RESEARCH CENTER

FIELD
Perception, Cognition and Interaction

Activity Report 2019

Section Highlights of the Team

Edition: 2020-03-21

VISION, PERCEPTION AND MULTIMEDIA INTERPRETATION

<h1 style="text-align:center; color:red;">CEDAR Project-Team</h1>

5. Highlights of the Year

5.1. Highlights of the Year

- Through 2019 competitive **hiring**, the team has doubled its number of senior members: Oana Bălălău has been hired on an Inria Starting Researcher Position (SRP), and she joined in november; Angelos Anadiotis has been hired as a Gaspard Monge Assistant Professor at Ecole Polytechnique within the team.

- I. Manolescu and M. Buron have demonstrated the **ConnectionLens** system to the Defense Minister Florence Parly, as part of DataIA's showing for her visit at Inria, in April 2019 [0]. The national Inria director Bruno Sportisse, the military director of Ecole polytechnique François Bouchet, and the Fields medalist Cédric Villani were also present.

- As a member of the scientific committee of the **GFAIH** (Global Forum on AI for Humanity), I. Manolescu had the opportunity to meet, in a dinner at the Elysée Palace, and exchange with the French President Emmanuel Macron, the Economy and Industry Minister Bruno Le Maire, the Research Minister Frédérique Vidal, and the Digital Affairs Minister Cedric O [0].

5.1.1. Awards

- The demonstration "Spade: A Modular Framework for Analytical Exploration of RDF Graphs"[15] has obtained the **Best Demonstration Award** at the BDA conference 2019, where it has also been informally presented [0].

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[0]https://team.inria.fr/cedar/connectionlens/
[0]https://twitter.com/ioanamanol/status/1189478849651904513
[0]https://twitter.com/cedarinrialix/status/1185203276142256128

GRAPHIK Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

- One of our papers ([15]) has been recognized as a **highlight of the year 2020** of the INRA department CEPIA.

- The SudoQual engine, which was developed in the context of the Qualinca research project (2012-2016), has been reused by ABES (the French National Agency for Academic Libraries) to build Paprika, a professional tool for documentalists, released this year (https://paprika.idref.fr/). SudoQual/Paprika is devoted to data curation in the context of bibliographic databases.

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

5. Highlights of the Year

5.1. Highlights of the Year

- Elisa Fromont was awarded a Junior Member position at the Institut Universitaire de France (IUF). This is a prestigious position given for 5 years (2019-2024), the selection process is especially competitive.
- Tassadit Bouadi (MCF Univ Rennes 1) joined the team in July 2019. Her research topics are skyline queries and preference mining. Her work will especially contribute to the design of approaches having results easier to grasp by human users.

LINKS Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. Data Integration and Schema Validation

The ShEx language for defining RDF schemas was proposed and developed earlier by the Links team in cooperation with the W3C. S. Staworko et al. now studied the containment problem for ShEx schemas for RDF documents. They showed at *PODS* [10] – the best database theory conference – that the problem is decidable, but co-NEXP-hard. This is a joint work with P. Wieczorek from the University of Wroclaw, Poland.

5.1.2. Aggregates

Florent Capelli et al. showed at *STACS* [7] – 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.

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

5. Highlights of the Year

5.1. Highlights of the Year

- Metric-Learn software has been included in the scikit-learn-contrib packages. It records more than 900 stars and 190 forks on GitHub. It is also used by 51 projects.

- AURÉLIEN BELLET has applied for a ERC Starting Grant on privacy-preserving decentralized machine learning.

- MATHIEU DEHOUCK has successfully defended his PhD dissertation on *Multi-Lingual Dependency Parsing: Word Representation and Joint Training for Syntactic Analysis*, and he is doing a post-doc at University of A Coruña (Spain) funded by ERC grant FASTPARSE.

- MARIANA VARGAS VIEYRA's work on probabilistic end-to-end graph-based semi-supervised learning was accepted as one of the 8 contributed talks (among 92 accepted submissions) as the NeurIPS'19 workshop on Graph Representation Learning [0].

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[0]https://grlearning.github.io/papers/

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

4. Highlights of the Year

4.1. Highlights of the Year

- We published our work on relational concept analysis applied to link key extraction in *Discrete applied mathematics* [5].

- Jérôme Euzenat was invited to deliver a keynote talk at the International semantic web conference (ISWC), in Aukland (NZ). The title of the talk was a call to brains: *For knowledge!*

- The teams leads the *Knowledge communication and evolution* chair of the Multidisciplinary Institute of Artificial Intelligence awarded in Grenoble.

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 conference paper [10] got the best paper award at the International Conference on Formal Concept Analysis 2019 in Frankfurt, June 2019 (https://icfca2019.frankfurt-university.de/).

- Classical properties of functions such as associativity, although algebraically easy to read, are hard to meaningfully interpret. In [18], Miguel Couceiro and colleagues showed that associative and quasi-trivial operations that are non-decreasing are characterized in terms of total and weak orderings through the so-called single-peakedness property introduced in social choice theory by Duncan Black. This enabled visual interpretations of the above mentioned algebraic properties, and the enumeration of such operations led to several, previously unknown, integer sequences in Sloane's On-Line Encyclopedia of Integer Sequences (http://www.oeis.org), e.g., A292932, A292933, and A292934.

BEST PAPERS AWARDS :

[42]

J. REYNAUD, Y. TOUSSAINT, A. NAPOLI.*Using Redescriptions and Formal Concept Analysis for Mining Definitions Linked Data*, in "ICFCA 2019 - 15th International Conference on Formal Concept Analysis", Francfort, Germany, June 2019, https://hal.inria.fr/hal-02170760

PETRUS Project-Team (section vide)

TYREX Project-Team (section vide)

VALDA Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

Leonid Libkin, formerly Professor at the University of Edinburgh, was recruited as a senior member of the group in 2019, first (from September to November 2019), with a *Chaire d'Excellence* from FSMP (Fédération des Sciences Mathématiques de Paris), and then as a Professor at ENS.

