Activity Report 2018

Section Highlights of the Team

5. Highlights of the Year

5.1. Highlights of the Year

Computer Algebra in Scientific Computing

The GAIA team organized the conference *Computer Algebra in Scientific Computing* (CASC), University of Lille, 17–21 September 2018.

BONUS Team

5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. Awards

- Patent with Beckman & Coulter on the optimization of large medical laboratories (Prof. E-G. Talbi, S. Faramarzi-oghani, M. Bué).

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INOCS Project-Team

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5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. Awards

- Martim Joyce-Moniz, former INOCS PhD student supervised by Bernard Fortz, won the Best Dissertation Award of the INFORMS Section on Telecommunications and Network Analytics.

- Bernard Fortz, Enrico Gorgone and Dimitri Papadimitriou received the 2017 Glover-Klingman prize for the best paper published in *Networks* (an international journal) [6].

- Wenjuan Gu, together with co-authors Diego Cattaruzza, Maxime Ogier and Frédéric Semet, has been classified finalist for the best article GT2L (Groupe de Travail Transport et Logistique) award with the paper titled *Adaptive large neighborhood search for multicommodity VRP* [49]. The work has been presented during the conference Roadef 2018 held in Lorient, France.

5.1.2. Publications & dissemination

- Luce Brotcorne was the EURO Plenary Speaker at the XIX Latin-Iberoamerican Conference on Operations Research (CLAIO 2018) in Lima, Peru, September 2018 [28].

- Martine Labbé was plenary speaker at the «Journées de l'optimisation» in Montreal, Canada, May 2018 [31].

MEPHYSTO-POST Team (section vide)

<p style="text-align:center">**MODAL Project-Team**</p>

5. Highlights of the Year

5.1. Highlights of the Year

- Hemant Tyagi has been recruited as CR in the team.
- Three new ANR funded (one began in 2018, two will start in 2019).
- One H2020 European project funded (started in November 2018).
- One-year EIT European project called SysBooster with ApSys and Nokia.
- Creation of a startup using MODAL's technology (MixtComp software).

NON-A POST Team

4. Highlights of the Year

4.1. Highlights of the Year

4.1.1. Awards

- Gabriele Perozzi (a PhD student of the team) get the creativity prize of FR CNRS TTM (La Fédération de Recherche Transports Terrestres & Mobilité);

- Hafiz Ahmed (a former PhD student of the team) is a winner of Annual European PhD Award on Control for Complex and Heterogeneous Systems.

RAPSODI Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

In 2018, the RAPSODI project-team was strongly involved in the organization of scientific events. In particular, in the framework of the LabEx CEMPI thematic semester on Numerical Analysis and PDEs, the following events were organized by RAPSODI members:

- the Mathematics-Enterprises Study Week, co-organized at LILLIAD Learning Center by E. Creusé from January 29 to February 2;

- the third edition of the ABPDE conference (on Asymptotic Behavior of systems of PDEs arising in physics and biology), co-organized at LILLIAD Learning Center by C. Cancès, C. Chainais-Hillairet, I. Lacroix-Violet, and T. Rey on August 28-31;

- the second edition of the One-day conference on Calculus of Variations, co-organized at Laboratoire Paul Painlevé by I. Lacroix-Violet and B. Merlet on October 12;

- the fifth edition of the Lille days on Numerical Analysis (dedicated to domain decomposition and its applications to PDEs), co-organized at Laboratoire Paul Painlevé by C. Calgaro Zotto and E. Creusé on November 13-14.

A research school on Mathematics for Nuclear Energy was also co-organized at the Roscoff Marine Station by C. Cancès on July 2-6, in partnership with the GdR MaNu. Let us as well mention the organization in the CANUM (national NUMerical Analysis Congress) at Cap d'Agde from May 28 to June 1 of three mini-symposia by members of the team: one by C. Cancès on cross-diffusion systems, one by S. Lemaire on polytopal discretization methods, and one co-organized by T. Rey on kinetic models. Team contributions finally include the co-organization by E. Creusé of the Maths Jobs Forum that was held in Paris on December 13, and the co-organization by A. Zurek of the Young Mathematicians Regional Tournament that was held in Laboratoire Paul Painlevé on April 14-15.

