



RESEARCH CENTER
Nancy - Grand Est

FIELD

Activity Report 2018

Section Highlights of the Team

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CAMUS Team

5. Highlights of the Year

5.1. Highlights of the Year

Bérenger Bramas, Inria Research Scientist, has joined the team in September 2018.
Matthew Wahab, Inria Research Engineer, has joined the team in August 2018.

CARAMBA Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

- Several Invited talks: Pierrick Gaudry was an invited speaker at the ECC 2018 workshop (Osaka, Japan); Emmanuel Thomé was an invited speaker at the ANTS-XIII conference in Madison, WI, USA (The biennial ANTS conference is the main international conference on algorithmic number theory); Paul Zimmermann was an invited speaker at the 75th anniversary celebration of the journal *Mathematics of Computation* (Providence, RI, USA).
- Cécile Pierrot was awarded the DGA (Direction Générale de l'Armement) Prize from Florence Parly, the Minister of the Armed Forces, for her PhD Thesis.

BEST PAPER AWARD :

[11]

M. SCOTT, A. GUILLEVIC. *A New Family of Pairing-Friendly elliptic curves*, in "International Workshop on the Arithmetic of Finite Fields - WAIFI", Bergen, Norway, L. BUDAGHYAN, F. RODRIGUEZ-HENRIQUEZ (editors), June 2018, <https://hal.inria.fr/hal-01875361>

GAMBLE Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

Given a set of possibly intersecting polygons in 3D, we presented a breakthrough result on the problem of computing a set of interior-disjoint triangles whose geometry is close to that of the input and such that the output vertices have coordinates of fixed precision, typically integers or floating-point numbers of bounded precision (eg. int, float, double). This problem is important in academic and industrial contexts because many 3D digital models contain self intersections and many applications require models without self intersections. Despite the theoretical and practical relevance of this problem, there was almost no literature on the subject and we presented its first satisfactory solution [12].

MOCQUA Team

5. Highlights of the Year

5.1. Highlights of the Year

Completeness of the ZX-Calculus

We have proved this year the completeness of the ZX-calculus. The completeness of the ZX-calculus was the main open question in the field of categorical quantum mechanics and was open for about 10 years. This results has been published at LiCS'18 [17], [16] and also presented at TQC'18 and QIP'19, the main two conferences in quantum information processing.

PESTO Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

Analysis of the 5G Standard

The work on the security analysis of the upcoming 5G mobile phone standard presented at CCS'18 [13] was acknowledged in the GSMA “Mobile Security Research Hall of Fame” and picked up by media in France, Switzerland and the UK (Daily Mail, 20 Minutes, Est Républicain, Tagesanzeiger, CNRS Le Journal, etc.).

5.1.1. Awards

BEST PAPERS AWARDS :

[18]

V. CHEVAL, S. KREMER, I. RAKOTONIRINA. *DEEPSEC: Deciding Equivalence Properties in Security Protocols - Theory and Practice*, in "39th IEEE Symposium on Security and Privacy", San Francisco, United States, May 2018, <https://hal.inria.fr/hal-01763122>

VERIDIS Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

Marie Duflot-Kremer received the Serge Hocquenghem prize awarded biannually by *Association pour l'Innovation Didactique* for her contributions to the popularization of computer science and in particular her work on developing and promoting unplugged computer science activities.

Thomas Sturm was a plenary invited speaker at ISSAC 2018, the leading conference in Symbolic Computation.

SPHINX Project-Team

4. Highlights of the Year

4.1. Highlights of the Year

4.1.1. Recruitments

Ludovick Gagnon has been recruited as a junior researcher (Chargé de recherche) in the team (from September 2018).

TOSCA Project-Team (section vide)

BIGS Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

- BIGS organised the annual meeting of the European Network of Business and Industrial Statistics (ENBIS), 150 participants, 3 days of conference (3-5 september) plus 3 tutorials.
- Romain Azaïs and Florian Bouguet edited a book “Statistical Inference for Piecewise-deterministic Markov Processes” [33]. The idea for this book stemmed from a workshop organized in Nancy in the 2016-17 winter. Two chapters [48] [31] have been co-authored by one or more BIGS members.
- T. Bastogne created of a new start-up specialized on the automatic analysis of cardiac signals from cells up to patients.

