Activity Report 2012

Section highlights of the Team

AMIB Project-Team (section vide)

AVIZ Project-Team

2.3. Highlights of the Year

AVIZ has received two best paper honorable mentions at the VisWeek 2012 conference [] , [] .

AVIZ has also received a best poster award [39] and best poster honorable mention [40] .

Tobias Isenberg has been recruited as Senior Researcher and will broaden the scope of AVIZ in the direction of Scientific Visualization and Non-Photorealistic Rendering (NPR) for interactive visualization.

AVIZ has started to port its visualizations for standard Web platforms and collaborate with industry to deploy it in various domains. For example, the French Open Data Provider "Data Publica" has deployed ScatterDice to visualize employment data in France: http://labs.data-publica.com/emploi.

BEST PAPERS AWARDS :

[] **IEEE Transactions on Visualization and Computer Graphics**. L. MICALLEF, P. DRAGICEVIC, J.-D. FEKETE.

[] **IEEE Transactions on Visualization and Computer Graphics**. L. YU, K. EFSTATHIOU, P. ISENBERG, T. ISENBERG.

<h1 style="color:red; text-align:center">BYMOORE Exploratory Action</h1>

2.2. Highlights of the Year

- Set up of a joint lab on *Accelerators for Emerging Applications* between Inria (BYMOORE) and the Institute for Computing Technology (Beijing, China). Official signature ceremony took place in Dec. 2012.

- Our paper entitled *BenchNN: On the Broad Potential Application Scope of Hardware Neural Network Accelerators* was short-listed for best paper award at IISWC 2012.

- I have been elected to become Steering Committee Chair of the International Symposium on Code Generation and Optimization starting 2013 for a 3-year tenure.

COMETE Project-Team

2.2. Highlights of the Year

Mário Alvim, an ex PhD student of Comète who defended his thesis in October 2011, has been nominated for the "Prix de thèse ParisTech 2012".

COMMANDS Project-Team (section vide)

DAHU Project-Team

2.2. Highlights of the Year

Serge Abiteboul has been professor at College de France till September 2012. He organized a course on Web data management.

DEFI Project-Team

2.2. Highlights of the Year

- Grégoire Allaire was elected as president of SMAI.

DISCO Project-Team

2.2. Highlights of the Year

With Anja Korporal and Markus Rosenkranz, G. Regensburger got the *Distinguished software presentation* award at ISSAC 2012 (International Symposium on Symbolic and Algebraic Computation) for the MAPLE packages `IntDiffOp` and `IntDiffOperations` (see [17]).

GALEN Team

2.2. Highlights of the Year

- **BIOMED Summer School**: Galen has organized the Biomedical Image Analysis Summer School : Modalities, Methodologies & Clinical Research at Paris between July 9th and July 14th, 2012 involving international leaders/contributors in the field of biomedical image analysis as instructors where approx 100 participants were selected from an outstanding number of applications.

- **China Research Council Award**: Chaohui Wang was the recipient of the Chinese Government Award for Outstanding (self-financed) PhD. In 2012, a total of 495 awards were given worldwide in all disciplines, with 17 Chinese students in France receiving awards.

- **CVPR Participation**: GALEN has participated in the 2012 annual IEEE Conference in Computer Vision and Pattern Recognition (CVPR'12) conference, the leading event in the field of computer vision with five papers (double blind full submissions, acceptance rate %25).

- **EU FP7 Success**: GALEN has secured cutting edge research funding from the European Union through the highly competitive 2012 "Cognitive Vision and Robotics" FP7-ICT-9 call (5% acceptance) through two accepted grants (out of 12 for the entire call): MOBOT (Intelligent Active MObility Assistance RoBOT integrating Multimodal Sensory Processing, Proactive Autonomy and Adaptive Interaction) and RECONFIG (Cognitive, Decentralized Coordination of Heterogeneous Multi-Robot Systems).

- **MICCAI Participation**: GALEN has participated in the 2012 annual Medical Image Computing and Computer Assisted Intervention (MICCAI'12) conference one of the leading events in the field of medical image analysis with four papers (double blind full submissions, acceptance rate %30) and two invited talks in the associated workshops.

GECO Team

2.1. Highlights of the Year

Emmanuel Trélat obtained the Felix Klein Prize at the 6th European Congress of Mathematics in Krakow.

