Activity Report 2018

Section Highlights of the Team

ALMAnaCH Team (section vide)

ALPINES Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

Laura Grigori was awarded with E. Cances, Y. Maday, and J.-P. Piquemal an ERC Syngergy Grant for the Extreme-scale Mathematically-based Computational Chemistry project (EMC2), 2018. A description of the project can be found here.

ANGE Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

Human resources

A major event in the year was new positions of J. Sainte-Marie (Détachement at Inria, 2 years position) and of Y. Penel (Advanced Research Position, 3 years position). Two new students have started a PhD (Liudi Lu and Nelly Boulos Al Makary).

Evaluation of the team

This year, the team went through the first evaluation since its creation. The report was very positive, as this excerpt shows:

The activity of the team in modeling and mathematical and numerical analysis has lead to significant contributions in various areas. In particular, we mention the study of models that can reproduce specific 'dispersive effects,' observed in nature, or the review of several multi-physics models that incorporate the coupling of heterogeneous systems. The theoretical analysis of the models has often led to the proposal of new algorithmic developments and new numerical techniques and, in general, it has resulted in a significant advancement of scientific knowledge.

Scientific activities There has been major achievements within the team in the framework of dispersive models.

As detailed in Section 10.1 , members of the team were involved in the organisation of a substantial number of scientific events, either in the framework of national initiatives or due to the expertise in the field. Members are is particularly involved in the mathematical community.

5.1.1. Awards

- Léa Boittin received the award of the best presentation at GDR-EGRIN summer school in June,
- Léa Boittin was rewarded by Best Phd Student Poster Award, at CMWR XXII, Saint-Malo,
- Janelle Hammond received a post-doctoral grant from DIM Math Innov 2018.

ANTIQUE Project-Team (section vide)

AOSTE2 Team

5. Highlights of the Year

5.1. Highlights of the Year

This is the last activity report of the team AOSTE2 since it ends in 2018.

The ATT StatInf project, prepared by Liliana Cucu-Grosjean and Adriana Gogonel has been accepted in July 2018. The associated start-up creation has been selected for participation to the Digital Start-up program (jointly supported by EMLyon and Inria). The start-up will be created beginning of 2019 by Adriana Gogonel, Cristian Maxim and Liliana Cucu-Grosjean as founding members.

ARAMIS Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

- The team has been awarded a "Fondation pour la Recherche sur la maladie d'Alzheimer" research grant.

5.1.1. Awards

- Ninon Burgos received the Galileo Galilei Award 2017, best publication in the European Journal of Medical Physics - Physica Medica in 2017, for the paper 'Evaluation of a multi-atlas CT synthesis approach for MRI-only radiotherapy treatment planning'.
- S. Durrleman successfully defended his "habilitation à diriger des Recherches" from Sorbonne University
- F. De Vico Fallani received the Young Investigator award from Complex Systems Society (CSS)
- Stéphane Epelbaum was awarded the Joel Ménard prize from the "Fondation Alzheimer".

CAGE Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

Emmanuel Trélat has been invited speaker at the International Congress of Mathematicians (ICM2018) in Rio, Brazil, in the session "Control theory and optimization".

5.1.1. Awards

- The poster "Adaptive Stimulation Strategy for Selective Brain Oscillations Disruption in a Neuronal Population Model with Delays" by **Jakub Orlowski**, Antoine Chaillet, **Mario Sigalotti**, and Alain Destexhe, has received the CPHS 2018 Best Poster Prize at the 2nd IFAC Conference on Cyber-Physical & Human Systems.

CASCADE Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. Awards

- Melissa Rossi received a 2018 Google's WomenTechmakers Scholarship.

COML Team (section vide)

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

4. Highlights of the Year

4.1. Highlights of the Year

In 2018, the DELYS team published papers at major conferences in Systems, Distributed Systems, Theoretical Computer Science, Verification, and AI:

- Scheduling under Uncertainty: A Query-based Approach. L. Arantes, E. Bampis, A. Kononov, M. Letsios, G. Lucarelli, P. Sens. IJCAI, [19].

