Activity Report 2014

Section Partnerships and Cooperations

ATEAMS Project-Team

7. Partnerships and Cooperations

7.1. National Initiatives

7.1.1. *Master Software Engineering*

ATEAMS is the core partner in the Master Software Engineering at Universiteit van Amsterdam. This master is a collaboration between SWAT/ATEAMS, Universiteit van Amsterdam, Vrije Universiteit and Hogeschool van Amsterdam.

7.1.2. *Early Quality Assurance in Software Production*

The EQUA project is a collaboration among Hogeschool van Amsterdam (main partner) Centrum Wiskunde & Informatica (CWI), Technisch Universiteit Delft, Laboratory for Quality of Software (LaQuSo), Info Support, Software Improvement Group (SIG), and Fontys Hogeschool Eindhoven.

7.1.3. *Next Generation Auditing: Data-assurance as a service*

This is a collaboration between Centrum Wiskunde & Informatic (CWI) PriceWaterhouseCoopers (PWC), Belastingdienst (National Tax Office), and Computational Auditing, is to enable research in the field of computational auditing.

7.2. European Initiatives

7.2.1. *FP7 & H2020 Projects*

Program: FP7 STREP

Project acronym: OSSMeter

Project title: Automated Measurement and Analysis of Open Source Software

Duration: 30 months (2012-10-01 – 2015-03-31)

Coordinator: Scott Hansen

Other partners: CWI, SOFTEAM (France), Tecnalia Research and Innovation (Spain), The Open Group (Belgium), University of L'Aquila (Italy), UNINOVA (Portugal), National Centre for Text Mining University of Manchester (UK), University of York (UK), Unparallel Innovation (Portugal).

7.3. International Research Visitors

7.3.1. *Visits of International Scientists*

7.3.1.1. *Internships*

- Cleverton Hentz, PhD Candidate at the Department of Informatics and Applied Mathematics (Dimap) at Federal University of Rio Grande do Norte (UFRN).

BONSAI Project-Team

8. Partnerships and Cooperations

8.1. Regional Initiatives

- Projet émergent call 2011. "Scénarios d'évolution génomique basés sur les régions de cassure des réarrangements génomiques" involving GEPV (UMR CNRS 8198, Université Lille 1) and BONSAI. The project led to the recruitment of Amandine Perrin in 2014.

- SIRIC OncoLille supports our research in collaboration with Lille hospital on quantification of lymphocyte rearrangements, funding the contract of Marc Duez in 2014.

8.2. National Initiatives

8.2.1. ANR

- PIA France Génomique: National funding from Investissements d'Avenir (call *Infrastructures en Biologie-Santé*). France Génomique is a shared infrastructure, whose goal is to support sequencing, genotyping and associated computational analysis, and increase French capacities in genome and bioinformatics data analysis. It gathers 9 sequencing platforms and 8 bioinformatics platforms. Within this consortium, we are responsible for the workpackage devoted to the computational analysis of sRNA-seq data, in coordination with the bioinformatics platform of Génopole Toulouse-Midi-Pyrénées

- Mastodons (2014): National funding from CNRS (call *Scientific big data*). This call targets the management, analysis and exploitation of massive scientific data sets. We have a collaborative project for Next Generation Sequencing data analysis with LIRMM (Montpellier) and Genscale (Inria Rennes).

- PEPS Bio-Math-Info *ReSeqVar* (2013-2014): National funding from CNRS. This new project aims at designing new read mapping algorithms in the context of human genome resequencing, taking into account known variants. There are two partners: UMR 8199 (Génomique et maladie métabolique, Ph Froguel, O. Sand, part of the LIGAN sequencing platform) and BONSAI.

8.2.2. ADT

- ADT biosciences resources (2012-2014): This ADT aims to build a portal of available applications in bioinformatics at Inria. The projects involves all the 8 teams from theme Bio-A and is more specifically developed by BONSAI and Rennes. The engineer hired from 2012 to 2014 in Lille finished its contract at fall. The portal is available at http://ibr.genouest.org.

8.3. European Initiatives

8.3.1. Collaborations in European Programs, except FP7 & H2020

- International ANR RNAlands (2014-2017): National funding from the French Agency Research (call *International call*). The subject is fast and efficient sampling of structures in RNA Folding Landscapes. The project gathers three partners: Amib from Inria Saclay, the Theoretical Biochemistry Group from Universität Wien and Bonsai.

- EuroClonality-NGS: This working group belongs to the ESLHO (European Scientific foundation for Laboratory HematoOncology), which aims at standardizing laboratory diagnostics focused on lymphoid malignancies, it is also responsible for quality controls of European laboratories. The EuroClonality-NGS working group itself is dedicated to provide new standards using high-throughput sequencing.

8.4. International Initiatives

8.4.1. Inria Associate Teams

8.4.1.1. CG-ALCODE

The title of the project is "Comparative Genomics for the analysis of gene structure evolution: ALternative CODing in Eukaryote genes through alternative splicing, transcription, and translation.". The project involves partners from EPI BONSAI and from the Université du Québec À Montréal (UQÀM, Canada), from year 2014 to year 2017 (see also: http://thales.math.uqam.ca/~cgalcode/).

The aim of this Associated Team is the development of comparative genomics models and methods for the analysis of eukaryotes gene structure evolution. The goal is to answer very important questions arising from recent discoveries on the major role played by alternative transcription, splicing, and translation, in the functional diversification of eukaryote genes.

8.4.2. Inria International Partners

8.4.2.1. Informal International Partners

- *Novo Nordisk Foundation Center for Biosustainability, Technical University of Denmark:* Collaboration with Tilmann Weber on nonribosomal peptides.
- *Computational Biology Research Center, Tokyo*: Collaboration with Martin C. Frith on transition spaced seeds [3].
- *Department of Statistics of the North Carolina State University (Raleigh)*: Collaboration with Donald E.K. Martin one spaced seeds coverage [6].
- *Institut für Biophysik und physikalische Biochemie', University of Regensburg*: Collaboration with Rainer Merkl on ancestral sequence inference and synthesis.
- *University of Bielefeld*: Collaboration with Robert Giegerich on RNA bioinformatics [4].

8.5. International Research Visitors

8.5.1. Visits of International Scientists

- Anne Bergeron, professor, UQÀM, Canada (from July 7 to July 11 2014).
- Paul Guertin, UQÁM (from July 7 to July 24).

DOLPHIN Project-Team

8. Partnerships and Cooperations

8.1. Regional Initiatives

- PPF (Bioinformatics): This national program within the University of Lille 1 deals with solving bioinformatics and computational biology problems using combinatorial optimization techniques.
- PPF HPC (High performance computing).

8.2. National Initiatives

8.2.1. ANR

- ANR project Transports Terrestres Durable "RESPET - Gestion de réseaux de service porte-à-porte efficace pour le transport de marchandises", in collaboration with LAAS (Toulouse), DHL, JASSP, LIA (Univ. Avignon) (2011-2014).
- ANR project Modèles Numériques "NumBBO - Analysis, Improvement and Evaluation of Numerical Blackbox Optimizers" (2012-2016) in collaboration with Inria Saclay, TAO team, Ecole des Mines de St. Etienne, CROCUS team, and TU Dortmund University, Germany (2012-2016).
- ANR project TECSAN (Technologies pour la Santé) "ClinMine - Optimisation de la prise en Charge des Patients à l'Hôpital" in collaboration with University Lille 1, Université Lille 2, CHRU Lille, CHRU Montpelier, CHICL, Alicante (7 partners) (2014-2017) - Coordinator -
- PGMO project "Towards a Complexity Theory for Black-Box Optimization", together with Carola Doerr (CNRS, LIP6), Benjamin Doerr (Ecole Polytechnique), Anne Auger, Nikolaus Hansen (both Inria Saclay), Timo Koetzing (University of Jena, Germany), Johannes Lengler (ETH Zurich, Switzerland), and Jonathan Rowe (The University of Birmingham, UK)

8.3. European Initiatives

8.3.1. Collaborations in European Programs, except FP7 & H2020

Program: COST

Project acronym: cHiPSet

Project title: High-Performance Modelling and Simulation for Big Data Applications

Duration: 01 2015 - 01 2018

Coordinator: Joanna Kolodziej

Other partners: organisme, labo (pays): Spain, Poland, Germany, France, Luxembourg, italy, ...

Abstract: The Big Data era poses a critically difficult challenge and striking development opportunities in High-Performance Computing (HPC): how to efficiently turn massively large data into valuable information and meaningful knowledge. Computationally effective HPC is required in a rapidly-increasing number of data-intensive domains, such as Life and Physical Sciences, and Socio-economical Systems.

Modelling and Simulation (MS) offers suitable abstractions to manage the complexity of analysing Big Data in various scientific and engineering domains. Unfortunately, Big Data problems are not always easily amenable to efficient MS over HPC. Also, MS communities may lack the detailed expertise required to exploit the full potential of HPC solutions, and HPC architects may not be fully aware of specific MS requirements.

Therefore, there is an urgent need for European co-ordination to facilitate interactions among data-intensive MS and HPC experts, ensuring that the field, which is strategic and of long-standing interest in Europe, develops efficiently - from academic research to industrial practice. This Action will provide the integration to foster a novel, coordinated Big Data endeavour supported by HPC. It will strongly support information exchange, synergy and coordination of activities among leading European research groups and top global partner institutions, and will promote European software industry competitiveness

8.3.2. Collaborations with Major European Organizations

University of Luxembourg: organisme 1, labo 1 (Luxembourg)

Energy aware scheduling in Cloud computing systems

University of Tunis: LARODEC (Tunisia)

Multi-objective optimization under uncertainty using possibility theory

8.4. International Initiatives

8.4.1. Inria Associate Teams

8.4.1.1. STEM

Title: deciSion Tools for Energy Management (STEM)

International Partner (Institution - Laboratory - Researcher):

Université de Montréal (CANADA)

Duration: 2012-2014

See also: http://dolphin.lille.inria.fr/Dolphin/STEM

The economic rise of developing countries, together with the need to meet ever more stringent pollution reduction targets, will increase the stress on the global energy system. Within this framework, the goal of the current project is to develop decision tools for energy management in a context of market deregulation. We will focus on two issues, namely demand management and production planning.

The first problem is concerned with the efficient management of consumption. More precisely, the short or long term behaviour of customers can be influenced through signals sent by a utility (or several utilities) to the end-users. These signals can take the form of an "optimal" pricing scheme, or yet of devices (timers, automatic switches, etc.) designed to induce an "optimal" behaviour from the users.

The second issue is concerned with efficient management of sustainable energy production . Indeed the development of renewable energy introduces new parameters in the supply/demand global equilibrium process. The issue is to achieve the right trade-off according to costs when determining the daily generation, usage and storage of renewable energy within an environment where grid prices and renewable energy level productions are stochastic.

