - Full Waveform Inversion). These solvers are concerned with the numerical resolution of PDE systems of acoustics and elastodynamics. TOTAL is now interested in having a similar DGTD solver for the numerical resolution of the system of time-domain Maxwell equations, in view of the development of an electromagnetic imaging process to identify conductivity of a medium. This electromagnetic imaging process would then be coupled to the existing seismic imaging ones.

**NANO-D Team (section vide)**

## POEMS Project-Team

# 7. Bilateral Contracts and Grants with Industry

## 7.1. Bilateral Contracts with Industry

- 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, B. Cotté, N. Trafny  
Start: 04/2018. End: 03/2021. Administrator: ENSTA
- Contract and CIFRE PhD with CEA on *Modelling of thin layers of randomly distributed nanoparticles for electromagnetic waves* Participants: A. Boucart, S. Fliss, L. Giovangigli  
Start: 10/2019. End: 09/2022. Administrator: ENSTA

## **RAPSODI Project-Team**

# **8. Bilateral Contracts and Grants with Industry**

## **8.1. Bilateral Contracts with Industry**

A new contractual collaboration between C. Cancès and IFPEN corresponding to the supervision of the PhD thesis of S. Bassetto started in January 2019. This contract is part of the Inria-IFPEN framework agreement.

## **8.2. Bilateral Grants with Industry**

C. Bataillon (CEA) and L. Trenty (ANDRA) are involved in the EURAD project on corrosion modeling together with C. Cancès, C. Chainais-Hillairet, and B. Merlet. More details in Section [9.3](#).

## **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).

**COMMANDS Project-Team (section vide)**

**DISCO Project-Team (section vide)**

## FACTAS Project-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) accompanied the PhD of David Martinez Martinez and focused 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 has also been considered (see new results section). The contract ended mid 2019.

### 7.1.2. Contract Inria-Inoveos

A contract was signed with the SMB company Inoveos in order to build a prototypical robot dedicated to the automatic tuning of microwave devices, see Section [5.1.1](#).



## I4S Project-Team

# 7. Bilateral Contracts and Grants with Industry

## 7.1. Bilateral Contracts with Industry

### 7.1.1. *Collaboration with SNCF on Road circuits*

**Participants:** Vincent Le Cam, Arthur Bouché.

The 2 objectives of the Circuit de Voie project aimed to detect the phenomenon of deshuntage are, with SNCF Innovation Research, develop criteria and models to detect, in real time, the appearance of the phenomenon, and implementing in one of several PEGASE boxes spread over several test sites these models and comparison indicators.

3 criteria have been developed and validated in simulation on real dataset: 1 criterion in residual power on the spectral band of the harmonic of rank 3, a criterion of spectral shape recognition typical in case of bad deshuntage, a statistical criterion on the RMS component of the residual signal. Future work is envisaged in 2020 to go further in comparing these models with real field data and comparison with other detection systems. Several PEGASE units have been built, deployed and implemented for one-off or long-term measurement phases, including during deshuntage tests conducted by SNCF teams.

### 7.1.2. *Collaboration with SNCF Reseau*

**Participants:** Vincent Le Cam, Arthur Bouché.

SNCF has commissioned 5 new DETECTEAU water level sensors adapted to the conditions of nozzles and waterways in the rail network. From a technological point of view the sensor is of small size and very weak consumption. DETECTEAU communicates according to the LORA network. From September to November 2019, one to 3 sites of LGV Paris East will probably be deployed. Scientifically a dynamic sending algorithm has been implemented, taking into account the dynamics of the watercourse (sending more information if there are phases of flood or recession). As it stands, the DETEC-TEAU project is opening the field, probably for 2020, to a more scientific follow-up of the project where the data collected will feed watershed flow models that SNCF wishes to qualify.

