



RESEARCH CENTER

FIELD

Digital Health, Biology and Earth

Activity Report 2015

Section Contracts and Grants with Industry

Edition: 2016-03-21

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ABS Project-Team (section vide)

AMIB Project-Team (section vide)

BEAGLE Project-Team (section vide)

BIGS Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

T. Bastogne, full Professor at Université de Lorraine and BIGS member is head of the startup Cybernano that provides computational solutions for biopharma and nano-medicine. <http://www.cybernano.eu/>

BONSAI Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

The PhD thesis of Lea Siegwald is funded by a CIFRE contract with the biotechnology company Gene Diffusion.

CAPSID Project-Team (section vide)

DYLISS Project-Team (section vide)

ERABLE Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

From April 2013 to April 2015, N. Pisanti had a 60,000 euros + TVA grant from the private company Galileo Research srl for Scientific Counseling on “New technological Platform for Immunotherapy of cancers with synergic treatment”.

GENSCALE Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

8.1.1. *Empowered memory*

Participants: Charles Deltel, Dominique Lavenier.

The UPMEM company is currently developing new memory devices with embedded computing power. GenScale investigates how bioinformatics algorithms can benefit from these new types of memory (see section New Results).

8.2. Bilateral Grants with Industry

8.2.1. *Korilog: I-Lab KoriScale*

Participants: Sébastien Brillet, Erwan Drezen, Dominique Lavenier, Ivaylo Petrov.

In June 2013, GenScale and the Korilog Company created an Inria common structure research (I-LAB) called KoriScale. This is the outcome of a solid relationship, which has enabled the transfer of the PLAST software (bank to bank genomic sequence comparison) from GenScale to Korilog. The resulting commercial product (Klast) is now 5 to 10 times faster than the reference software (Blast). The main research axe of the I-LAB focuses on comparing huge genomic and metagenomic datasets. In June 2015, Korilog stopped its activity.

8.2.2. *Rapsodyn project*

Participants: Dominique Lavenier, Claire Lemaitre, Sebastien Letort, Pierre Peterlongo.

RAPSODYN is a long term project funded by the IA French program (Investissement d'Avenir) and several field seed companies, such as Biogemma, Limagrain and Euralis. The objective is the optimization of the rapeseed oil content and yield under low nitrogen input. GenScale is involved in the bioinformatics work package, in collaboration with Biogemma's bioinformatics team, to elaborate advanced tools dedicated to polymorphism.

IBIS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. BGene

Participants: Johannes Geiselmann, Hidde de Jong, Corinne Pinel.

BGene is a start-up company of Université Joseph Fourier in the field of DNA engineering. BGene proposes efficient and custom-made modifications of bacterial genomes, leaving no scars or antibiotics resistance genes. The company has know-how and expertise at all stages of the development process, including the *in-silico* design of a desired construction, the choice of the appropriate genetic tools, and the delivery of the finished product. Former IBIS-member Caroline Ranquet and Johannes Geiselmann are co-founders of BGene, together with Marie-Gabrielle Jouan (Floralis, Université Joseph Fourier). Corinne Pinel works part-time at BGene, and Johannes Geiselmann and Hidde de Jong are members of its scientific advisory board. For more information on BGene, see <http://www.bgene-genetics.com/>.

7.2. Genostar

Participants: Hidde de Jong, Michel Page, François Rechenmann.

Genostar, an Inria start-up created in 2004, provides bioinformatics solutions for the comparative analysis of bacterial genomes, proteomes and metabolomes. Genostar's software suite performs the annotation of sets of genomic sequences, *i.e.*, the identification of the coding sequences and other features, followed by the prediction of the functions of the gene products. The modules which make up the software suite were originally developed within the Genostar consortium and the HELIX project team at Inria Grenoble - Rhône-Alpes. The software suite also includes the modeling and simulation tool GNA developed by members of IBIS (Section 5.1). Genostar offers a comprehensive service line-up that spans genome sequencing, read assembly, annotation, and comparison. Genostar thus works with trusted subcontractors, each specialized in state-of-the-art sequencing technologies. François Rechenmann is CEO of the company. For more information, see <http://www.genostar.com>.