The first problem is modeled as a bilevel program, the second one as a integer mutli-objective stochastic program. Efficient and effective solution methods are developed and implemented to solve these problems.

8.4.2. Inria International Partners

8.4.2.1. Declared Inria International Partners

- Memorandum of Understanding between Shinshu University (Nagano, Japan) and Inria, signed on March 2014

8.4.2.2. Informal International Partners

- University of Coimbra, Portugal.

- VUB, Brussels, Belgium.
- IRIDIA, Université Libre de Bruxelles.
- Cologne University of Applied Sciences, Germany.
- Leiden University, Netherlands.
- UMONS University and Tractebel company, Belgium.
- EMI - Univ. Rabat, Morocco.

8.4.3. Participation In other International Programs

- JSPS-MEXT project on Evolutionary multi-objective optimization, landscape analysis, and search performance, with Shinshu University, Nagano, Japan (2013—2016).

8.5. International Research Visitors

8.5.1. Visits of International Scientists

- Prof. Hernan Aguirre, Shinshu University, Nagano, Japan
- Prof. Bernard Gendron, University of Montreal, Canada
- Prof. Kiyoshi Tanaka, Shinshu University, Nagano, Japan
- Fabio Daolio [PostDoc, Shinshu University, Nagano, Japan, from Sept 2014 to Sept 2015]
- Saúl Zapotecas-Martínez [PostDoc, Shinshu University, Nagano, Japan, from Nov 2014 to March 2015]
- Prof. Bernard Gendron, University of Montreal, Canada

8.5.1.1. Internships

- Martin Drozdik [PhD student, Shinshu University, Nagano, Japan, from Nov 2013 to Sept 2014]
- Miyako Sagawa [Master student, Shinshu University, Nagano, Japan, from Oct 2014 to Nov 2014]

8.5.2. Visits to International Teams

8.5.2.1. Explorer programme

Liefooghe Arnaud

Date: June 2014 - Jul 2014

Institution: Shinshu (Japan)

8.5.2.2. Research stays abroad

- A. Liefooghe, Oct 2014, IRIDIA, Univ. Libre de Bruxelles, Belgium
- D. Brockhoff, Research visit (invited) in China in October 2014 including East China Normal University, Shanghai, China (group of Aimin Zhou), Jiaotong University, Xi'An, China (group of Hui Li), and Xidian University, Xi'An, China (group of Maoguo Gong)
- L. Brotcorne, Sept 2014, Polytechnic School of Montreal
- L. Brotcorne, Oct 2014, Huhne Logisitc University, Hamburg
- E-G. Talbi, Mar 2014, Univ. Murcia, Spain
- E-G. Talbi, Juin 2014, EMI, Univ. Agdal Rabat, Morocco

DREAMPAL Team

7. Partnerships and Cooperations

7.1. Regional Initiatives

The CPER has financed the visit of Prof. Dorel Lucanu from Univ. Iasi (Romania) in July and August 2014.

7.2. International Initiatives

7.2.1. Participation In other International Programs

Wissem Chouchene is financed by the Euramus Mondus programme.

7.3. International Research Visitors

7.3.1. Visits of International Scientists

Prof. Dorel Lucanu from Univ. Iasi (Romania) visited us in July and August 2014. We continued work on language-independent program-verification techniques and on the formal definitions of the HiHope and HoMade assembler languages, as well as on the formally proved correctness of communication IPs.

<p style="text-align:center; color:red; font-weight:bold">FUN Project-Team</p>

7. Partnerships and Cooperations

7.1. Regional Initiatives

7.1.1. *Tracaverre*

Participants: Nathalie Mitton [correspondant], Gabriele Sabatino.

Title: Tracaverre

Type: FUI

Duration: November 2012 - Avril 2015

Coordinator: Saver Glass

Others partners: Inria FUN IEMN Courbon Camus La Grande Marque LIRIS DISP

Abstract: Tracaverre studies the use of RFID for traceability of prestigious bottles. Tracaverre has yielded to the implementation of the T-Scan software.

7.2. National Initiatives

7.2.1. *ANR*

7.2.1.1. RESCUE

Participants: Nathalie Mitton, Karen Miranda, Tahiry Razafindralambo [correspondant].

Title: Reseau Coordonne de substitution mobile

Type: VERSO

Duration: December 2010 - April 2014

Coordinator: Inria FUN

Other partners: LAAS UPMC France Telecom ENS Lyon

See also: http://rescue.lille.inria.fr/

Abstract: In RESCUE, we propose to exploit the controlled mobility of mobile routers to help a base network in trouble provide a better service. The base network may be any access network or metropolitan network (including wired and wireless technologies). Troubles may come from an increase of unplanned traffic, a failure of an equipment, or a power outage.

When no backup networks are available, it would be interesting to deploy, for a limited time corresponding to the period of the problem (i.e., failure or traffic overload), a substitution network to help the base network keep providing services to users. In the RESCUE project, we will investigate both the underlying mechanisms and the deployment of a substitution network composed of a fleet of dirigible wireless mobile routers. Unlike many projects and other scientific works that consider mobility as a drawback, in RESCUE we use the controlled mobility of the substitution network to help the base network reduce contention or to create an alternative network in case of failure.

7.2.1.2. BinThatThinks

Participant: Nathalie Mitton [correspondant].

Title: BinThatThinks

Type: ECOTECH

Duration: November 2010 - March 2014

Coordinator: Inria ACES (Rennes)

Other partners: Etineo Veolia

See also: http://binthatthink.inria.fr/

Abstract: Efficient dust sorting is a main challenge for the current society. BinThatThinks is a research project that aims to propose a system that makes the collect and sorting easier through the use of RFID and sensors. Publications in 2014 in the framework of this project are: [12], [13].

7.2.2. ADT

7.2.2.1. MiAOU

Participants: Ibrahim Amadou, Rim Driss, Nathalie Mitton [correspondant], Loic Schmidt, Julien Vandaele.

Title: Middleware Application to Optimal Use (MiAOU)

Type: ADT

Duration: December 2012 - November 2014

Coordinator: Inria FUN

Abstract: Miaou is an ADT that aims to promote the AspireRFID middleware to a new level of manageability and usability. Miaou has yielded to a software module.

7.2.2.2. ARUNTA

Participants: Emilio Compagnone, Valeria Loscri [correspondant], Julien Vandaele, Sonja Nienaber.

Title: Arduino-based Robots for Ubiquitous Network (ARUNTA)

Type: ADT

Duration: September 2014 - August 2016

Coordinator: Inria FUN

Abstract: This ADT focuses on the use of Arduino, an open-source electronics prototyping platform, really flexible and easy-to-use [1] to allow a fleet of robots to perform specific tasks. The goal of the ADT is to make experiments on Arduino-based robotic platforms, by implementing two robot cooperation algorithms that have been already tested through simulation tools. In order to extend the users' community and to allow more people to benefit from this research on robot cooperation, this ADT will output a tutorial and a test-bed will be developed. Moreover, the final project will be shared with the Arduino community and every interested user.

7.2.3. Equipements d'Excellence

7.2.3.1. FIT

Participants: Raymond Borenstein, Nathalie Mitton [correspondant], Anne-Sophie Tonneau, Julien Vandaele, Roberto Quilez.

Title: Future Internet of Things

Type: EquipEx

Duration: March 2010 - December 2019

Coordinator: UPMC

See also: http://fit-equipex.fr/

Abstract: FIT (Future Internet of Things) aims to develop an experimental facility, a federated and competitive infrastructure with international visibility and a broad panel of customers. It will provide this facility with a set of complementary components that enable experimentation on innovative services for academic and industrial users. The project will give French Internet stakeholders a means to experiment on mobile wireless communications at the network and application layers thereby accelerating the design of advanced networking technologies for the Future Internet.

FIT is one of 52 winning projects from the first wave of the French Ministry of Higher Education and Research's "Equipements d'Excellence" (Equipex) research grant program. Coordinated by Professor Serge Fdida of UPMC Sorbonne Universités and running over a nine-year period, the project will benefit from a 5.8 million euro grant from the French government.

7.3. European Initiatives

7.3.1. FP7 & H2020 Projects

7.3.1.1. VITAL

Participants: Nathalie Mitton [correspondant], Valeria Loscri, Riccardo Petrolo.

Type: FP7

Defi: Pervasive and Trusted Network and Service Infrastructure

Instrument: Specific Targeted Research Project

Objectif: A reliable, smart and secure Internet of Things for Smart Cities

Duration: September 2013 - August 2016

Coordinator: DERI

Partner: National University of Ireland (NUI), Inria, Reply (Italy), Silo (Greece), Atos (Spain), AIT (Greece), IMAGES (UK), Camden Town Unlimited (UK), ITU (Turkey), Istanbul Metropolitan Municipality (Turkey)

Inria contact: Nathalie Mitton

Abstract: Internet-of-Things (IoT) applications are currently based on multiple architectures, standards and platforms, which have led to a highly fragmented IoT landscape. This fragmentation is evident in the area of smart cities, which typically comprise several technological silos (i.e. IoT systems that have been developed and deployed independently). Nowadays there is a pressing need to remove these silos in order to allow cities to share data across systems and coordinate processes across domains, thereby essentially improving sustainability and quality of life. In response to this need, VITAL will realize a radical shift in the development, deployment and operation of IoT applications, through introducing an abstract virtualized digital layer that will operate across multiple IoT architectures, platforms and business contexts. Specifically, VITAL will provide platform and business context agnostic access to Internet-Connected-Objects (ICO). Moreover, it will research virtualized filtering, complex event processing (CEP) and business process management mechanisms, which will be operational over a variety of IoT architectures/ecosystems. The mechanisms will compromise the diverse characteristics of the underlying ecosystems, thereby boosting interoperability at the technical and business levels. VITAL will also provide development and governance tools, which will leverage the project's interfaces for virtualized access to ICOs. VITAL will allow solution providers to (re)use a wider range of data steams, thereby increasing the scope of potential applications. It will also enable a more connected/integrated approach to smart city applications development, which will be validated in realistic deployments in London and Istanbul. The partners will contribute and adapt a host of readily available urban infrastructures, IoT platforms and novel IoT applications, which will ease the accomplishment of the project's goals based on an optimal value for EC money.

Publications in 2014 in the framework of this project are: [6], [7], [11], [21], [22].

7.4. International Initiatives

7.4.1. Inria International Labs

7.4.1.1. PREDNET

Participants: Nathalie Mitton [correspondant], Viktor Toldov, Julien Vandaele, Cesar Marchal.