### 7.1.3. *Collaboration with SNCF : Hot boxes detection*

**Participants:** Jean Dumoulin, Thibaud Toullier.

The main strategic issue is the maintenance in operational condition of the Hot Box Detectors (DBC). The removal of the DBC from the track is part of Tech4Rail's ambition: reducing equipment to the track. The innovation aimed at in this project is to study and develop a measurement solution to be deployed at the edge of a lane out of danger zone and independent of track equipment. Among the scientific obstacles identified are the following three:

- the behavior of the measurement system in deteriorated meteorological conditions in a real site
- the design and implementation of an automated prototype for in-situ deployment (connection to an existing announcement system, hardware packaging of the system, study and design of a scalable software solution allowing pre-processing data).
- the development of automatic processing tools for the analysis of massive data generated by in-situ measurement systems

### 7.1.4. *Contract with SIEMENS : Proof of Concept monitoring coupled with prediction model for deicing metro lane surface*

**Participants:** Jean Dumoulin, Nicolas Le Touz, Thibaud Toullier.

This proof of concept aims at combining real site monitoring solutions with adjoint state FE thermal model approach to predict optimal heating required to preserve surface from icing in winter conditions. Furthermore, we introduced in our prediction model connection with in-line weather forecast provided by Meteo France Geoservice at different time horizon and spatial scale.

## MCTAO Project-Team

# 8. Bilateral Contracts and Grants with Industry

## 8.1. Bilateral Grants with Industry

- A grant “PEPS AMIES”, title: “Conception d’un électrostimulateur intelligent”, was obtained, co-financed by **AMIES** and **SEGULA**.

PI: Bernard Bonnard.

Start: December 2018. Duration: 2 years.

- A grant CIFRE co-financed by and **SEGULA**, title: “Réalisation d’un prototype d’électrostimulateur intelligent”, was obtained.

PI: Bernard Bonnard and T. Bakir (IMvia).

Start: January 2020. Duration: 3 years.

## **NECS Team**

# **8. Bilateral Contracts and Grants with Industry**

## **8.1. Bilateral Contracts with Industry**

**TMI-V (Tachymètre Magnéto-Inertiel couplé Vision).** Co-PI: H. Fourati (2018-2022)

The objective of the TMI-V project is the indoor localization without infrastructure, by developing an autonomous, precise, robust solution with no prior knowledge of the environment integrated in equipment worn on the upper body to be used in virtual reality and augmented reality applications. An array of magnetometers and inertial sensors will be used. The project is ongoing, in collaboration with SysNav company.

**QUANTIC Project-Team (section vide)**

## **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.

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**TRIPOP Project-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**

- 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.

**VALSE Project-Team (section vide)**



## BONUS Project-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.

- *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 Decathlon (2019, Lille)*: This project deals with scalable multi-objective optimization for the eco-design of material, clothing and sports shoes.
- *In contact with Vinci Autoroutes (2019, Paris)*: This project deals with the optimization of deep neural networks for computer vision.

**CELESTE Project-Team (section vide)**

## **GEOSTAT Project-Team**

# **8. Bilateral Contracts and Grants with Industry**

## **8.1. Bilateral Contracts with Industry**

InnovationLab with I2S company, starting scheduled after 1st 2019 COPIL in January 2019.

## **INOCS Project-Team**

# **8. Bilateral Contracts and Grants with Industry**

## **8.1. Bilateral Contracts with Industry**

Utocat (2018-2020): Study optimization problems arising in the blockchain

## **8.2. Bilateral Grants with Industry**

- Program PGMO funded by the Fondation Mathématiques Jacques Hadamard. EDF is the industrial partner (2017-2019)
- Program PGMO funded by the Fondation Mathématiques Jacques Hadamard. A generic framework for routing and scheduling problems (2019-2021)
- Program PGMO funded by the Fondation Mathématiques Jacques Hadamard. Integrated models for the dimensioning and location of charging electric vehicles stations in the presence of renewable energy sources: Models and Algorithms (2019-2020)

## **MISTIS Project-Team**

# **8. Bilateral Contracts and Grants with Industry**

## **8.1. Bilateral Contracts with Industry**

**Contract with EDF (2019).** Stéphane Girard is the advisor of the internship of Valentin Chevalier founded by 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 50 keuros.

**Contract with VALEO (2018-2019).** Stéphane 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 nonwoven tissues. The financial support for MISTIS is of 15 keuros.

