RESEARCH CENTER

FIELD
Applied Mathematics, Computation and Simulation

Activity Report 2018

Section Contracts and Grants with Industry

Edition: 2019-03-07

STOCHASTIC APPROACHES

ACUMES Project-Team (section vide)

CAGIRE Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

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

8.2. Bilateral Grants with Industry

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

CARDAMOM Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

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

DEFI Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

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

8.2. Bilateral Grants with Industry

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

ECUADOR Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

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

ELAN Team (section vide)

GAMMA3 Project-Team

6. Bilateral Contracts and Grants with Industry

6.1. Bilateral Contracts with Industry

- Boeing
- Safran Tech

6.2. Bilateral Grants with Industry

- Projet RAPID DGA

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.

MEMPHIS Project-Team (section vide)

MEPHYSTO-POST Team (section vide)

MINGUS Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

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

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

MOKAPLAN Project-Team (section vide)

NACHOS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. Numerical study of light absorption in a photovoltaic glass

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

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

NANO-D Project-Team (section vide)

RAPSODI Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

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

CAGE Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

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

COMMANDS Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

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

DISCO Project-Team (section vide)

FACTAS Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. Contract CNES-Inria-XLIM

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

7.1.2. Contract Inria-SKAVENJI

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

I4S Project-Team

6. Bilateral Contracts and Grants with Industry

6.1. Bilateral Contracts with Industry

6.1.1. Contract with SNCF: DEMETER

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

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

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

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

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

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

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

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

For the future, new projects related to

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

have been initiated with SNCF R&D department.

6.1.2. Contracts with SDEL-CC (VINCI Group)

Participants: Vincent Le Cam, Mathieu Le Pen.

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

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

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

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

MCTAO Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contract with Industry

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

8.2. Bilateral Grant with Industry

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

NECS Project-Team (section vide)

NON-A POST Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

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

QUANTIC Project-Team (section vide)

SPHINX Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Grants with Industry

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

TRIPOP Team

7. Bilateral Contracts and Grants with Industry

7.1. Schneider Electric

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

7.2. STRMTG

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

TROPICAL Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

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

BONUS Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

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

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

GEOSTAT Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

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

INOCS Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

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

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

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

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

8.2. Bilateral Grants with Industry

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

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

8.3. Inria Innovation Lab

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

MISTIS Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

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

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

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

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

MODAL Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts: SEMENCES DE FRANCE

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

8.2. Bilateral Contracts: Arcelor-Mittal

Participants: Christophe Biernacki, Vincent Vandewalle.

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

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

8.3. Bilateral Contracts: Alstom

Participants: Christophe Biernacki, Benjamin Guedj.

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

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

8.4. Bilateral Contracts: Decathlon

Participant: Christophe Biernacki.

Decathlon is a leading sports retailer.

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

RANDOPT Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

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

REALOPT Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

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

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

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

SELECT Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Contract with NEXTER

Participants: Gilles Celeux, Florence Ducros, Patrick Pamphile.

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

SEQUEL Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

8.1.1. Lelivrescolaire.fr

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

  Title: Sequential Machine Learning for Adaptive Educational Systems

  Duration: Mar. 2018 – Feb. 2021

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

8.1.2. Sidexa

- contract with "Sidexa"; PI: Philippe Preux

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

  Duration: 6 months

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

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

8.1.3. Renault

- contract with Renault; PI: Philippe Preux

  Title: Control of an autonomous vehicle

  Duration: 3 years (12/2017–11/2020)

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

8.1.4. Critéo

- contract with "Criteo"; PI: Philippe Preux

  Title: Computational advertizing

  Duration: 3 years (12/2017–11/2020)

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

8.1.5. Orange Labs

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

  Title: Inter User Transfer in dialogue systems

  Duration: 3 years

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

8.1.6. 55

- contract with “55”; PI: Jérémie Mary

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

  Duration: Oct. 2015 – Sep. 2018

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

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

8.1.7. AB-Tasty

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

  Duration: 1 month

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

SIERRA Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

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

8.2. Bilateral Grants with Industry

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

TAU Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

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

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

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

Participants: Balthazar Donon, Marc Schoenauer

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

CQFD Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. Naval Group

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

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

7.1.2. Thales Optronique

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

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

7.1.3. Lyre: ADEQWAT project

Participants: François Dufour, Alexandre Genadot, Jérôme Saracco.

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

MATHRISK Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

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

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

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

SIMSMART Team

7. Bilateral Contracts and Grants with Industry

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

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

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

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

TOSCA Project-Team

6. Bilateral Contracts and Grants with Industry

6.1. Bilateral Contracts with Industry

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