

Inria

RESEARCH CENTER

FIELD

Digital Health, Biology and Earth

Activity Report 2019

Section Highlights of the Team

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ABS Project-Team (section vide)

BEAGLE Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

Last year our highlights were focused on remarkable publications. This year the main events are on organizations and grants applications.

- We have been in charge of organizing the Scientific Days of Inria in July 2019 <https://project.inria.fr/journeesscientifiques2019/>
- We were awarded two exploratory actions by Inria in 2019, one on high performance computing, the other in agro-ecology
- We were auditioned for an ERC synergy grant call (very last step in the many steps for the grant obtention)
- We organized MMEE <https://mmee2019lyon.sciencesconf.org/> in Lyon

BIGS Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. Awards

BIGS participated to the organization the JdS 2019 (Journées de Statistique 2019) <http://www.jds2019.sfds.asso.fr/> in Nancy.

B. Scherrer and his co-authors received the Outstanding paper award for AAAI-2019“ from the AAAI (Association for the Advancement of Artificial Intelligence).

BEST PAPERS AWARDS :

[9]

Y. EFRONI, G. DALAL, B. SCHERRER, S. MANNOR. *How to Combine Tree-Search Methods in Reinforcement Learning*, in "AAAI 19 - Thirty-Third AAAI Conference on Artificial Intelligence", Honolulu, Hawaii, United States, January 2019, <https://arxiv.org/abs/1809.01843> - AAAI 2019, <https://hal.inria.fr/hal-02273713>

CAPSID Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

Malika Smaïl-Tabbone was invited with Bastien Rance to coordinate the selection of the best contributions from 2018 literature on Bioinformatics and Translational Informatics for the 2019 IMIA YearBook of Medical Informatics [20].

Bishnu Sarker (PhD student) obtained a DrEAM fellowship from Lorraine Université d'Excellence for a 3-month internship at the MILA (Machine Learning Laboratory of the University of Montreal and University of Quebec) in Montreal.

DYLISS Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

The AuReMe software for metabolic network reconstruction has been selected for the Service Delivery Plan of the French Institute of Bioinformatics (IFB).

5.1.1. Awards

Lucas Bourneuf is the World champion of man vs. machine challenge of the Angry Birds AI competition (during IJCAI) where humans can challenge the four best AI agents. Note that Lucas was the human, not the AI and that there is no direct connection with his PhD project. World champion nonetheless!

Nicolas Guillaudeau (with Grégoire Siekaniec from the GenScale team) won the public's prize at the short scientific film festival "Sciences en cour[t]s" for their movie about Nicolas's PhD thesis.

ERABLE Project-Team (section vide)

GENSCALE Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. Awards

The Gilles Kahn *accessits* prize was awarded to Camille Marchet for her PhD thesis: *From reads to transcripts: de novo methods for the analysis of transcriptome second and third generation sequencing* [8]. This thesis was prepared in the GenScale team under the supervision of P. Peterlongo.

The Gilles Kahn prize is awarded each year by the SIF, the French Society of Computer Science, for an excellent PhD thesis in the field of computer science.

The thesis of Camille dealt with the processing of transcriptome sequencing data. More precisely, the question was how to take advantage of the characteristics of the data produced by third generation sequencing technologies, as they produce large sequences covering the total length of RNA molecules. The core work of this thesis consisted in the methodological development and implementation of new algorithms allowing the clustering of third generation sequences by gene, then their correction and finally the detection of the different isoforms of each gene.

IBIS Project-Team

4. Highlights of the Year

4.1. Highlights of the Year

A publication on the use of mixed-effects models for the analysis of the inheritance and variability of gene expression parameters along lineage trees was published in a special issue of *Bioinformatics* and presented at the major bioinformatics conference ISMB/ECCB 2020. A publication in *BMC Bioinformatics* accompanied the release of the new version of the web application WELLINVERTER for the analysis of fluorescent reporter gene data. IBIS member Michel Page launched his start-up ProLeads (<https://proleads.fr/>), a specialized business search engine.

LIFEWARE Project-Team

5. Highlights of the Year

5.1. Highlights of the Year



Figure 1. La Recherche magazine award 2019 ceremony.