5.1.1. *Awards*

Mikaël Monet received the 2019 PhD award of the French database community (BDA) for his PhD prepared within Valda and defended in 2018.

WIMMICS Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

28th International Joint Conference on Artificial Intelligence (IJCAI-2019) Runner-up (second place) for the Application Impact Award for the paper "DISPUTool – A tool for the Argumentative Analysis of Political Debates", for Shohreh Haddadan, Serena Villata and Elena Cabrio [22].

Best Poster Runners-Up at the 34th ACM/SIGAPP Symposium On Applied Computing (SAC 2019), for the paper: Pinar Arslan, Michele Corazza, Elena Cabrio, Serena Villata, *Overwhelmed by negative emotions?: maybe you are being cyber-bullied!* [7].

Hai Huang and Fabien Gandon received the Université Côte d'Azur Research Award.

Fabien Gandon, Andrea Tettamanzi and Serena Villata were nominated Fellow of the 3IA Côte d'Azur.

5.1.1. *Awards*

BEST PAPERS AWARDS :

[24]

H. HUANG, F. GANDON.*Learning URI Selection Criteria to Improve the Crawling of Linked Open Data*, in "ESWC2019 - 16th Extended Semantic Web Conference", Portoroz, Slovenia, June 2019, https://hal.inria.fr/hal-02073854

[33]

S. REN, S. LETZ, Y. ORLAREY, R. MICHON, D. FOBER, M. BUFFA, E. AMMARI, J. LEBRUN.*FAUST online IDE: dynamically compile and publish FAUST code as WebAudio Plugins*, in "WAC 2019 - 5th Web Audio Conference", Trindheim, Norway, December 2019, https://hal.inria.fr/hal-02366725

ZENITH Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. Awards

- Antoine Liutkus and Fabian Stoter won the second place at the Global Pytorch Summer Hackaton 2019 organized by FaceBook with the open-unmix software.
- Antoine Liutkus obtained the *Outstanding Reviewer Award* from IEEE.
- Vitor Silva obtained the *best PhD thesis award* from SBBD.

5.1.2. Software

The Pl@ntNet mobile application reached its ten million downloads.

ALICE Team

5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. Awards

Dmitry Sokolov has won the "best expertise" nomination for TechnoText 2019, the challenge for the best russian language IT-related text of 2019. The award was given for the article on understandable raytracing [0].

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[0] https://github.com/ssloy/tinyraytracer/wiki

AVIZ Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

- Aviz researchers contributed 36 publications this year. Amongst these 3 papers were presented at IEEE VIS, the largest international Visualization and Visual Analytics conference.

- Aviz researchers remained active in the research community. We organized one Dagstuhl seminar and one Shonan seminar, served in 8 different organizing committee roles, on 19 program committees, and on 5 different journal editorial board. We reviewed for 25 different conference venues and for 12 different journals. We also gave 26 invited talks and served on two different steering committees and a best PhD award committee and served on 10 different juries (for both PhD and Master students).

- Aviz researchers started two four-year ANR grants as principle investigators.

5.1.1. Awards

- Tobias Isenberg was named the Associate Editor of the Year for Elsevier Computers & Graphic.

- Pierre Dragicevic and his co-authors received a best paper award at ACM CHI .

- Natkamon Tovanich and his co-authors received the Honorable Mention poster award at EuroVis 2019 .

BEST PAPERS AWARDS :

[34]
P. DRAGICEVIC, Y. JANSEN, A. SARMA, M. KAY, F. CHEVALIER.*Increasing the Transparency of Research Papers with Explorable Multiverse Analyses*, in "CHI 2019 - The ACM CHI Conference on Human Factors in Computing Systems", Glasgow, United Kingdom, May 2019 [*DOI :* 10.1145/3290605.3300295], https://hal.inria.fr/hal-01976951

[51]
N. TOVANICH, N. HEULOT, J.-D. FEKETE, P. ISENBERG.*A Systematic Review of Online Bitcoin Visualizations*, 2019, Posters of the European Conference on Visualization (EuroVis), The poster received the Honorable Mention award at EuroVis 2019 [*DOI :* 10.2312/EURP.20191148], https://hal.archives-ouvertes.fr/hal-02155171

EX-SITU Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. Awards

- Wanyu Liu: First prize, Télécom ParisTech thesis award, "Information theory as a unified tool for understanding and designing human-computer interaction"

- Stacy Hsueh, Sarah Fdili Alaoui, and Wendy Mackay: Honorable Mention Award at ACM CSCW 2019 for "Deconstructing Creativity: Non-Linear Processes and Fluid Roles in Contemporary Music and Dance." [21]

- Alexander Eiselmayer, Chat Wacharamanotham, Michel Beaudouin-Lafon, and Wendy Mackay: Best Paper award at ACM CHI 2019 for "Touchstone2: An Interactive Environment for Exploring Trade-offs in HCI Experiment Design" [19]

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

4. Highlights of the Year

4.1. Highlights of the Year

The SIGGRAPH paper "Multi-view relighting using a geometry-aware network" by J. Philip et al. [19] was presented at the Adobe Max event in November 2019 in San Fransisco. The project was part of the 11 projects selected out of 200 to be presented at Adobe MAX under the name project #LightRightSneak (Link to the video of the event).

G. Drettakis presented at the French Academy of Sciences days at Sophia-Antipolis in June: video on the Academy of Sciences site.

