RESEARCH CENTER
Saclay - Île-de-France

FIELD

Activity Report 2014

Section Contracts and Grants with Industry

Edition: 2015-03-24

AMIB Project-Team (section vide)

AVIZ Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Google Research Award

Participants: Jean-Daniel Fekete [correspondant], Petra Isenberg, Jeremy Boy, Heidi Lam.

Offering data access to the public is a strong trend of the recent years. Several free data providers or repositories are now online (e.g. http://data.gov.uk, http://stats.oecd.org, http://publicdata.eu, http://opendata.paris.fr, http://www.google.com/publicdata, http://www.data-publica.com), offering a rich set of data to allow citizens to build their own understanding of complex political and economic information by exploring information in its original form. However, these initiatives have had little impact directly on the public since working with this open data is often cumbersome, requires additional data wrangling, and the spreadsheets themselves take a long time to understand before useful further work can be done with them. This proposal focuses on public data visualization to offer more engaging environments for exploration of public data and to enable stronger democratic discourse about the data contents.

The goal of this proposed research project is to bridge the gap between generic visualization sites for public data and engaging content-specific visualization of this data which can be used and individually adapted to tell a story about public data. Through the design and deployment of rich and engaging interactive visualizations from public data sources we want to truly reach the goal of the public data movement: empowering the citizens and social actors by allowing them to better understand the world they are living in, to make informed decisions on complex issues such as the impact of a medical treatment on a dangerous illness or the tradeoffs offered of power plant technologies based on facts instead of assumptions.

For more information, see http://peopleviz.gforge.inria.fr/www.

COMETE Project-Team (section vide)

COMMANDS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

- EDF, PhD thesis of N. Grébille, 'Numerical methods for solving stochastic equilibrium problems'.
- IFPEN, PhD thesis of F.Bleuse, 'Optimal control and robustness for rechargeable hybrid vehicles'. The study is focused on the so-called parallel architecture, with both the thermal and electric engines able to move the vehicle. The main axis is to optimize the use of the thermal engine.
- Safety Line (startup in aeronautics), research and transfer contract, optimization of fuel consumption for civil planes. A first part is devoted to the identification of the aerodynamic and thrust characteristics of the plane, using recorded flight data. A second part is optimizing the fuel consumption during the climb phase.

DAHU Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

The CIFRE scholarship of David Montoya started in 2014, with Sinovia, Cofely Ineo (group GDF Suez). The topic is on analysis of multimodal itineraries.

DEFI Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

- Contract with EDF R&D on non destructive testing of concrete materials (in the framework of the PhD thesis of Lorenzo Audibert, to be defended in 2015)
- Houssem Haddar has a contract with EDF R&D on data assimilation for temprature estimates in nuclear reactors (in the framework of the PhD thesis of Thibault Mercier, to be defended in 2015)

7.2. Bilateral Grants with Industry

7.2.1. FUI Projects

- Gregoire Allaire is in charge of the RODIN project. RODIN is the acronym of "Robust structural Optimization for Design in INdustry". This is a consortium of various companies and universities which has been sponsored by the FUI AAP 13 for 3 years, starting on July 2012. The industrial partners are: Renault, EADS, ESI, Eurodecision, Alneos, DPS. The academic partners are: CMAP at Ecole Polytechnique, Laboratoire J.-L. Lions at Paris 6 and 7 Universities, centre de recherches Bordeaux Sud-Ouest at Inria. The goal of the RODIN project is to perform research and develop a computer code on geometry and topology optimization of solid structures, based on the level set method.
- Houssem Haddar is in charge of DEFI part of the FUI project Nanolytix. This three years project started in October 2012 and involves Xenocs (coordinator), imXPAD, Arkema, Inria (DEFI) and CEA-Leti. It aims at building a compact and easy-to use device that images nonaparticles using X-ray diffraction at small or wide angles (SAXS and WAXS technologies). We are in charge of direct and inverse simulation of the SAXS and WAXS experiments.
- Houssem Haddar is in charge of the electormagnetic simulation work package of the FUI project Tandem. This three years project started in December 2012 and involves Bull-Amesys (coordinator), BOWEN (ERTE+SART), Ecole Polytechnique (CMAP), Inria, LEAT et VSM. It aims at constructing a radar system on a flying device capable of real-time imaging mines embedded in dry soils (up to 40 cm deep). We are in charge of numerical validation of the inverse simulator.