LIFEWARE Project-Team (section vide)

MORPHEME Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

General Electric Healthcare: a 6 months (from february to july) contract to finalize the PhD work of T. Benseghir.

PLEIADE Team (section vide)

SERPICO Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

8.1.1. *Contract with Innopsis: Tissue microarrays (TMA) image analysis*

Participants: Hoai Nam Nguyen, Charles Kervrann.

Collaborators: Vincent Paveau and Cyril Cauchois (Innopys).

A three-year contract has been established with Innopsis in 2013 to support Hoai Nam Nguyen's Ph-D thesis. The objective is to investigate and develop methods and algorithms dedicated to fluorescence images acquired by the scanners and devices designed by the company. In this project, we focus on i/ localization and segmentation fluorescence tissue microarrays (TMA) cores in very large 2D images; ii/ de-arraying of digital images and correction of grid deformation adapted to devices; iii/ correction of scanning artifacts to improve image reconstruction; iv/ deconvolution, denoising and superresolution of fluorescence TMA images corrupted by Poisson noise. The algorithms will be integrated into the platforms and devices designed by Innopsis.

8.1.2. *Contract (CIFRE) with Technicolor: Semantically meaningful motion descriptors for video understanding*

Participants: Juan Manuel Perez Rua, Patrick Bouthemy.

Collaborators: Tomas Crivelli and Patrick Pérez (Technicolor).

A three-year contract has been established with Technicolor on January 2015 for a CIFRE grant supporting Juan Manuel Perez Rua's Ph-D thesis. The purpose is to investigate new methods for extracting meaningful mid-level motion-related descriptors that may help for the semantic discovery of the scene. In 2015, we started with the occlusion detection problem. We have proposed a novel approach where occlusion in the next frame or not is formulated in terms of visual reconstruction. Contrary to the ubiquitous displaced-frame-difference, the proposed alternative does not critically depend on a pre-computed, dense displacement field, while being shown to be more effective. We then leverage this local modeling within an energy-minimization framework that delivers occlusion maps. An easy-to-obtain collection of parametric motion models is exploited within the energy to provide the required level of motion information. Our approach outperforms state-of-the-art occlusion detection methods on the challenging MPI Sintel dataset.

8.2. Bilateral grants with industry

8.2.1. *Fourmentin-Guilbert Foundation: Macromolecule detection in cryo-electron tomograms*

Participants: Emmanuel Moebel, Charles Kervrann.

Collaborator: Damien Larivière (Fourmentin-Guilbert Foundation).

The Fourmentin-Guilbert Foundation strives for building a virtual E. coli bacteria. Information about the position of macromolecules within the cell is necessary to achieve such a 3D molecularly-detailed model. The Fourmentin-Guilbert Foundation supports cutting-edge *in-situ* cryo-electron tomography combined with image processing at the Max-Planck Institute of Biochemistry to map the spatial distribution of the ribosomes and obtain structural information on the complexes they form *in-situ* with cofactors and other ribosomes. The objective of the project is to explore and evaluate novel methods from the field of 3D shape retrieval for identifying, localizing and counting macromolecules (e.g. 70S ribosome) within a tomogram. This project is also supported by "Region Bretagne".

VIRTUAL PLANTS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

Guillaume Garin has been funded by ITK.

ARAMIS Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

8.1.1. *Air-Liquide Medical Systems*

Participants: Mario Chavez [Correspondant], Xavier Navarro.

Project title: Real-time characterisation of respiratory states from EEG

Founded in 2014

Amount: 370 K€

Coordinator: Thomas Similowski

Other partners: UPMC, Inserm UMR 1158

Abstract: The project aims at developing a real-time brain computer interface (BCI) for the monitoring of respiratory states from scalp EEG data of healthy volunteers and patients, recorded at the laboratory, hospital ward, operating room or intensive care units..

ASCLEPIOS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. CIFRE PhD Fellowships

7.1.1.1. Neurelec/Oticon Medical

The work of Thomas Demarcy, *Segmentation and anatomic variability of the cochlea and other temporal bone structures from medical images*, is supported by a PhD fellowship from the Neurelec/Oticon Medical company.