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

5. Highlights of the Year

5.1. Highlights of the Year

- Daniele Calandriello is awarded with the AFIA price for his PhD defended in December 2017. As a side note, this is the 5th time a PhD student of SEQUEL receives this award since our first PhD defense in 2010.

- We organized the 14th European Workshop on Reinforcement Learning in Lille. This event gathered 200 researchers; there were a dozen invited presentations by world research leaders, including Prof. Richard Sutton (U. Alberta), the founder of modern RL, Prof. Tze Leung Lai (Stanford U.), one of the key reference in bandit research, and also Nicolò Cesa-Bianchi (U. Milan), Peter Auer (U. of Leoben), Rémi Munos (Deepmind Paris), and Joelle Pineau (Mc Gill and FAIR).

5.1.1. Awards

- Former 2017 intern M. Asadi got a It was "Best Poster Award" at Transylvania Machine Learning Summer School (TMLSS), July 2018 for the work she did while in SEQUEL

- É. Kaufmann is among the top 10 reviewers at ICML 2018 (out of 1800 reviewers)

- Ph. Preux was among the 24 "level-2 Distinguished Senior Program Committee Members" for IJCAI 2018 (out of 498 SPC members, 115 were distinguished, 23 at level 2, the highest level)

- M. Valko is among the top 10 reviewers at ICML 2018 (out of 1800 reviewers)

BONSAI Project-Team

4. Highlights of the Year

4.1. Highlights of the Year

The team was actively involved in the organization of the international conference RECOMB in Paris (April 2018), that was attended by more than 800 people.

4.1.1. Awards

First place at the metagenomics assembly challenge organized by the company Mosaic DNANexus: https://www.businesswire.com/news/home/20180620005408/en/DNAnexus-Powered-Mosaic-Microbiome-Platform-Announces-Winners-Community

FUN Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

- Valeria Loscrí has been elevated to the IEEE Senior Membership degree.
- Valeria Loscrí and Nathalie Mitton highlighted as Women in Computer Science 2018 by Elsevier https://www.elsevier.com/physical-sciences-and-engineering/computer-science/journals/women-in-computer-science.

5.1.1. Awards

Paper [65] has been awarded Top Paper from 2017 in Transactions on Emerging Telecommunications Technologies, as selected by the Editorial Board. See https://onlinelibrary.wiley.com/page/journal/21613915/homepage/ett_best_paper_awards.htm.

VITALOS, issued from the FP7 VITAL project from which the FUN team is one of the main contributors, has been awarded as one of the 50 most transformative smart projects: https://spring.smartcitiesconnect.org/Smart50Awards/.

RMOD Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. Release of Pharo 7

We released a release candidate for Pharo 7, with a release to be expected early 2019. More information at http://pharo.org.

5.1.2. Awards

- Guillermo Polito, Pablo Tesone, Esteban Lorenzano and Nicolás Passerini won the 1st place in the Innovation Technologies Award at ESUG 2018.
- Christian Marlon Souza Couto, Henrique Rocha, and Ricardo Terra. A Quality-oriented Approach to Recommend Move Method Refactorings. 1st place in 17th Brazilian Symposium on Software Quality, SBQS p. 11—20, ACM, New York, NY, USA, 2018.

SPIRALS Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. Awards

Thomas Durieux, who defended his PhD thesis [11] in September 2018 on automated software repair, has obtained two best paper awards in 2018: at the 29th IEEE International Symposium on Software Reliability Engineering (ISSRE) [26] for his work on self-healing web applications based on HTML and JavaScript rewriting, and at the 6th Workshop on Software Visualization, Evolution and Maintenance (VEM) [38] for his contribution to the automatic detection of bug fixing patterns, which is a joint work with Fernanda Madeiral and colleagues from the Federal University of Uberlândia in Brazil.