- Byzantine Gathering in Polynomial Time. S. Bouchard, Y. Dieudonné, A. Lamani. ICALP [22].

- The Battle of the Schedulers: FreeBSD ULE vs. Linux CFS. J. Bouron, S. Chevalley, B. Lepers, W. Zwaenepoel, R. Gouicem, J. Lawall, G. Muller, J. Sopena. ATC [24].

- Distributed transactional reads: the strong, the quick, the fresh & the impossible. A. Z. Tomsic, M. Bravo, M. Shapiro. Middleware [31].

- Co-design and verification of an available file system. M. Najafzadeh, M. Shapiro, P. Eugster. VMCAI [28].

DYOGENE Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

Publication of a monograph *Stochastic Geometry Analysis of Cellular Networks* by Cambridge University Press [30] that presents latest analytic techniques and results from stochastic geometry for modelling of heterogeneous cellular networks.

5.1.1. Awards

Our paper " Optimal Algorithms for Non-Smooth Distributed Optimization in Networks" by K. Scaman, F. Bach, S. Bubeck, Y.T. Lee and L. Massoulié won a best paper award at the NeurIPS 2018 conference.

EVA Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. Awards

- Finalist, best paper award at the Global IoT Summit 2018, for paper "Why Channel Hopping Makes Sense, even with IEEE 802.15.4 OFDM at 2.4 GHz".
- **Thomas Watteyne** identified as "Key Innovator" by the European Commission's Innovation Radar, category "commitment" for the innovation "Online platform of testing tools for the Internet of Things".

5.1.2. Transfer

- Creationg of the Wattson Element startup, which commercializes the Falco solution (https://wefalco.fr/).
- Publication of RFC8480

5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. Awards

In 2018, Xavier Leroy received the "Grand prix" jointly awarded by Inria and Académie des sciences.

Gergö Barany received the Best Paper Award for the paper "Finding Missed Compiler Optimizations by Differential Testing" [19] at the 27th International Conference on Compiler Construction (CC 2018).

GANG Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

WENDY: Workshop on Emergent Algorithms and Network Dynamics

GANG/Inria Paris was the institutional organizer of WENDY workshop at Institut Henri-Poincaré, Paris, October 10-11, 2018, https://wendy.paris (chair: Adrian Kosowski).

The goal of the project was to facilitate the exchange of ideas between researchers working on distributed computing theory, modeling random structures, and discrete dynamical systems.

The main theme of the workshop was programming local interaction dynamics on networks, so as to obtain the desired emergent effects on the system as a whole. Central topics included:

- Evolving graph models and dynamics on random graphs
- Bio-inspired computing and computing with biological agents
- Chemical reaction networks
- Markovian and non-Markovian processes on networks.

BDA: Workshop on Biological Distributed Algorithms

Amos Korman chaired the organizing committee and co-chaired the program committee of the 6th workshop on Biological Distributed Algorithms (BDA, http://www.snl.salk.edu/~navlakha/BDA2018/), co-located with ACM PODC in London on July 23rd, 2018.

BDA was focused on the relationships between distributed computing and distributed biological systems and in particular, on analysis and case studies that combine the two. Such research can lead to better understanding of the behavior of the biological systems while at the same time developing novel algorithms that can be used to solve basic distributed computing problems.

The workshop featured 6 invited talks and over a dozen accepted contributed submissions, with generous financial support offered to participants by Amos Korman's ERC grant.

MAMBA Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

We welcome a new team member, Nastassia Pouradier-Duteil, junior research scientist since September 2018.

We welcome Ayman Moussa in delegation since September 2018; he defended his habilitation thesis on December 13th.

Marie Doumic finished her two-year sabbatical stay in September 2018.

Jean Clairambault is emeritus DR since March 2018.

5.1.1. *Awards*

In December 5, 2017, Benoit Perthame has been elected at the Académie des Sciences, and was received in the Académie on May 28, 2018.

Christian Schmeiser, associate member of Mamba through the associated team MaMoCeMa with the university of Vienna, being the laureate of the "chaire d'excellence" of the FSMP, is for six months in Paris (september 2018 to february 2019).