- **Creation of a new team at Inria Paris**

At the end of 2019, the Lifeware team gave birth to a new Inria team, called InBio and affiliated to the Inria Paris research centre. So far, InBio was a Pasteur research unit that was hosting a fraction of the members of the Lifeware team on the campus of Institut Pasteur. So in 2020, InBio becomes a new Common Project-Team between Inria Paris and Pasteur Institute. This demonstrates that Inria is actively supporting research in the computational systems biology field.

- **Launching of Inria Exploratory Action GRAM on chemical programming of artificial vesicles**

Chemical reaction networks are a computation paradigm used by natural cells to process information, take decisions and control their vital processes. The synthesis of artificial vesicles without DNA nor RNA but containing precise quantities of enzymes allows us today to implement high-level functions in proto-cells with numerous potential applications in health and the environment. Based on previous work of the Lifeware project-team on chemical analog computation theory and programming, of the CNRS-Alcediag Sys2diag laboratory on the synthesis of biosensors in artificial vesicles, and on the expertise of the Roscoff Biological Station on membrane transporters, we explore an original approach to analog chemical circuit design applied to the programming of high-level functions in chemical analog computers.

5.1.1. Awards

- **Award Ceremony - La Recherche magazine 2019 - Information Sciences**

The ceremony for awards La Recherche magazine 2019 at University Paris-Dauphine was a great occasion to present our article “Strong Turing Completeness of Continuous Chemical Reaction Networks and Compilation of Mixed Analog-Digital Programs” by F. Fages, G. Le Guludec, O. Bournez and A. Pouly, Best Paper award at CMSB 2017, recipient of La Recherche magazine 2019 Award - Information Sciences.

MORPHEME Project-Team

4. Highlights of the Year

4.1. Highlights of the Year

Luca Calatroni get a CNRS position as scientist and joined the team in october 2019.

MOSAIC Project-Team

4. Highlights of the Year

4.1. Highlights of the Year

- MOSAIC has been promoted to Inria project-team in July 2019.
- In collaboration with CNRS (LIRMM and CRBM units in Montpellier), the team published a new web browser-based computational tool, Morphonet, to interactively explore complex 3D+time biological structures in silico, [8].

PLEIADE Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. Genomic determinants:

The study [7] appearing in *BMC Genomics* resolves a longstanding enigma in winemaking. While the fact of resistant strains of wine yeasts has been known for many years, the actual mechanism underlying the phenomena have only now been elucidated by a combined genetic and bioinformatic analysis.

5.1.2. INRAE-Inria PhD:

PLEIADE was succesful in applying for a PhD in 2019 INRA-Inria call for PhD. The submitted topic is: "Statistical Learning for OTU identification and Biodiversty characterizaton." This PhD is a collaboration between PLEIADE (INRAE-Inria, supervision), HiePACS (Inria) and MIAT Toulouse (INRAE).

SERPICO Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

- The SERPICO team organized the 7th International Conference on “Quantitative BioImaging” (QBI, <https://www.quantitativebioimaging.com/qbi2019/>) in January 2019 (350 attendees) in Rennes. The Quantitative BioImaging conference encourages scientific communication between researchers with interest in quantitative imaging in biological and biomedical sciences. A particular emphasis is to promote interdisciplinary interactions between physicists, computer scientists, chemists, mathematicians, and biologists.
- Emmanuel Moebel and Sandeep Manandhar defended their PhD theses in 2019.
- The DeepFinder algorithm was ranked first at the international SHREC’19 Challenge: "classification in cryo-electron tomograms" (Eurographics Workshop on 3D Object Retrieval – SHREC - 3D Shape Retrieval Contest (2019), Genova, Italy).

ARAMIS Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

- F. De Vico Fallani was awarded an ERC Consolidator Grant.
- N. Burgos was awarded a Chair at the Paris Artificial Intelligence Research Institute (PRAIRIE).
- O. Colliot was awarded a Chair at the Paris Artificial Intelligence Research Institute (PRAIRIE).
- S. Durrleman was awarded a Chair at the Paris Artificial Intelligence Research Institute (PRAIRIE).
- S. Epelbaum holds a "Poste d'accueil" Inria since november 2019.

5.1.1. Awards

- N. Burgos received the Cor Baayen Young Researcher Award from ERCIM.
- V. Debavelaere was awarded a best paper award at the MICCAI conference in Shenzhen .