Title: Predator network

Type: LIRIMA

Duration: January 2013 - December 2016

See also: https://iww.inria.fr/prednet/en/

Abstract: PREDNET (PREDator adhoc NETwork) proposes to do research on the most suitable topology and subsequent deployment of a wireless sensor network for sparsely populated outlying rural and wilderness areas, for effective monitoring and protection of resources and ecosystems. This collaboration gave birth to joint project submission, joint conference organization and several publications, among them for 2014: [36]

7.4.1.2. CIRIC Chile
Participant: Tahiry Razafindralambo.

Tahiry Razafindralambo is in leave at Inria Chile since August 2013 until April 2014. Tahiry's project within Inria Chile is linked to a project developed by NIC research Labs - Chile (Dr. Javier Bustos, Ms. Carolina Sandoval, Mr. Felipe Lema and Ms. Karina Ventura) regarding Quality of Experience, the Universidad de Chile (Pr. Nelson Baloian and Pr. Gustavo Zurita Alarcon) regarding data display, Psicomedica regarding the clinical aspect regarding the wireless sensor networks aspect. The proposed project tries to evaluate the user perception regarding a wearable monitoring system. The Wearable monitoring system will be installed on patients with mental diseases to monitor their body temperatures, heart rate, ...

7.4.1.3. Declared Inria International Partners

Title: Palmares

International Partner (Institution - Laboratory - Researcher):

Université Mediterranea di Reggio Calabria (UNIC) (Italy)

Duration: 2014 - 2016

See also: http://www.palmares.unirc.it

Objective of this collaboration is the design of an innovative architecture that enables autonomic and decentralized fruition of the services offered by the network of smart objects in many heterogeneous and dynamic environments, in a way that is independent of the network topology, reliable and flexible. The result is an 'ecosystem' of objects, self-organized and self-sustained, capable of making data and services available to the users wherever and whenever required, thus supporting the fruition of an 'augmented' reality thanks to a new environmental and social awareness. This collaboration gave birth to the PALMARES project (see section International programs), students and researchers exchanges (see section international visits) and joint publications, among them for 2014: [1], [2], [28], [29], [23], [13].

7.4.1.4. Informal International Partners
Southern University, China

The purpose of this collaboration is to study the green (or energy-efficient) communication problem in vehicular ad hoc networks (VANETs) and the application of vehicular network communication in green transportation. It gave birth to joint project submission, joint conference organization and several publications, among them for 2014: [26], [27].

7.4.1.5. PhD co-supervision
PhD co-supervision with Sfax University

Since January 2013, Nathalie Mitton co-supervises Mouna Rekik as a PhD student with Pr Zied Chtourou from Université de Sfax, Tunisia. Her topic is about swarm intelligence based multi-path geographic routing for wireless sensor and actuator networks.

7.5. International Research Visitors

7.5.1. *Visits of International Scientists*

Several researchers have visited our group in 2014, mainly from our partner universities but not only:

- Marthinus Johannes Booysen, Univ. Stellenbosch, South Africa, July 2014
- Zied Chtourou, Univ. Sfax, Tunisia, June and December 2014
- Riaan Wolhuter, Univ. Stellenbosch, South Africa, March and June 2014
- Willem Smit, Univ. Stellenbosch, South Africa, July 2014
- OP Vyas, Indian Institute of Information Technology, India July 2014

In addition, 2 ERCIM fellows have visited us for a week : Andrea Hess and Matthew Orlinski.

7.5.1.1. Internships

We have hosted and supervised several master students. Some came to run their master internship in our lab, like

Christos Katsikiotis from Athenes University, Greece (6 months), Abdoul-Aziz Mbacke from Université Anta Diop in Senegal (6 months), Siavash Mohamadabadi from UPMC (4 months), Basile Mona from Université Jules Vernes (4 months)/.

Other students have visited us from our partner universities in the framework of the joint project we run together. This is the case for Sonja Nienaber (4 months) and Adriaan Zeeman (4 months) who came from Stellenbosch university, South Africa, in the framework of the Prednet program and Nicola Zema from our International partner University of Reggio Calabria, Italy (6 months).

7.5.2. *Visits to International Teams*

- Roudy Dagher visited University of Brno, Czech Republic a week in May 2014.
- Roudy Dagher visited University of Santanders, Spain in July 2014.
- Viktor Toldov visited Stellenbosch University, South Africa for 2 months (Oct-dec 2014).

7.5.2.1. Research stays abroad

Tahiry Razafindralambo spent 20 months in Chile (See other section).

<p align="center" style="color:red">**LINKS Team**</p>

7. Partnerships and Cooperations

7.1. Regional Initiatives

7.1.1. FUI Région AAP 14 Hermes(2013-2015)

Participants: Angela Bonifati [correspondent], Joachim Niehren, Iovka Boneva Denis Debarbieux

The Hermes projecton "Relation Client Personalisée et Contextualisée" is coordinated by Bonifati from Links. Our partners are the Université Lille 1, Logos Keyneosoft, Cylande, Norsys, Numsight, Leroy Merlin, Kiabi and Auchan. The project addresses the problem of enriching the client communication within the marketing process. Starting from heterogeneous data sources (connected devices, social networks and traditional marketing channels), one has to extract the necessary information at hand. The data sources can be seen in a streaming fashion as they produce continuous data.

7.2. National Initiatives

7.2.1. ANR

7.2.1.1. ANR Aggreg

Particpants: Joachim Niehren [correspondent], Pierre Bourhis, Aurelien Lemay, Adrien Boiret This project has been accepted this year and it is in collaboration with University Paris 7, University of Marseille and University of Caen. The main goal of the Aggreg project is to develop efficient algorithms for answering aggregate queries for databases and data streams of various kinds.

7.2.2. Competitivity Clusters

We participate to the following http://www.picom.fr/ (Pôle de compétitivité PICOM - regional research cluster on commerce industries). In particular, the Hermes project has been conceived within the cluster.

7.3. European Initiatives

7.3.1. Collaborations with Major European Organizations

Partner 1: University of Oxford, Departement of Computer Science Database Group.

This collaboration is related the Inria North-European Lab Lille-Oxford. It is related to managing linked data and its exchange. If the Database Group has deep roots with Joachim Niehren and Angela Bonifati, new topics have been recently developped by younger researchers as Slawek Staworko and Pierre Bourhis.

7.4. International Initiatives

7.4.1. Inria International Partners

7.4.1.1. Declared Inria International Partners

Links is in Inria North-European Lab team with University of Oxford. The main people involved are Joachim Niehren [correspondent] , Pierre Bourhis and Angela Bonifati, but the cooperation is equally relevant for Iovka Boneva, Aurélien Lemay, Slawek Staworko, Sophie Tison, Radu Ciucanu (PhD student). The Oxford database group (http://www.cs.ox.ac.uk/isg/db) is one of the top database groups world wide. The main persons involved will be Michael Benedikt [correspondent], Dan Olteanu, Andreas Pieris (postdoc). Further promising cooperation opportunities are to be explored with members of Georg Gottlob's ERCproject DiaDem(http://www.cs.ox.ac.uk/projects/DIADEM/index.html) on semantics-based information extraction.

7.5. International Research Visitors

7.5.1. Visits of International Scientists

Martin Musicante from Universidade Federal do Rio Grande do Norte has been an invited Professor since December 2014.

7.5.2. Visits to International Teams

7.5.2.1. Sabbatical programme

Slawomir Stawork has been in sabbatical at University of Edinburg for a year.

7.5.2.2. Research stays abroad

Pierre Bourhis has visited University of Oxford for more than a month in different visits over the year.

MAGNET Team

8. Partnerships and Cooperations

8.1. Regional Initiatives

MARC TOMMASI and PASCAL DENIS supervise the PhD thesis of DAVID CHATEL on semi-supervised spectral clustering. The PhD is funded by Inria and the "Région Nord – Pas de Calais".

MARC TOMMASI belongs to the scientific committee involved in the process of building the IDEX proposal for Lille.

8.2. National Initiatives

8.2.1. ANR

8.2.1.1. ANR Lampada (2009-2014)

Participants: Marc Tommasi [correspondent], Rémi Gilleron, Fabien Torre.

The Lampada project on "Learning Algorithms, Models and sPArse representations for structured DAta" is coordinated by Tommasi from Mostrare. Our partners are the SEQUEL project of Inria Lille Nord Europe, the LIF (Marseille), the HUBERT CURIEN laboratory (Saint-Etienne), and LIP6 (Paris). More information on the project can be found on http://lampada.gforge.inria.fr/.

8.2.2. Competitivity Clusters

We are part of FUI HERMES (2012-2015), a joint project in collaboration with many companies (Auchan, KeyneSoft, Cylande, ...). The main objective is to develop a platform for contextual customer relation management. The project started in November 2012.

8.2.3. EFL

PASCAL DENIS is an associate member of the Laboratoire d'Excellence *Empirical Foundations of Linguistics* (EFL), http://www.labex-efl.org/.

8.2.4. Conseil national des universités

FABIEN TORRE is elected for "CNU section 27 (informatique)" since Oct. 2011

8.3. European Initiatives

8.3.1. Collaborations in European Programs, except FP7 & H2020

Program: ERC Advanced Grant
Project acronym: STAC
Project title: Strategic conversation
Duration: Sept. 2011 - Aug. 2016
Coordinator: Nicholas Asher, CNRS, Université Paul Sabatier, IRIT (France)
Other partners: School of Informatics, Edinburgh University; Heriot Watt University, Edinburgh
Abstract: STAC is a five year interdisciplinary project that aims to develop a new, formal and robust model of conversation, drawing from ideas in linguistics, philosophy, computer science and economics. The project brings a state of the art, linguistic theory of discourse interpretation together with a sophisticated view of agent interaction and strategic decision making, taking advantage of work on game theory.

8.4. International Research Visitors

8.4.1. Visits of International Scientists

We invited Prof. Claudio Gentile (University of Insubria, Italy) in January (he gave a talk on "Online Clustering of Bandits in a Social Network") and in June.

Prof. Nicolò Cesa-Bianchi (University of Milan, Italy) visited us in July (he gave a talk on "The Online Approach to Machine Learning").

Finally, we invited Prof. Mark Herbster (University College London) in July (he gave a talk on "Online Approximate Prediction at the Limit of Zero Temperature in an Ising Model") and November.

8.4.2. Visits to International Teams

In May FABIO VITALE visited the Department of Computer Science of the University of Milan, collaborating with Prof. Nicolò Cesa-Bianchi.

MEPHYSTO Team

8. Partnerships and Cooperations

8.1. National Initiatives

8.1.1. ANR BECASIM

G. Dujardin and I. Lacroix are members of the ANR BECASIM project (http://becasim.math.cnrs.fr/). This ANR project gathers mathematicians with theoretical and numerical backgrounds together with engineers. The objective is to develop numerical methods to accurately simulate the behavior of Bose-Einstein condensates.