MATHERIALS Project-Team

4. Highlights of the Year

4.1. Highlights of the Year

4.1.1. Awards

Claude Le Bris was selected to deliver the Coxeter lectures at the Fields Institute in Toronto and the Aziz lectures at the University of Maryland.

Florent Hédin received the "Best student/postdoc oral presentation" award at the 7th Workshop on Parallel-in-Time methods, Roscoff, France, May.

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

5. Highlights of the Year

5.1. Highlights of the Year

The project team Mathrisk has been evaluated in March. The report was very positive.

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

5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. Awards

- Renata Teixeira was named ACM Distinguished member for outstanding scientific contributions to computing in 2018.

- Our paper "Narrowing the gap between QoS metrics and Web QoE using Above-the-fold metrics" received the Best Dataset Award at the Passive and Active Measurement Conference 2018.

BEST PAPERS AWARDS :

[27]

R. GOMES, G. BOULOUKAKIS, F. COSTA, N. GEORGANTAS, R. DA ROCHA.*QoS-Aware Resource Allocation for Mobile IoT Pub/Sub Systems*, in "2018 International Conference on Internet of Things (ICIOT)", Seattle, United States, June 2018, https://hal.inria.fr/hal-01797933

MOKAPLAN Project-Team

4. Highlights of the Year

4.1. Highlights of the Year

4.1.1. Awards

G. Carlier was a John von Neumann invited Professor at TUM (Munich) in 2018.

OURAGAN Team

5. Highlights of the Year

5.1. Highlights of the Year

- In [24], Antonin Guilloux and Julien Marché propose a closed formula for the Mahler measure of a class of bivariate polynomials with rational coefficients (exact polynomials). This class of polynomials contains A-polynomials of knot complements and the authors express the Mahler Measure of a volume function defined on the vanishing set of the polynomial.

  As computing Mahler measures is a well known challenge in number theory and as computing volumes of knots complements is a critical objective for our research on character varieties, this result make an original bridge between our two main research directions.

- A key encapsulation message named Mersenne-756839 has been submitted at the NIST call for standard on Post-Quantum Cryptography. This submission is a complement to the article [13] presented in three invited lectures by Antoine Joux (JFLI (UMI CNRS) / Tokyo university , Nanyang Technological University, LATtice Crypto and Algorithms conference).

- Our agreement with WATERLOO MAPLE INC. has been reviewed for a two years term in 2018. Out next objective is the diffusion of our new solver for univariate polynomials with real coefficients.

PARKAS Project-Team

4. Highlights of the Year

4.1. Highlights of the Year

Guillaume Baudart was awarded the **ACM SIGBED Paul Caspi Memorial Dissertation Award** for his thesis "A Synchronous Approach to Quasi-Periodic Systems" [27] prepared in the PARKAS Team under the supervision of Marc Pouzet and Timothy Bourke and defended in 2017.

4. Highlights of the Year

4.1. Highlights of the Year

4.1.1. Awards

Matthieu Sozeau received a Distinguished Paper award at ICFP 2018 for his work on "Equivalences for Free!"[36], together with co-authors Nicolas Tabareau and Eric Tanter.

Amina Doumane received in January 2018 the best paper award given by *La Recherche* for her paper in LICS 2017 entitled *Constructive Completeness for the Linear-Time mu-Calculus* for which she already received the Kleene Award from the LICS conference in 2017.

Amina Doumane received the Ackermann Award from the EACSL committee. As a result, she was invited to give a lecture at CSL 2018.

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

4. Highlights of the Year

4.1. Highlights of the Year

Jean-Charles Faugère and Ludovic Perret received the Atos-Joseph Fourier 2018 prize [0] for their project on Quantum Safe Security.