7.1.2. Inria - Mauna Kea Technologies I-Lab SIWA

Participants: Nicholas Ayache [correspondent], Xavier Pennec, Marzieh Kohandani Tafreshi, Rémi Cuingnet.

This I-lab involves the Mauna Kea Technologies company.

The first focus of this I-lab is to develop efficient and friendly content-based image retrieval (CBIR) tools to help users make a diagnosis. The second focus is on image registration to provide near real-time and robust image registration tools built on GPU implementations for image stabilization and super-resolution since it is a critical method for the smart atlas.

For more information, see [this link](#)⁰.

7.1.3. Microsoft Research

Microsoft Research is funding through the Inria-Microsoft joint lab the projects "[4D Cardiac MR Images](#)"⁰ and "[Medilearn](#)"⁰ which aim at analyzing large databases of cardiac images to help the diagnosis of cardiac diseases and planning of therapy. This project involves A. Crimisi from MSR and partially funds the PhDs of Loic Le Folgoc and Jan Margeta, as well as the post doctoral stay of Hervé Lombaert.

7.1.4. Spin-off company Therapixel

[Therapixel](#)⁰ is a spin-off of the Asclepios (Inria Sophia Antipolis) and Parietal (Inria Saclay) project teams founded in 2013. Therapixel makes surgical information systems. It relies on depth sensing, advanced software processing and innovative user interfaces to provide touchless control of the computer. This technology allows for a direct control of the computer, which sterility constraints made impractical in the past. In 2015, Therapixel obtained the CE marking of its product on touchless visualization of medical images.

7.1.5. Other contracts

Contracts with Philips and Siemens are described in our previous activity reports.

⁰<https://lisa.sophia.inria.fr/siwa-loasis-numerique-dinria-et-de-mauna-kea-706.html>

⁰<http://www.msr-inria.fr/projects/4d-cardiac-mr-images>

⁰<http://www.msr-inria.fr/projects/medilearn>

⁰<http://www.therapixel.com/>

ATHENA Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Grants with Industry

- The **Olea Medical** company from La Ciotat (FR) funds 50% of the PhD of Marco Pizzolato, supervised by Rachid Deriche, which is funded by the PACA Region for the remaining 50%.
- The **BESA** company (Brain Electrical Source Analysis) from Germany funds 50% of the PhD of Christos Papageorgakis, co-supervised by Maureen Clerc (Athena) and Juliette Leblond (Apics), which is funded by the PACA Region for the remaining 50%.
- The **Neurelec company** (Cochlear Implants) has obtained a CIFRE PhD funding for Kai Dang, supervised by Maureen Clerc.

DEMAR Project-Team (section vide)

GALEN Project-Team (section vide)

MIMESIS Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

InSimo is a startup we created in January 2013, after two years of thinking, maturation and incubation. Its founding members were all former team members of the SHACRA team (our previous team): Jérémie Allard, Juan Pablo de la Plata Alcalde and Pierre Jean Bensoussan have joined the operation team, while Stéphane Cotin and Christian Duriez serve as scientific advisors. The business model of the company is based on the SOFA platform and its community to transfer state-of-the-art simulation technologies into commercially-supported software components that medical simulator vendors can integrate into their products. The goal is to foster the creation of a new generation of medical simulators, highly realistic, faster to develop, allowing a broader commercial offer and novel uses. InSimo participated to the 2012 OSEO / MESR national innovative technology company creation competition (Emergence category) and was selected as the best project in the Alsace region as well as one of the three projects highlighted at the national level. InSimo also won the HelpMeSee contract (in partnership with Moog and SenseGraphics) and entered in February 2013 into a 3-year development phase to build a first batch of 100 MSICS simulators.

In the context of the SOFA Consortium, the team is also in close collaborations with:

Altran : is a global leader in innovation and high-tech engineering consulting, Altran accompanies its clients in the creation and development of their new products and services. At the occasion of the “Journée Poster”, several members of the team (Rosalie Plantefève, Bruno Marques Jaime Guevara and Christoph Paulus) presented their work.

Anatoscope: is a young start-up company created in 2015 by researchers, engineers and one surgeon. We develop a software solution to automatically build 3D digital avatars based on medical images of patients. The avatars allow biomechanical simulations of the real person.