4.1.1. Awards

Jean-Dominique Favreau (co-supervised with the TITANE team) received the best Ph.D. thesis award 2019 (assessit prize) from IGRV.

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HYBRID Project-Team

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5. Highlights of the Year

5.1. Highlights of the Year

- Mélanie Cogné (Medical Doctor, PhD, CHU Rennes) has joined the Hybrid team as a new External Collaborator.
- Hybrid team has been strongly involved in the organization of the IEEE Virtual Reality Conference 2019 (IEEE VR), with F. Argelaguet (Program Chair) and A. Lécuyer (Panels Chair) and Jean-Marie Normand (Program Committee).
- The Immersia VR platform has celebrated its 20 years of existence at Inria Rennes/IRISA center, within the "20ans d'Immersia" event (November 2019).
- Hybrid team has organized a "VR Hackathon" at the Inria Rennes/IRISA Center, gathering around 20 participants (May 2019).

5.1.1. *Awards*

- IEEE VGTC Virtual Reality Technical Achievement Award 2019 was obtained by Anatole Lécuyer.
- IEEE VR Best 3DUI Contest Demo Award 2019: was obtained by Team Hybrid (Hugo Brument, Rebecca Fribourg, Gerard Gallagher, Thomas Howard, Flavien Lecuyer, Tiffany Luong, Victor Mercado, Etienne Peillard, Xavier de Tinguy, and Maud Marchal), for the demo entitled "Pyramid Escape: Design of Novel Passive Haptics Interactions for an Immersive and Modular Scenario" [11].

BEST PAPERS AWARDS :

[31]

E. PEILLARD, T. THEBAUD, J.-M. NORMAND, F. ARGELAGUET SANZ, G. MOREAU, A. LÉCUYER.*Virtual Objects Look Farther on the Sides: The Anisotropy of Distance Perception in Virtual Reality*, in "VR 2019 - 26th IEEE Conference on Virtual Reality and 3D User Interfaces", Osaka, Japan, IEEE, March 2019, p. 227-236 [*DOI :* 10.1109/VR.2019.8797826], https://hal.archives-ouvertes.fr/hal-02084069

[18]

R. GAUGNE, T. NICOLAS, Q. PETIT, M. OTSUKI, V. GOURANTON.*Evaluation of a Mixed Reality based Method for Archaeological Excavation Support*, in "ICAT-EGVE 2019 - International Conference on Artificial Reality and Telexistence - Eurographics Symposium on Virtual Environments", Tokyo, Japan, September 2019, p. 1-8, https://hal.inria.fr/hal-02272910

[23]

J. LACOCHE, T. DUVAL, B. ARNALDI, E. MAISEL, J. ROYAN.*Machine Learning Based Interaction Technique Selection For 3D User Interfaces*, in "EuroVR 2019 - 16th EuroVR International Conference", Tallinn, Estonia, Springer, October 2019, p. 33-51 [*DOI :* 10.1007/978-3-030-31908-3_3], https://hal.archives-ouvertes.fr/hal-02292434

ILDA Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. Awards

- Honorable mention for ActiveInk: (Th)Inking with Data at CHI 2019 .

- Best paper and best doctoral student paper awards for Influence of Color and Size of Particles on their Perceived Speed in Node-Link Diagrams at INTERACT 2019 .

BEST PAPERS AWARDS :

[22]

H. ROMAT, N. RICHE, K. HINCKLEY, B. LEE, C. APPERT, E. PIETRIGA, C. COLLINS.*ActiveInk: (Th)Inking with Data*, in "CHI 2019 - The ACM CHI Conference on Human Factors in Computing Systems", Glasgow, United Kingdom, CHI 2019 - Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems, ACM, 2019 [*DOI :* 10.1145/3290605.3300272], https://hal.archives-ouvertes.fr/hal-02020272

[20]

H. ROMAT, D. LEBOUT, E. PIETRIGA, C. APPERT.*Influence of Color and Size of Particles on Their Perceived Speed in Node-Link Diagrams*, in "INTERACT 2019 - 17th IFIP TC 13 International Conference on Human-Computer Interaction", Paphos, Cyprus, Springer, August 2019, p. 619-637 [*DOI :* 10.1007/978-3-030-29384-0_37], https://hal.inria.fr/hal-02274134

IMAGINE Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

Maxime Garcia, Amélie Fondevilla and Geoffrey Guingo defended their PhD theses.

We published two papers [16], [20] at ACM Transaction on Graphics (Proceedings of SIGGRAPH) which is the most prestigious and selective conference in computer graphics.

5.1.1. *Awards*

Mélina Skouras was elected Eurographics Junior Fellow in May 2019.
Stefanie Hahmann was elected SMA Fellow (Solid Modeling Association) in June 2019.

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

5. Highlights of the Year

5.1. Highlights of the Year

Géry Casiez and Mathieu Nancel received a very selective Google Faculty Research Award for their project "Real-time Latency Measure and Compensation".

Mathieu Nancel contributed to the writing of the new NF Z71-300 French keyboard standard, and spoke at the official launch event in April 2019 at the National Assembly.

5.1.1. Personnel

Edward Lank joined Loki in October as part of the Inria International Chair program and will spend more than 50% of his time with us until 2023.

5.1.2. Awards

Best paper award from the ACM EICS conference to the paper "Polyphony: Programming Interfaces and Interactions with the Entity-Component-System Model", from T. Raffaillac & S. Huot .

Best paper award from the Francophone Conference on Human-Computer Interaction (IHM) to the paper "Reducing Error Aversion to Support Novice-to-Expert Transitions with FastTap", from A. Goguey, S. Malacria, A. Cockburn & C. Gutwin .