Browser fingerprinting [48] has emerged as a technique to track users without their consent. Studying the implication of this technique on user privacy, and proposing software systems that can self-protect against such techniques, have become an important topic in the research activities of Spirals on self-adaptation. In 2018, two papers authored by Spirals members in the context of the ongoing PhD thesis of Antoine Vastel have been published in A* conferences of the domain of security: [36] at the 39th IEEE Symposium on Security and Privacy, and [35] at 27th USENIX Security Symposium.

In 2018, we published at the 40th International Conference on Software Engineering, Track Software Engineering in Practice, a paper on Repairnator [34], which this is the very first bot for automated software repair. This work has been conducted by Simon Urli and his coworkers in Spirals in the context of Inria ADT Librepair. An article on Repairnator has also been published on the Inria web site.

Stéphanie Challita won the Prix L'Oréal-UNESCO For Women in Science. She is among the 30 laureates rewarded out of 900 candidates. Stéphanie Challita has defended her PhD thesis in December 2018 on FCLOUDS, a framework to achieve semantic interoperability in multi-cloud computing systems.

Xscalibur is a transfer project led by Christophe Gourdin and Philippe Merle that aims at creating a startup company with innovative solutions for the management of multi-cloud systems. The project has been selected by Serre Numérique Valenciennes. The research activities that led to this project have been, in part, conducted in the context of the joint lab between Spirals and the Scalair cloud hosting company. Several papers in relation with these research activities have also been published in 2018: [30], [25], [24], [13], [23].

BEST PAPERS AWARDS :

[26]
T. DURIEUX, Y. HAMADI, M. MONPERRUS.*Fully Automated HTML and Javascript Rewriting for Constructing a Self-healing Web Proxy*, in "Proceedings of the 29th IEEE International Symposium on Software Reliability Engineering (ISSRE 2018)", Memphis, United States, October 2018, https://arxiv.org/abs/1803.08725 [*DOI :* 10.1109/ISSRE.2018.00012], https://hal.inria.fr/hal-01746141

[38]
F. MADEIRAL, T. DURIEUX, V. SOBREIRA, M. MAIA.*Towards an automated approach for bug fix pattern detection*, in "VEM '18 - Proceedings of the VI Workshop on Software Visualization, Evolution and Maintenance", São Carlos, Brazil, September 2018, https://arxiv.org/abs/1807.11286 , https://hal.archives-ouvertes.fr/hal-01851813

DEFROST Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. Award from the Robotics Society of Japan

We received a best paper award from the *Robotics Society of Japan* for the paper entitled "Software toolkit for modeling, simulation, and control of soft robots" that have been published in the *Advanced Robotics* journal. This paper presents the SoftRobots plugin as a first unified software framework dedicated to modeling, simulation and control of soft robots.
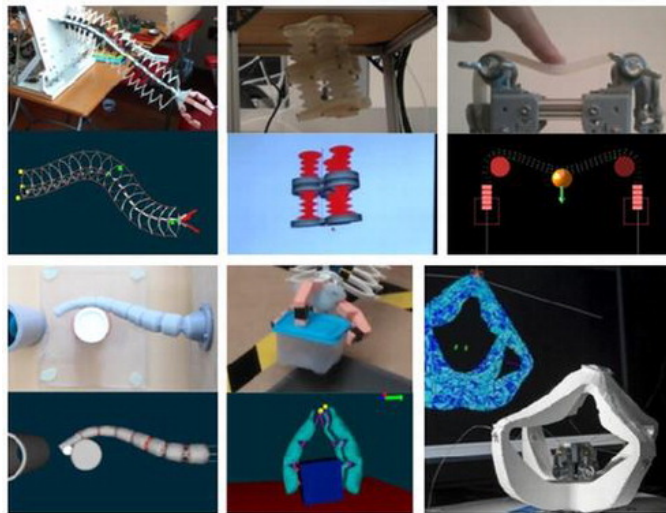

Figure 2. A unified software framework dedicated to modeling, simulation and control of soft robots [2].