CAPSID Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

Isaure Chauvot de Beauchêne has obtained H2020 funding for two international PhD students under the MSCA-ITN programme. The project will study protein/RNA interactions, and will start on 01/01/2019.

MIMESIS Team

5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. Awards

Stéphane Cotin received the Inria – French Académie des Sciences – Dassault Systèmes Innovation Award. The committee underlined the professional experience of Stéphane Cotin at the cutting edge of research into numerical simulation. "*Stéphane Cotin is leading the MIMESIS team, working in close collaboration with IHU Strasbourg since its creation in 2014. Besides the development of SOFA, the team is mainly dedicated to real-time simulation in operating theaters. Its flagship projects include the development of 3D models that are to be projected on the livers of patients having a tumour removed, or the development of highly realistic virtual images that would improve interventional radiology techniques by limiting exposure to X-rays.*"

Andrea Mendizabal received the Student Travel Award at MICCAI 2018 Granada. Spotlight presentation on the paper *A Combined Simulation & Machine Learning Approach for Image-based Force Classification during Robotized Intravitreal Injections*.

Fanny Morin and Yinoussa Adagolodjo received their PhD with awards respectively in October 2017 and September 2018.

NEUROSYS Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. Awards

BEST POSTER AWARD

Amélie Aussel, Laure Burhy and colleagues obtained the Best student poster award at the 27th Annual Computational Neuroscience Meeting CNS*2018 (Seattle, US) [7].

FEATURED ARTICLE

The journal article by L. Bougrain and colleagues, *A review of classification algorithms for EEG-based brain–computer interfaces: a 10 year update*, has been identified as a Featured article i.e. a recent article of high-interest across the entire IOP content (containing more than 70 science journal titles including *Journal of Neural Engineering*) [4].

TONUS Team

5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. Boundary conditions for kinetic relaxation methods

We have provided a new rigorous analysis for the stability of boundary conditions in kinetic relaxation methods. This analysis allows us to design stable and high order boundary conditions for this kind of schemes. This will lead to many practical applications in the future years.

5.1.2. Electromagnetic simulation on large computer

Bruno Weber has been able to run the CLAC software, jointly developed with the AxesSim company, for simulating a Bluetooth antenna interaction with a full human body. The computations were done on the supercomputer PizDaint, which is 5th at the "Top 500" ranking.

Coast Project-Team

4. Highlights of the Year

4.1. Highlights of the Year

In 2018 we organised in Nancy the 16th European Conference on Computer-Supported Cooperative Work: The International venue on Practice-centred computing and the Design of cooperation technologies (ECSCW 2018).

RESIST Team

5. Highlights of the Year

5.1. Highlights of the Year

- Raouf Boutaba gave his inaugural conference as Inria Internationale Chair and Professor@Lorraine about *Convergence of telecommunications and information technologies: towards programmable, intelligent and resilient networks*.
- The team (Jérôme François and Isabelle Chrisment) organized the RESSI'18 (Rendez-vous de la Recherche et de l'Enseignement de la Sécurité des Systèmes d'Information).

ALICE Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

In February 2018, Sylvain Lefebvre created the MFX team (Matter from Graphics). The new team will focus on synthesizing and designing complex shapes for additive manufacturing.

5.1.1. Awards

Jérémie Dumas, who was advised by Sylvain Lefebvre within the ALICE team, received the 2018 PhD prize from IG-RV <https://prixigrv2018.sciencesconf.org/>.

LARSEN Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

BEST PAPER AWARD :

[17]

A. GAIER, A. ASTEROTH, J.-B. MOURET. *Data-efficient Neuroevolution with Kernel-Based Surrogate Models*, in "GECCO 2018 - Genetic and Evolutionary Computation Conference", Kyoto, Japan, July 2018, <https://arxiv.org/abs/1804.05364> [DOI : 10.1145/3205455.3205510], <https://hal.inria.fr/hal-01768248>

MAGRIT Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

Vanishing point detection is an old problem of computer vision. We introduced this year a new method based on the a contrario methodology to solve this problem. By fractioning the 2-D search of meaningful vanishing points into three 1-D searches of meaningful events (Zenith line, Horizon line, and Vanishing points), we not only achieve state-of-the-art performance w.r.t. computation times and accuracy of the horizon line, but also yields more relevant vanishing points than the previous top-ranked methods. This work was presented at ECCV 2018 [23] and the associated code is freely distributed.