BEST PAPERS AWARDS :

[32]

V. DEBAVELAERE, A. BÔNE, S. DURRLEMAN, S. ALLASSONNIÈRE. *Clustering of longitudinal shape data sets using mixture of separate or branching trajectories*, in "Medical Image Computing and Computer Assisted Intervention – MICCAI", Shenzhen, China, Medical Image Computing and Computer Assisted Intervention – MICCAI 2019, October 2019, p. 66-74, <https://hal.archives-ouvertes.fr/hal-02103355>

ATHENA Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

Maureen Clerc left the group and took up her new position as new Director and Head of the Inria Sophia Antipolis - Méditerranée research centre on 8 November 2019.

5.1.1. Awards

The European Association for Signal Processing (EURASIP) elevated on Sept. 2019 Rachid DERICHE to EURASIP FELLOW, the Association's most prestigious honour in recognition of outstanding achievements in the broad field of Signal Processing and in particular in Computational Brain Imaging.

November 22nd 2019, Université Côte d'Azur officially launched its new Institute of artificial intelligence *3IA Côte d'Azur*. Rachid Deriche and Maureen Clerc are among the 27 awarded 3IA chairs.

BIOVISION Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

In November 2019, the Biovision project team recruited Dr. Aurelie Calabrèse as a “Starting Research Position” for a 3-year period. A. Calabrèse is a psychophysicist specialized in visual neuroscience with a strong clinical expertise. She has done extensive work on enhancing further the methods to detect and measure reading deficit in low-vision populations. She has extensive practice in experimenting with visually impaired individuals and will be a great asset to bridge the gap between development and validation of assistive technology solutions.

CAMIN Project-Team

4. Highlights of the Year

4.1. Highlights of the Year

4.1.1. Awards

Student Paper prize: X. Lu, D. Guiraud, S. Renaux, T. Similowski, C. Azevedo-Coste, "Monitoring phrenic nerve stimulation-induced breathing via tracheal sounds", the 58th International Spinal Cord Society Annual Scientific Meeting (ISCoS), Nice, France, 2019

Student Paper competition Finalist: L. Fonseca, A. Bo, D. Guiraud, B. Navarro, A. Gelis and C. Azevedo-Coste, "Investigating Upper Limb Movement Classification on Users with Tetraplegia as a Possible Neuro-prosthesis Interface," 2018 40th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC), Honolulu, USA, 2018, pp. 5053-5056.

EMPENN Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. *New NIRS system at the Neurinfo platform*

An MRI and EEG-compatible functional near-infrared spectroscopy (fNIRS) system was installed at the Neurinfo platform in September 2019.

5.1.2. *Sciences en Cour[t]s*

This event is a festival of short films, which offers doctoral students the opportunity to make short films about their thesis work. Raphael Truffet, Antoine Legouhy and Xavier Rolland won the high school award in science en Cour[t]s event <https://www.youtube.com/watch?v=IKgqv-iCwak>.

5.1.3. *Second neuroscience hackathon in Rennes*

We organized the second edition of hackathon in the Empenn team, November 14-15 as part of the international event Brainhack Global 2019.

EPIONE Project-Team

4. Highlights of the Year

4.1. Highlights of the Year

4.1.1. Awards

- Nicholas Ayache, Hervé Delingette, Marco Lorenzi, Xavier Pennec, and Maxime Sermesant were awarded a chair at the institute *3IA Côte d'Azur* focused on artificial intelligence.
- Hervé Delingette was elected a Fellow of MICCAI society at MICCAI 2019 : <http://www.miccai.org/about-miccai/miccai-fellows/>
- Julian Krebs received the Best Presenter Award at the workshop STACOM for his presentation of the paper
- Marco Lorenzi was awarded a Contrat jeune chercheur by the National Research Agency (ANR) for his Fed-BioMed project.
- Sara Garbarino was awarded the IPMI 2019 Erbsmann Award for her paper entitled "Modeling and inference of spatio-temporal protein dynamics across brain networks".
- Nicholas Ayache was awarded the Grand Prize of the City of Nice by the Mayor of Nice, at the Villa Masséna, on May 24, 2019.
- Maxime Sermesant received the Innovator of the Year Award by CentraleSupélec on January 21st, 2019.
- Yann Thanwerdas was nominated among the 5 running papers for the best paper award at the Geometric Sciences of Information conference GSI' 2019 at ENAC in Toulouse.