BEST PAPERS AWARDS :

[22]

T. RAFFAILLAC, S. HUOT.*Polyphony: Programming Interfaces and Interactions with the Entity-Component-System Model*, in "EICS 2019 - 11th ACM SIGCHI Symposium on Engineering Interactive Computing Systems", Valencia, Spain, June 2019, vol. 3 [*DOI :* 10.1145/3331150], https://hal.inria.fr/hal-02147180

[25]

A. GOGUEY, S. MALACRIA, A. COCKBURN, C. GUTWIN.*Reducing Error Aversion to Support Novice-to-Expert Transitions with FastTap*, in "Actes de la 31e conférence francophone sur l'Interaction Homme-Machine (IHM 2019)", Grenoble, France, ACM, 2019, p. 1:1-10 [*DOI :* 10.1145/3366550.3372247], https://hal.archives-ouvertes.fr/hal-02381584

MANAO Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. Public exhibitions

Textile(s) 3D, exhibition at the Musée Ethnographique de Bordeaux (MEB), until May 29th, 2020: measurement and reproduction of textiles.

The program has targeted the faithful reproduction of the appearance of fragile textiles. To this end, an optical appearance measurement setup has been developped and installed in the basement of the museum. Several textiles have been measured, including ancient asian textiles from the MEB collection; the originals along with their digital reproduction have been shown to the visitors of the museum.

5.1.2. Demonstration

SID Display Week I-Zone, San José Convention Center, May 14-16, 2019: Prototype of an autostereoscopic transparent display

We have showcased a 5-view, full-color, autostereoscopic transparent display prototype that we have developed [8], [13]. Its solution is much like a window that is able to superimpose autostereoscopic 3D data over the real world without the need of any wearables. There are many potential applications in augmented reality and head-up display fields; for example, in automotive, advertisement, and educational areas.

MAVERICK Project-Team (section vide)

5. Highlights of the Year

5.1. Highlights of the Year

This year we advanced on all of our main research axes [11], [12], [13], [14], [15], [17]. We would like to highlight two of these results. First, we cast a new view on the Gabor noise – a now well established procedural texturing technique – by reformulating it to enable new controls and properties [17]. This opens interesting possibilities for microstructure synthesis, a direction we are now pursuing. Second, we introduced a novel algorithm for curved 3D printing [11], a long term ongoing effort within the team. This algorithm is the first – to our knowledge – to optimize for curved layers throughout a part, under constraints allowing fabrication on standard 3D printers using thermoplastic filament. This paves the way to more general techniques for 6-DOF 3D printing.

Our software efforts have also intensified, with a clear increase in the use and popularity of our software IceSL (see *software*). We also announced an exciting collaboration with *AddUp*, a leading French company in the field of metal 3D printing.

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

5. Highlights of the Year

5.1. Highlights of the Year

Members of the MimeTIC team / M2S laboratory carried out a PIA3 EUR (Ecole Universitaire de Recherche) project (DIGISPORT project) for the University of Rennes, which brings together the universities and Grandes Ecoles of the Rennes site. This project, with a total budget of €86 million, is funded by the Ministry of Higher Education, Research and Innovation to the tune of €5.9 million. The objective of DIGISPORT is to create a unique graduate school of international excellence in interdisciplinary training and research in digital sport sciences. This project aims to offer students in initial and continuing training an opportunity to build a study strategy suited to their professional goals and to the labor market. The digital revolution in sports and exercise is indeed already underway, at the confluence of the fast-growing markets of sport (€80 billion worldwide) and digital technology and connected objects (€207 billion worldwide). It leads to the emergence of new professions at the interface of these domains requiring skills in sports science, digital, electronics, and human and social sciences. Currently, education system is not designed to train this type of multi-skilled and agile students able to integrate an evolving labor market. DIGISPORT aims to link and structure training courses and research to promote a transversal approach uniting teaching and research staff around the new discipline of digital sport science and to address the new skills generated by the entry of sport into the digital age. The EUR will provide a coordinated training offer, from masters to doctoral level, that is resolutely interdisciplinary and strongly linked to research and innovation.

Based on previous scientific results in dynamic motion analysis, MimeTIC has developed an efficient software platform to carry-out biomechanical analysis based on motion capture data. "Customizable Toolbox for Musculoskeletal simulation" (CusToM) was delivered as an open source software available on a repository (https://github.com/anmuller/CusToM) and documented in [22]. CusToM is a MATLAB toolbox aiming at performing inverse dynamics-based musculoskeletal analyzes. This type of analysis is essential to access mechanical quantities of human motion in different fields such as clinic, ergonomics and sports. CusToM exhibits several features. It can generate a personalized musculoskeletal model, and can solve from motion capture data inverse kinematics, external forces estimation, inverse dynamics and muscle forces estimation problems with a high level of customization for research purposes. It is also designed for non-expert users interested in motion analysis. CusToM is an OpenSource Software available with no restriction.

The Immersia VR platform has celebrated its 20 years of existence at Inria Rennes/IRISA center, within the "20ans d'Immersia" event (November 2019).

POTIOC Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

The HOBIT system has been exported to a foreign institution (University of Jena) for the first time. The licensing of the technology is in progress for a worldwide distribution.

