

**RESEARCH CENTER** 

FIELD Perception, Cognition and Interaction

# Activity Report 2017

# Section Contracts and Grants with Industry

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**CEDAR Team** (section vide)

## **GRAPHIK Project-Team**

## 8. Bilateral Contracts and Grants with Industry

## 8.1. Bilateral Grants with Industry

• Régilait contract: In the framework of a contract between INRA IATE and STLO (Rennes) research units, a master student from Toulouse University has been recruited in 2017. He developed a new version of the CoGui-Capex software tool, based on Cogui, which permits to navigate and reason in decision-support trees that link food descriptors and the actions that can be undertaken by some operators. The final delivery (December 2017) will be evaluated by Régilait till mid-2018.

## **LACODAM Project-Team**

## 8. Bilateral Contracts and Grants with Industry

## 8.1. Bilateral Contracts with Industry

#### 8.1.1. ITRAMI: Interactive Trace Mining

Participant: Alexandre Termier.

ITRAMI is a Nano2017 project. Such projects are designed to support joint research efforts between STMicrolectronics and academic partners in the domain of embedded systems. Alexandre Termier is the PI of this project whose goal is to design novel data mining methods for interactive analysis of execution traces. Such methods aim at considerably reducing the time that STMicroelectronics developers spend at understanding, debugging and profiling applications running on STMicrolectronics chips. The work is done at University Grenoble Alps, in collaboration with LACODAM researchers. Two contractual staff members are working on the project in Grenoble: Willy Ugarte as postdoc, and Soumaya Ben Alouane as engineer.

#### 8.1.2. Hyptser: Hybrid Prediction of Time-Series

Participants: Thomas Guyet, Vincent Lemaire [Orange Labs], Simon Malinowski [LinkMedia].

HYPTSER is a project funded by the Gaspard Monge Program for Optimisation and Operational Research (PGMO). It is dedicated to the development of innovative methods for predictions in time series. In the field of machine learning, *ensemble methods* have gained popularity in the last years. These methods combine several algorithms that solve the same task in order to improve the performance of the outcome. Two main families of ensemble methods can be found in the literature : The first family makes use of different models and combine their results a posteriori. The methods Bagging and Boosting are examples of methods in this family [26], [34]. The second family is based on a smart selection of the local algorithms in order to create a global hybrid algorithm. Logistic Model Tree [30] or Extreme Learning Machine Tree [36] are examples of such hybrid algorithms. In this project, starting at the end of 2017 for one year, we envision to explore the second family of methods in order to analyze how efficiently hybrid models can perform on the task of time series prediction. We plan to apply these methods to predict resource usage for cloud computing (CPU, memory) so as to minimize their infrastructure.

#### 8.1.3. Particular Contract of the Strategic Action EDF/Inria

Participants: Manel Boumghar [EDF R&D], Laurent Pierre [EDF R&D], Thomas Guyet, René Quiniou.

The analysis of customer pathways has become a strategic issue for many businesses. The interaction traces left by clients when connecting to the customer services can be combined with data from other communication channels (phone, web form, e-mail, mail, fax, SMS, shop, etc.) and allow to analyse the customer pathways in details.

Pattern mining tools are able to extract the frequent customer behaviors in very large databases of client pathways. Nevertheless, taking into account the duration and the delay between the customer actions in the mining remains a challenge. The objective of this one-year contract was to design and develop a frequent mining tool that accounts for temporal patterns with negations for analysis of multichannel customer pathways. In this line, we developed and implemented the NTGSP algorithm [17].

### 8.2. Bilateral Grants with Industry

Maël Guillemé has obtained a CIFRE PhD grant with the Energiency startup, supervised by V. Masson and L. Rozé. The goal of Maël's thesis is to propose new approaches to improve industrial energy performance by integrating both numerical and symbolic attributes. An M2 internship from 2016 explored an approach based on an algorithm proposed by Shokoohi and al, and proposed several improvements: avoid data normalisation, detect patterns as fast as possible, enhance functions like distance and score.

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Another CIFRE thesis has started, this time with the Amossys company, which specializes in cyber-security. This is the PhD of Alban Siffer, located in the EMSEC team of IRISA and co-supervised between EMSEC (P.A. Fouque) and LACODAM (A. Termier, C. Largouët). The goal of this PhD is to propose new methods for intrusion detection in networks. The novel insight is to consider only IP flow as input (metadata of packets and not packet contents) and detect intrusion via unusual traffic patterns.

On October 2017, Colin Leverger started a thesis funded by Orange and co-supervised between Orange Labs (R. Marguerie), LACODAM (A. Termier, T. Guyet) and LinkMedia (S. Malinowski). The goal of this thesis is to propose new methods to forecast time series in order to support capacity planning tasks.

Elisa Fromont is still involved in the supervision of two PhD students through her former employer: the University of Saint-Etienne. One of the students is Guillaume Metzler, who works with the sponsorship of the Blitz company on bank fraud detection. On the other hand, Kevin Bascol (financed by a FUI project) works in collaboration with Bluecime (Grenoble) and works on improving ski-lift security.

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LINKS Project-Team (section vide)

## **MAGNET Project-Team**

## 8. Bilateral Contracts and Grants with Industry

### 8.1. Product Name Disambiguation

Optimix is a company that provides marketing campaign optimization services and pricing policies for companies. One of the OptiMix tools offers a competitive price comparison. In this collaboration with Magnet, the objective was to use machine learning approaches and natural language processing for product names disambiguation.