Motivations by the prize committee: Emmanuel Trélat receives the Felix Klein Prize for combining truly impressive and beautiful contributions in fine fundamental mathematics to understand and solve new problems in control of PDE's and ODE's (continuous, discrete and mixed problems), and above all for his studies on singular trajectories, with remarkable numerical methods and algorithms able to provide solutions to many industrial problems in real time, with substantial impact especially in the area of astronautics.

GEOMETRICA Project-Team

2.2. Highlights of the Year

- Creation of a new Inria research team called TITANE on geometric modeling of 3D environments. Creation expected in 2013.
- Best Paper Award for "The Simplex Tree: An Efficient Data Structure for General Simplicial Complexes" at ESA 2012.

GRACE Team

2.1. Highlights of the Year

D. Augot co-edited a special issue of Designs, Codes and Cryptography, devoted to WCC 2011. Online versions of the articles are avalaible, while the issue will appear as volume number 66, issue 1-3, in January 2013.

GRAND-LARGE Project-Team (section vide)

HIPERCOM Project-Team

2.2. Highlights of the Year

- **Habilitation à Diriger des recherches**: Emmanuel Baccelli got his HDR entitled "IP-Disruptive Wireless Networking: Integration in the Internet", from the University Pierre et Marie Curie - Paris VI, December 2012.

- **PhD Thesis**: During year 2012, four PhD theses were defended:
  - **Salman Malik**, "Evaluation et Optimisation des Réseaux Sans Fil Denses", University Pierre et Marie Curie - Paris VI, November 2012, with Philippe Jacquet as adviser.
  - **Yacine Mezali**, "Algorithme de Géolocalisation Intérieure par Différenciation de Signaux WiFi", University Pierre et Marie Curie - Paris VI, March 2012, with Philippe Jacquet as adviser.
  - **Iskander Banaouas**, "Analyse et Optimisation des Protoocles d'Accès dans les Réseaux sans fil Ad Hoc", University Pierre et Marie Curie - Paris VI, February 2012, with Paul Muhlethaler as adviser.
  - **Ana Cristina B. Kochem Vendramin**, "Cultural GrAnt: um protocolo de roteamento baseado em inteligência coletiva para redes tolerantes a atrasos", Federal Technological University of Paraná, June 2012, with Anelise Munaretto Fonseca, Myriam R. De B. da Silva Delgado and Aline Carneiro Viana as co-advisers.

- **PEMWN 2012**, Performance Evaluation and Modeling of Wireless Networks is the workshop held in conjunction with the NoF 2012 conference (Network of the Future) : The HIPERCOM team actively contributed to the technical and practical organization of the PEMWN 2012 workshop held in Tunis in November 2012. Pascale Minet and Leila Saidane from ENSI (Tunis) were co-general chairs. Cedric Adjih and Paul Muhlethaler were members of the program committee. Christine Anocq was in charge of the registration.

- **Demonstration of OCARI**: The HIPERCOM team and more precisely, Cedric Adjih, Ichrak Amdouni, Ines Khoufi, Pascale Minet and Ridha Soua made a presentation and a demonstration of the routing protocol and the coloring algorithm of OCARI, an energy-efficient wireless sensor network supporting determinism, at:
  - the EPRI international workshop organized by EDF, Chatou, April 2012,
  - the ICSSEA international conference in Paris, October 2012.

- **Vulgarisation of computer science**: The HIPERCOM team and more precisely, Cedric Adjih, Ichrak Amdouni, Ines Khoufi and Ridha Soua explained the principles of communication and routing in wireless sensor networks to undergraduates and students.

IN-SITU Project-Team

2.3. Highlights of the Year

- INSITU had 4 full papers and 2 notes accepted at the most prestigious conference in our field, ACM CHI 2012, including a Best Paper Award and an Honorable Mention Award.

- Wendy Mackay was awarded a five-year Advanced Grant by the European Research Council (ERC).

- Ilaria Liccardi was awarded a three-year Marie Curie grant by the European Research Council, to work with Wendy Mackay and Prof. H. Abelson at M.I.T.

BEST PAPERS AWARDS :

[24] **CHI '12: Proceedings of the SIGCHI Conference on Human Factors and Computing Systems**. E. GHOMI, G. FAURE, S. HUOT, O. CHAPUIS, M. BEAUDOUIN-LAFON.