TruPhysics: develops Industry 4.0 software solutions to support manufacturing companies in development and sales processes by using a real-time and high-resolution physics simulation. We provide software that enables developers and engineers to simulate control programs, physical properties, kinematics and behavior of industrial robots, machines and assemblies.

MNEMOSYNE Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

8.1.1. *Contract with Algotech*

Participants: Frédéric Alexandre, Ikram Chraïbi Kaadoud, Nicolas Rougier, Thierry Viéville.

Algotech is a SME working in the domain of CADD software edition for electrical circuit diagram interpretation and design. Its activity is interesting for our team because they are also interested in the design, by learning, of perception (for diagram identification) and action aspects of loops (for diagram genesis) with the specificity of working at a small scale, considering the variety of items to be manipulated. This is consequently a very interesting benchmark for transferring our bio-inspired models to the domain of classical machine learning, as we have begun this year.

NEUROMATHCOMP Project-Team (section vide)

NEUROSYS Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

8.1.1. CertiViBE

Laurent Bougrain is a member of the steering committee of OpenViBE and CertiViBE.

CertiViBE, a medically certifiable core for OpenViBE, the software for Brain Computer Interfaces and Neuroscience research. It is a iLAB project between the Inria project-team Hybrid and Mensia Technologies SA (<http://www.mensiatech.com/>)

Founded in 2012, Mensia Technologies is a medical-device spin-off of Inria owning an exclusive worldwide license of the OpenViBE software for commercial applications. So far, OpenViBE has raised a lot of interest in the research community, especially on medical applications. However, OpenViBE being a research-software, it does not yet matches the requirements of medical devices in terms of stability, performance, documentation, as well as engineering processes in general, slowing down the transfer of OpenViBE-based medical research to the industry. Within the CertiViBE project, Inria and Mensia Technologies are putting their task forces and respective expertise together to deliver a certifiable core for the OpenViBE software. While the OpenViBE software will continue to be published as an Open Source software, the project will dramatically facilitate the transfer of the research made with OpenViBE as it will be built on ready-to-certify foundations, following the processes and normative regulation of medical devices development including risk analysis, quality assurance and medical device software development and maintenance.

PARIETAL Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. The LearnClues Labcomm

The LearnClues LabComm has been granted in Oct, 2014, and the agreement was signed in Dec. 2015.

Statistical learning is a field of mathematics and computer science that enables the extraction of predictive models from data with weak signal to noise ratio. These techniques are behind the successes of Google or the progresses of automatic medical diagnostic. Combined with a knowledge of the field of application, they open the door to optimal decisions. Tynyclues is a start-up that applies statistical learning to e-commerce, adapting the marketing practice from customer databases. Parietal is an Inria research group that develops statistical learning for neurosciences and is the driving force behind the software tool "scikit-learn", that is a standard in statistical learning.

The goal of this proposed common lab is to transfer the expertise of Parietal on big data and to improve statistical learning techniques and implementation on distributed systems to open the door to faster analysis of very large datasets. Indeed, processing more data implies detecting smaller effects in the signals. Tynyclues already uses the tools developed par Parietal on the "cloud", and thus in distributed computing environments. The practical experience of Parietal enables us to plan substantial improvements to computational performance as well as to the amount of information extracted from big data.

From a strategical standpoint for Tynyclues, such progress are important to vary the number of domain scenarios that it can address, by analyzing jointly more data of a wider type, and to render fully automatic the data analysis platform that it is offering to its customers, replacing challenging tasks currently performed by experts. These developments are particularly important given that Tynyclues is developing at a very fast rate and is processing bigger and bigger datasets and an increasing number of different problems.

The project partners are:

- Parietal, Inria
- Tiny Clues

8.2. The Wendelin FUI project

The Wendelin project has been granted on December 3rd, 2014. It has been selected at the *Programme d'Investissements d'Avenir (PIA)* that supports "cloud computing et Big Data". It gives visibility and fosters the French technological big data sector, and in particular the scikit-learn library, the NoSQL "NEO" et the decentralized "SlapOS" cloud, three open-source software supported by the Systematic *pôle de compétitivité*.