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[0] https://atos.net/fr/2018/communiques-de-presse_2018_07_06/atos-et-genci-annoncent-les-laureats-du-prix-atos-joseph-fourier-2018

PROSECCO Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

- We published 20 papers at top-tier conferences and journals such as POPL (5), ICFP (2), PLDI (1), OOPSLA (1), ACM CCS (1), IEEE S&P (1), IEEE CSF (1), TOPLAS (1), and JCS (1).
- The HACL* verified cryptographic library developed in our group was integrated by Linux (Wire-Guard) and Tezos, and more verified crypto primitives were integrated in Mozilla Firefox.
- We organized a Dagstuhl Seminar on Secure Compilation (18201)
- Catalin Hritcu served as Program Chair for the Workshop on Principles of Secure Compilation at POPL'18

QUANTIC Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

- Pierre Rouchon was the main organizer of the spring thematic quarter at Institut Henri Poincaré entitled "Measurement and control of quantum systems: theory and experiments" (16 April – 13 July 2018). This thematic quarter included courses, lectures and conferences. In particular, a research school of one week at CIRM, two 3-day workshops in May and June and the 2018 issue of PRACQSYS conference in July were organized throughout the quarter. This thematic quarter involved several hundred of participants. See IHP web page (http://www.ihp.fr/en/CEB/T2-2018), CIRM web page (https://conferences.cirm-math.fr/1732.html) and the specific quarter web site (https://sites.google.com/view/mcqs2018/home).

- QUANTIC has received a sub-award from Yale university for pursuing the collaborations of Mazyar Mirrahimi and his students/postdocs. In the framework of a new ARO (Army Research Office) grant received by our collaborators at Yale, QUANTIC receives 500k dollars over 4 years to fund the hiring of PhD students/ postdocs working on the collaborative subjects with Yale and also to cover the travels between Inria and Yale.

- Alain Sarlette has received a JCJC ANR grant entitled HAMROQS "High-accuracy model reduction for open quantum systems". This grant of 212k euros over 4 years will fund the activities of Alain Sarlette and his students/postdocs on systematic methods for quantum systems model reduction.

- PhD students of Alain Sarlette, Arash Farnam and Simon Apers, defended their PhD at his previous institution (Ghent university, Belgium).

- Mazyar Mirrahimi was an invited speaker at the American Physical Society March Meeting in Los Angeles.

- Mazyar Mirrahimi was a semi-plenary speaker at MTNS in Hong Kong (Mathematical Theory of Networks and Systems).

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

5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. Awards

Chloé Audebert was awarded the AMIES PhD prize 2018 for her PhD thesis under the supervision of J.-F. Gerbeau and I. Vignon Clementel, in the framework of a collaboration with the SME company Fluoptics and with clinicians from Hôpital Paul Brousse (E. Vibert PUPH, Inserm 1193).

5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. *Awards*

Mohammad Abualhoul, with the paper , won the Runner-up Best Paper Award at ICVES 2018 (2018 IEEE International Conference on Vehicular Electronics and Safety, September 12-14, Madrid, Spain).
BEST PAPERS AWARDS :
[17]
M. ABUALHOUL, E. TALAVERA MUNOZ, F. NASHASHIBI.*The Use of Lane-Centering to Ensure the Visible Light Communication Connectivity for a Platoon of Autonomous Vehicles*, in "ICVES'2018 - 20th IEEE International Conference on Vehicular Electronics and Safety", Madrid, Spain, September 2018, https://hal.inria.fr/hal-01888549

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

5. Highlights of the Year

5.1. Highlights of the Year

- **Keynote at Eurocrypt:** A. Canteaut bas been an invited keynote speaker at Eurocrypt 2018 in Tel-Aviv.

- **Cryptanalysis of candidates to the NIST post-quantum competition:** The members of the project-team are involved in the design of several attacks against submissions to the NIST standardization effort for post-quantum cryptography. This work has led to the break of `EDON-K` key encapsulation mechanism, of `RLCE` encryption scheme, of `RankSign`, and of a recently proposed IBE scheme.

- **Quantum fault-tolerance with constant overhead:** In a couple of papers published at STOC 2018 and FOCS 2018, A. Grospellier and A. Leverrier together with O. Fawzi (from ENS Lyon) proved that quantum expander codes can be combined with quantum fault-tolerance techniques to achieve constant overhead: the ratio between the total number of physical qubits required for a quantum computation with faulty hardware and the number of logical qubits involved in the ideal computation is asymptotically constant, and can even be taken arbitrarily close to 1 in the limit of small physical error rate. This improves on the polylogarithmic overhead promised by the celebrated threshold theorem.