Title: Simulation numérique avancée pour les condensats de Bose-Einstein.

Type: Modèles Numériques - 2012

ANR reference: ANR-12-MONU-0007

Coordinator: Ionut DANAILA, Université de Rouen.

Duration: January 2013 - December 2016.

Partners: Université Lille 1, UPMC, Ecole des Ponts ParisTech, Inria-Nancy Grand-Est, Université Montpellier 2.

8.1.2. Labex CEMPI

Title: Centre Européen pour les Mathématiques, la Physique et leurs interactions

Coordinator: Stephan De Bièvre.

Duration: January 2012 - December 2019.

Partners: Laboratoire Paul Painlevé and Laser physics department (PhLAM), Université Lille 1.

The "Laboratoire d'Excellence" Centre Européen pour les Mathématiques, la Physique et leurs interactions (CEMPI), a project of the Laboratoire de Mathématiques Paul Painlevé and the Laboratoire de Physique des Lasers, Atomes et Molécules (PhLAM), was created in the context of the "Programme d'Investissements d'Avenir" in February 2012.

The association Painlevé-PhLAM creates in Lille a research unit for fundamental and applied research and for training and technological development that covers a wide spectrum of knowledge stretching from pure and applied mathematics to experimental and applied physics.

One of the three focus areas of CEMPI research is the interface between mathematics and physics. This focus area encompasses three themes. The first is concerned with key problems of a mathematical, physical and technological nature coming from the study of complex behaviour in cold atoms physics and non-linear optics, in particular fibre optics. The two other themes deal with fields of mathematics such as algebraic geometry, modular forms, operator algebras, harmonic analysis and quantum groups that have promising interactions with several branches of theoretical physics.

8.2. European Initiatives

8.2.1. FP7 & H2020 Projects

8.2.1.1. QUANTHOM

Type: FP7

Instrument: ERC Starting Grant

Duration: February 2014 - January 2019

Coordinator: Antoine Gloria

Partner: Département de mathématique, Université Libre de Bruxelles (Belgium)

Inria contact: Antoine Gloria

Abstract: Quantitative methods in stochastic homogenization

8.2.2. Collaborations with Major European Organizations

Max Planck Institute for Mathematics in the Sciences (Germany).

Development of a quantitative theory of stochastic homogenization.

8.3. International Initiatives

8.3.1. Inria International Partners

8.3.1.1. Informal International Partners

The activity around quantitative stochastic homogenization was developed in collaboration with F. Otto, director of the Max Planck Institute for Mathematics in the Sciences, Leipzig (Germany).

8.4. International Research Visitors

8.4.1. Visits of International Scientists

- Daniel Marahrens (MPIMS, Leipzig): one week in March (A. Gloria), annealed estimates on Green's functions.

- Felix Otto (MPIMS, Leipzig): one week in April (A. Gloria), quantitative stochastic homogenization.

- Gilbert Reinisch (physicist at University of Reykjavik): from May 12th 2014 to May 28th 2014 (G. Dujardin and M. Gazeau), numerical simulations of several differential systems modelling the evolution of quantum dots. This visit was cofounded by Inria and the LabEx CEMPI. This work is a follow up of the paper [18].

- Marco Cicalese (Univ. Munich): one week in May (A. Gloria), derivation of nonlinear elasticity from polymer-physics.

- Jean-Christophe Mourrat (ENS Lyon): 10 days in May (A. Gloria), quantitative stochastic homogenization.

- Stefan Neukamm (Weierstrass Institute, Berlin, now at Univ. Dresden): 10 days in May (A. Gloria), quantitative stochastic homogenization.

- Ansgar Jüngel (Univ. Vienna): one week in July (C. Chainais and I. Lacroix-Violet), discrete functional inequalities for asymptotic preserving schemes.

MINT Project-Team

8. Partnerships and Cooperations

8.1. National Initiatives

8.1.1. TurboTouch (ANR, Oct 2014-2018)

Participants: Géry Casiez [correspondant], Nicolas Roussel, Thomas Pietrzak.

Touch-based interactions with computing systems are greatly affected by two interrelated factors: the transfer functions applied on finger movements, and latency. Little is actually known on these functions, and latency only recently received attention in this context. This project aims at transforming the design of touch transfer functions from black art to science to support high-performance interactions. We will precisely characterize the functions used and the latency observed in current touch systems. We will develop a testbed environment to support multidisciplinary research on touch transfer functions. We will use this testbed to design latency reduction and compensation techniques, and new transfer functions.

Partners: Inria Lille's NON-A team and the "Perceptual-motor behavior group" from the Institute of Movement Sciences.

8.1.2. Touchit (13th FUI, May 2012-2015)

Participants: Michel Amberg, Géry Casiez, Frédéric Giraud, Thomas Pietrzak, Nicolas Roussel [correspondant], Betty Lemaire-Semail [correspondant].

The purpose of this project is twofold. It aims at designing and implementing hardware solutions for tactile feedback based on programmable friction. It also aims at developing the knowledge and software tools required to use these new technologies for human-computer interaction. Grant for MINT is balanced on 272 keuro handled at University for L2EP, and 220 Keuros for Inria.

Partners: STMicroelectronics, CEA/LETI, Orange Labs, CNRS, EASii IC, MENAPIC and ALPHAUI.

Competitive clusters involved: Minalogic, Cap Digital and MAUD.

8.1.3. Smart-Store (12th FUI, 2011-2014, extended to 2015)

Participants: Samuel Degrande [correspondant], Laurent Grisoni, Fabrice Aubert.

The aim of this project is to set up, in the context of retail, some middleware and hardware setup for retail interactive terminal, that allows customer to connect with their own smart-phone on a system that includes a large screen, and allows to browse some store offer, as well as pre-order and/or link to further reconsulting. SME Idées-3com leads this FUI, which also includes Immochan, Oxylane, and VisioNord. Grant for MINT is 301 Keuros. This project started on September 2012 (start of this project has been delayed due to administrative problems), for a duration of 36 months.

Associated competitivity cluster: PICOM (retail)

8.2. European Initiatives

8.2.1. FP7 & H2020 Projects

8.2.1.1. Happiness (H2020-ICT-2014-1/ICT-03-2014/RIA, Jan 2015 - Jan 2018)

Participants: Thomas Pietrzak, Nicolas Roussel [correspondant].

The main objective of this project is to develop and evaluate new types of haptic actuators based on Advanced Thin, Organic and Large Area Electronics (TOLAE) technologies for use in car dashboards.

Partners: CEA (coordinator), Inria Rennes' HYBRID team, Arkema, Bosch, Glasgow University, ISD, Walter Pack, Fundacion Gaiker.

8.3. International Initiatives

8.3.1. Inria International Partners

8.3.1.1. Declared Inria International Partners

Inria Northern lab with LUCID group (Liege, P. Leclercq). We initiated this year a joint work on collaborative tools for architects. One of the goal of this collaboration is to initiate discussions and early results for a H2020 proposal.

8.4. International Research Visitors

8.4.1. Visits of International Scientists

- Marcelo Wanderley (McGill, dec. 2014)
- Masaya Takasaki (Profesor at Saitama Univerity), one month (july 2014)

MODAL Project-Team

8. Partnerships and Cooperations

8.1. Regional Initiatives

8.1.1. Collaborations within SIRIC

Participants: Guillemette Marot, Alain Celisse.

SIRIC (Site of integrated research in Cancerology) ONCOLille has been created during "Plan Cancer 2". More information about it can be found at http://www.canceropole-nordouest.org/qui-sommes-nous/le-cancer-en-region/le-siric-oncolille.html. Collaborations established through common articles or funding proposals writings with members of MODAL concern the following teams:

Univ. Lille 2, Functional and structural genomics, M. Figeac

CHRU Lille, Hematology laboratory, C. Preudhomme

CNRS, UMR8161, IBL (Institute of Biology of Lille), O. Pluquet

Inserm UMR837 - Team 5, I. Van Seuningen

8.1.2. Other collaborations

Institut Pasteur Lille, Transcriptomics and Applied Genomics, D. Hot (**Participant:** G. Marot)

Inserm U1011, J. Eeckhoute (**Participants:** G. Marot, A. Celisse)

Registre Regional des Cancers de Lille et sa Region, Dr. Karine Ligier (**Participant:** C. Preda)

8.2. National Initiatives

8.2.1. ANR ClinMine

Participants: Julien Jacques, Cristian Preda, Vincent Vandewalle.

Modal team is member of ClinMine ANR project (http://www.lifl.fr/ClinMine/pmwiki/index.php) in charge with statistical methdology. Collaborators : LIFL, CHRU Lille, CHU Montpellier, ALICANTE, GHICL.

8.2.2. Working groups

Alain Celisse belongs to the Statistics for Systems Biology group (SSB) in Paris.

Guillemette Marot belongs to the StatOmique working group http://vim-iip.jouy.inra.fr:8080/statomique/

8.3. International Initiatives

8.3.1. Inria Associate Teams

Associate Team acronym: SIMERGE (Statistics Inference for the Management of Extreme Risks and Global Epidemiology)

Principal investigator (Inria): Stéphane Girard Mistis, Inria Grenoble Rhône-Alpes, France.

Principal investigator (Main team): Abdou Kâ Diongue LERSTAD, Université Gaston Berger, Sénégal.

Other participants: Laboratory EQUIPPE (Economie QUantitative Intégration Politiques Publiques Econométrie), Univ. Lille 1, 2 and 3, MODAL, IRD (Institut de Recherche pour le Développement), Unité de Recherche sur les Maladies Infectieuses et Tropicales Emergentes (URMITE), Dakar, Sénégal.

NON-A Project-Team

8. Partnerships and Cooperations

8.1. Regional Initiatives

- Project ARCIR «Estimation distribuée de systèmes dynamiques en réseaux», coordinator Prof. Mihaly Petreczky, URIA – Mines de Douai, 2013–2015
- CPER CIA, "Internet of Things", 2011–2015
- CPER CISIT (becoming ELSAT in 2015), "Campus international sur la securite et intermodalite de transport", project "CONTRAERO" with LML and IEMN, 2011–2015
- ADT Inria SLIM "Development of ROS software library for multi-robots cooperation", 2013–2014 Project Agrégation, Conseil Général du Val d'Oise, (http://www.scilab.org/fr/community/scilabtec/2013/Projet-Agregation-la-simulation-numerique-dans-les-essais)

8.2. National Initiatives

- ANR project TourboTouch (High-performance touch interactions), coordinator Prof. Géry Casiez (MJOLNIR team, Inria): 2014-2019
- ANR project ChaSliM (Chattering-free Sliding Modes), coordinator Prof. B. Brogliato (BIBOP team, Inria): 2012-2015
- ANR ROCC-SYS (Robust Control of Cyber-Physical Systems), coordinator Dr. L. Hetel: 2014-2017
- We are also involved in several technical groups of the GDR MACS (CNRS, "Modélisation, Analyse de Conduite des Systèmes dynamiques", see http://www.univ-valenciennes.fr/GDR-MACS), in particular: Technical Groups "Identification", "Time Delay Systems", "Hybrid Systems", "Complex Systems, Biological Systems and Automatic Control," and "Control in Electrical Engineering".
- Model-free control: collaborations with the startup ALIEN SAS (created by C. Join and M. Fliess).