MFX Team

5. Highlights of the Year

5.1. Highlights of the Year

Academic Life

We had 3 publications in the top journal in our field, ACM Transactions on Graphics, including 2 from the proceedings of the ACM SIGGRAPH conference [11], [12], [13].

Cédric Zanni has been awarded an ANR JCJC 2018 project entitled IMPRIMA (Implicit modeling for additive manufacturing). IMPRIMA aims at exploring representations for the modeling, visualization and processing of both geometry and control fields for material properties within the authoring pipeline for additive manufacturing. The project will effectively start in March 2019.

Sylvain Lefebvre co-organized the first multidisciplinary workshop on academic research in additive manufacturing within the Lorraine area, which hosted 70 participants over two days. The two days workshop started on May 31, 2018 at Inria-Nancy Grand Est and was co-organized with Sandrine Hoppe (LRGP), Samuel Kenzari (IJL) and Hakim Boudaoud (ERPI). See <https://www.inria.fr/centre/nancy/agenda/workshop-fa>.

Creativ'Lab



Figure 1. The new MFX space within the Creativ'Lab.

The newly created experimental space for the MFX team was finished in September 2018. We are gradually moving our equipment. We worked to maximize usability and create a logical layout, organized in several spaces: one for powder devices, one for resin machines and another for filament 3D printers.

This new lab will greatly improve our capability to experiment, produce and test results.

5.1.1. Awards

Jérémie Dumas, who was advised by Sylvain Lefebvre and defended in February 2017, received the 2018 PhD prize from IG-RV (<https://prixigrv2018.sciencesconf.org/>).

MULTISPEECH Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

E. Vincent has co-edited a 500-page book on audio source separation and speech enhancement, which provides a unifying view of various established and recent methods [64].

5.1.1. Awards

2018 ISCA Award for the best paper published in *Computer Speech and Language* (2013–2017) [1].

Best paper award of MISSI 2018 (11th International Conference on Multimedia and Network Information Systems) [44].

BEST PAPERS AWARDS :

[1]

J. BARKER, E. VINCENT, N. MA, H. CHRISTENSEN, P. GREEN. *The PASCAL CHiME Speech Separation and Recognition Challenge*, in "Computer Speech and Language", February 2013, vol. 27, n^o 3, p. 621-633 [DOI : 10.1016/J.CSL.2012.10.004], <https://hal.inria.fr/hal-00743529>

[44]

K. SMAÏLI, D. FOHR, C. GONZÁLEZ-GALLARDO, M. GREGA, L. JANOWSKI, D. JOUVET, A. KOMOROWSKI, A. KOZBIAL, D. LANGLOIS, M. LESZCZUK, O. MELLA, M. A. MENACER, A. MENDEZ, E. LINHARES PONTES, E. SANJUAN, D. SWIST, J.-M. TORRES-MORENO, B. GARCIA-ZAPIRAIN. *A First Summarization System of a Video in a Target Language*, in "MISSI 2018 - 11th edition of the International Conference on Multimedia and Network Information Systems", Wrocław, Poland, September 2018, p. 1-12, <https://hal.archives-ouvertes.fr/hal-01819720>

ORPAILLEUR Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

This year we would like to mention two publications as highlights of the year.

- The first highlight is related to the Snowball Inria Associated Team supervised by Adrien Coulet (see § 8.4.1). The participants to Snowball have obtained very good results in AI and Medicine which have been recently published in the selective journal “Scientific Reports” [4]. In addition, the same participants have obtained a “Grant Seed” funded by Stanford University, to pursue their research efforts in building fair and equitable predictive models for medicine (see <http://medicine.stanford.edu/news/current-news/standard-news/presenceannouncesseedgrantawardees.html>).
- The second highlight is related to the stay of Chedy Raïssi at NASA lab in 2018 (see § 8.4.3.1). Chedy Raïssi worked with some other researchers on a machine-learning model for classifying signals from local and global views of the light curves. The researchers had the idea of associating expert domain knowledge with the model and they were able to obtain very good results unseen until now (see <https://aasnova.org/2018/12/07/using-machine-learning-to-find-planets/?fbclid=IwAR0UI9LcjISYKh8JNDiJzztwK00UqxkhtzdTGod20U10JLKO4vm6sPPU990>). A publication on this work was accepted and published [2].

SEMAGRAMME Project-Team (section vide)