5.1.2. Development of a New Open-Source Plugin for SOFA - Model Order Reduction

The plugin Model Order Reduction (MOR) was developed based on the work of the paper [11]. It allows to reduce a SOFA finite element model to gain simulation speed while keeping a good accuracy. It can be used in the SOFA community not only for robotics, but for any application where computational time is an issue, e.g. medical simulations. It is distributed under the GPL license and is available on github: https://github.com/SofaDefrost/ModelOrderReduction.

The plugin is a combination of C++ and Python Code. The user can define the reduction parameters using a python Script or a Graphical User Interface (GUI).

5.1.3. Echelon III: A compliant manipulator

We have participated to the grand challenge of RobotSoft conference that took place in Linorvo, Italy. We have build a robot dedicated to the manipulation competition and we got the 2nd place. A new version of the robot has been developed for the Inria Showroom, installed at Euratechnology in Lille. This version, equipped with a camera, demonstrates the ability of the robot to perform inspection tasks in a limited workspace. We plan to build a new version in 2019 to use it as a research platform, in particular to test planning and control algorithms.

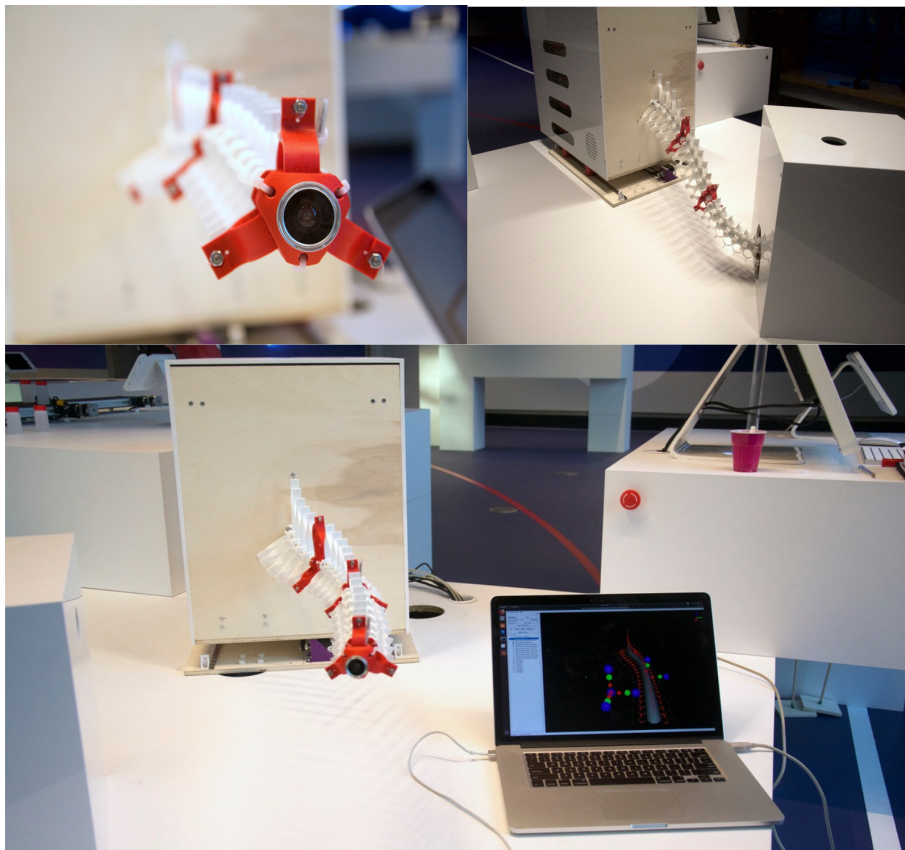*Figure 3. From a computationally intensive simulation to a surrogate version saving accuracy*

Figure 4. Echelon III in action

5.1.4. Collaboration with Allison Okamura's team at Stanford

This year we had a very close collaboration with the CHARM Lab directed by Allison Okamura at Stanford University. This collaboration resulted in two exchanges: A Stanford PhD student, Margaret Koehler came for 6 months from September 2017 to February 2018 in the team in Lille and Christian Duriez left 7 months of February to August 2018, (thanks to a Fulbright fellowship). We mainly investigated two projects: the haptic rendering on deformable interfaces (A publication in the RAL journal has just been accepted and will be published in 2019) and on the project "Vine Robot" (eversion locomotion). Our teams continue to work on these project. We have also applied to the "Equipe Associée" program.