### 8.2. Coreference resolution

In an ongoing collaboration with Orange, we develop a Natural Language Processing library for co-reference resolution. The library is based on a previous work (CorTeX) and will be extended in several ways. It will handle French language, it will include new features based on vectorial representations of words (word embeddings) and it will be more scalable. PASCAL DENIS is the local PI at Inria of this project.

## 8.3. Privacy preserving data mining for Mobility Data

JAN RAMON is the local PI at Inria for the ADEME-MUST project (Méthodologie d'exploitation des données d'usage des véhicules et d'identification de nouveaux services pour les usagers et les territoires). We study machine learning and data mining methods for knowledge discovery from mobility data, which are time-stamped signals collected from cars, for example, GPS locations, accelerations and fuel consumption. We aim to discover knowledge that helps us to address important questions in the transportation system such as road safety, traffic congestion, parking, ride-sharing, pollution and energy consumption. As the mobility data contains a lot of personal information, for instance, driving styles and locations of the users, we hence also study methods that allow the users to keep their personal data and only exchange part of them to collaboratively derive the knowledge.

The project has four partners, including, Xee company, CEREMA, i-Trans and Inria. The Xee company is responsible for recruiting drivers and collecting the data. CEREMA and i-Trans function as domain experts who help us to form the questions and verify the analytical results. MAGNET is responsible for developing and applying data mining methods for analyzing the data. The developed methods and the discovered knowledge from the project will be transferred to Metropole Lille and ADEME.

In [17], we presented our preliminary idea for a decentralized and privacy-aware machine learning method for predicting traversal time in the Data Mining with Secure Computing workshop held in conjunction with the 2017 European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases (ECML/PKDD-2017).

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**MOEX Project-Team** (section vide)

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**ORPAILLEUR Project-Team (section vide)** 

## **PETRUS Project-Team**

## 7. Bilateral Contracts and Grants with Industry

### 7.1. Bilateral Contracts with Industry

#### 7.1.1. OwnCare II-Lab (Jul 2017 - Dec 2020)

Partners: PETRUS (Inria-UVSQ), Hippocad (SME)

Funding: to be determined

End 2016, the Yvelines district lauched a public call for tender to deploy an industrial solution aiming at covering the whole distinct (10.000 patients). The Hippocad company, in partnership with Inria, won this call for tender with a solution called DomYcile in May 2017 and the project was launched in July 2017. DomYcile is based on a home box combining the PlugDB hardware/software technology developed by the Petus team and a communication layer based on SigFox. Hippocad and Petrus then decided to launch a joint II-Lab (Inria Innovation Lab) named OwnCare. The objective is threefold: (1) build an industrial solution based on PlugDB and deploy it in the Yvelines district in the short-term, (2) use this Yvelines testbed to improve the solution and try to deploy it at the national/international level in the medium-term and (3) design flexible/secure/mobile personal medical folder solutions targeting individual uses rather than professional uses in the long-term. The DomYcile project with the Yvelynes district has started in July 2017 and the II-Lab should be officially created in January 2018.

### 7.2. Bilateral Grants with Industry

#### 7.2.1. Cozy Cloud CIFRE - Tran Van contract (Oct 2014 - Feb 2017)

Partners: Cozy Cloud, PETRUS (Inria-UVSQ)

SMIS funding: 30k€

In relation with the bilateral contract mentioned above, a CIFRE PhD thesis has been started by Paul Tran Van. The objective is to capitalize on the Cozy-PlugDB platform to devise new access and usage control models to exchange data among devices of the same user (devices may have different levels of trustworthiness) and among different users thanks to a user-friendly sharing model (see the work on the SWYSWYK - Share What You See with Who You Know - model presented above).

#### 7.2.2. Cozy Cloud CIFRE - Loudet contract (Apr 2016 - Apr 2019

Partners: Cozy Cloud, Inria-SMIS

SMIS funding: 45k€

In relation with the bilateral contract mentioned above, a second CIFRE PhD thesis has been started by Julien Loudet. The objective is to allow for a secure execution of distributed queries on a set of personal clouds associated to users, depending on social links, user's localization or user's profile. The general idea is to build secure indexes, distributed on the users' personal clouds and to devise a secure execution protocol revealing solely the query result to the querier. Such highly distributed secure queries potentially enable new (social) applications fed by user's personal data which could be developed on the Cozy-PlugDB platform.

## **TYREX Project-Team**

## 7. Bilateral Contracts and Grants with Industry

## 7.1. Bilateral Contracts with Industry

Transfer contract

Partner: Oppidoc startup

Coordinator: Pierre Genevès

Abstract: the goal of this project is to investigate the integration of advanced static analyses in Oppidoc's flagship product, Oppidum, which is a software framework for constructing web sites with forms for the collaborative edition and publishing of structured documents.

Data and Knowledge Representation and Processing - Contracts and Grants with Industry - Team

Valda Team (section vide)

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## WIMMICS Project-Team

## 8. Bilateral Contracts and Grants with Industry

### 8.1. Bilateral Contracts with Industry

#### 8.1.1. PREMISSE Collaborative Project

Participants: Molka Dhouib, Catherine Faron Zucker, Andrea Tettamanzi.

#### Partner: SILEX France.

This collaborative project with the SILEX France company started in march 2017, funded by the ANRT (CIFRE PhD) and UCA (post-doc). SILEX France is developing a B2B (business to business) platform where service providers and consumers upload their service offers or requests in free natural language; the platform is intended to recommend service providers to the applicant, which are likely to fit his/her service request. The aim of this project is to develop a solution to link together service providers and consumers.

