



RESEARCH CENTER
Lille - Nord Europe

FIELD

Activity Report 2013

Section highlights of the Team

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ALGORITHMICS, PROGRAMMING, SOFTWARE AND ARCHITECTURE

1. ATEAMS Project-Team 4
2. DREAMPAL Team (section vide) 5

APPLIED MATHEMATICS, COMPUTATION AND SIMULATION

3. DOLPHIN Project-Team 6
4. MODAL Project-Team 7
5. NON-A Project-Team 8
6. SequeL Project-Team 9
7. SIMPAF Project-Team 10

DIGITAL HEALTH, BIOLOGY AND EARTH

8. BONSAI Project-Team (section vide) 11
9. SHACRA Project-Team 12

NETWORKS, SYSTEMS AND SERVICES, DISTRIBUTED COMPUTING

10. ADAM Project-Team 13
11. FUN Project-Team 14
12. RMOD Project-Team 15

PERCEPTION, COGNITION AND INTERACTION

13. LINKS Team 16
14. MAGNET Team 17
15. MINT Project-Team 18

ATEAMS Project-Team

2.2. Highlights of the Year

- Paul Klint was Knighted Officer in the order of Oranje Nassau based on his contributions to science and education.
- Paul Klint was appointed Research Fellow, Centrum Wiskunde & Informatica

DREAMPAL Team (section vide)

DOLPHIN Project-Team

2.2. Highlights of the Year

BEST PAPER AWARD :

[62] **GECCO - Genetic and Evolutionary Computation Conference - 2013.** M. NOUREDINE, T. V. LUONG, B. KARIMA, T. EL-GHAZALI.

MODAL Project-Team

2.2. Highlights of the Year

- The team developed an extended version of the Rmixmod package allowing to cluster simultaneous mixed categorical and continuous data (see Section [Rmixmod package for mixed data]).
- The full understanding of cross-validation procedures in density estimation has been tackled with new results in terms of risk estimation and model selection (Section [Resampling procedures]).

NON-A Project-Team

2.3. Highlights of the Year

- The Implicit Lyapunov Function (ILF) method for non-asymptotic (finite-time and fixed-time) stability analysis of ordinary differential equations has been developed in [75]. The new principles for design of non-asymptotic controls based on ILF are presented.
- New developments for interval estimation of time-delay systems [22], [56] and control of systems with unknown time-varying input delays based on interval predictors [34], [76].
- New results for control of linear [59] or nonlinear [73] systems using asynchronous sampling.
- New book on fault detection and isolation in aerospace systems [86].
- New application has been addressed dealing with the networked control of haptic systems.
- New concrete application of homogeneous, finite-time control, to a pneumatic actuator [36].
- A patent with Airbus has been deposited for a fault detection in actuators of an airplane [87].

SequeL Project-Team

2.2. Highlights of the Year

- In 2013, Crazy Stone won the 6th edition of the UEC Cup and the first edition of the Densesen. Crazy Stone is a Go-playing program developed by Rémi Coulom since 2005, based on the Monte Carlo Tree Search method. The UEC Cup is the most important international computer-Go competition, organized yearly by the University of Electro-Communications in Tokyo, Japan. The Densesen is a match between the winner of the UEC Cup and a top Japanese professional Go player. This year Crazy Stone won a game with 4 stones of handicap against 9-dan professional player Yoshio Ishida.
- The International Machine Learning Society selects SEQUEL to organize the 32nd International Conference on Machine Learning in 2015 at Lille. ICML is the most important conference in the field of machine learning.

SIMPAF Project-Team

2.2. Highlights of the Year

A. Gloria was awarded an ERC Starting Grant.

BONSAI Project-Team (section vide)

SHACRA Project-Team

2.3. Highlights of the Year

2.3.1. Scientific exhibition for the french government

The intergovernmental seminar on digital sciences was held in february at the University of Cergy-Pontoise. Within this context, the team has exhibited a demonstration of a cataract surgery simulator which is dedicated to train surgeons to a new cost-effective cataract surgery procedure MSICS (*manual small incision cataract surgery*). This simulator was developed at Inria and has been transferred to the start-up InSimo.



Figure 2. Demonstration of a cataract surgery simulator during the intergovernmental seminar on digital sciences.

2.3.2. Best Papers

We received the runner-up best paper award for the paper published in ISMAR 2013, the leading conference in Augmented and Mixed Reality.

BEST PAPERS AWARDS :

[22] **ISMAR - IEEE International Symposium on Mixed and Augmented Reality 2013**. N. HAOUCHINE, J. DEQUIDT, I. PETERLIK, E. KERRIEN, M.-O. BERGER, S. COTIN.

ADAM Project-Team

2.2. Highlights of the Year

Romain Rouvoy received the Best Paper Award on distributed systems of the 28th Symposium On Applied Computing (SAC) for the paper *Improving Context Interpretation by Using Fuzzy Policies: The Case of Adaptive Video Streaming* written in collaboration with Lucas Provensi, Frank Eliassen, and Roman Vitenberg from the University of Oslo (Norway) within the context of the *Sensor-as-a-Service* (SEAS) associate team. Furthermore, Romain Rouvoy has been invited as a keynote speaker of the French conference on software architectures (CAL - *Conférence sur les Architectures Logicielles*) to report on the contributions of the SEAS associate team in the area of designing distributed software architectures for sensor-based systems.