Scikit-learn is a worldwide reference library for machine learning. Gaël Varoquaux, Olivier Grisel and Alexandre Gramfort have been major players in the design of the library and Scikit-learn has then been supported by the growing scientific Python community. It is currently used by major internet companies as well as dynamic start-ups, including Google, Airbnb, Spotify, Evernote, AWeber, TinyClues; it wins more than half of the data science "Kaggle" competitions. Scikit-learn makes it possible to predict future outcomes given a training data, and thus to optimize company decisions. Almost 1 million euros will be invested to improve the algorithmic core of scikit-learn through the Wendelin project thanks to the Inria, ENS and Institut Mines Télécom teams. In particular, scikit-learn will be extended in order to ease online prediction and to include recent stochastic gradient algorithms.

NEO is the native NoSQL base of the Python language. It was initially designed by Nexedi and is currently used and embedded in the main software of company information systems. More than one million euros will be invested into NEO, so that scikit-learn can process within 10 years (out-of-core) data of 1 exabyte size.

Paris13 university and the Mines Télécom institute will extend the SlapOS distributed mesh cloud to deploy Wendelin in *Big Data as a Service* (BDaaS) mode, to achieve the interoperability between the Grid5000 and Teralab infrastructures and to extend the cloud toward smart sensor systems.

The combination of scikit-learn, NEO and SlapOS will improve the predictive maintenance of industrial plants with two major use cases: connected windmills (GDF SUEZ, Woelfel) and customer satisfaction in car sale systems (MMC Rus). In both cases it is about non-personal, yet profitable big data. The Wendelin project actually demonstrates that Big data can improve infrastructure and everyday-life equipment without intrusive data collection. For more information, please see www.wendelin.io.

The project partners are:

- Nexedi (leader)
- GDF SUEZ
- Abilian
- 2ndQuadrant
- Institut Mines Télécom
- Inria
- Université Paris 13

POPIX Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

POPIX has a contract with Lixoft (June 2011 - June 2015)

SISTM Project-Team (section vide)

VISAGES Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

8.1.1. Siemens

duration: 5 years from 2011/10/26

In the context of the Neurinfo imaging platform, a partnership between Siemens SAS - Healthcare and University of Rennes 1 was signed in October 2011 for 5 years. This contract defines the terms of the collaboration between Siemens and the Neurinfo platform. The Neurinfo platform has received work in progress (WIP) sequences from Siemens in the form of object code for evaluation in the context of clinical research. The Neurinfo platform has also received source code of selected MRI sequences. This is a major advance in the collaboration since it will enable the development of MRI sequences on site.

8.2. Bilateral Grants with Industry

8.2.1. MEDday

As part of its activities, MEDday led the final testing phase on patients diagnosed from Multiple Sclerosis in order to find treatment of progressive multiple sclerosis. This is done in partnership with several hospitals in France. The goal is to achieve an effective treatment for this disease. The role of the team in this industrial grant is to develop new algorithms to perform the processing and the analysis of the images from this study.

AIRSEA Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

- A 4-year contract named ReDICE (Re Deep Inside Computer Experiments) with EDF, CEA, IRSN, RENAULT, IFP on the thematic computer experiments.
- A 3-year contract with ARTELIA Group: funding for the PhD thesis of M.P. Daou (CIFRE)
- A 1-year contract with NOVELTIS on the thematic "Développement de démonstrateurs avec AGRIF": see [6.1](#)
- A 1-year contract with IFREMER on the thematic "Evolution de la librairie de raffinement de maillage en Fortran (AGRIF) : amélioration de la prise en compte du trait de côte et des frontières ouvertes en contexte parallèle MPI/OpenMP" : see [6.1](#)

ANGE Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

- A research contract with SAUR (company managing water supplies) was negotiated in 2015. It deals with the modelling and the simulation of saline stratification in a dam reservoir of the Vilaine river in Brittany.
- ANGE appealed to SciWorks Technologies to transfer Freshkiss3D in a user-friendly tool for a larger diffusion to potential industrial partners. The joint development will result in an advanced easy-to-use software.

8.2. Bilateral Grants with Industry

P. Ung's PhD was funded by EDF, CNRS, AMIES (French agency for mathematics in interaction with companies and the society) and ANTEA-group and ended in late 2015. A collaboration with EDF for a new PhD grant in 2016 is currently under consideration.