5.1.1. Awards

- Honorable mention award at ACM ISS 2019

- Best paper award at ACM UIST 2019

- Best presentation award at Neuroadaptive Technologies 2019 (NAT'19): "Modular biofeedback: build your own tangible experience" by Joan Sol Roo and Jeremy Frey

BEST PAPERS AWARDS :

[23]

P. GIRAUDEAU, A. OLRY, J. SOL ROO, S. FLECK, D. BERTOLO, R. VIVIAN, M. HACHET.*CARDS: A Mixed-Reality System for Collaborative Learning at School*, in "ACM ISS'19 - ACM International Conference on Interactive Surfaces and Spaces", Deajon, South Korea, November 2019 [*DOI :* 10.1145/3343055.3359721], https://hal.inria.fr/hal-02313463

[25]

A. KHAN, J. SOL ROO, T. KRAUS, J. STEIMLE.*Soft Inkjet Circuits: Rapid Multi Material Fabrication of Soft Circuits Using a Commodity Inkjet Printer*, in "UIST'19 - 32nd ACM Symposium on User interface software and technology", New Orleans, United States, October 2019, https://hal.archives-ouvertes.fr/hal-02279960

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

5. Highlights of the Year

5.1. Highlights of the Year

Pierre Alliez was program co-chair of the EUROGRAPHICS 2019 conference and of the Symposium on Solid and Physical Modeling (SPM). From February 2019 Yuliya Tarabalka is on leave to the Luxcarta company for two years.

5.1.1. *Awards*

Cédric Portaneri and Pierre Alliez obtained a best paper award at the ACM Conference on Multimedia Systems for a contribution to the progressive compression of textured meshes, in collaboration with the Draco team from Google. Jean-Philippe Bauchet obtained an award for the best presentation at a national workshop (GMTG 2019). Jean-Dominique Favreau received the best PhD thesis award 2019 (assessit prize) from IG-RV. Onur Tasar was part of the winning team of the tomtom AI summer school challenge organized in the Netherlands.

5. Highlights of the Year

5.1. Highlights of the Year

The main highlight for ALMAnaCH in 2019 is the publication of CamemBERT, a French neural language model trained on the French section of OSCAR, our very large multilingual web-based raw corpus. The publication of this first Transformer-based language model for French, which allowed us to improve the state of the art in several classical NLP tasks, met a large success both in the academic and industrial worlds. It is the topic of an article in the major French daily newspaper Le Monde and of a broadcast on the national radio France Culture.

COML Team (section vide)

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MULTISPEECH Project-Team

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5. Highlights of the Year

5.1. Highlights of the Year

We developed the first deep learning-based multichannel speech enhancement algorithm that jointly reduces acoustic echo, reverberation, and background noise [57].

E. Vincent gave a keynote at the Voice Tech Paris 2019 trade fair [18].

A. Deleforge organized the IEEE Signal Processing Cup 2019 on "Search & Rescue with Drone-Embedded Sound Source Localization", to which 20 teams of undergraduate students from 18 universities in 11 countries participated, for a total of 132 participants [5]. The final took place on May the 13th at the international conference ICASSP in Brighton. The associated DREGON dataset, which was made publicly available afterwards, has received over 1,000 file downloads as of December 2019.

5.1.1. Awards

L. Perotin obtained the Best Poster Award of the 2019 IEEE Workshop on Applications of Signal Processing to Audio and Acoustics (WASPAA) .

BEST PAPERS AWARDS :

[43]

L. PEROTIN, A. DÉFOSSEZ, E. VINCENT, R. SERIZEL, A. GUÉRIN.*Regression versus classification for neural network based audio source localization*, in "WASPAA 2019 - IEEE Workshop on Applications of Signal Processing to Audio and Acoustics", New Paltz, United States, IEEE, October 2019, https://hal.inria.fr/hal-02125985

5. Highlights of the Year

5.1. Highlights of the Year

- The **Premier Prix de Thèse de la Fondation Rennes 1** in the area of *Mathématiques, Sciences et Technologies de l'Information et de la Communication*, was awarded to **Himalaya Jain** for his Ph.D. [73] titled "Learning compact representations for large scale image search", conducted under the joint supervision of R. Gribonval and Patrick Perez, Technicolor R & I, Rennes.

- The **Prix Jeune Chercheur** from the *Journée Science et Musique 2019 (Rennes)* was awarded to **Corentin Louboutin** for a contribution titled "Modélisation multi-échelle et multi-dimensionnelle de la structure musicale", in relation to his PhD thesis [13].

SEMAGRAMME Project-Team (section vide)

5. Highlights of the Year

5.1. Highlights of the Year

- Jean-Marc Salotti has been elected Member of the International Academy of Astronautics
- The startup Touch Sensity [0] has been created by Ganna Pugach.

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[0] http://touchsensity.com/

CHORALE Team (section vide)

CHROMA Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

- Success for European H2020 ICT Robotics project application 'BugWright2' (9M€), led by C. Pradalier (CNRS, GeorgiaTech Metz). O. Simonin leads the multi-robot systems Work-Package (funding for Chroma & Agora teams 600K€). Domain : Autonomous Robotic Inspection and Maintenance on Ship Hulls and Storage Tanks.

- Success for several ANR project applications in the field of Artificial Intelligence :
    - ANR JCJC 'PLASMA' led by J. Dibangoye (250K€)
    - ANR 'DELICIO' led by C. Wolf (510 K€), Chroma is partner.
    - AI Chair led by C. Wolf (520 K€), Chroma is partner (O. Simonin, J. Dibangoye).

- Success for several project applications in the field of Autonomous Vehicles : 2 multi-annual R&D projects with Toyota Motor Europe, a PSPC project ES3CAP leaded by Kalray (3 years), and an EU ECSEL project CPS4EU (3 years).

- Our team LyonTech obtained the 3rd place at the Robocup@Home Pepper league in the 2019 RoboCup competition organized in Sydney (July).

- O. Simonin co-chaired with F. Charpillet (Inria Nancy) the JNRR'2019 bi-annual conference, gathering the French Robotic community (GDR Robotique) ($\sim$ 200 pers.).

- New book by A. Martinelli : "Observability: A new theory based on the group of invariance". To be edited by SIAM on year 2020.