#### 8.1.2. Synchronext Collaborative Project

Participants: Raphaël Gazzotti, Catherine Faron Zucker, Fabien Gandon.

Partner: Synchronext.

This project is funded by the ANRT (CIFRE PhD). Synchronext is a startup aiming at developing Semantic Web business solutions. The goal of this project is to develop a NLP and semantic Web based artificial agent for online support in the insurance domain. The objective is to reduce the dropout rate of Internet users on FAQs and to reduce the number of incoming calls and e-mails. This will enable to customer advisers to focus on more difficult questions. As a first step, we are working on automatically categorizing online requests to properly rout them.

### 8.2. Bilateral Grants with Industry

#### 8.2.1. Intelliquiz Carnot Project

Participants: Oscar Rodríguez Rocha, Catherine Faron Zucker.

#### Partner: GAYAtech/QWANT.

This project started in March 2017. It is a joint project with Gayatech (now acquired by QWANT) on the automatic generation of quizzes from the Web of Data. It is a continuation of a former collaborative project with GAYAtech on the recommendation of pedagogical resources based on ontology-based modelling and processing.

Based on example quizzes extracted from the famous game *Les Incollables* card game, we are proposing an approach to develop quizzes from a domain ontology and we are experimenting on the geographical domain for primary school students.

#### 8.2.2. Inria LabCom EduMICS

Participants: Catherine Faron Zucker, Geraud Fokou Pelap, Olivier Corby, Fabien Gandon, Alain Giboin.

Partner: Educlever.

EduMICS (Educative Models Interactions Communities with Semantics) is a joint laboratory (LabCom, 2016-2018) between the Wimmics team and the Educlever company. Adaptive Learning, Social Learning and Linked Open Data and links between them are at the core of this LabCom. The purpose of EduMICS is both to develop research and technologies with the ultimate goal to adapt educational progressions and pedagogical resource recommendation to learner profiles.

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During the first year of the project we worked on developing light-weight ontologies and thesaurus to capture the Educlever ontological knowledge and we annotated the pedagogical resources of the Educlever solution. Then we developed a benchmark and showed that Semantic Web solutions can be deployed within their industrial context. In the continuation of this first step of the project, we will show the added value of Semantic Web modelling enabling ontology-based reasoning on the acquired knowledge graph.

## **ZENITH Project-Team**

## 8. Bilateral Contracts and Grants with Industry

### 8.1. Microsoft ZcloudFlow (2013-2017)

Participants: Ji Liu, Esther Pacitti, Patrick Valduriez.

ZcloudFlow is a project in collaboration with the Kerdata team in the context of the Joint Inria–Microsoft Research Centre. It addresses the problem of advanced data storage and processing for supporting scientific workflows in the cloud. The goal is to design and implement a framework for the efficient processing of scientific workflows in clouds. The validation is performed using synthetic benchmarks and real-life applications from bioinformatics on the Microsoft Azure cloud with multiple sites.

### 8.2. Triton I-lab (2014-2017)

Participants: Benjamin Billet, Didier Parigot.

Triton is a common Inria lab (i-lab) between Zenith and Beepeers (http://www.beepeers.com) to work on a scalable platform for developing social networks in mobile/Web environments. The main objective of this project is to design and implement a new architecture for Beepeers applications to scale up to high numbers of participants. The new platform relyes on our SON middleware and NoSQL graph databases.

### 8.3. SAFRAN (2018)

Participants: Reza Akbarinia, Florent Masseglia.

SAFRAN and Inria are involved in the DESIR frame-agreement (Florent Masseglia is the scientific contact on "Data Analytics and System Monitoring" topic. In this context, SAFRAN dedicates  $80K \in$  for a joint study of one year on time series indexing. The specific time series to be exploited are those of engine benchmarking with novel characteristics for the team (multiscale and multidimensional).

## **ALICE Project-Team**

## 8. Bilateral Contracts and Grants with Industry

### 8.1. Bilateral Contracts with Industry

We developed a collaboration with a local company regarding additive manufacturing technologies. This contract allowed us to host two interns (Mélanie Siret and Jimmy Etienne), both supervised by Sylvain Lefebvre. The topic is confidential.

## AVIZ Project-Team (section vide)

EX-SITU Project-Team (section vide)

## **GRAPHDECO Project-Team**

## 7. Bilateral Contracts and Grants with Industry

### 7.1. Bilateral Contracts with Industry

#### 7.1.1. Optis

Participants: Valentin Deschaintre, Adrien Bousseau, George Drettakis.

Valentin Deschaintre has a CIFRE PhD fellowship on Material Acquisition using Machine Learning, in collaboration with Optis, a company specialized in material acquisition and rendering.

#### 7.1.2. Adobe

Participants: Adrien Bousseau, Johana Delanoy.

As part of a long standing collaboration with Adobe, J. Delanoy interned at Adobe Research with A. Hertzman, (San Fransisco). Adobe provides research and software donations as part of this collaboration.

#### 7.1.3. Technicolor

Participants: George Drettakis, Adrien Bousseau.

We have initiated a collaboration with Technicolor on the use of deep learning for computational photography and video tasks. This involves the use of our synthetic ground truth data generation platform for graphics and vision tasks.