[25] **CHI'12 - 30th International Conference on Human Factors in Computing Systems - 2012**. C. LIU, S. HUOT, J. DIEHL, W. E. MACKAY, M. BEAUDOUIN-LAFON.

[29] **MobileHCI '12: Proceedings of the 14th international conference on Human-computer interaction with mobile devices and services**. D. SPELMEZAN.

MACS Project-Team

2.2. Highlights of the Year

The team has relocated from Rocquencourt to the Saclay Ile-de-France Inria research center in June 2012. This change was motivated by the very strong potential of this rapidly-evolving environment in terms of multi-disciplinary collaborations, with the actors already in place as well as those to come, in particular with the creation of the ambitious new Paris-Saclay University. We are already part of a local initiative entitled "Mechanics and living systems" in association with various components of the two mechanics laboratories of Ecole Polytechnique, and which encompasses fundamental, experimental and numerical aspects in biomechanics. This environment is also foreseen as most favorable to the launching of our successor-team, since 2012 was the last year of the Macs team itself, indeed.

MAXPLUS Project-Team (section vide)

MEXICO Project-Team (section vide)

OAK Team

2.1. Highlights of the Year

Our best results of the year appeared in extremely visible and selective venues: automated recommendation of materialized XML views in ACM SIGMOD conference [18], XML query-update independence [6] and RDF materialized view selection in the VLDB 2012 conference, and scalable duplicate detection in IEEE TKDE [8].

On the national scientific stage, our team has invested significant effort in the recently accepted LabEx DigiCosme proposal, where I. Manolescu is coordinating the "Scalable and secure data management" task, and in the national database conference where I. Manolescu has been the Program Committee chair, while Nicole Bidoit and François Goasdoué were part of the Program Committee.

Significant prototype development effort was invested in particular leading to the ACM CIKM Amada [10] and Nautilus [15] software demonstrations.

PARIETAL Project-Team

2.1. Highlights of the Year

Fabian Pedregosa, PhD candidate at the Parietal team won the best poster award at the EuroScipy 2012 conference. The poster, Memory Profiler: monitor memory usage of Python code describes the Python package memory_profiler, a tool to monitor memory usage from within the Python language. Among other features, the package is able to perform line-by-line analysis of the memory usage program and to insert breakpoints on excessive memory consumption.

PARSIFAL Project-Team

2.2. Highlights of the Year

- Stefan Hetzl received his Habilitation 5 November 2012 from the Technical University of Vienna.
- Kaustuv Chaudhuri and Stefan Hetzl organized "Collegium Logicum 2012: Structural Proof Theory" at Inria-Saclay.
- Dale Miller and Gopalan Nadathur (Professor at the University of Minnesota) published a book title "Programming with higher-order logic" (June 2012, Cambridge University Press).

POEMS Project-Team

2.2. Highlights of the Year

Among the significative scientific advances and successes of this year, we would like to emphasize:

- The habilitation of L. Bourgeois on various imverse problems governed by elliptic equations.

- The PhD thesis of J. Chabassier on the numerical simulation of a grand piano

- The PhD thesis of L. Chesnel on the analysis of dign changing transmission coefficients with applications to electromagnetic metamaterials.

- Three new ANR Projects : CHROME on electromagnetic wave propagation in fusion plasmas, SODDA on the non destructive testing of networks of electric cables and RAFFINE about a posteriori estimators for integral equations.

POPIX Exploratory Action (section vide)

REGULARITY Project-Team

2.2. Highlights of the Year

- Release of version 2.1 of the software toolbox FracLab.

BEST PAPER AWARD :

[39] **International Conference on Mass Data Analysis of Images and Signals (MDA'2012)**. J. LÉVY-VÉHEL, M. TESMER.

SECSI Project-Team

2.2. Highlights of the Year

- Workshop celebrating the 15th anniversary of LSV (the lab where SECSI is hosted) and Jean Goubault-Larrecq's CNRS silver medal, ENS Cachan, February 06-07, 2012 (http://www.lsv.ens-cachan.fr/Events/LSV15Y/)

- The ANR project AVOTÉ on the formal analysis of electronic voting protocols (http://www.lsv.ens-cachan.fr/Projects/anr-avote/) has been nominated to receive a price awarded by the ANR.