## MODAL Project-Team

# 8. Bilateral Contracts and Grants with Industry

## 8.1. Bilateral Contracts with Industry

### 8.1.1. COLAS company

**Participant:** Christophe Biernacki.

COLAS is a world leader in the construction and maintenance of transport infrastructure. This bilateral contract aims at classifying mixed data obtained with sensors coming from a study of the aging of road surfacing. The challenge is to deal with many missing (sensors failures) and correlated data (sensors proximity).

## 8.2. Bilateral Grants with Industry

### 8.2.1. EIT-Sysbooster: Nokia - Apsys/Airbus

**Participant:** Alain Celisse.

Nokia and Airbus are two worldwide known companies respectively working in communications and transport areas. The purpose of this contract is to perform root cause analysis to reduce (at the end) the number of failures.

## **RANDOPT Project-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)
- Contract with PSA in the context of the CIFRE PhD thesis of Marie-Ange Dahito (2019–2022)
- Pending contract for the thesis of Paul Dufossé with Thales (2020–2022)

## **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 has continued through a new contract within Inria Tech. Its 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 contract with RTE to develop strategies inspired from stochastic gradient methods to speed-up Benders' decomposition. The PhD thesis of Xavier Blanchot is part of this contract.

We have a contract with Thales Avionique to study a robust scheduling problem.



## 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: 3 years (Mar 2018 – Feb 2021)

Abstract: This contract comes along the CIFRE grant on the same topic. 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. *Renault*

- Contract with Renault; PI: Philippe Preux

Title: Control of an autonomous vehicle

Duration: 3 years (Dec 2017 – Nov 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-Ambrym Maillard, Philippe Preux.

### 8.1.3. *Critéo*

- Contract with “Critéo”; PI: Philippe Preux

Title: Computational advertizing

Duration: 3 years (Dec 2017 – Jun 2019)

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.

Note: this contract came to its end because the PhD candidate quitted Critéo, hence aborting his PhD studies.

**Participants:** Philippe Preux, Kiewan Villatell.

### 8.1.4. *Share My Space*

- Contract with “Share My Space”.

Duration: 6 months

**Participant:** Philippe Preux.

## **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.

## TAU Project-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 led 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.

- **DMH 2019** (1 an, 45kEuros) related to consulting activities with DMH (Digital for Mental Health)<sup>0</sup>.  
Coordinator: Aurélien Decelle and Simon Moulieras (DMH)  
Participants: Michèle Sebag
- **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)
- **BOBCAT** The new B-to-B work intermediaries: comparing business models in the “CollaborATive” digital economy, 2018-2020 (100k euros), funded by DARES (French Ministry of Labor).  
Coordinator : Odile Chagny (IRES)  
Participants: Paola Tubaro and Antonio A. Casilli (Telecom Paris)
- **INDL-KW** International Network on Digital Labor - Kickoff Workshops, 2019 (10k euros), funded by CNRS and the University of Toronto.  
Coordinator: Paola Tubaro and Alessandro Delfanti (UoT)  
Participants: Antonio A. Casilli (Telecom Paris)
- **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)  
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)  
Participants: Guillaume Charpiat, Michèle Sebag, Léonard Blier
- **IFPEN** (Institut Français du Pétrole Energies Nouvelles) 2019-2023 (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 ). Started October 2019.  
Coordinator: Marc Schoenauer  
Participants: Alessandro Bucci, Guillaume Charpiat

<sup>0</sup>This “Affiliate” contract has been inspired by [the affiliate program of Technion](#)

## CQFD Project-Team

# 7. Bilateral Contracts and Grants with Industry

## 7.1. Bilateral Contracts with Industry

### 7.1.1. Naval Group

Participants: Huilong Zhang, François Dufour, Dann Laneuville, Alexandre Genadot.

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 equipments 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. Case Law Analytics

Pierrick Legrand is a consultant for the startup Case Law Analytics. The object of the consulting is confidential.

## **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

## **SIMSMART Project-Team**

# **6. Bilateral Contracts and Grants with Industry**

## **6.1. Bilateral Contracts with Industry**

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.
4. **Cooper Standard**, Machine Learning for joints design.

## **6.2. Bilateral Grants with Industry**

1. **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).

## **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.