### **HYBRID** Project-Team

## 8. Bilateral Contracts and Grants with Industry

#### 8.1. Bilateral Contracts with Industry

#### 8.1.1. Mensia Technologies

Participants: Anatole Lécuyer, Jussi Tapio Lindgren.

Mensia Technologies is an Inria start-up company created in November 2012 as a spin-off of Hybrid team. Mensia is focused on wellness and healthcare applications emerging from the BCI and Neurofeedback technologies. The Mensia startup should benefit from the team's expertise and of valuable and proprietary BCI research results. Mensia is based in Rennes and Paris. Anatole Lécuyer and Yann Renard (former Inria expert engineer who designed the OpenViBE software architecture and was involved in team projects for 5 years) are co-founders of Mensia Technologies together with CEO Jean-Yves Quentel.

The on-going contract between Hybrid and Mensia started in November 2013 and supports the transfer of several softwares designed by Hybrid team ("OpenViBE", "StateFinder") related to our BCI activity to Mensia Technologies for multimedia or medical applications of Mensia.

#### 8.2. Bilateral Grants with Industry

#### 8.2.1. Technicolor

Participants: Antoine Costes, Anatole Lécuyer, Ferran Argelaguet.

This grant started in December 2015. It supports Antoine Costes's CIFRE PhD program with Technicolor company on "Haptic Texturing".

#### 8.2.2. Realyz

Participants: Guillaume Cortes, Anatole Lécuyer.

This grant started in December 2015. It supports Guillaume Cortes's CIFRE PhD program with Realyz company on "Improving tracking in VR".

#### 8.2.3. VINCI Construction

Participants: Anne-Solène Dris-Kerdreux, Bruno Arnaldi, Valérie Gouranton.

This grant started in November 2015. It supports Anne-Solene Dris-Kerdreux's CIFRE PhD program with Vinci company on "Training in VR for construction applications".

#### 8.2.4. Orange Labs

Participants: Guillaume Bataille, Bruno Arnaldi, Valérie Gouranton.

This grant started in October 2017. It supports Guillaume Bataille's PhD program with Orange Labs company on "Natural Interactions with IoT using VR/AR".

## **ILDA Project-Team**

## 8. Bilateral Contracts and Grants with Industry

## 8.1. Bilateral Contracts with Industry

• Tecknowmetrix (TKM): ANRT/CIFRE PhD (Hugo Romat), 3 years, starting June 2016.

## **IMAGINE Project-Team**

## 7. Bilateral Contracts and Grants with Industry

## 7.1. Bilateral Grants with Industry

#### 7.1.1. CIFRE SILEANE (2015 - 2018)

Participants: Frédéric Devernay, Romain Brégier.

#### 7.1.2. CIFRE PSA (2017 - 2020)

Participants: Stefanie Hahmann, Jean-Claude Léon, Youna Le Vaou.

## **MANAO Project-Team**

## 8. Bilateral Contracts and Grants with Industry

### 8.1. Bilateral Contracts with Industry

#### 8.1.1. CIFRE PhD contract with Technicolor (2014-2018)

**Participants:** A. Dufay, X. Granier & R. Pacanowski For this project, we aim at providing interactive previsualization of complex lighting with a smooth transition to the final solution.

#### 8.1.2. CIFRE PhD contract with Thermo Fisher Scientific (2014-2018)

**Participants:** D. Murray & X. Granier For this project, we aim at providing expressive rendering techniques for volumes.

#### 8.1.3. CIFRE PhD contract with Imaging Optics (2017-2020)

**Participants:** C. Herzog & X. Granier For this project, we aim at developing 3 dimensions X-rays imaging techniques for medical applications. MAVERICK Project-Team (section vide)

## **MIMETIC Project-Team**

## 8. Bilateral Contracts and Grants with Industry

### 8.1. Bilateral Contracts with Industry

#### 8.1.1. BPI-PCR Robo-KII

Participant: Armel Crétual [contact].

This contract has started in February 2017 and will last in October 2018. In M2S, it involves two permanent members of MimeTic team, Armel Crétual and Franck Multon, and two engineers, Antoine Marin (18 months grant) and Brice Bouvier (10 months grant).

This project is a collaboration between BA Healthcare and M2S lab. It aims at developing a robotics platform to allow physicians to start gait rehabilitation as soon as possible, even before patients are able to maintain upright posture alone. The usual way to perform such rehab sessions is to make the patient walk on a treadmill benefiting from a harness to prevent patient from falling. The two main limits of this approach are that:

- only straightforward at constant speed gaits are feasible whereas falling risks are much higher when modifying speed or turning
- walking on a treadmill when motor abilities are very affected can be challenging and can generate strong apprehension.

In a previous project, Robo-K, ended in september 2016, BA Healthcare has developed a first prototype of a mobile robot which strongly modified the approach: the harness is mobile and follows the patient displacement. In this way, the patient walks on the ground at his/her desired speed and the physician can include curved trajectories in the rehab process.

The main novelty of Robo-KII project is to implement a biofeeedback system onto the robotics platform to reinforce rehab sessions. Closely working with physicians from two PMR services, CHU Rennes and Kerpape center, we intend to define the optimal feedback to be given to the patients and to measure the corresponding gait parameters thanks to depth cameras mounted on the robot.

### 8.2. Bilateral Grants with Industry

Participants: Marc Christie, Christophe Lino.

Bilateral contract with Technicolor on empowering drones with cinematographics knowledge. Participants: Philippe Guillotel, Julien Fleureau, Quentin Galvane. Amount 25kE. Duration 24 months.