CASTOR Project-Team (section vide)

CLIME Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

- Clime is partner with IRSN (<http://www.irsn.fr/>), the French national institute for radioprotection and nuclear safety, for uncertainty estimation of dispersion simulations. The collaboration aims at better estimating emission sources, at improving operational forecasts for crisis situations and at estimating the reliability of forecasts. The work is derived at large scale (continental scale) and small scale (a few kilometers around a nuclear power plant).
- Clime takes part to an Inria innovation lab with the group SETH (Numtech <http://www.numtech.fr/>). The objective is to (1) transfer Clime work in data assimilation, ensemble forecasting and uncertainty estimation, with application to urban air quality, (2) identify the specific problems encountered at urban scale in order to determine new research directions.

COFFEE Project-Team

6. Bilateral Contracts and Grants with Industry

6.1. Bilateral Contracts with Industry

The project has industrial collaborations with Total, GDFSuez EP and Storengy on oil and gas recovery and gas storage.

The collaboration with Andra is concerned with the modelling and the simulation of mass and heat exchanges between porous media and ventilation channels. It leads to consider porous medium equations and hydrodynamic systems, coupled through intricate boundary conditions. Clearly one of the difficulties relies on the multiphase nature of the flows (at least water and air are present). We identify relevant physical scales, typical of the flows under consideration in nuclear waste engineering. We start by dealing with quite simple geometries, in order to discuss properly the order of magnitude of the different phenomena, and to design suitable schemes

FLUMINANCE Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Grants with Industry

7.1.1. Contrat CERSAT/IFREMER

Participants: Etienne Mémin, Valentin Resseguier.

duration 36 months. This partnership between Inria and Ifremer funds the PhD of Valentin Resseguier, which aims at studying image based data assimilation strategies for oceanic models incorporating random uncertainty terms. The goal targeted will consist in deriving appropriate stochastic version of oceanic model and on top of them to devise estimation procedures from noisy data to calibrate the associated subgrid models.

LEMON Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

8.1.1. *Free surface hydraulics*

The finite volume-based, SW2D computational code (see Software section) is used by **Cereg Ingénierie** and **Enveo** (Montpellier Lavérune location) on a regular basis to carry out flood risk assessment studies. The code is constantly being developed on a work-for-hire basis depending on the company needs. The developments mostly concern pre- and post-processing functionalities, as well as specific hydraulic modules.

8.1.2. *Hydrodynamics of coastal lagoons with porosity models*

A two-dimensional shallow water with depth-variable porosity has been developed. The depth-variable porosity allows the subgrid-scale variations of the topography and hydraulic connectivity to be accounted for. The governing equations are written in conservation form and solved using a finite volume scheme. This allows the CPU time of the computational code to be divided by 2 to 3 orders of magnitude. The model is currently being tested against in situ measurements in the Vaccarès system in collaboration with Tour du Valat.

8.2. Bilateral Grants with Industry

Antoine ROUSSEAU collaborates with ARTELIA in the framework of M-P Daou's PhD thesis (CIFRE).

MAGIQUE-3D Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Contracts with TOTAL

- Depth Imaging Partnership (DIP)
Period: 2014 May - 2019 April , Management: Inria Bordeaux Sud-Ouest, Amount: 120000 euros/year.
- Construction de milieux équivalents en vue de la simulation d'ondes élastiques harmoniques en milieux fortement hétérogènes par des méthodes DG
Period: 2012 October - 2015 October, Management: Inria Bordeaux Sud-Ouest, Amount: 165000 euros
- Simulation de la propagation d'ondes élastiques et visco-élastiques en régime harmonique par des méthodes Galerkin discontinues d'ordre élevé en maillage non structuré adaptées au calcul haute-performance.
Period: 2012 October - 2015 October, Management: Inria Bordeaux Sud-Ouest, Amount: 165000 euros
- Méthodes d'inversion sismique dans le domaine fréquentiel
Period: 2014 October - 2017 December , Management: Inria Bordeaux Sud-Ouest, Amount: 180000 euros.

SAGE Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

8.1.1. ANDRA project

Participants: Yvan Crenner, Benjamin Delfino, Jean-Raynald de Dreuzy, Jocelyne Erhel.