DISCO Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

A collaboration with SAGEM Défense Sécurité, Etablissement de Massy, has been developed on the effect of time-delay in inertially stabilized platforms for optical imaging systems. This collaboration led to research contracts made by Alban Quadrat, Silviu Niculescu and Hugues Mounier (L2S, University Paris Sud).

GALEN Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

- **Microsoft Research, Cambridge, UK**: Large Scale Diverse Learning for Structured Output Prediction [Ph.D. thesis D. Bouchacourt]
- **General Electrric HealthCare, Buc, FR**: Patient-Specific Optimization of Computed Tomography Acquisition Protocols [Ph.D. thesis H. Pasquier]

GECO Project-Team (section vide)

GEOMETRICA Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. Cifre Contract with Geometry Factory

Mael Rouxel-Labbé's PhD thesis is supported by a Cifre contract with GEOMETRY FACTORY (http://www.geometryfactory.com). The subject is the generation of anisotropic meshes.

7.1.2. Commercialization of cgal packages through Geometry Factory

In 2014, GEOMETRY FACTORY (http://www.geometryfactory.com) had the following new customers for CGAL packages developed by GEOMETRICA:

LMI Technologies (Canada, GIS): 2D triangulations

Rio Tinto (Australie, mining): 2D triangulations

Geovariances (France, oil and gas): 3D triangulations and meshes

Elektrobit (Allemagne, GIS): 2D triangulations

First Light Fusion (UK, energie): 2D triangulations

GRACE Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. Alcatel-Lucent

Within the framework of the joint lab Inria-ALU, Grace and Alcatel-Lucent collaborate on the topic of Private Information Retrieval: that is, enabling a user to retrieve data from a remote database while revealing neither the query nor the retrieved data. (This is not the same as data confidentiality, which refers to the need for users to ensure secrecy of their data; this is classically obtained through encryption, which prevents access to data in the clear.)

A typical application would be a centralized database of medical records, which can be accessed by doctors, nurses, and so on. A desirable privacy goal would be that the central system does not know which patient is queried for when a query is made, and this goal is precisely achieved by a Private Information Retrieval protocol. Note also that in this scenario the database is not encrypted, since many users are allowed to access it.

We are exploring applications of Locally Decodable Codes to Private Information Retrieval in the multi-cloud (multi-host) setting, to ensure both secure, reliable storage, and privacy of database queries.

We hired Man-Cuong Ngo as a PhD student, in February 2014. We proposed a much better way of using LDC codes in PIR protocols, allowing less storage and a very small number of servers. This idea was at the heart of a European patent (EP14305549.9), co-submitted by Inria and Alcatel-Lucent. A preliminary presentation was made at CANS [19].

INFINE Team

7. Bilateral Contracts and Grants with Industry

7.1. GranData

Participants: Aline Carneiro Viana, Eduardo Mucelli.

Since June 2014, we have a collaboration with GranData (http://grandata.com/), Buenos Aires, Argentina on traffic vs mobility modeling of smartphone users. GranData is a small company that integrates first-party and telco partner data to understand key market trends, to predict customer behavior, and to deliver business results. Its products integrates and analyzes diverse data traces (e.g., telco, social media, or mobile data) to generate behavioral insights and deliver targeted mobile marketing. Part of the thesis of Eduardo Mucelli analysis data traffic using telco traces provided by GranDatas. While this collaboration allow us collaborating with machine learning experts, GranData has the opportunity to get our expertise in mobiliy analysis.