## **MINT2 Team**

## 7. Bilateral Contracts and Grants with Industry

## 7.1. Bilateral Contracts with Industry

- Hap2U SME is licensed two patents of MINT team.
- An InriaTech contract has been made with GoTouchVR SME for contributing to the company SDK.

## **Mjolnir Team**

## 8. Bilateral Contracts and Grants with Industry

### 8.1. Bilateral Contracts with Industry

• Mock-up of a tool for dynamic media pre-production: we did work with the HCOP holding company on the design of new tools for the pre-production of dynamic media such as videos, e-learning animations, etc. This work involved interviews of professional video producers, the identification of opportunities for tools that could help them, and the production of descriptions and mock-ups of these tools.

## **POTIOC Project-Team**

## 8. Bilateral Contracts and Grants with Industry

## 8.1. Bilateral Contracts with Industry

Interactive Collaboration in Virtual Reality for Aerospace Scenarii:

Duration: 2014-2017

PhD Thesis of Damien Clergeaud

Partners: Airbus Group

Local coordinator: Pascal Guitton

The Airbus company regularly uses virtual reality for design, manufacturing and maintenance. We work with them on collaborative interaction in order to enable an efficient collaboration between operators immersed in the virtual environment from remote locations and with heterogeneous equipment. More precisely, we have developped tools to point and manipulate objects, to remotely visualize the virtual environment, to be aware of remote manipulations and to describe tools and components trajectories

### **TITANE Project-Team**

## 8. Bilateral Contracts and Grants with Industry

#### 8.1. Bilateral Contracts with Industry

#### 8.1.1. Google

Participants: Pierre Alliez, Cedric Portaneri.

We aim to develop a novel approach and software prototype for the compression of 3D models. Our main focus is on progressive compression of surface triangle meshes with color textures, with emphasis on fine grain, genericity and flexible metric. The proposed methodology is to turn the input models into a stream of refinements, in which both mesh and texture refinement details are multiplexed in accordance to rate-distortion principles. Fine grain will be achieved through considering all components, local as well as non-local, from both the mesh and its textures: mesh complexity, vertex accuracy, texture definition and accuracy. We will leverage the recent advances on perceptual metrics to improve the visual appearance, and perform joint consolidation and encoding of the models to further optimize the rate-distortion tradeoffs and visual perception.

- Starting date: January 2017 - Duration: 1 year

#### 8.1.2. Geoimage

Participants: Liuyun Duan, Florent Lafarge.

The aim of this collaboration is to devise a new type of 2.5D representation from satellite multi-view stereo images which is more accurate, compact and meaningful than the conventional digital elevation models (DEMs). A key direction consists in incorporating semantic information directly during the image matching process. Such a semantic information is related to the type of components of the scene, such as vegetation, roofs, building edges, roads and land.

- Starting date: November 2013 - Duration: 4 years

#### 8.1.3. CSTB

Participants: Hao Fang, Florent Lafarge.

The goal of this recent collaboration is to develop methods for analyzing and exploring scale-spaces into urban 3D data.

- Starting date: March 2016 - Duration: 3 years

#### 8.1.4. Luxcarta

Participants: Jean-Philippe Bauchet, Florent Lafarge.

The goal of this recent collaboration is to design automated approaches for producing city models from the last generation of satellites. The models should conform to the level 2 (LOD2) of the popular CityGML format.

- Starting date: October 2016 - Duration: 3 years

#### 8.1.5. CNES

Participants: Emmanuel Maggiori, Yuliya Tarabalka.

The objective of the project was to devise hierarchical approaches for object-oriented classification of multisource images. Multi-source images are generated from a scene observed by different types of sensors.

- Starting date: November 2015 - Duration: 2 years

#### 8.1.6. CNES and Acri-ST

Participants: Onur Tasar, Yuliya Tarabalka.

The aim is to devise efficient representations for satellite images.