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

5. Highlights of the Year

5.1. Highlights of the Year

Alexandre Ern co-edited with Daniele Di Pietro (Montpellier) and Luca Formaggia (Milano) a book on Numerical Methods for PDEs, SEMA SIMAI Springer Series, Vol. 15, Springer, 2018. ISBN 978-3-319-94675-7.

Many new results of the ERC GATIPOR project in the ERC GATIPOR Gallery.

<p align="center" style="color:red">SIERRA Project-Team</p>

5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. Awards

Francis Bach, Lagrange Prize in Continuous Optimization, Society for Industrial and Applied Mathematics 2018

Francis Bach, Best Paper Award, NeurIPS 2018.

Francis Bach included in the report *Highly cited researchers, year 2018*, Clarivate Analytics, 2018

Nicolas Flammarion, PhD thesis award in the *Programme Gaspard Monge*, Fondation Mathématique Jacques Hadamard, 2018.

Adrien Taylor, Tucker Prize (finalist) 2018 (dissertation prize by the Math- ematical Optimization Society for 2015-2017).

Adrien Taylor, IBM/FNRS innovation award 2018 (dissertation prize for original contributions to informatics).

Adrien Taylor, Icteam thesis award 2018 (dissertation award by the icteam institute of UCLouvain, Belgium).

Adrien Taylor, Best paper award 2018 from the journal Optimization Letters for the paper *On the worst-case complexity of the gradient method with exact line search for smooth strongly convex functions*, Etienne De Klerk, François Glineur, Adrien Taylor. journal=.

VALDA Project-Team (section vide)

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

5. Highlights of the Year

5.1. Highlights of the Year

The Whisper team published three papers at USENIX ATC, one of the major conferences of our domain:

- Coccinelle: 10 Years of Automated Evolution in the Linux Kernel. J. Lawall and G.Muller. [14]
- DSAC: Effective Static Analysis of Sleep-in-Atomic-Context Bugs in Kernel Modules. J.-J. Bai, Y.-P. Wang, J. Lawall, S.-M. Hu. [12]
- The Battle of the Schedulers: FreeBSD ULE vs. Linux CFS. J. Bouron, S. Chevalley, B. Lepers, W. Zwaenepoel, R. Gouicem, J. Lawall, G. Muller, J. Sopena. [13]

Gilles Muller was co-PC chair of DSN 2018, the premier venue for dependable systems.

Julia Lawall was co-PC chair of the ASE 2018 Tool Demo track, in preparation for being the co-PC chair of the main ASE research paper track in 2019.

5.1.1. Awards

The original work on Coccinelle "Documenting and automating collateral evolutions in Linux device drivers" [8] received an ACM EuroSys Test-of-Time award, recognizing it as the paper from EuroSys 2008 that is having the most lasting and current impact (http://eurosys2018.org/awards/).

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

5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. Prizes and Awards

Antoine Miech, winner of a 2018 Google Fellowship.

5.1.2. Visibility

- J. Ponce co-organized the PRAIRIE AI Summer School, Grenoble, 2018, which brought together 200 participants representing 44 different nationalities, and selected from 700 applications, with 60% students, 15% academics , and 25% industrials. 25% of these participants were women.

- I. Laptev served as Program Chair for the IEEE Conference on Computer Vision and Pattern Recognition, Salt Lake City, USA, 2018. CVPR is the largest computer vision conference. The 2018 edition has 3,309 paper submissions, 979 accepted papers and 6,128 registered attendees.

- J. Ponce has been a key person in creating the PRAIRIE Institute for AI research in Paris, announced on the occasion of the AI for Humanity summit organized by President Emmanuel Macron in 2018 (https://www.inria.fr/en/news/news-from-inria/launch-of-the-prairie-institute). He has also been a key player in bringing together its industrial and international partners.