IN-SITU Project-Team (section vide)

M3DISIM Team (section vide)

Maxplus Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Contrats avec l'Industrie/Bilateral Contracts with Industry

- Modélisation et Résolution des problèmes de très grande taille dans les applications du yield management au réseau des télécommunications mobiles: CRE avec Orange Labs (responsable du suivi Orange Labs: Mustapha Bouhtou), signé en août 2013.

MEXICO Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts and Grants with Industry

Our industrial cooperations are currently centered in the IRT SystemX, see below; there are currently no *bilateral* agreements.

OAK Project-Team (section vide)

PARIETAL Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. The LearnClues Labcomm

The LearnClues LabComm has been granted on Oct 2.

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. Tinyclues 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. Tinyclues 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 Tinyclues, 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 Tinyclues 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

7.2. 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. Gael 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

PARSIFAL Project-Team (section vide)

POEMS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

Contract POEMS-DGA
Participants: Anne-Sophie Bonnet-Ben Dhia, Sonia Fliss, Patrick Joly.

Start : 09/01/2011, End : 12/31/2015. Administrator : ENSTA.
This contract is about guided waves in photonic crystals : we want to develop new mathematical and numerical tools for the characterization, the study and the computation of the guided modes in photonic crystals.

Contract POEMS-CEA-LIST
Participants: Marc Bonnet, Audrey Vigneron.

Start : 01/01/2013, End : 12/31/2015. Administrator : ENSTA.
This contract is about the modelisation of eddy current by integral equations.

Contract POEMS-CEA-LIST
Participants: Marc Bonnet, Stéphanie Chaillat, Laure Pesudo.

Start : 12/01/2014, End : 11/31/2017. Administrator : CNRS.
This contract is about the coupling between high frequency methods and integral equations.

Contract POEMS-SHELL
Participants: Stéphanie Chaillat, Patrick Ciarlet, Luca Desiderio.

Start : 10/01/2010, End : 09/31/2016. Administrator : CNRS.
This contract is about fast direct solvers to simulate seismic wave propagation in complex media.

Contract POEMS-EDF
Participants: Stéphanie Chaillat, Marc Bonnet, Zouhair Adnani.

Start : 12/01/2014, End : 11/31/2017. Administrator : CNRS.
This contract is about fast solvers to simulate soil-structure interactions.

7.2. Bilateral Grants with Industry

Contract POEMS-CEA-LIST-DIGITEO
Participants: Anne-Sophie Bonnet-Ben Dhia, Sonia Fliss, Antoine Tonnoir.

Start : 10/01/2011, End : 09/30/2014. Administrator : CEA-LIST.
SIDONIE : SImulation numérique de la Diffraction d'Ondes ultrasonores par un défaut localisé dans une Plaque aNIsotropE

POPIX Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

POPIX had a contract with Astrazeneca (November 2011 - November 2014)

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

POSTALE Team

6. Bilateral Contracts and Grants with Industry

6.1. Bilateral Contracts with Industry

- **EDF R& D**: this is a collaboration with the department SINETICS of EDF in the area of high-performance computing.
  Participants: Marc Baboulin, Grigori Fursin, Amal Khabou.

  It concerns two differents topics:

  – Enhancing performance of numerical solvers using accelerators (postdoc starting in October 2014) and vectorization techniques (internship starting in November 2014).

  – Studying numerical quality and reproducibility in HPC exascale applications (ongoing ANR submission).

- **ARM Ltd**
  Participant: Grigori Fursin.

  UK: this collaboration is related to systematizing benchmarking of OpenCL programs for new ARM GPU architectures and applying machine learning to predict better optimizations (Grigori Fursin).

- **Collaboration with the small size company NumScale** (PME, 10 people) NumScale on C++ parallel code generation technology. NumScale is a start-up created in 2012 as the result of a Digiteo/University Paris Sud technological transfer program (Digiteo OMTE). NumScale exploits scientific results and tools based around code generation for parallel programs as well as advanced code optimization techniques developed by members of the team.