- Exploitation Licenses of CMCDOT have respectively been sold to Toyota and to a French company in the field autonomous vehicles (confidential), with an engineer support for the related transfer of technology.

5.1.1. Awards

BEST PAPERS AWARDS :

[43]

J. SARAYDARYAN, R. LEBER, F. JUMEL.*People management framework using a 2D camera for human-robot social interactions*, in "RoboCup 2019 - 23rd Annual RoboCup International Symposium", Sydney, Australia, Robocup 2019: Robot World Cup XXIII, July 2019, p. 1-13, https://hal.archives-ouvertes.fr/hal-02318916

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

5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. Fondamental results

Three PhD students have defended excellent thesis in 2019:

- **Eulalie Coevoet**: Optimization-Based Inverse Model of Soft Robots With Contact Handling
- **Zhongkai Zhang**: Vision-based Calibration, Position Control and Force Sensing for Soft Robots
- **Maxime Thieffry**: Dynamic control of soft robots

In each of these thesis we presented fundamental results on the team's roadmap. Eulalie Coevoet presented the first algorithms that allow inversing the robot model in contact situations. It can be used for planning, manipulation and locomotion. Zhongkai Zhang's results allow the use of the robot as a generalized force sensor thanks to vision. We use that for feedback control for both position and force. Maxime Thieffry developed the first method for dynamic control based on model order reduction. The method is very generic and significantly improves the precision of soft robots.

5.1.2. Awards for software development

DEFROST actively contributed to the open source community by developing plugins for the SOFA framework. The team participated in the SofaWeek2019, during which the SOFA consortium organized the "Open-Source SOFA awards". One prize was offered to the candidate who developed the best open source plugin for SOFA. Another prize was offered to the best open source plugin according to the public (conference attendants). **Both prizes were won by the DEFROST team**, for the Model Order Reduction plugin and the SofaPython3 plugin respectively: link.

5.1.3. Organization of workshops and tutorials

This year, special effort was expended on the promotion of our tools through the organization of workshops and tutorials. A full tutorial day about our tools was organized at the IEEE International Conference on Soft Robotics (RobotSoft019). We then organized the first Journée de Robotique Souple in Lille with 70 participants from 9 countries. The team also participated in the organization of the (2nd Workshop on Proximity Perception in Robotics) at the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2019).

5.1.4. ANR project ROBOCOP

The project ROBOCOP (ROBOtization of COchlear ImPlant) was funded by the ANR (Agence nationale de la recherche) for the development of cochlear implants for the future that are activated by electroactive polymers. The project is in collaboration with the IEMN, the LPPI, Inserm and Oticon Medical. This project will allow us to fund a PhD Student and a postdoctoral fellow for 2 years.

FLOWERS Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

- Clément Moulin-Frier was recruited as CRCN permanent research scientist.

- PY Oudeyer was invited to give plenary keynote talks at several international AI conferences, including ICLR 2019 in New Orleans (https://www.youtube.com/watch?v=7bJ0fnvPLaA) and ACM International Conference on Virtual Agents (ACM IVA 2019), Paris.

- The team published papers in several major machine learning conferences, including ICML [33], Neurips [32], CoRL [38] and IJCNN [36], [37], and one in a major educational technology conference, CHI 2019 [29].

- PY Oudeyer was awarded an individual "Chaire IA" in the context of the national plan on artificial intelligence.

- The Poppy Station association, initiated by the team from the Poppy Education project, and co-directed by Didier Roy, was created and gathers several major national and international educational associations. It aims at scaling up and disseminating the educational robotics kits designed by the Flowers team, and now used in many educational and artistic projects, see https://www.poppy-station.org.

- The work of the PhD of Sébastien Forestier (sup. by PY Oudeyer) on curiosity-driven learning of tool use in robots and children, was integrated as a video interview in the new permanent exhibition on robots at Cité des Sciences et de l'Industrie, Paris, see http://www.cite-sciences.fr/fr/au-programme/expos-permanentes/expos-permanentes-dexplora/robots/lexposition/.

5.1.1. Awards

- Y Oudeyer was awarded the Atos Joseph Fourier prize for his work on curiosity-driven machine learning.

HEPHAISTOS Project-Team

4. Highlights of the Year

4.1. Highlights of the Year

4.1.1. Science

- strong advances on the analysis of cable-driven parallel robots (section 6.1.1)
- first results the daily activities monitoring in a day hospital (section 6.2)

4.1.2. Experimentation

- Two months experimentation of a very large cable-driven parallel robot for an artistic exhibition (section 6.1.2)
- Completion of the second version of our immersive environment for rehabilitation (section 5.3.2.1)

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

5. Highlights of the Year

5.1. Highlights of the Year

- Arrival of a Talos robot in our team (Fig. 1). This is a full-scale humanoid (1.7 m / 100kg / 32 degrees of freedom) that can be fully torque-controlled. The robot is made by PAL Robotics, a Spanish company and is funded by the CPER "Cyber-Entreprise".
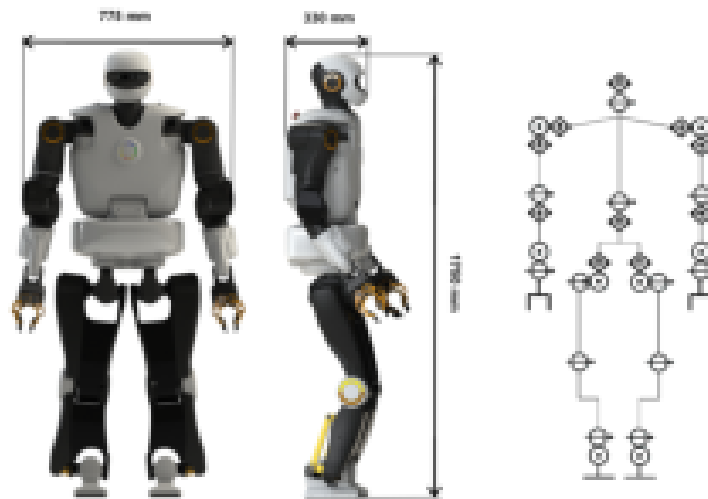- Arrival of Pauline Maurice as a CRCN (CNRS).