Contract with ANDRA (National Agency for Nuclear Waste)

Duration: three years from November 2015.

Title: reactive transport in fractured porous media

Coordination: Jocelyne Erhel.

Partners: Geosciences Rennes.

Web page: <http://www.irisa.fr/sage/>

Abstract: Even in small numbers, fractures must be carefully considered for the geological disposal of radioactive wastes. They critically enhance diffusivity, speed up solute transport, extend mixing fronts and, in turn, modify the physicochemical conditions of reactivity around possible storage sites. Numerous studies in various fields have shown that fractures cannot be simply integrated within an equivalent porous medium with a simple enhancement of its petro-physical properties (porosity and permeability). We propose a combined numerical and experimental approach to determine the influence on reactivity of typical fracture patterns found in some radioactive waste applications.

SERENA Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

A one-year contract with the **IFP Energies Nouvelles** department of Applied mathematics on “Etudes d’estimations d’erreur a posteriori sur des maillages généraux” (“Study if a posteriori error estimates on general meshes) within the *contrat-cadre* between **Inria** and **IFP Energies Nouvelles** has been concluded and started.

8.2. Bilateral Grants with Industry

ANDRA is funding the Ph.D. thesis of S. Ali Hassan (an agreement that is part of an *accord cadre* between **Inria** and **ANDRA**).

STEEP Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

The PhD thesis of Jean-Yves Courtonne is co-sponsored by ARTELIA and Inria, via a bilateral contract.

Related to the former computer vision research activities of team members, we still had one contract with EADS Astrium Satellites (now Airbus Defence and Space), where we appear as sub-contractor: DECSA (DGA).

TONUS Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

We are involved in a common project with the company AxesSim in Strasbourg. The objective is to help to the development of a commercial software for the numerical simulation of electromagnetic phenomena. The applications are directed towards antenna design and electromagnetic compatibility. This project was partly supported by DGA through "RAPID" (régime d'appui à l'innovation duale) funds. The CIFRE PhD of Thomas Strub is part of this project. Another CIFRE PhD has started in AxesSim on the same kind of subjects in March 2015 (Bruno Weber). The new project is devoted to the use of runtime system in order to optimize DG solvers applied to electromagnetism. The resulting software will be applied to the numerical simulation of connected devices for clothes or medicine. The project is supported by the "Banque Public d'Investissement" (BPI) and coordinated by the Thales company.

BIOCORE Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

BioEnTech: the contract with the BioEnTech start-up is aiming at developing new functionalities for ODIN in order to improve the advanced monitoring and control of industrial anaerobic digesters.

CARMEN Team (section vide)

DRACULA Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

The industrial connections of the Dracula team have been made through the "Modeling of the immune response" project. Contacts have been established with both large pharmaceutical companies (Sanofi-Pasteur and Merial) and SMEs (Altrabio and Cosmo). The current ANR PrediVac incorporates the two aforementioned SMEs and therefore strengthens the ties between Dracula and its industrial local ecosystem. Furthermore, the ties with the COSMO companies have been strengthened through a joint CIFR PhD (see below).

M3DISIM Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

We have signed a collaboration agreement with Clinique Pasteur (Toulouse), the 3rd private hospital in France in global activity and the 1st in cardiology, in particular with the motivation of performing research oriented towards the perspective of developing connected applications for the monitoring of cardiac pathologies.

MAMBA Project-Team (section vide)

MODEMIC Project-Team (section vide)

Monc Team (section vide)

MYCENAE Project-Team (section vide)

NUMED Project-Team

5. Bilateral Contracts and Grants with Industry

5.1. Bilateral Contracts with Industry

- Industrial contract with Sanofi Pasteur (sept 2014 - march 2016)
- Four years framework contract with Servier (2014-2017)
- Industrial contract with Tiama (june 2015 - january 2016)

REO Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

8.1.1. CIFRE convention

Participants: Céline Grandmont, Nicolas Pozin, Irène Vignon-Clementel.

CIFRE convention and contract with Air Liquide Santé International in the context of the ANRT on “Multiscale lung ventilation modeling in health and disease”, for the PhD thesis of Nicolas Pozin (March 2014 - February 2017).