4.1.2. Dissemination

- Publication of the book *Riemannian Geometric Statistics in Medical Image Analysis* [53] edited by Xavier Pennec, Stefan Sommer and Tom Fletcher, 3rd volume of "The Elsevier and MICCAI Society book series". The book contains 5 introductory chapters on the methodological foundations by Xavier Pennec, Tom Fletcher, Stefan Sommer, Stephen Marsland and Marco Lorenzi, and 11 contributed chapters on applications, including a chapter by Nina Miolane, Loic Devillier and Xavier Pennec.
- Publication of the book *Voir l'invisible - Tome 2, Comprendre, Agir* by the Collectif Amir with Maxime Sermesant as one of the scientific contributors. The second version of the book informs the public reader of the latest innovations in science and technology from different fields.
- Organization of the scientific program of the conference "The Academie des sciences in Nice and Sophia Antipolis" by N. Ayache in June 20-21, 2019.

BEST PAPERS AWARDS :

[40]

J. KREBS, T. MANSI, N. AYACHE, H. DELINGETTE. *Probabilistic Motion Modeling from Medical Image Sequences: Application to Cardiac Cine-MRI*, in "STACOM 2019 - 10th Workshop on Statistical Atlases and Computational Modelling of the Heart", Shenzhen, China, October 2019, <https://arxiv.org/abs/1907.13524> - Probabilistic Motion Model, Motion Tracking, Temporal Super-Resolution, Diffeomorphic Registration, Temporal Variational Autoencoder, <https://hal.inria.fr/hal-02239318>

[48]

S. GARBARINO, M. LORENZI. *Modeling and Inference of Spatio-Temporal Protein Dynamics Across Brain Networks*, in "IPMI 2019 - 26th International Conference on Information Processing in Medical Imaging", Hong-Kong, China, LNCS, Springer, 2019, vol. 11492, p. 57-69, <https://hal.inria.fr/hal-02165021>

MATHNEURO Project-Team

4. Highlights of the Year

4.1. Highlights of the Year

4.1.1. Awards

Ariane Delrocq received on 29th November 2019, a price from Ecole Polytechnique Paris for her research internship co-supervised by E. Deval and R. Veltz.

MIMESIS Team

5. Highlights of the Year

5.1. Highlights of the Year

- Our paper entitled "Physics-based Deep Neural Network for Augmented Reality during Liver Surgery" was selected for oral presentation at the MICCAI conference in Shenzhen China and presented to more than 2,000 attendees [22]. In this work we demonstrated that it is possible to combine a neural network with physics-based simulation to reproduce the deformation of a complex organ.
- SOFA, our open source simulation software, continues to grow and attract scientists and companies. New results were presented during the SOFA week in November at Station F in Paris. Three start-ups created by former SOFA engineers or researchers, were among the attendees.

MNEMOSYNE Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

We recently considered a new domain of application for our models, educational science. In a very stimulating perspective, we wonder how our cognitive models of cerebral architectures can be used to study children performing problem solving. Our first steps in this domain concern the establishment of relations with a laboratory in educational science, designing a software platform (*cf.* § 6.4). and being associated to ongoing projects, **one project with the French ANR** regarding cocreativity and problem solving evaluation during a computational thinking initiation activity and one in the Erasmus+ CAI « Communauté d'Apprentissage de l'Informatique » 19PE0004 project, in link with the Erasmus+ **Let'Steam** project.

NEUROSYS Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

Laurent Bougrain is the coordinator of the 4-years ANR project Grasp-IT on the design and the evaluation of a tangible and haptic brain-computer interface for upper limb rehabilitation after stroke including 4 research teams, 3 centers or hospital departments for physical medicine and rehabilitation and one manufacturer of 3D printers (see Sec. [8.2.1](#)).

OPIS Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

- Our M.Sc. program in Data Sciences and Business Analytics (with ESSEC Business School) was ranked 3rd worldwide in the QS World University Rankings.
- E. Chouzenoux was laureate of the ERC Starting Grant MAJORIS (starting date: 01-01-2020).
- M.C. Corbineau received the best poster award at “Journée de rencontre entre entreprises, doctorants et jeunes docteurs” (J-RED) in 2019.

PARIETAL Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. Awards

- November 2019: Académie des sciences / Dassault System / Inria prize awarded to the developers of scikit-learn: Loic Estève, Alexandre Gramfort, Olivier Grisel, Bertrand Thirion and Gael Varoquaux.
- December 2019: Alexandre Gramfort, Bertrand Thirion and Gael Varoquaux are each awarded a *Chaire IA* following a national call.
- December 2019: Carole Lazarus, former PhD student supervised by Philippe Ciuciu got the Prix de la Chancellerie des Universités de Paris 2019 - Section Sciences.