Figure 1. The Talos robot.

5.1.1. Awards

- International Society for Artificial Life (ISAL) award for the Outstanding Publication of the Decade 2004-2014: Clune J, Mouret JB, Lipson H. The evolutionary origins of modularity. Proceedings of the Royal Society b: Biological sciences. 2013 Mar 22;280(1755):20122863.

BEST PAPERS AWARDS :

[16]

N. GAUVILLE, F. CHARPILLET.*Exploration et couverture par stigmergie d'un environnement inconnu avec une flotte de robots autonomes réactifs*, in "JFSMA 2019 - 27emes Journées Francophones sur les Systèmes Multi-Agents", Toulouse, France, Cépaduès 2019, ISBN 9782364937192, July 2019, https://hal.inria.fr/hal-02195812

PERVASIVE Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

James Crowley was named to the Chair on Intelligent Collaborative Systems.

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

4. Highlights of the Year

4.1. Highlights of the Year

- J. Pettré is the unit PI of the new H2020 ICT project "PRESENT" started on Sep 2019

4.1.1. Awards

- P. Robuffo Giordano received the Prix Michel Monpetit – Inria from the Académie des sciences
- B. Penin (former PhD student), P. Robuffo Giordano and F. Chaumette received at ICRA 2019 the IEEE RA-L 2018 Best Paper Award for the paper "Vision-Based Reactive Planning for Aggressive Target Tracking while Avoiding Collisions and Occlusions"
- M. Babel received the Innovation Award from the Société Française de Médecine physique et de Réadaptation (SOFMER) for the power wheelchair simulator in virtual reality described in Sect. 6.4.6

RITS Project-Team (section vide)

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

5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. Highlights of the year

- Our activities in relation with fake news were extensively highlighted in 2019. Ewa Kijak and Vincent Claveau gave a few interviews in newspapers, in a nationwide radio broadcast as well as in several TV shows.

- A chaire position in Artificial Intelligence for Defense has been granted to Teddy Furon. This chaire is supported by the national Defense Innovation Agency. The chaire will last 4 years, starting early 2020.

- Laurent Amsaleg (General Chair), Guillaume Gravier (Program Committee Chair), Yannis Avrithis (Workshops Chair) as well as almost all students of LINKMEDIA (as volunteers) were involved in running the 27th ACM Multimedia conference in Nice. This edition, very successful, was attended by close to 800 people.

5.1.2. Awards

Oriane Siméoni received the best presentation award from the International Computer Vision Summer School (ICVSS) 2019 [0].

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[0] https://iplab.dmi.unict.it/icvss2019/

5. Highlights of the Year

5.1. Highlights of the Year

Two patents have been filed during this year: [28] relates to computational photomechanics and [27] relates to localization from objects.

MORPHEO Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. Awards

BEST PAPERS AWARDS :

[15]

R. KLOKOV, J. VERBEEK, E. BOYER.*Probabilistic Reconstruction Networks for 3D Shape Inference from a Single Image*, in "BMVC 2019 - British Machine Vision Conference", Cardiff, United Kingdom, September 2019, p. 1-15, https://arxiv.org/abs/1908.07475 - Awarded with Best Science Paper Honourable Mention Award at BMVC'19., https://hal.inria.fr/hal-02268466

PERCEPTION Project-Team

4. Highlights of the Year

4.1. Highlights of the Year

4.1.1. IEEE Senior Member.

Xavier Alameda-Pineda has become an IEEE Senior Member on February 1st, 2019. The grade of Senior Member requires experience reflecting professional maturity as an engineer, scientist, educator, technical executive, or originator in IEEE-designated fields for a total of 10 years and have demonstrated 5 years of significant performance.

4.1.2. H2020 Project SPRING

(1 Januray 2020 – 31 December 2023) is a research and innovation action (RIA) with eight partners: Inria Grenoble (coordinator), Università degli Studi di Trento, Czech Technical University Prague, Heriot-Watt University Edinburgh, Bar-Ilan University Tel Aviv, ERM Automatismes Industriels Carpentras, PAL Robotics Barcelona, and Hôpital Broca Paris.. The main objective of SPRING (Socially Pertinent Robots in Gerontological Healthcare) is the development of socially assistive robots with the capacity of performing multimodal multiple-person interaction and open-domain dialogue. In more detail:

- The scientific objective of SPRING is to develop a novel paradigm and novel concept of socially-aware robots, and to conceive innovative methods and algorithms for computer vision, audio processing, sensor-based control, and spoken dialog systems based on modern statistical- and deep-learning to ground the required social robot skills.

- The technological objective of SPRING is to create and launch a brand new generation of robots that are flexible enough to adapt to the needs of the users, and not the other way around.

- The experimental objective of SPRING is twofold: to validate the technology based on HRI experiments in a gerontology hospital, and to assess its acceptability by patients and medical staff.

Website: https://spring-h2020.eu/

4.1.3. ANR JCJC Project ML3RI

(1 March 2020 – 28 February 2024) has been awarded to Xavier Alameda-Pineda. Multi-person robot interaction in the wild (i.e. unconstrained and using only the robot's resources) is nowadays unachievable because of the lack of suitable machine perception and decision-taking models. *Multi-Modal Multi-person Low-Level Learning models for Robot Interaction* (ML3RI) has the ambition to develop the capacity to understand and react to low-level behavioral cues, which is crucial for autonomous robot communication. The main scientific impact of ML3RI is to develop new learning methods and algorithms, thus opening the door to study multi-party conversations with robots. In addition, the project supports open and reproducible research.