BEST PAPERS AWARDS :

[2]

E. COEVOET, T. MORALES BIEZE, F. LARGILLIERE, Z. ZHANG, M. THIEFFRY, M. SANZ-LOPEZ, B. CARREZ, D. MARCHAL, O. GOURY, J. DEQUIDT, C. DURIEZ.*Software toolkit for modeling, simulation, and control of soft robots*, in "Advanced Robotics", 2017, https://doi.org/10.1080/01691864.2017.1395362

LINKS Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

Containment for RDF Schemas

The ShEx language for defining RDF schemas was proposed and developed earlier by the Links team in cooperation with the W3C. Slawek Staworko et al. now studied the containment problem for ShEx schemas for RDF documents. They showed at **PODS** [7] – the best database theory conference – that the problem is decidable, but `co-NEXP`-hard. This is joined work with P. Wieczorek from the University of Wrazlaw.

Foundations of AI: Knowledge Compilation

Florent Capelli et al. showed at **STACS** [15] – a top conferences in theoretical computer science – a new knowledge compilation procedure for quantified boolean formulas allowing to decide the satisfiability quantified boolean formulas with bounded tree width in polynomial time. This can be applied in particular to first-order database queries with quantifiers. This is joined work with S. Mengel from the CNRS in Lens.

Foundations of AI: Constrained Topologial Sort

Charles Paperman et al. showed at **ICALP** [8] – a top conferences in theoretical computer science – how to compute efficiently topological sorts of graphs under regular constraints. The problem was initially introduced in the context of preferential query answer for uncertain databases, where on usually wants to sort the query answers by some preferences, that are known only partially. It becomes then crucial to look for total orders on the answer set satisfying regular constraints that specify the preferences. Finding such an order for regular constraints was know to be infeasible in general. In this article, a class of regular constraints is identified for which this problem becomes tractable. A (partial) decidable dichotomy theorem is proven drawing the frontier between the kind of constraints which are feasible from those which are not. This is joined work with A. Amarilli from Telecom Paristech.

LOKI Team

5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. Personnel

Géry Casiez has been appointed junior member of the Institut Universitaire de France.

Géry Casiez has been appointed at the rank of Adjunct Professor by the University of Waterloo, Canada (2018-2020).

5.1.2. Publications

Loki presented 6 papers at ACM CHI and 1 paper at ACM UIST, the most prestigious conferences in our field.

5.1.3. Awards

"Honorable mention" (top 4% of the 2500+ submissions) from the ACM CHI conference to the paper "Storyboard-Based Empirical Modelling of Touch Interface Performance", from A. Goguey, G. Casiez, A. Cockburn, & C. Gutwin .

BEST PAPERS AWARDS :

[19]

A. GOGUEY, G. CASIEZ, A. COCKBURN, C. GUTWIN.*Storyboard-Based Empirical Modeling of Touch Interface Performance*, in "Adjunct Proceedings of the ACM Conference on Human Factors in Computing Systems (CHI 2018), Demonstration", Montreal, Canada, April 2018 [*DOI :* 10.1145/3170427.3186479], https://hal.inria.fr/hal-01736699

MAGNET Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

- Strengthening of the privacy aware machine learning activity with a new associate team with the Alan Turing Institute and the organization of a workshop at NeurIPS (formerly NIPS).
- New collaboration with Multispeech (Inria Nancy) on decentralized and private machine learning for speech processing leading to an ANR and an H2020 project.

5.1.1. Awards

AURÉLIEN BELLET received a best reviewer award (top 200 out of 3000) at the conference NeurIPS 2018. PASCAL DENIS received a Distinguished Senior Program Committee award at IJCAI-ECAI 2018.