AIRSEA Project-Team (section vide)

ANGE Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. Human ressources

Martin Parisot left the team in september 2019 to join the team Cardamom (Inria-Bordeaux). Apoline El Baz joined the team on an ADT position to developp Fresh Kiss 3D. Julien Guieu is the new assistant of the team (May). Mathieu Rigal and Chourouk El Hassanieh started a PhD. (September).

5.1.2. Travel policy

The team started to limit flies for professional activities. A deeper reflexion on the environmental impact of scientific activities has been initiated in the team. C. Guichard and Y. Penel are members of the CLDD of Inria Paris.

5.1.3. Awards and new grants

- J. Sainte-Marie was promoted Adjoint au Directeur Scientifique, in charge of the topic "Sciences de la planète, de l'environnement et de l'énergie". (July)
- M. Parisot was invited for a long term stay at Aachen University (Sept.-Nov.)
- The ANR project ALLOWAP supported by J. Salomon (with L. Halpern, F. Kwok and B. Delourme) was accepted for a start in Jan. 2020.
- M. Parisot and E. Audusse organized the CEMRACS project "Land Slide Tsunami" at CIRM (July-Aug.).
- Y. Penel organized the CEMRACS project "SGN-Num" at CIRM (July-Aug.).
- E. Audusse and Y. Penel organized the CEMRACS project "SW-Cor".

CASTOR Project-Team (section vide)

COFFEE Project-Team (section vide)

FLUMINANCE Project-Team

4. Highlights of the Year

4.1. Highlights of the Year

4.1.1. Awards

Best paper award 2019 Romain Schuster "Visualisation et mesure du flux d'aspiration d'une Sorbonne", ContaminExpert 2019. Paris, FR

BEST PAPERS AWARDS :

[43]

R. SCHUSTER, D. HEITZ, E. MÉMIN. *Visualisation et mesure du flux d'aspiration d'une Sorbonne*, in "ContaminExpert 2019", Paris, France, March 2019, p. 1-8, <https://hal.archives-ouvertes.fr/hal-02330348>

LEMON Project-Team

4. Highlights of the Year

4.1. Highlights of the Year

- Antoine Rousseau and Cécile Choley have participated to the Climate Change Conference (COP25) in Madrid.
- Year 2019 has been a year with lots of changes for the team with 4 new members and 1 departure:
 - Since October 2019, Fátima Palacios Rodríguez is hired as associate professor at the *Departement Economía Financiera Actuarial y Estadística de Facultad de Ciencias Económicas y Empresariales de Universidad Complutense de Madrid*
 - 4 new members joined the team in 2019: Pascal Finaud-Guyot (associate professor at the Montpellier University, Laboratory HydroSciences Montpellier) has a permanent member and Cécile Choley (PhD, funding: ANR Project DEUFI), Vita Ayoub (PhD, funding: Luxembourg National Research Fund) and Yassine Bel-Ghaddar (PhD, funding: Bourse CIFRE ANRT).

MAGIQUE-3D Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

Inria's Autumn school, November 4-8 2019, Inria Bordeaux Sud-Ouest co-organized by E. Agullo (**HiEPACS**), H. Beaugendre (**CARDAMOM**) and J. Diaz. The school aimed at simulating a physical problem, from its modeling to its implementation in a high performance computing (HPC) framework. The school offered both plenary courses and hands-on sessions that involved many members of the three teams. The physical problem considered was the harmonic wave propagation.

The first day was dedicated to the modeling of the problem and its discretization using a Discontinuous Galerkin scheme. The following two days were dedicated to linear algebra for solving large sparse systems. Background on direct, iterative and hybrid methods for sparse linear systems were discussed. Hands-on on related parallel solvers were then proposed. Has followed a session dedicated to advanced parallel schemes using task-based paradigms, including a hands-on with the starpu runtime system. The ultimate hands-on session was devoted to the use of parallel profiling tools. The school was closed with plenary talks illustrating the usage of such a workflow in an industrial context.

The hands-on sessions were conducted on the Federative Platform for Research in Computer Science and Mathematics (PlaFRIM) machine in a **guix-hpc** reproducible environment.

The school was attended by about 40 participants mostly PhDs and postdocs from Inria teams.