4.1.4. MIAI Chair.

The Multidisciplinary Institue in Artificial Intelligence (MIAI) is one of the four AI French institutes launched in 2019 by the French government. MIAI is structured around several chairs, each chair gathering 3-6 researchers as well as postdocs and PhD students. Team members Radu Horaud and Xavier Alameda-Pineda are co-chairs of the *Audio-visual machine perception and interaction for companion robots* chair. The development of methods and algorithms for enabling socially-aware robot behavior with the specific goal of interacting with humans is the core topic. The emphasis is put on unsupervised and weakly supervised learning with audio and visual data, based on Bayesian methods, deep learning and reinforcement learning. It is planned to develop challenging proof-of-concept implementations and demonstrators.

SIROCCO Project-Team

5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. Awards

- C. Guillemot has received the 2019 EURASIP Technical Achievement Award.

4. Highlights of the Year

4.1. Highlights of the Year

4.1.1. *People detection*

People detection is a very challenging topic, where many top-level research groups are competing and have already proposed impressive approaches (e.g. Faster-RCNN, SSD, YOLO). Yet, we were able to design a novel algorithm able to better balance the speed and accuracy trade-off on the most challenging pedestrian detection benchmarks (e.g. Caltech and Citypersons).

4.1.2. *Person Re-Identification*

Person Re-Identification is a very challenging task, where current Computer Vision algorithms manage to obtain better results than humans. By proposing a simple and elegant technique, based on Spatial-Channel Partitions, we have obtained the best performance compared to the State-of-the-art approaches on the most popular benchmark datasets (e.g. Market-1501, CUHK03 and MARS).

4.1.3. *Action recognition*

This year, we have proposed several action recognition approaches able to outperform the State-of-the-art algorithms and get nearly maximal performance on most of ADL benchmark video datasets (e.g. Northwestern-UCLA Multiview Action 3D, NTUTU-RGB and DAHLIA). We have also released a novel ADL benchmark video dataset, which is more challenging, as it has been collected within real-world settings.

4.1.4. *Awards*

Antitza Dantcheva and Abhijit Das recceived a Best Poster Award at the 14th IEEE International Conference on Automatic Face and Gesture Recognition (FG 2019) in Lille, France (the flagship face analysis conference) for the paper: "Robust remote heart rate estimation from face utilizing spatial-temporal attention" [28].

<div align="center">

THOTH Project-Team

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5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. Awards

- Cordelia Schmid received the Royal Society Milner Award, 2019.
- Julien Mairal received the test-of-time award at the International Conference on Machine Learning (ICML), 2019.
- The paper [21] authored by Roman Klokov, Jakob Verbeek, Edmond Boyer [Inria Morpheo] won the "Best Science Paper Award Honourable Mention" at BMVC 2019.
- Jakob Verbeek was awarded as an outstanding reviewer at ICLR 2019.
- Adria Ruiz Ovejero was awarded as an outstanding reviewer at ICCV 2019.

5.1.2. Dissemination

- The team co-organized PAISS 2019, an international AI summer school in Paris. This is the second edition of the school that was first organized in Grenoble in 2018. The 2019 edition brought together over 200 participants. We also provided scholarships to 21 students to encourage diversity among the attendees.

<p align="center" style="color:red">**WILLOW Team**</p>

5. Highlights of the Year

5.1. Highlights of the Year

5.1.1. Awards

- Four Prairie chairs awarded to I. Laptev, J.-P. Laumond, J. Ponce and J. Sivic by the international selection committee.
- Best Paper Award at FG (Automatic Face and Gesture Recognition - http://fg2019.org/awards/) 2019. (M. Tapaswi)
- Best paper finalist at CVPR 2019 for the work of Z. Li, J. Sedlar, J. Carpentier, I. Laptev, N. Mansard and J. Sivic Estimating 3D Motion and Forces of Person-Object Interactions From Monocular Video, IEEE Conference on Computer Vision and Pattern Recognition (CVPR) (2019) [0]
- Best student paper awarded to H Cisneros, J Sivic, T Mikolov, Evolving Structures in Complex Systems at IEEE Symposium Series on Computational Intelligence (2019)

5.1.2. Visibility

- In 2019 we have recruited two excellent researchers with robotics background: Justin Carpentier and Jean-Paul Laumond, who will strengthen the team and will help developing a new research axis on learning embodied representations.
- J. Ponce co-organized the PRAIRIE AI Summer School, Paris, 2019.
- J. Ponce has been a key person in creating the PRAIRIE Institute for AI research in Paris, innagurated in October 2019.

BEST PAPERS AWARDS :

[11]

H. CISNEROS, J. SIVIC, T. MIKOLOV.*Evolving Structures in Complex Systems*, in "SSCI 2019 - IEEE Symposium Series on Computational Intelligence", Xiamen, China, December 2019, https://arxiv.org/abs/1911.01086 - IEEE Symposium Series on Computational Intelligence 2019 (IEEE SSCI 2019), https://hal.inria.fr/hal-02448134

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[0]More details at: https://www.ciirc.cvut.cz/vysledek-ciirc-cvut-se-dostal-do-uzsiho-vyberu-nejlepsich-clanku-prestizni-konference-cvpr-v-pocitacovem-videni/ and the list of all shortlisted papers is available at http://cvpr2019.thecvf.com/files/CVPR%202019%20-%20Welcome%20Slides%20Final.pdf