REGULARITY Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

- The Tandem Project is a consortium involving several industrial companies (e.g. Bull Amesys) and some research laboratories (e.g. CMAP). The aim is to detect landmines from 3D radar images.
- Hadopi contract on the economical feasibility of a way to reduce pirating of cultural goods on the Internet.

SELECT Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Contract with SNECMA

Participants: Gilles Celeux, Rémy Fouchereau, Patrick Pamphile.

SELECT has a contract with SAFRAN - SNECMA, an high-technology group (Aerospace propul- sion, Aicraft equipment, Defense Security, Communications),regarding modelling reliability of Air- craft Equipment.

7.2. Contract with Thales

Participants: Erwan Le Pennec, Michel Prenat, Solenne Thivin.

SELECT has a contract with Thales Optronique on target detection on complex backgrounds.

SPECFUN Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

Mathematical Components (project of the MSR–INRIA Joint Centre).
Goal: Investigate the design of large-scale, modular and reusable libraries of formalized mathematics, using the Coq proof assistant. This project successfully formalized the proof of the Odd Order Theorem, resulting in a corpus of libraries related to various areas of algebra.
Leader: G. Gonthier (MSR Cambridge). Participants: F. Chyzak, A. Mahboubi, E. Tassi.
Website: http://www.msr-inria.fr/projects/mathematical-components/.

TAO Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

- **Thalès Air Systems** (corr. Areski Hadjaz)– 2011-2014 (45 kEuros)
  Related to Gaétan Marceau-Caron's CIFRE PhD
  Participants: Marc Schoenauer
- **Thalès Research & Technology** (corr. Johann Dreo)– 2014-2017 (30 kEuros)
  Related to Nacim Belkhir's CIFRE PhD
  Participants: Marc Schoenauer
- **Modyrum (Modélisation Dynamique d'un Réseau Médiatique, related to Marco Bressan's postdoc** SME Augure – 2013-2015 (150 kEuros)
  Participants: Philippe Caillou, Cyril Furtlehner, Michèle Sebag
- **I-Lab METIS (A general framework for decision making with uncertainty plus energy-specific applications)** ARTELYS – 2011-2014 (40 kEuros)
  Related to Jérémie Decock's PhD
  Participants: Jérémie Decock, Jean-Joseph Christophe, Olivier Teytaud.

TOCCATA Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. ProofInUse Joint Laboratory

Participants: Claude Marché [contact], Jean-Christophe Filliâtre, Andrei Paskevich.

ProofInUse is a joint project between the Toccata team and the SME AdaCore. It was selected and funded by the ANR programme "Laboratoires communs", starting from April 2014, for 3 years http://www.spark-2014.org/proofinuse.

The SME AdaCore is a software publisher specializing in providing software development tools for critical systems. A previous successful collaboration between Toccata and AdaCore enabled *Why3* technology to be put into the heart of the AdaCore-developed SPARK technology.

The goal is now to promote and transfer the use of deduction-based verification tools to industry users, who develop critical software using the programming language Ada. The proof tools are aimed at replacing or complementing the existing test activities, whilst reducing costs.

7.1.2. CIFRE contract with Adacore

Participants: Claude Marché [contact], Andrei Paskevich, Claire Dross.

Jointly with the thesis of C. Dross, supervised in collaboration with the AdaCore company, we established a 3-year bilateral collaboration contract, that ended in April 2014.

The aim was to strengthen the usability of the *Alt-Ergo* theorem prover in the context of the GnatProve environment for the verification of safety-critical Ada programs [84]. A focus was made on programs involving Ada containers [85]. C. Dross defended her PhD in April 1st 2014 [14].

7.2. Bilateral Grants with Industry

7.2.1. Intel Grant

Participants: Sylvain Conchon [contact], Alain Mebsout.

S. Conchon has obtained an academic grant by Intel corporation on the development of the Cubicle model checker, for 2 years starting from Dec. 2012 The goal of this project is to develop a new version of Cubicle with significantly improved model-checking power. This required innovative algorithmic enhancements to be implemented and evaluated.

Partner: Intel Strategic Cad Labs in Hillsboro, OR, USA