- Starting date: October 2017 - Duration: 3 years

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### **ALMANACH Team**

## 8. Bilateral Contracts and Grants with Industry

#### 8.1. Industrial Collaborations

- Verbatim Analysis: this Inria start-up was co-created in 2009 by BS. It uses some of AL-PAGE/ALMAnaCH's free NLP software (SxPipe) as well as a data mining solution co-developed by BS, VERA, for processing employee surveys with a focus on answers to open-ended questions. A new Inria startup, **opensquare**, was co-created in December 2016 by BS with 2 senior specialists of HR consulting. It is dedicated to designing, carrying out and analysing employee surveys as well as HR consulting based on these results. It uses a new employee survey analysis tool, *enqi*, which is still under development.
- Facebook: A collaboration on text simplification ("français Facile À Lire et à Comprendre", FALC) is starting with Facebook's Parisian FAIR laboratory. It should start with a co-supervised (CIFRE) PhD thesis in collaboration with UNAPEI, the largest French federation of associations defending and supporting people with special needs and their families (the CIFRE application has just been submitted). This collaboration is expected to be part of a larger initiative involving (at least) these three partners as well as the relevant ministries.
- **Bluenove**: A contract with this company has been signed, which initiates a collaboration in the integration of NLP tools (e.g. chatbot-related modules) within Bluenove's plateform Assembl, dedicated to online citizen debating forums. It involves a total of 24 months of fixed-term contracts (12 months for an engineer and 12 months for a research ingineer).
- Science Miner: ALMAnaCH (following ALPAGE) has been collaborating since 2014 years with this company founded by Patrice Lopez, a specialist in machine learning techniques and initiator of the GROBID and NERD (now entity-fishing) suites. Patrice Lopez provides scientific support on the corresponding software components in the context of the Parthenos, EHRI and Iperion projects, as well as in the context of the Inria anHALytics initiative, aiming at providing a scholarly dashboard on the scientific papers available from the HAL national publication repository.
- Konverso: A collaboration with this start-up is starting, focused on chatbots and text generation. One of our objectives with this collaborations is to initiate a larger initiative involving ALMAnaCH and several small companies, whose goal will be the development of open-source, NLP-enhanced chatbot modules. This is because such developments are complex and would benefit from such a mutualisation initiative. In turn, an open-source chatbot engine would allow startups and ALMAnaCH to more rapidly develop and deploy high-performance application-specific chatbots. The first concrete outcome of this collaboration is our joint submission to the call for projects published by the DILA (French government agency) for exploring the relevance of deploying a chatbot on the public information plateform service-public.fr.
- There exists at least one formal collaboration between a company and EPHE involving future AL-MAnaCH members. It involves **Insight-Signals**, an EPHE start-up that "designs data analytics and decision support systems that integrate the complexity of humans' behaviour and their interactions".
- **Trooclick**: A direct and active collaboration with this company is now strengthened by the "RAPID" ANR project VerDI on the automatic detection of omissions in news reports and other types of texts. This project will come to an end in February 2018.
- ALMAnaCH members have recently initiated discussions with other companies (Fujitsu, HyperLex, Fortia Financial Solutions...), so that additional collaborations might start in the near future. They have also presented their work to companies interested in knowing more about the activities of Inria Paris in AI and NLP (Google, Toyota, Samsung...).

## **COML Team**

## 8. Bilateral Contracts and Grants with Industry

## 8.1. Bilateral Grants with Industry

- Grant from MSR (Zero Resources Challenge, 2017)  $5K \in$
- AWS Grant (Zero Resources Challenge, 2017) 20K€

### **MULTISPEECH Project-Team**

## 8. Bilateral Contracts and Grants with Industry

#### 8.1. Bilateral Contracts with Industry

#### 8.1.1. Orange

Company: Orange SA (France)

Duration: Nov 2016 - Nov 2019

Participants: Laureline Perotin, Romain Serizel, Emmanuel Vincent

Abstract: This CIFRE contract funds the PhD thesis of Laureline Perotin with Orange Labs. Our goal is to develop deep learning based speaker localization and speech enhancement algorithms for robust hands-free voice command. We are especially targetting difficult scenarios involving several simultaneous speakers.

#### 8.1.2. Invoxia

Company: Invoxia SAS (France)

Duration: Mar 2017 - Mar 2020

Participants: Guillaume Carbajal, Romain Serizel, Emmanuel Vincent

Abstract: This CIFRE contract funds the PhD thesis of Guillaume Carbajal. Our goal is to design a unified end-to-end deep learning based speech enhancement system that integrates all steps in the current speech enhancement chain (acoustic echo cancellation and suppression, dereverberation, and denoising) for improved hands-free voice communication.

#### 8.1.3. Studio Maia

Company: Studio Maia SARL (France)

Other partners: Imaging Factory

Duration: Jul 2017 - Dec 2018

Participants: Yassine Boudi, Vincent Colotte, Mathieu Hu, Emmanuel Vincent

Abstract: This Inria Innovation Lab aims to develop a software suite for voice processing in the multimedia creation chain. The software is aimed at sound engineers and it will rely on the team's expertise in speech enhancement, robust speech and speaker recognition, and speech synthesis.

#### 8.1.4. Samsung

Company: Samsung Electronics Co., Ltd (South Korea)

Duration: Jan - Nov 2017

Participants: Aditya Nugraha, Romain Serizel, Emmanuel Vincent

Abstract: This project aimed to transfer a modified version of dnnsep for hands-free voice command applications. We changed the type of multichannel filter used and modified the software so that it runs online in real time.

## **PANAMA Project-Team**

## 8. Bilateral Contracts and Grants with Industry

### 8.1. Bilateral Grants with Industry

8.1.1. CIFRE contract with Technicolor R&I France on Very large scale visual comparison Participants: Rémi Gribonval, Himalaya Jain.

> Duration: 3 years (2015-2018) Research axis: 3.1.2 Partners: Technicolor R&I France; Inria-Rennes Funding: Technicolor R&I France; ANRT

The grand goal of this thesis is to design, analyze and test new tools to allow large-scale comparison of high-dimensional visual signatures. Leveraging state of the art visual descriptors, the objective is to obtain new compact codes for visual representations, exploiting sparsity and learning, so that they can be stored and compared in an efficient, yet meaningful, way.

**SEMAGRAMME Project-Team (section vide)** 

## **CHROMA Project-Team**

## 8. Bilateral Contracts and Grants with Industry

#### 8.1. Bilateral Contracts with Industry

#### 8.1.1. VOLVO-Renault Trucks Group (2016-2019)

Participants: Olivier Simonin, Jilles Dibangoye, Laetitia Matignon.

This collaboration has been built inside the INSA-VOLVO Chair, led by Prof. Didier Remond. In this context, the Chair funds the PhD Thesis of Guillaume Bono (2016-19). The objective is to study how machine learning techniques can deal with optimization of goods distribution using a fleet of autonomous vehicles. In the following of the first results, VOLVO proposed to extend our collaboration by funding a Post-doc position concerning good distribution with a platoon of autonomous vehicles. This Post-Doc will start on February 2018.