8.3. European Initiatives

8.3.1. FP7 & H2020 Projects

- HYCON2 (http://www.hycon2.eu/) The FP7 NoE HYCON2, started in September 2010, is a four-year project coordinated by the CNRS (Françoise Lamnabhi-Lagarrigue). It aims at stimulating and establishing a long-term integration in the strategic field of control of complex, large-scale, and networked dynamical systems. It focuses in particular on the domains of ground and aerospace transportation, electrical power networks, process industries, and biological and medical systems. Our PhD students are regularly supported for their participation to the EECI training.

8.3.2. Collaborations in European Programs, except FP7 & H2020

- SYSIASS (http://www.sysiass.eu/) Here is the major issue on which the project SYSIASS seeks to answer by developing new technologies and putting them in the service of patients and health professionals from our regions. Indeed preserve the autonomy of the elderly and disabled people is a major issue in today's society. In Europe, with the progressive ageing of the population policy to support the elderly is increasingly based on the assumption that care must be provided efficiently to the patient where he is based. In addition, special attention is devoted to people with disabilities for their better integration into society. Advances in technology proposed by SYSIASS (SYStème Intelligent et Autonome d'aide aux Soins de Santé / Autonomous and Intelligent Healthcare System) will be realized in practice through an intelligent wheelchair that can provide better mobility to

the patient and to allow health care professionals to easily transport patients to desired locations within a clinic or home environment. Moreover such a system must be able to communicate with the outside world, to adapt to specific patient needs and any special disability that he may have, and to facilitate access to medical data for health professionals. Our PhD students are regularly supported for participation in the accociated EECI traning.

- ICityForAll: EU Ambiant Assisted Living Program (http://www.icityforall.eu/) The project is leaded by CEA and it includes University of Paris Descartes-UPD, CENTICH, Active Audio (SME, France), Tech. Univ of Munich - TUM (Germany), EPFL (Suisse), ENEA (Italy), Centro Ricerche FIAT-CRF (Italy). The goal of I'City for All (Age sensitive ICT systems for Intelligible City for All) is to enhance speech and audio alarms intelligibility in order to improve the sense of well-being of seniors through better social interactions, better security and then improved mobility. Mamadou Mboup is involved as a subcontractor of UPD.

8.4. International Initiatives

8.4.1. Inria Associate Teams

- Associate team with Norwegian University of Science and Technology (Tronheim, Norway) and UMEA university (Sweden), 2013-2016
  Subject: "Dynamical precision improvement for industrial robots"

8.4.2. Inria International Partners

8.4.2.1. Informal International Partners

- Professor Emilia Fridman, Tel Aviv University, Israel

- Sliding Mode Control Lab., UNAM, Mexico

- Department Control Automatico, CINVESTAV-IPN, Mexico

- UPIBI, National Polytechnic Institute, Mexico

- Department of Control Systems and Informatics, Saint Petersburg State University of Information Technologies Mechanics and Optics (ITMO), Russia

8.4.3. Participation In other International Programs

- CNRS GDRI DelSys (http://www.cnrs.fr/ins2i/spip.php?article217)

- CNRS-CONACYT project, UNAM, Mexico, "Estimation of state for hybrid systems using sliding mode techniques", 2014

8.5. International Research Visitors

8.5.1. Visits of International Scientists

- Prof. Emilia Fridman, Tel Aviv State University, Israel, from Jun 2014 until Jul 2014
  Subject:*Homogeneity application for time-delay systems : finite-time stability*

- Dr. Francisco Bejarano Rodriguez, National Polytechnic Institute, Mexico, until Jul 2014
  Subject:*Observability and observer for linear time-delay systems with unknown inputs*

- Prof. Leonid Fridman, UNAM, Mexico, until Jul 2014
  Subject:*State Observation and Parameter Identification in Hybrid Systems via High-Order Sliding-Modes*

8.5.1.1. Internships

- Mimia Benhadri, Skikda University Algeria, Jun 2014
  Subject:*Time Delay Systems*

- Andrea Aparicio Martinez, UNAM, Mexico, from Jun 2014 until Jul 2014
  Subject:*State Observation and Parameter Identification in Hybrid Systems via High-Order Sliding-Modes*

- Ivan De Jesus Salgado Ramos, National Polytechnic Institute, Mexico, from Jul 2014
  Subject:*PID control design based on the different differentiation techniques*

- Tonametl Sanchez Ramirez,UNAM, Mexico, until Jul 2014
  Subject:*State Observation and Parameter Identification in Hybrid Systems via High-Order Sliding-Modes*

- Carlos Vazquez Aguilera, UMEA, Sweden, from Nov 2014
  Subject:*Application of discontinuous Lyapunov functions for dead-zone compensation*

- Konstantin Zimenko, ITMO, Russia, from Nov 2014
  Subject:*Transfer functions for homogeneous finite-time stable systems*

- Zohra Kader from March 2014 to September 2014
  Subject: *Left inversion of nonlinear time delay system.*

8.5.2. *Visits to International Teams*

8.5.2.1. Explorer programme

- Gang Zheng, Nanjing University of Science and Technology (China), in December 2014, supported Sino-French International Joint Laboratory of Automation and Signals (University Lille 1)

- Andrey Polyakov, UPIBI, National Polytechnic Institute, Mexico, in October 2014, supported by UPIBI-IPN

<p style="text-align:center;color:red;">**RMOD Project-Team**</p>

8. Partnerships and Cooperations

8.1. Regional Initiatives

We have signed a convention with the CAR team led by Noury Bouraqadi of Ecole des Mines de Douai. In such context we co-supervized two PhD students (Mariano Martinez-Peck, Nick Papoylias). Two co-supervisions are ongoing (Guillermo Polito, Max Mattone). The team is also an important contributor and supporting organization of the Pharo project.

8.2. National Initiatives

8.2.1. ANR

8.2.1.1. Cutter

Participants: Stéphane Ducasse [Correspondant], Nicolas Anquetil, Damien Pollet, Muhammad Bhatti, Andre Calvante Hora.

This partnership is done with the following members from the LIRMM-D'OC-APR: Marianne Huchard, Roland Ducournau, Jean-Claude König, Rodolphe Giroudeau, Abdelhak-Djamel Seriai, and Rémi Watrigant.

CUTTER is a Basic Research project that addresses the problems of object-oriented system remodularization by developing, combining, and evaluating new techniques for analyzing and modularizing code. In particular, it will: (i) use concurrently and collaboratively four package decomposition techniques; and (ii) take into account different levels of abstractions (packages, classes).

The project started in march 2011 and ended this year in November just after the defense of PhD student André Hora

8.3. European Initiatives

8.3.1. FP7 & H2020 Projects

MEALS FP7 Marie Curie Research Staff Exchange Scheme

MEALS (Mobility between Europe and Argentina applying Logics to Systems) is a mobility project financed by the 7th Framework programme under Marie Curie's International Research Staff Exchange Scheme. It involves seven academic institutions from Europe and four from Argentina, and a total of about 80 researchers to be exchanged. The project started on the 1st of October, 2011, and it has a duration of 4 years. Nr: FP7-PEOPEL-2011-IRSES

http://www.meals-project.eu

8.3.2. Collaborations in European Programs, except FP7 & H2020

8.3.2.1. ERCIM Software Evolution

We are involved in the ERCIM Software Evolution working group since its inception. We participated at his creation when we were at the University of Bern.

8.4. International Initiatives

8.4.1. Inria International Labs

CIRIC Chile and Pleiad Team of University of Chile at Santiago

We are collaborating with ObjectProfile, a startup company which is hosted at Inria Chile. ObjectProfile is a collaborator within the PLOMO2 Associated Team and a contributor to both Pharo and Moose. http://objectprofile.com

The DeepIntoPharo book is a collaboration with the Pleiad Team of University of Chile at Santiago.

8.4.2. Inria Associate Teams

8.4.2.1. PLOMO2

Title: Infrastructure for a new generation of development tools

International Partner:

Universidad de Chile (Chile), DCC.

Duration: 2014 - 2016

See also: http://pleiad.cl/research/plomo2

Performing effective software development and maintenance are best achieved with effective tool support. Provided by a variety of tools, each one presenting a specific kind of information supporting the task at hand. The goal of the first PLOMO was to develop new meta tools to improve and bring synergy in the existing infrastructure of Pharo (for software development) and the Moose software analysis platform (for maintenance). With Plomo2, we want to build on top of this work and invent a new generation of tools to navigate and profile programs.

The hypotheses that Plomo2 will seek to verify are:

- Use of reflection enables new profiling techniques
- Use of visualization in a programming environment improves programmer performance

The overall objectives of Plomo2 are:

- Infrastructure for profiling programs and recording programmer activity.
- Visual software maps defined in a flexible and agile fashion
- Combining dynamic information with visualization to improve the development environment
- Empirical evaluation of this environment
- All the efforts will be performed on Pharo and Moose, two platforms heavily used by the RMoD and Pleiad teams.

The detailed work plan and the results of the first year can be found in the PLOMO2 report at http://pleiad.cl/research/plomo2.

8.4.3. Inria International Partners

8.4.3.1. Uqbar - Argentina
Participants: Marcus Denker [correspondant], Stéphane Ducasse [RMoD], Nicolas Anquetil [RMoD], Diego Garbervetsky [UBA,LAFHIS], Gabriela Arevalo [Universidad Nacional de Quilmes)], Nicolas Passerini [Uqbar].

Uqbar is a foundation of researchers teaching in several universities of the Buenos Aires area. Universidad Tecnologica Nacional (FRBA) Universidad Nacional de Quilmes, Universidad Nacional de San Martin,Universidad Nacional del Oeste. LAFHIS is a research laboratory from the University of Buenos Aires. More information at (http://www.uqbar-project.org).

8.4.3.2. Informal International Partners
Pharo in Research: We are building an ecosystem around Pharo with international research groups, universities and companies. Several research groups (such as Software Composition Group – Bern, and Pleiad – Santiago) are using Pharo. Many universities are teaching OOP using Pharo and its books. Several companies worldwide are deploying business solutions using Pharo.