SERENA Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

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

STEPP Project-Team (section vide)

TONUS Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

Low Mach relaxation scheme

We designed a new relaxation scheme [16]-[18] for the Euler/shallow water equations in the low Mach regime. The scheme admits a uniform convergence and a close to uniform cost compare to the Mach number. Additionally the implicit part (the most complicated classically) is reduced at the maximum. This method is a good candidate for the MHD in Tokamak and the extension of the method for this problem is an ongoing work.

BIOCORE Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. Highlights

- The patented approach to produce microalgae under a biofilm form was further optimized with gradient based approaches [71] and strategies to still enhance productivities were identified and tested experimentally [26].
- The introduction of resistant plants for the protection against pathogens often leads to the appearance of virulent pathogenic strains that are capable of infecting these resistant plants. We developed a model for the pyramiding of these qualitative resistances with genetically controlled infection bottlenecks, and showed the efficiency of this technique when the fitness cost of Resistance Breaking pathogen variants in susceptible plants is intermediate [36].
- In the context of ANR project ICycle, following the PhD thesis of Sofia Almeida and in collaboration with F. Delaunay's lab (Institut Biologie Valrose, CNRS), a calibrated and validated model of the mammalian circadian clock was published in [13]. The interactions between the circadian clock and the cell cycle were then investigated [44]. The coupled models replicate the oscillators' period-lock response and recover clock to cell cycle period ratios such as 1:1 or 3:2, as observed in F. Delaunay's lab.

5.1.2. Awards

- Lucie Chambon and J.-L. Gouzé won a Best Paper award at the DYCOPS conference in Brazil (April 2019), on original control strategies for the genetic toggle switch.

BEST PAPERS AWARDS :

[46]

L. CHAMBON, J.-L. GOUZÉ. *A new qualitative control strategy for the genetic Toggle Switch*, in "DYCOPS 2019 - 12th IFAC Symposium on Dynamics and Control of Process Systems, including Biosystems", Florianopolis, Brazil, B. CHACHUAT, O. BERNARD, J. E. NORMEY-RICO (editors), IFAC-PapersOnLine, Ifac, 2019, vol. 52, n^o 1, p. 532-537 [DOI : 10.1016/J.IFACOL.2019.06.117], <https://hal.inria.fr/hal-02319873>

CARMEN Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

Mark Potse has been recruited on a permanent position researcher at Bordeaux University.

The team has been involved in the organization of the 10th international conference on Functional Imaging and Modeling of the Heart (FIMH), that was held at Bordeaux in July 2019.

The Direction Generale de l'offre de soins (DGOS) has accepted to fund the clinical project of phase III Parkeo2. In this project 11 hospitals in France will use the software OptimDBS for the planification of deep cerebral surgery. The project will start in October 2020 and will last three years.

COMMEDIA Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

- Major results have been obtained on the simulation of fluid-structure interaction [1] and of cardiac hemodynamics [8].

DRACULA Project-Team (section vide)

M3DISIM Project-Team

4. Highlights of the Year

4.1. Highlights of the Year

The team obtained 3 ANR fundings this year: LungManyScale, ODISSE and SIMR.

MAMBA Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

- Marie Doumic gave a plenary talk at the AIP Conference (Applied Inverse Problems) in Grenoble, July 8-12th (around 600 participants).
- Diane Peurichard and Nastassia Pouradier Duteil won a Mittag-Leffler and EWS-EMS Call to organize a summer school at the Mittag-Leffler institute in July 2020.
- the STIC AmSud cooperative project NEMBICA, between France, Chile, Paraguay and Colombia, headed by Pierre-Alexandre Bliman, has been accepted (2020-2021).

MONC Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

- 2 abstracts accepted as oral communications at the PAGE meeting (main international conference in population modeling) (C. Nicolò and S. Benzekry)

5.1.1. Awards

- Floriane Gidel is French Young Talent 2019 - L'Oréal-UNESCO for Women in Science.

NUMED Project-Team (section vide)

REO Team

5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. Awards

ERC consolidator grant MoDeLLiver (I Vignon-Clementel).