#### 8.1.2. Toyota Motor Europe (2006 - 2018)

Participant: Christian Laugier.

The contract with Toyota Motors Europe is a joint collaboration involving Toyota Motors Europe, Inria and ProbaYes. It follows a first successful short term collaboration with Toyota in 2005. This contract aims at developing innovative technologies in the context of automotive safety. The idea is to improve road safety in driving situations by equipping vehicles with the technology to model on the fly the dynamic environment, to sense and identify potentially dangerous traffic participants or road obstacles, and to evaluate the collision risk. The sensing is performed using sensors commonly used in automotive applications such as cameras and lidar.

This collaboration is on the process to be extended for 4 years (period 2018-2021) and Toyota provides us with an experimental vehicle Lexus equipped with various sensing and control capabilities. Several additional connected technical contracts have been signed also.

#### **8.2. Bilateral Grants with Industry**

#### 8.2.1. Renault (2015 - 2018)

Participants: Mathieu Barbier, Christian Laugier, Olivier Simonin.

This contract was linked to the PhD Thesis of Mathieu Barbier (Cifre Thesis). The objective is to develop technologies for collaborative driving as part of a Driving Assistance Systems for improving car safety in road intersections. Both vehicle perception and communications are considered in the scope of this study. Some additional short-term contracts (about 3 months) and an evaluation license for the team *CMCDOT* software have also been signed during this period. We are on the process of signing a new PhD research agreement for the period 2018 – 2020, with objective to address the open problem of emergency obstacle avoidance in complex traffic situations (for ADAS applications).

#### 8.2.2. IRT Nanoelec – Perfect project (2012 - 2020)

Participants: Christian Laugier, Jerome Lussereau, Jean-Alix David.

Perfect is a project supported by ANR in the scope of the IRT (Technological Research Institute) Nanoelectronic driven by the CEA (Nuclear Energy Agency). The partners of the project are the CEA-LETI LIALP laboratory, ST-Microelectronics, Schneider Electric and Inria. The goal of this project is to propose integrated solutions for *Embedded Bayesian Perception for Dynamic Environment* and to develop integrated open platforms. The focus is on the application domain of autonomous mobile robots and vehicles, while considering both vehicle and infrastructure issues.

#### 8.2.3. FUI Tornado (2017 – 2020)

Participants: Anne Spalanzani, Christian Laugier, Olivier Simonin, Jerome Lussereau, Jean-Alix David.

The project Tornado is coordinated by Renault. The academic partners of the project are Inria Grenoble-Rhône Alpes, UTC, Institut Pascal, University of Pau, IFSTTAR. The industrial and application partners are Renault, EasyMile, Neavia, Exoskills, 4D-Virtualiz, MBPC and Rambouillet Territoires. The objective of the project is to demonstrate the feasibility of a mobility service systems operating in the commercial zone of Rambouillet and on some public roads located in its vicinity. Several autonomous cars (Autonomous Renault Zoe) and one automatic Shuttle provided by EasyMiles will be customized and used. The *IRT Nanoelec* is also involved in the project as a subcontractor, for testing the perception, decision-making, navigation and controls components developed in the project.

#### 8.2.4. Cooperation with EasyMile (2017 – 2020)

Participants: Christian Laugier, Jerome Lussereau, Jean-Alix David.

A first successful Proof of Concept (PoC) of the implementation of our *CMCDOT* embedded system on the EV10 automatic Shuttle of EasyMile, has been performed during the first trimester of 2017. This work has been done in the scope of the Project Perfect of IRT Nanoelec, and it has conducted to very encouraging results. A multiannual workplan has been prepared in the scope of the IRT Nanoelec for transferring and adapting our technology to the EasyMile shuttles.

### **DEFROST Project-Team**

## 8. Bilateral Contracts and Grants with Industry

### 8.1. Bilateral Contracts with Industry

TDR group is a robotics integrator specialized on optimizing production chains, usually multiplexing robots to perform several activities. Hence, their interest in graspers and the time invested in this activity has been growing within the last years. To improve this aspect, we have been developing together a concept of "universal grasper", based on soft robotics technology and capable of grasping an object with an arbitrary shape, and partially misplaced or misoriented. The prototype developed complies with the specifications and allows for scalability, with flexibility between grasping force and shape tolerance, and the ability for replacing objects without the need of an external vision system. Relying in SOFA for physical simulation, we could validate the different prototypes proposed, put in place test scenarios and put in place a design tool to test generic, application-specific prototypes. A patent redaction is ongoing.

## **FLOWERS Project-Team**

## 8. Bilateral Contracts and Grants with Industry

## 8.1. Bilateral Contracts with Industry

#### 8.1.1. Autonomous Driving Commuter Car

Participants: David Filliat [correspondant], Emmanuel Battesti.

We further developed a planning algorithm for a autonomous electric car for Renault SAS in the continuation of the previous PAMU project. We improved our planning algorithm in order to go toward navigation on open roads, in particular with the ability to reach higher speed than previously possible, deal with more road intersection case (roundabouts), and with multiple lane roads (overtake, insertion...).

### 8.2. Bilateral Grants with Industry

# **8.2.1.** Adaptive device for disease awareness and treatment adherence of asthma in children Participants: Manuel Lopes [correspondant], Alexandra Delmas, Pierre-Yves Oudeyer.