8.4.4. Participation In other International Programs

8.4.4.1. STIC AmSud

Participants: Damien Cassou [correspondant], Gustavo Santos [RMoD], Martin Martin [RMoD], David Röthlisberger [UDP - Universidad Diego Portales, Santiago, Chile], Marcelo Almeida Maia [UFU - Federal University of Uberlândia, Brasil], Romain Robbes [Departamento de Ciencias de la Computación (DCC), Universidad de Chile, Santiago, Chile], Martin Monperrus [Spirals].

Project Partners: Inria RMOD, Inria Spirals, DCC Universidad de Chile, Universidad Diego Portale Chile, Federal University of Uberlândia, Brasil.

This project aims at facilitating the usage of frameworks and application programming interfaces (APIs) by mining software repositories. Our intuition is that mining reveals how existing projects instantiate these frameworks. By locating concrete framework instantiations in existing projects, we can recommend to developers the concrete procedures for how to use a particular framework for a particular task in a new system. Our project also tackles the challenge of adapting existing systems to new versions of a framework or API by seeking repositories for how other systems adapted to such changes. We plan to integrate recommendations of how to instantiate a framework and adapt to changes directly in the development environment. Those points taken together, considerably distinguish our approach from existing research in the area of framework engineering.

8.4.4.2. European Lab with Delft

We have a Lille Nord Europe European Lab with A. Bachelli from Delft University. We are working on infrastructure and tools for code reviewing. We have exchange of staff and got a paper accepted to SANER 2015.

8.5. International Research Visitors

8.5.1. Visits of International Scientists

In the context of the PLOMO2 associated Team with the University of Chile:

- Ronie Saldago: 24/08/2014 until 07/09/2014. Subject was FFI and OSWindow.
- Miguel Campusano: 16/08/2014 until 11/09/2014. Subject was Slots and visual representation of code.
- Alexandre Bergel: 13/12/2014 until 01/01/2015. Subject: system support for advanced profiling.
- Juraj Kubelka: 06/12/2014 until 19/12/2014. First visit to RMoD to plan future collaboration.

In the context of MEALS:

- Guido Chari visited RMoD from November 2014.

Other visitors:

- Laurence Tratt, Software Development Team, King's College London (15-16/05/14)
- Johan Fabry, University of Chile, November 2014.
- Max Leske, University of Bern, Mar 2014.
- Miao Fang, Siemens, from Jun 2014 until Jul 2014.
- Alain Plantec, Univ. Bretagne Occidentale, Jan 2014

8.5.1.1. Internships

> **Pablo Herrero**, Universidad de Buenos Aires (Argentina): *Compressed ASTs for Pharo*, from Oct 2013.

> **Lucas Godoy**, Universidad de Buenos Aires (Argentina):*Tracking depeendencies between code changes.*, May 2014 - Oct 2014.

> **Baptiste Quide**, Polytech Lille: *Package dependencies analysis*, from May 2014 until Aug 2014.

> **Hayatou Oumarou**, Universite de Maroua, Cameroun:*Cost of Rules*, frome June 2014 to Oct 2014.

> **Clara Allende**, Universidad Tecnológica Nacional, Buenos Aires (Argentina): *BreakPoints for Pharo*, from May 2014 until Oct 2014.

> **Max Mattone**, École des Mines Douai: *VirtualCPU for Pharo*. From May 2014 until Oct 2014.

> **Mark Rizun**, Ivan Franko National University of Lviv, Ukraine: *Refactoring Improvements*, from July 2014 until Aug 2014.

> **Kevin Lanvin**, University Lille: *A web front-end for Moose*, from Jan until Apr 2014.

> **Leo Perard**, University Lille: *Telescope: a new way to describe visualizations*, from Mar 2014 until Aug 2014.

8.5.2. Visits to International Teams

- Stéphane Ducasse visited LAM Research, Inc, USA for one week in December 2014.

- Stéphane Ducasse visited the University of Delft, 3 days, July 2014

- Stefan Marr visited the Software Composition Group at Universität Bern in Switzerland for two days in December 2014

- Stefan Marr visited the Institut für Systemsoftware at the JKU University Linz in Austria for three days in July 2014

- Stefan Marr visited the Software Development Team of Laurence Tratt at King's College London for two days in May 2014

- Martín Dias visited the University of Technology of Delft for one week in September, 2014.

- Martín Dias visited the University of Buenos Aires in January 2014.

SEQUEL Project-Team

8. Partnerships and Cooperations

8.1. Regional Initiatives

Pierre Chainais and Hong-Phuong Dang are part of the ARCIR project *REPAR*, PARcimonious REpresentations, which is funded by the Region Nord-Pas de Calais for 2 years. This project is focused on sparsity based methods for signal and image processing. It has permitted to hire 1 postdoc for 1 year (2014-2015) who works on the use of sparse representation for video-tracking. The targetted application is in biological microscopy to track cellular vesiculas (collab. Laurent Héliot, Aymeric Leray, Univ. Lille 1).

8.2. National Initiatives

8.2.1. ANR BNPSI

Participants: Pierre Chainais, Hong-Phuong Dang, Clément Elvira, Emmanuel Duflos, Philippe Vanheeghe.

- *Title*: Bayesian Non Parametric approaches for Signal and Image Processing
- *Type*: National Research Agency no ANR-13-BS-03-0006-01
- *Coordinator*: Ecole Centrale Lille, LAGIS (P. Chainais)
- *Duration*: 2014-2018
- *Other Partners*: Inria Bordeaux, team ALEA, Université de Bordeaux, IMS, Institut de Recherche en Indormatique de Toulouse (IRIT), CEA-LIST Saclay.
- *Abstract*: Statistical methods have become more and more popular in signal and image processing over the past decades. These methods have been able to tackle various applications such as speech recognition, object tracking, image segmentation or restoration, classification, clustering, etc. We propose here to investigate the use of Bayesian nonparametric methods in statistical signal and image processing. Similarly to Bayesian parametric methods, this set of methods is concerned with the elicitation of prior and computation of posterior distributions, but now on infinite-dimensional parameter spaces. Although these methods have become very popular in statistics and machine learning over the last 15 years, their potential is largely underexploited in signal and image processing. The aim of the overall project, which gathers researchers in applied probabilities, statistics, machine learning and signal and image processing, is to develop a new framework for the statistical signal and image processing communities. Based on results from statistics and machine learning we aim at defining new models, methods and algorithms for statistical signal and image processing. Applications to hyperspectral image analysis, image segmentation, GPS localization, image restoration or space-time tomographic reconstruction will allow various concrete illustrations of the theoretical advances and validation on real data coming from realistic contexts.
- *Activity Report*: This ANR Project was accepted in 2013. It has started in february 2014 on a new area of research for signal and image processing and is supervised by Pierre Chainais. Three meetings have taken place in Lille (in February), Toulouse (in June) and Bordeaux (in November). One special session on Bayesian non parametric approaches has been submitted and accepted to the international conference EUSIPCO 2015. We have also been selected by the Franch National Signal & Image Processing Society (GRETSI) to organize the Peyresq 2016 Signal processing summer school. Two PhD students have been recruited in october 2014 thanks to this project: Clément Elvira works in Lille is co-supervised by P. Chainais and N. Dobigeon (Toulouse), Jessica Sodjo works in Bordeaux and is co-supervised by A. Giremus (IMS), N. Dobigeon (Toulouse) and F. Caron (Oxford). Moreover, Hong-Phuong Dang (PhD, 2nd year) has obtained new results on BNP for dictionary learning. The Indian Buffet Process permits to propose a method to learn a dictionary of which size automatically adapts to data. Several publications are in preparation. François Caron who is co-leading this project with Pierre Chainais has moved to Oxford University as an Assistant Professor so that we will benefit from strong connections with the Statistics Departmnt in Oxford University.

8.2.2. ANR ExTra-Learn

Participants: Alessandro Lazaric, Jérémie Mary, Rémi Munos, Michal Valko.

- *Title*: Extraction and Transfer of Knowledge in Reinforcement Learning
- *Type*: National Research Agency (ANR-9011)
- *Coordinator*: Inria Lille (A. Lazaric)
- *Duration*: 2014-2018
- *Abstract*: ExTra-Learn is directly motivated by the evidence that one of the key features that allows humans to accomplish complicated tasks is their ability of building knowledge from past experience and transfer it while learning new tasks. We believe that integrating transfer of learning in machine learning algorithms will dramatically improve their learning performance and enable them to solve complex tasks. We identify in the reinforcement learning (RL) framework the most suitable candidate for this integration. RL formalizes the problem of learning an optimal control policy from the experience directly collected from an unknown environment. Nonetheless, practical limitations of current algorithms encouraged research to focus on how to integrate prior knowledge into the learning process. Although this improves the performance of RL algorithms, it dramatically reduces their autonomy. In this project we pursue a paradigm shift from designing RL algorithms incorporating prior knowledge, to methods able to incrementally discover, construct, and transfer "prior" knowledge in a fully automatic way. More in detail, three main elements of RL algorithms would significantly benefit from transfer of knowledge. *(i)* For every new task, RL algorithms need exploring the environment for a long time, and this corresponds to slow learning processes for large environments. Transfer learning would enable RL algorithms to dramatically reduce the exploration of each new task by exploiting its resemblance with tasks solved in the past. *(ii)* RL algorithms evaluate the quality of a policy by computing its state-value function. Whenever the number of states is too large, approximation is needed. Since approximation may cause instability, designing suitable approximation schemes is particularly critical. While this is currently done by a domain expert, we propose to perform this step automatically by constructing features that incrementally adapt to the tasks encountered over time. This would significantly reduce human supervision and increase the accuracy and stability of RL algorithms across different tasks. *(iii)* In order to deal with complex environments, hierarchical RL solutions have been proposed, where state representations and policies are organized over a hierarchy of subtasks. This requires a careful definition of the hierarchy, which, if not properly constructed, may lead to very poor learning performance. The ambitious goal of transfer learning is to automatically construct a hierarchy of skills, which can be effectively reused over a wide range of similar tasks.
- *Activity Report*: ExTra-Learn started officially in October and one paper has been published at NIPS'14 and in the workshop on "Transfer and Multi-task Learning" at NIPS'14.

8.2.3. National Partners

- Laboratoire Paul Painlevé Université des Sciences et Technologies de Lille, France
  - Mylène Maïda *Collaborator*

    Ph. Preux has collaborated with M. Maïda and co-advised a student of the École Centrale de Lille. The motivation of this collaboration is the study of random matrices and the potential use of this theory in machine learning.
- CMLA - ENS Cachan.
  - Julien Audiffren *Collaborator*
    M. Valko, A. Lazaric, and M. Ghavamzadeh work with Julien on Semi-Supervised Apprenticeship Learning. We work on a maximum entropy algorithm that outperforms the approach without unlabeled data.
- Laboratoire Lagrange, Université de Nice, France.