SISTM Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. Team structure

The SISTM team was re-structured into three research axes (formerly two) in 2019:

- Axis “High Dimensional Statistical Learning” (coordinator Boris Hejblum)
- Axis “Mechanistic Learning” (coordinator Mélanie Prague)
- Axis “Translational Vaccinology” (coordinator Laura Richert)

The third research axis on “Translational vaccinology” was created in order to formalize research activities already performed previously in a less structure way. This axis is dedicated to applied research questions in early stage clinical vaccine trials, with two objectives:

- to elucidate the potential effects and mechanisms of action of vaccines and immunotherapies in integrative statistical analyses of the induced responses at various levels of the immune system
- to better inform future trial designs and statistical analysis methods by means of modelling and methodological developments.

The three axes collaborate closely with each other.

In fact, the third axis gives the motivating examples leading to the methodological work done in the two other axes. The first axis deals with the raw high-dimensional data generated in clinical epidemiology or biological studies and aims at reducing the dimension of the problem or better annotate the data available (e.g. automatic gating of cytometry data). The second axis aims at building mechanistic model to understand and predict the biological phenomena by using the available information. The idea then is that the results of this modelling part feed the third axis to define the next strategies to be evaluated in clinical studies and the design of these studies.

5.1.2. Team composition

The SISTM team core has changed in December 2019: Daniel Commenges, DRE Inserm, HDR (emeritus from September 2014) has retired from research activities. Daniel Commenges founded the “Biostatistic” team of Bordeaux within an Inserm unit in the 1990s. The research team was officially labelled by Inserm in the early 2000s and was lead by Daniel Commenges until 2013. The team split in 2014 into two teams: the Inserm “Biostatistic” team (led by H  l  ne Jacqmin-Gadda), and the “SISTM” team (led by Rodolphe Thi  baut) that joined the Inria BSO center.

5.1.3. Funded projects

- Launch of the Graduate’s School Digital Public Health (PI: R Thi  baut) including the Master of Public Health Data Sciences that started with its first cohort of 9 international students in Sep 2019.
- Positive response for funding of the H2020 IP-Cure-B project (Immune profiling to guide host-directed interventions to cure hepatitis B infections, project coordinator: Pr. F. Zoulim, Inserm U1052 CRCL), in which the work package “Data Science” is led by the SISTM team. The project will be launched in January 2020.
- Kick-off of the EDTCP-2 funded project PREVAC-UP (partnership for research on Ebola vaccinations – extended follow-up and clinical research capacity build-up, project coordinator: Pr Y. Yazdanpanah, Inserm), in which the work package “Systems vaccinology” is led by the SISTM team.

- A new collaboration has started with the pharmaceutical company Ipsen on the integration of “omics” data into in-silico modelling of early-stage clinical trials in cancer. This project will be conducted with a “CIFRE” (*Conventions Industrielles de Formation par la REcherche*) PhD contract starting in January 2020.
- *Action de Développement technologique* VASI: Visualization and Analytics Solution for Immunologists.
- The Ebovac2 IMI project on Ebola vaccine development has been extended to 11/2020 (no cost extension).
- Associate Team DYNAMHIC: Dynamical Modeling of HIV Cure in Collaboration With Harvard Program for evolutionary dynamics.

5.1.4. Advancements in projects

- A translational phase I clinical trial of an experimental placental malaria vaccine, conducted by an interdisciplinary consortium including members of the SISTM team (Primalvac trial), has reached its publication, with a manuscript accepted for publication in the *Lancet Infectious Diseases*
- Two HIV clinical vaccine trials have reached their final stage with all results available, including integrative data analyses of the immune responses, and the corresponding manuscripts are in preparation (ANRS VRI01 trial and ANRS 149 Light trial).
- The two phase II Ebola vaccine trials conducted by the IMI-2 EBOVAC2 consortium that is coordinated by Rodolphe Thiébaud are terminated. Results have been presented at international conferences and the manuscripts with the primary results are either submitted (EBL2001 study, submitted to the *Lancet*) or in preparation (EBL2002 study). Systems vaccinology analyses of the data from these trials are ongoing in the SISTM team.
- Robin Genuer co-authored a book with Jean-Michel Poggi on random forests entitled *Les forêts aléatoires avec R* in *Presses Universitaires de Rennes*, Rennes, France.

5.1.5. Awards

- Award for Doctoral Supervision and Research Activity (PEDR) attributed by the University of Bordeaux to Marta Avalos and Robin Genuer

XPOP Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

Version 2.0 of the SPIX software was available in June 2019.

5.1.1. Awards

Geneviève Robin was awarded: “Prix L’Oréal-UNESCO Pour les Femmes et la Science (Jeunes Talents France 2019)”