SELECT Project-Team (section vide)

TAO Project-Team

2.3. Highlights of the Year

- Energy management is becoming one of the main focuses, and the most important applicative focus of TAO UCT-SIG. Underlying the various debates, ranging from climate change to nuclear power and integration of renewable energies in the grid (including transportation and storage), is a burning need for scenario simulation, evaluation and optimization. The scientific challenges concern the handling of continuous and discrete uncertainties (e.g. ecological impacts or emergence of future technologies) with a long term horizon. Our commitment is to provide principled studies of various investment scenarios in economical and ecological terms, including a rigorous handling of uncertainties. Specifically,
    - We actively worked to develop collaborations between European and Taiwanese experts of energy management (organization of a forum in Taiwan, http://top.twman.org/2012frtw, of meetings between French companies and Taiwanese academic visitors in Limoges and Paris http://www.lri.fr/ teytaud/france2012.html).
    - We developed a Ilab (collaboration between Inria Saclay-IDF / Artelys) on energy, involving our common participation to the European project Citines http://www.citines.com, aimed at optimal energy management at the scale of a city or an industrial area. We also successfully applied for an ADEME project named POST, aimed at the long term (2050) optimization of the power grid in Europe and North Africa and raising hard stochastic stock management issues. Another critical issue concerns the representation of strategies enabling to combine the good long term properties of direct policy search, and the efficiency of combinatorial optimization tools for structured problems.
    Additionally, a collaboration with Inria-Chile is under discussion. We are also working on creating a company in Taiwan, working with tools from the French industry.
    - We also participated in several energy-related European meetings, including companies (section 8.5.1).
- Games remain a key and cool showcase to demonstrate the efficiency of our algorithms:
Our meta-learning approach in Monte-Carlo Tree Search (MCTS) was illustrated by playing 12 games against professional players in even conditions in 7x7; it won 7 games (6/6 win with the easy side and 1/6 win with the difficult side). We achieved the best performances so far on small board minesweeper, demonstrating the efficiency of MCTS on one-player stochastic games. In collaboration with Olivier Buffet (Loria), we scaled up previous implementations to large boards, demonstrating the efficiency of Monte-Carlo Tree Search as a tool for improving existing heuristics. For illustrating the pedagogical properties of simulation-based approaches, we developed tools for generating nice test cases in games and automatically checking the opponent level.
Besides, we realized experimental biological measurements (neuro-imagery, skin conductivity) on amateur and professional players, for further comparison and analysis.
- One of the main fundamental milestones on the TAO research agenda has been achieved by the OPT-SIG, bridging the gap between practice and theory in stochastic optimization through information-geometric optimization (IGO). IGO is devised as a canonical way to turn any smooth parametric family of probability distributions on an arbitrary, discrete or continuous search space X into a continuous-time black-box optimization method on X. Rooted on the Fisher metric, IGO shows invariance properties under various parameterizations of the distribution family [71], [19], [20]. IGO covers the state-of-art CMA-ES (invariant w.r.t. monotonous transformations of the objective function and linear transformations of the coordinate space) as a special case where the probability distribution is Gaussian.

This paper got the *excellent paper award* (international track) at TAAI conference (given to 3/55 papers).
Best Paper Award :

[36] **TAAI**. C.-W. Chou, P.-C. Chou, C.-S. Lee, D. Lupien Saint-Pierre, O. Teytaud, M.-H. Wang, L.-W. Wu, S.-J. Yen.

TOCCATA Team

2.2. Highlights of the Year

A major event in the life of our team this year is naturally its creation, as a refoundation of the former ProVal team, starting officially on September 1st, with C. Marché as a new leader. This report indeed covers all the activities of the team in 2012, including the activities of ProVal from January to August.

Another important event is the arrival of Arthur Charguéraud as a new "Chargé de Recherche", since October.

The current section and the next one present the scientific foundations, objectives and axes of research of the new team. The theme of verification of numerical programs, that took importance in the former project, is now a major axis. We also emphasize a new axis of research concerning the certification of tools.

TYPICAL Project-Team

2.2. Highlights of the Year

Assia Mahboubi, Enrico Tassi and Cyril Cohen were among the main participants in the project of formalization of the Feit-Thompson (Odd Order) theorem finally completed in September 2012 by the Mathematical Components team (lead by Georges Gonthier).

Bruno Barras and Assia Mahboubi have been granted fellowships by the Insititute for Advanced Study (Princeton, USA).