- – Cédric Richard *Collaborator*
  We have had collaboration on the topic of *dictionary learning over a sensor network*.
- Laboratoire de Mécanique de Lille, Université de Lille 1, France.
  - – Jean-Philippe Laval *Collaborator*
    We co-supervise a starting PhD student (Linh Van Nguyen) on the topic of *high resolution field reconstruction from low resolution measurements in turbulent flows*.
- Institut Carnot de Bourgogne, CNRS UMR 6303, Université de Bourgogne, Dijon, France.
  - – Aymeric Leray *Collaborator*
    P. Chainais and A. Leray have written an article on the topic of *quantitative guarantees of a super resolution method via concentration inequalities*. A paper has been published in ICASSP 2014 proceedings and a journal article is submitted to IEEE Transactions on Image Processing.
- LAGIS (CRIStAL), Ecole Centrale Lille - Université de Lille 1, France.
  - – Patrick Bas *Collaborator*
    P. Chainais and P. Bas have a collaboration on the topic of *adaptive quantization to optimize classification from histrograms of features with an application to the steganalysis of textured images*.
- University of Oxford (Great-Britain)
  - – Dr. François Caron *Collaborators*
  - – P. Chainais is co-leading the ANR BNPSI in collaboration with François Caron. Note that Rémi Bardenet will arrive in Lille as a CNRS researcher in feb. 2015 after a post-doc at Oxford University.
- LTCI, Institut Télécom-ParisTech, France.
  - – Charanpal Dhanjal*Collaborator*
    We have a collaboration on the topic of *Matrix Factorization update* with application to sequential recommendation and sequential clustering. This collaboration has leaded to two publications this year: one in Neurocomputing journal [2], one at SDM'14 conference [14].

8.3. European Initiatives

8.3.1. FP7 & H2020 Projects

8.3.1.1. CompLACS

Type: FP7

Defi: Cognitive Systems, Interaction, Robotics

Instrument: Specific Targeted Research Project

Objectif: Cognitive Systems and Robotics

Duration: March 2011 - February 2015

Coordinator: John Shaw-Taylor

Partner: University College London, University of Bristol, Royal Holloway, University of London, Radboud Universiteit Nijmegen, Technische Universitat Berlin, Montanuniversitat Leoben, Institut National de Recherche en Informatique et en Automatique, Technische Universität Darmstadt

Inria contact: Rémi MUNOS

Abstract: One of the aspirations of machine learning is to develop intelligent systems that can address a wide variety of control problems of many different types. However, although the community has developed successful technologies for many individual problems, these technologies have not previously been integrated into a unified framework. As a result, the technology used to specify, solve and analyse one control problem typically cannot be reused on a different problem. The community has fragmented into a diverse set of specialists with particular solutions to particular problems. The purpose of this project is to develop a unified toolkit for intelligent control in many different problem areas. This toolkit will incorporate many of the most successful approaches to a variety of important control problems within a single framework, including bandit problems, Markov Decision Processes (MDPs), Partially Observable MDPs (POMDPs), continuous stochastic control, and multi-agent systems. In addition, the toolkit will provide methods for the automatic construction of representations and capabilities, which can then be applied to any of these problem types. Finally, the toolkit will provide a generic interface to specifying problems and analysing performance, by mapping intuitive, human-understandable goals into machine-understandable objectives, and by mapping algorithm performance and regret back into human-understandable terms.

8.4. International Initiatives

8.4.1. Inria International Partners

- Inria International partnership with Leoben, Austria; starting October 2014; duration: 4 years.
    – Ronald Ortner and Peter Auer: Montanuniversität Leoben (Austria).
    – Reinforcement learning (RL) deals with the problem of interacting with an unknown stochastic environment that occasionally provides rewards, with the goal of maximizing the cumulative reward. The problem is well-understood when the unknown environment is a finite-state Markov process. This collaboration is centered around reducing the general RL problem to this case.

      In particular, the following problems are considered: representation learning, learning in continuous-state environments, bandit problems with dependent arms, and pure exploration in bandit problems. On each of these problems we have successfully collaborated in the past, and plan to sustain this collaboration possibly extending its scopes.

8.4.1.1. Informal International Partners

- Technion - Israel Institute of Technology, Haifa, Israel.
    – Odalric-Ambrym Maillard *Collaborator*
      Daniil Ryabko has worked with Odalric Maillard on representation learning for reinforcement learning problems. It led to a paper in AISTATS [46].
- School of Computer Science, Carnegie Mellon University, USA.
    – Prof. Emma Brunskill *Collaborator*
    – Mohammad Gheshlaghi Azar, (now at Northwestern University in Chicago) *Collaborator*
      A. Lazaric continued his collaboration on transfer in multi-arm bandit and reinforcement learning which led to one publication at ICML'14. We have submitted an associate team project with E. Brunskill on the topic of multi-arm bandit applied to education.
- Technicolor Research, Palo Alto.
    – Branislav Kveton *Collaborator*
      Michal Valko and Rémi Munos worked with Branislav on Spectral Bandits aimed at recommendation for the entertainment content recommendation. Michal continued the ongoing research on online semi-supervised learning and this year delivered the algorithm for a challenging single picture per person setting. Victor Gabillon has spent 6 month at Technicolor as an intern to work on the sequential learning with submodularity, which resulted in 1 accepted paper at NIPS, 1 in ICML, and 1 in AAAI.

- University of Cambridge (UK)
  - Alexandra Carpentier *Collaborator*
  - Michal Valko collaborates with A. Carpentier on extreme event detection (such as network intrusion) with limited allocation capabilities.
- Politecnico di Milano (Italy)
  - Prof. Marcello Restelli and Prof. Nicola Gatti *Collaborators*
  - A. Lazaric continued his collaboration on transfer in reinforcement learning which leads to a publication in NIPS'14. Furthermore, we have submitted a journal version of an application of multi-arm bandit in sponsored search auctions which is currently under review.

8.5. International Research Visitors

8.5.1. Visits of International Scientists

8.5.1.1. Internships

- Daniele Calandriello, student at Politecnico di Milano, Italy

  Period: April 2013 to May 2014.

  He was working with A. Lazaric on multi-task reinforcement learning.
- Jessica Chemali, Master, Carnegie Mellon University, May-August 2014

8.5.2. Visits to International Teams

8.5.2.1. Sabbatical programme

Ryabko Daniil

Date: Jan 2014 - Jan 2015

Institution: Centro de Modelamiento Matematico (Chile)

8.5.2.2. Research stays abroad

Munos Rémi

Date: Jul 2013 - June 2014

Institution: Microsoft Research New England (USA)

Munos Rémi

Date: October 2014 - now

Institution: Google Deepmind (UK)

Ghavamzadeh Mohammad

Date: September 2013 - now

Institution: Adobe Research (USA)

<p align="center" style="color:red">SPIRALS Team</p>

8. Partnerships and Cooperations

8.1. Regional Initiatives

8.1.1. ADT eSurgeon

Participants: Maxime Colmant, Loïc Huertas, Romain Rouvoy [correspondant].

ADT eSurgeon (2013–15) is a technology development initiative supported by the Inria Lille - Nord Europe Center that aims at supporting the development of the POWERAPI software library (see Section 5.3) for measuring and monitoring the energy consumption of middleware and software systems.

8.1.2. ADT Spoon3R

Participants: Gérard Paligot, Martin Monperrus [correspondant].

ADT Spoon3R (2014–16) is a technology development initiative supported by the Inria Lille - Nord Europe Center that aims at supporting the development of the SPOON software library. (see Section 5.5) Spoon3R aims at extending SPOON with the features defined in the context of our research activities on automated software repair.

8.1.3. North European Lab SOCS

Participants: María Gómez Lacruz, Nicolas Haderer, Christophe Ribeiro, Romain Rouvoy [correspondant], Lionel Seinturier.

North European Lab SOCS (2013–15) is an international initiative supported by the Inria Lille - Nord Europe Center that takes place in the context of a well-established collaboration between Inria and *Universitet i Oslo* (UiO) initiated in 2008. SOCS (Self-Optimization of Cyber-physical Systems) focuses on the self-optimization issues in cyber-physical systems. Cyber-Physical Systems (CPS) are complex systems-of-systems that blend hardware and software to fulfill specific missions. However, traditional CPS are statically configured to achieve predefined goals, which not only limit their sharing and their reuse, but also hinder their sustainability. We believe that this waste of resources stems from the lack of agility of CPS to adapt to change in their environment or objectives. The SOCS Inria Lab takes advantage of the technologies developed as part of the APISENSE$^{®}$ crowdsensing platform (see Section 5.1) to leverage the development of agile CPS.

8.1.4. LEDA

Participant: Philippe Merle [correspondant].

LEDA (2013–16) Laboratoire d'Expérimentation et de Démonstrations Ambiantes is a demonstration space allocated by the Inria Lille - Nord Europe Center whose goal is to show the scientific results of the Spirals team in the domains of distributed systems, adaptable middleware, software product lines, green computing, and ambiant computing. These results are illustrated around the scenario of a mock digital home.

8.2. National Initiatives

8.2.1. ANR

8.2.1.1. ANR MOANO

Participant: Laurence Duchien [correspondant].

MOANO (Models & Tools for Pervasive Applications focusing on Territory Discovery) is a 46-month project of the ANR CONTINT program which started in December 2010. The partners are LIUPPA/University of Pau and Pays de L'Adour, University of Toulouse/IRIT, University of Grenoble/LIG, University Lille 1/LIFL. While going through a territory, mobile users often encounter problems with their handheld computers/mobiles. Some locally stored data become useless or unnecessary whereas other data is not included in the handheld computer. Some software components, part of the whole applications can become unnecessary to process some information or documents that the user did no plan to manage during his mission. In order to answer such difficulties, our project has three operational studies which are i) to enlarge the communication scale, ii) to provide people without computer-science skills with a toolset that will enable them to produce/configure mapping applications to be hosted on their mobile phone and iii) to process all the documents of interest in order to make their spatial and thematic semantics available to mobile users.

8.2.1.2. ANR YourCast
Participants: Laurence Duchien [correspondant], Clément Quinton, Daniel Romero Acero.

YourCast (Software Product Lines for Broadcasting Systems) is a 36-month ANR Emergence project that started in January 2012 and that involves University of Nice Sophia Antipolis, Valorpaca and University Lille 1. The project aims at defining an information broadcasting system by a dedicated software product line which will be used in schools or events, such as gatherings of scouts.

8.2.2. Competitivity Clusters

8.2.2.1. FUI Hermes
Participants: Laurence Duchien, Romain Rouvoy, Lionel Seinturier [correspondant].

Hermes is a 41-month project funded by FUI and labelized by the PICOM (Pôle des Industries du COMmerce) competitivity cluster which has started in August 2012. The goal of the project is to define a modular and context-aware marketing platform for the retail industry. The focus is put on the interactions with customers in order to extract and mine relevant informations related to shopping habits, and on a multi-device, cross-canal, approach to better match customer usages.