The APISENSE[®] crowd-sensing platform developed by the project-team has been awarded a research grant by the **Microsoft Azure for Research program** to work on the elastic processing of crowd-based datasets. This grant intends to leverage APISENSE[®] to support the real-time processing of big datasets collected in the physical world by a large crowd of smartphones. Examples of case studies covered in this area include the automatic inference of roadmaps, the continuous cartography of network coverage quality, or even the detection and the dynamic analysis of earthquakes. In particular, the unpredictable volume of data to be collected in the wild requires the adoption of elastic computation models and infrastructures to continuously provision the processing capabilities to fit uploads of information reports.

Gabriel Tamura has won the 2013 PRES Université Lille Nord de France International PhD Award for his PhD dissertation [85] on the reliable preservation of quality of service (QoS) contracts in self-adaptive distributed systems. The contribution is twofold. The first one is a model for component-based software systems where reconfiguration rules are viewed as typed attributed graphs [64] and where QoS-contracts are viewed as state machines in which transitions correspond to software reconfigurations. The second contribution is the characterization of adaptation properties to evaluate self-adaptive software systems in a standardized and comparable way. This work led to the development of the QOS-CARE framework that was the topic of several major publications [42], [43], [86], [84] in addition to the thesis dissertation itself.

BEST PAPERS AWARDS :

[36] **28th ACM Symposium on Applied Computing (SAC) - 8th Track on Dependable and Adaptive Distributed Systems (DADS)**. L. PROVENSİ, F. ELIASSEN, R. VITENBERG, R. ROUYOY.

FUN Project-Team

2.2. Highlights of the Year

CENTR R&D award 2013 have been attributed on October 2nd at CENTR GA meeting. The ANR VERSO WINGS in which the FUN research group is partner has been awarded among 45 nominees. There were 4 categories (Security, R&D, Marketing and Communication, Contributor of the Year), 5 projects have been awarded in each category.

RMOD Project-Team

2.4. Highlights of the Year

- Stéphane Ducasse got promoted DR1 (December 2012).
- A *Web with Pharo* Conference was held 6 June 2013 @ Euratechnologies, Lille
- Pharo 2.0 (our open-source language and environment) was released. (<http://www.pharo.org>)
- Three releases of Moose: 4.7, 4.8 and 4.9. Moose is our open-source reengineering platform. (<http://www.moosetechnology.org>)
- The second PharoConf was held at University of Bern, Switzerland April 2-4.
- The first ever Pharo Tutorial at ECOOP in 2013.
- RMoD helped to Organize the Dyla workshop at ECOOP 2013.
- Creation of Synectique. The company is a spin-off based on the research done in RMoD. Synectique is selling software maintenance solutions based on Pharo. (<http://www.synectique.eu>)
- RMoD participated to the organization of the ESUG conference in Annecy, France in September (over 100 participants).
- *Deep into Pharo* Book Released. *Deep into Pharo* is the second volume of a series of books covering Pharo. (<http://rmod.lille.inria.fr/deepIntoPharo/>)
- Organization of the MooseDay in Lille on the 19th December with around 25 persons from all around the world.

LINKS Team

2.2. Highlights of the Year

Our paper ‘A trichotomy for regular simple path queries on graphs’ has been accepted for publication in the Proceedings of the 32nd ACM SIGMOD-SIGACT-SIGART Symposium on *Principles of Database Systems*, PODS 2013, the top conference in the field of theoretical databases. The paper addresses an open problem, i.e. giving a complete classification of regular languages with respect to regular simple path queries (RSPQs), the latter being regular path queries (RPQs) with an additional constraint that prevents traversing two nodes multiple times. In particular, we have characterized the boundary between tractability and intractability, and proved a trichotomy: the evaluation of RSPQs is either AC₀, NL-complete or NP-complete in data complexity. Pierre Bourhis has been recruited as CNRS researcher at LIFL and joined the team in October.

MAGNET Team

2.2. Highlights of the Year

As first highlight, we are happy to report that our paper “Fiedler Random Fields: A Large-Scale Spectral Approach to Statistical Network Modeling” has been accepted for publication at *Journal of Machine Learning Research*, the top journal in the field of machine learning. This paper’s contributions are twofold. First, we introduce the Fiedler delta statistic, based on the Laplacian spectrum of graphs, which allows to dispense with any parametric assumption concerning the modeled network properties. Second, we use the defined statistic to develop the Fiedler random field model, which allows for efficient estimation of edge distributions over large-scale random networks. After analyzing the dependence structure involved in Fiedler random fields, we estimate them over several real-world networks, showing that they achieve a much higher modeling accuracy than other well-known statistical approaches.

The second highlight of the year is the publication of our paper “Improving pairwise coreference models through feature space hierarchy learning” at the annual *Meeting of the Association for Computational Linguistics (ACL 2013)*, the premier conference in the field of Natural Language Processing. This paper proposes a new method for significantly improving the performance of pairwise coreference models. Given a set of indicators, our method learns how to best separate types of mention pairs into equivalence classes for which we construct distinct classification models. In effect, our approach finds an optimal feature space (derived from a base feature set and indicator set) for discriminating coreferential mention pairs. Although our approach explores a very large space of possible feature spaces, it remains tractable by exploiting the structure of the hierarchies built from the indicators. Our experiments on the CoNLL-2012 Shared Task English datasets (gold mentions) indicate that our method is robust relative to different clustering strategies and evaluation metrics, showing large and consistent improvements over a single pairwise model using the same base features.

MINT Project-Team

2.2. Highlights of the Year

Gery Casiez was hired as full Professor.

Fanny Chevalier has been recruited as an Inria Researcher.