8.2.3. Programme Investissement d'Avenir (PIA)

8.2.3.1. PIA Datalyse
Participants: Filip Krikava, Romain Rouvoy, Lionel Seinturier [correspondant], Bo Zhang.

Datalyse is a 36-month project of the Programme Investissement d'Avenir Cloud Computing 3rd call for projects. The project started in May 2013. The partners are Business & Decision Eolas, Groupement des Mousquetaires, Université Grenoble 1, Université Lille 1, Inria, Université Montpellier 2. The project aims at defining an elastic cloud computing infrastructure for processing big volumes of data. The originality of the project is to consider jointly data generated by users and by the infrastructure, and to correlate data at these two levels.

8.2.3.2. PIA OCCIware
Participants: Romain Rouvoy, Philippe Merle [correspondant], Lionel Seinturier.

OCCIware is a 36-month project of the Programme Investissement d'Avenir Cloud Computing and Big Data 4th call for projects. The project started in Decembre 2014. The partners are Open Wide (leader), ActiveEon SA, CSRT, Institut Mines-Télécom/Télécom SudParis, Inria, Linagora GSO, Obeo, OW2 Consortium, Pôle Numérique, and Université Joseph Fourier - Grenoble. The project aims at defining a formal framework for managing every digital resources in the clouds, based on Open Cloud Computing Interface (OCCI) recommendations from Open Grid Forum (OGF).

8.2.4. Inria National Initiatives

8.2.4.1. Inria ADT AntDroid
Participants: María Gómez Lacruz, Nicolas Haderer, Christophe Ribeiro, Romain Rouvoy [correspondant].

ADT AntDroid (2012–14) is a technology development initiative supported by Inria that aims at pushing the results of Nicolas Haderer PhD thesis [12] into production. AntDroid therefore focuses on deploying and disseminating the APISENSE® crowdsensing platform (see Section 5.1) to the public and to support the users of the platform.

8.2.4.2. Inria ADT Focus CrowdLab

Participants: Clive Ferret-Canape, Julien Duribreux, María Gómez Lacruz, Christophe Ribeiro, Romain Rouvoy [correspondant], Antoine Veuiller.

The purpose of the ADT Focus CrowdLab (2014–2016) is to strengthen the technological part of the Metroscope consortium and to promote the APISENSE® crowdsensing platform (see Section 5.1) as a reference platform fo gathering mobile data within the scientific community. The CrowdLab project focuses on three stringent goals: (1) consolidating the current technological solutions, (2) technical and logistical support of the research activities initiated in different scientific domains, and (3) the improvement of security and anonymity of collected data. In addition to the Metroscope consortium, the Inria research teams participating of the ADT Focus CrowdLab project are: Spirals (coordinator), Madynes, Diana, Muse.

8.3. European Initiatives

8.3.1. FP7 & H2020 Projects

Program: FP7 ICT.

Project acronym: PaaSage.

Project title: Model Based Cloud Platform Upperware.

Duration: October 2012–September 2016.

Coordinator: ERCIM.

Other partners: ERCIM (Fr), SINTEF (No), STFC (UK), U. of Stuttgart (De), Inria (Fr), CETIC (Be), FORTH (El), Be.Wan (Be), EVRY Solutions (No), SysFera (Fr), Flexiant (UK), Lufthansa Systems AG (De), Gesellschaft fur wissenschaftliche Datenverarbeitung mbh Gottingen (De), Automotive Simulation Center Stuttgart (De).

Abstract: Cloud computing is a popular and over-hyped concept in ICT. The concept of infinitely scalable elastic resources changing without complex systems administration and paying only for resources used is attractive. These benefits are not immediately realizable. Within organisation benefits are realizable at considerable cost. IaaS (*Infrastructure-as-a-Service*) public Clouds have different interfaces and conditions of use thus for an organisation to "scale out" requires considerable investment using skilled technical staff. The business need is to allow organisations to "scale out" from their private Cloud to public Clouds without a technical chasm between. This cannot easily be achieved. Aligned with the EU strategic direction of an open market for services, SOA (*Service-Oriented architecture*) offers a way to virtualize across heterogeneous public Clouds and organizational private Clouds. It opens a market for European SMEs to provide services to be utilized (and paid for) by business applications and for all organisations to benefit from a catalogue of services that can be used across the environment. PaaSage will deliver an open and integrated platform, to support both deployment and design of Cloud applications, together with an accompanying methodology that allows model-based development, configuration, optimisation, and deployment of existing and new applications independently of the existing underlying Cloud infrastructures. Specifically it will deliver an IDE (*Integrated Development Environment*) incorporating modules for design time and execution time optimisation of applications specified in the Cloud Modeling Language (Cloud ML), execution-level mappers and interfaces and a metadata database.

Participants: Laurence Duchien, Clément Quinton, Daniel Romero Acero [correspondant], Romain Rouvoy, Lionel Seinturier.

Program: FP7 FET.

Project acronym: DIVERSIFY.

Project title: More software diversity. More adaptivity in CAS.

Duration: 36 months (2013-16).

Coordinator: Inria.

Other partners: SINTEF (Norway), Trinity College Dublin (Ireland), University of Rennes 1 (France).

Abstract: DIVERSIFY explores diversity as the foundation for a novel software design principle and increased adaptive capacities in CASs (*Collective Adaptive Systems*). Higher levels of diversity in the system provide a pool of software solutions that can eventually be used to adapt to unforeseen situations at design time. The scientific development of DIVERSIFY is based on a strong analogy with ecological systems, biodiversity, and evolutionary ecology. DIVERSIFY brings together researchers from the domains of software-intensive distributed systems and ecology in order to translate ecological concepts and processes into software design principles.

Participants: Martin Monperrus [correspondant], Matias Martinez.

8.4. International Initiatives

8.4.1. Inria Associate Teams

Title: Service-Oriented Architecture anti-patterns in Mobile and Cloud Applications (SOMCA).

Inria principal investigator: Romain Rouvoy.

International Partner (Institution - Laboratory - Researcher):

Université du Québec à Montréal (Canada) - LATECE Laboratory

Duration: 2014–2016.

See also: http://seas.ifi.uio.no.

The long-term goal of this research program is to propose a novel and innovative methodology embodied in a software platform, to support the runtime detection and correction of anti-patterns in large-scale service-oriented distributed systems in order to continuously optimize their quality of service. One originality of this program lies in the dynamic nature of service-oriented environments, the application on emerging frameworks for embedded and distributed systems (e.g., Android/iOS for mobile devices, PaaS/SaaS for Cloud environments), and in particular mobile systems interacting with remote services hosted on the Cloud. To achieve this goal, we propose to follow a three-step methodology targeting three objectives: (1) Identify and specify service-oriented anti-patterns, (2) Develop an approach to detect automatically, at runtime, service-oriented anti-patterns, (3) Develop an approach to suggest refactorings and automatically, at runtime, correct service-oriented anti-patterns. The ongoing PhD thesis of Geoffrey Hecht, in co-supervision between Montréal and Lille, is part of this associated team.

Participants: Laurence Duchien, María Gómez Lacruz, Geoffrey Hecht, Philippe Merle, Romain Rouvoy [correspondant], Lionel Seinturier.

8.4.2. Inria International Partners

8.4.2.1. Declared Inria International Partners

8.4.2.1.1. University of Los Andes, Bogota, Colombia

We have a long term collaboration since 2005 with this university. Over the years, four PhD thesis (Carlos Noguera, Carlos Parra, Daniel Romero Acero, Gabriel Tamura) have been defended in our team with students who obtained their MSc in this university. The first three were full French PhD, whereas the last one was a co-tutelle with this university. Professor Rubby Casallas from University of Los Andes is frequently visiting our team. The most recently defended PhD thesis, that of Gabriel Tamura, deals with QoS (quality-of-service) contract preservation in distributed service-oriented architectures. A formal theory to perform, in a safe way, the process of self-adaptation in response to quality-of-service (QoS) contracts violation has been proposed. The results have been published in [121], [119] and in the PhD thesis document itself [118].

Participants: Laurence Duchien [correspondant], Clément Quinton, Daniel Romero Acero, Romain Rouvoy, Lionel Seinturier.

8.4.2.1.2. University of Oslo, Norway

The scientific collaboration with this international partner deals with complex distributed systems that have to seamlessly adapt to a wide variety of deployment targets. This is due to the fact that developers cannot anticipate all the runtime conditions under which these systems are immersed. A major challenge for these software systems is to develop their capability to continuously reason about themselves and to take appropriate decisions and actions on the optimizations they can apply to improve themselves. This challenge encompasses research contributions in different areas, from environmental monitoring to real-time symptoms diagnosis, to automated decision making. The collaboration has been supported by the SEAS Inria associated team (2012-14).

Participants: María Gómez Lacruz, Nicolas Haderer, Daniel Romero Acero, Romain Rouvoy [correspondant], Lionel Seinturier.

8.4.3. Participation In Other International Programs

8.4.3.1. OW2

Participants: Philippe Merle [correspondant], Fawaz Paraiso, Romain Rouvoy, Lionel Seinturier.

OW2, previously ObjectWeb, is an international consortium to promote high quality open source middleware. The vision of OW2 is that of a set of components which can be assembled to offer high-quality middleware systems. We are members of this consortium since 2002. Philippe Merle is the leader of both FRACTAL and FRASCATI projects, which are hosted by this consortium. Philippe Merle and Lionel Seinturier are members of the Technology Council of OW2.

8.4.3.2. ERCIM Working Group on Software Evolution

Participant: Laurence Duchien [correspondant].

The Working Group (WG) on Software Evolution is one of the working groups supported by ERCIM. The main goal of the WG is to identify a set of formally-founded techniques and associated tools to support software developers with the common problems they encounter when evolving large and complex software systems. With this initiative, the WG plans to become a Virtual European Research and Training Centre on Software Evolution.

8.5. International Research Visitors

8.5.1. Visits of International Scientists

Participant: Earl Barr.
Subject: Anti-fragility of Software Systems
Date: June 2014
Institution: University College London (UK)

8.5.1.1. Internships

Sebastian Lamelas Marcote
Subject: Automatic Software Repair
Date: from May 2014 until Oct 2014
Institution: University of Buenos Aires (Argentina)

Carolina Valdez Gandara
Subject: SmartGate: An Android-based Gateway for the Internet of Things
Date: from May 2014 until Nov 2014
Institution: University of Central Buenos Aires (Argentina)

Mohamed Lamine Berkane
Subject: Advanced Modularity Concepts in Distributed Applications
Date: from Jan 2014 until Sep 2014
Institution: University Constantine 2 (Algeria)