Financing of the CIFRE PhD grant of Alexandra Delmas by Itwell with the goal of developing a tool for self-learning for patients to improve their compliance to treatment.

## **HEPHAISTOS Project-Team**

## 8. Bilateral Contracts and Grants with Industry

#### 8.1. Airbus

Participant: Yves Papegay.

Results of research activities on MOSELA environment have been transferred by a contract with Airbus company.

#### 8.2. Ellcie Healthy

Participants: Alain Coulbois, Jean-Pierre Merlet.

A contract has been granted for the evaluation of the performances of connected glasses that are developed by this company.

## **LAGADIC Project-Team**

## 8. Bilateral Contracts and Grants with Industry

### 8.1. Bilateral Contracts with Industry

#### 8.1.1. Robocortex

Participants: Souriya Trinh, Fabien Spindler, François Chaumette.

no Inria Rennes 11369, duration: 20 months.

This contract with the Inria Robocortex start up in Sophia-Antipolis started in September 2016. It is devoted to provide our expertise in visual tracking for an application specified by Dassault Aviation.

#### 8.1.2. ABB

Participants: Souriya Trinh, Fabien Spindler, François Chaumette.

no Inria Rennes 12597, duration: 8 months.

This contract with ABB in Barcelona started in September 2017. It is devoted to provide our expertise in visual tracking and visual servoing for an industrial application.

#### 8.1.3. IRT b<>com

Participants: Hadrien Gurnel, Fabien Spindler, Alexandre Krupa.

no Inria Rennes 11774, duration: 36 months.

This contract started in October 2016 and concerns the leasing to IRT b <> com of two modules of the Lagadic medical robotic platform. Each module is rent 40 days during a 3-year period in the context of the IRT <math>b <> com NeedleWare project (see Section 9.1.7).

### 8.2. Bilateral Grants with Industry

#### 8.2.1. Technicolor

Participants: Salma Jiddi, Eric Marchand.

no Univ. Rennes 1 15CC310-02D, duration: 36 months.

This project funded by Technicolor started in October 2015. It supports Salma Jiddi's Ph.D. about augmented reality (see Section 7.1.9).

#### 8.2.2. Realyz

Participant: Eric Marchand.

no Inria Rennes 10822, duration: 36 months.

This project funded by Realyz started in October 2015. It is achieved in cooperation with Anatole Lécuyer from Hybrid group at Irisa and Inria Rennes-Bretagne Atlantique to support Guillaume Cortes Ph.D. about motion tracking in virtual reality.

#### 8.2.3. Pôle Saint Hélier

Participants: Louise Devigne, Marie Babel.

no Insa Rennes 2015/0890, duration: 36 months.

This project started in November 2015. It addresses the following two issues. First, the idea is to design a low-cost indoor / outdoor efficient obstacle avoidance system that respects the user intention, and does not alter user perception. This involves embedding innovative sensors to tackle the outdoor wheelchair navigation problem. The second objective is to take advantage of the proposed assistive tool to enhance the user Quality of Experience by means of biofeedback as well as the understanding of the evolution of the pathology.

#### 8.2.4. Axyn

Participants: Dayana Hassan, Paolo Salaris, Patrick Rives.

#### no Inria Sophia 10874-1, duration: 36 months.

The objective of this project that started in November 2016 is to explore new methodologies for the interaction between humans and robots, autonomous navigation and mapping and to transfer the results obtained on the robotic platform developed by AXYN for assisting disabled/elderly people at home or in hospital structures. Cost limits, good accessibility to aged people, robustness and safety related to the applications are at the heart of the project. This contract (ANRT-CIFRE) support Dayana Hassan's Ph.D (see Section 7.5.6).

## **LARSEN Project-Team**

## 8. Bilateral Contracts and Grants with Industry

#### 8.1. Cifre Diatelic-Pharmagest

Participants: François Charpillet, Yassine El Khadiri, Cedric Rose, Gabriel Corona.

Cedric Rose and Gabriel Corona are from Diatelic.

The ageing of the population and the increase in life expectancy will confront modern societies with an unprecedented demographic transformation. The placement of older people in a nursing home (EPHAD) is often only a choice of reason and can be rather poorly experienced by people. One answer to this societal problem is the development of Smart home technologies that facilitate elderly to stay in their homes longer than they can do today. This new collaboration with Diatelic a subsidiary of the Pharmagest group is supported through a PhD thesis (Cifre) which started in june 2017. The objective is to enhance the CareLib solution developed by Diatelic and Larsen Team through a previous collaboration (Satelor project). The Carelib offer is a solution, consisting of

- a connected box (with touch screen),
- a 3D sensor (capable (1)to measure characteristics of the gait such as the speed and step length, (2) to identify Activities of Daily Life and (3) to detect emergency situation such as Fall,
- universal sensors (motion, ...) installed in each part of the housing.

The objective of the PhD program is to provides personalized follow-up by learning life habits, the main objective being to track the Activities of Daily Life (ADL) and detect emergency situations needing external interventions (E.G fall detection). This year we have developed an algorithm capable to detect sleep-wake cycles using only motion sensors. The approach is based on bayesian inference. The algorithms have been evaluated using publicly available dataset and Diatelic's own dataset.

47 Robotics and Smart environments - Contracts and Grants with Industry - Project-Team PERVASIVE INTERACTION

### **PERVASIVE INTERACTION Project-Team**

## 7. Bilateral Contracts and Grants with Industry

### 7.1. Bilateral Contracts with Industry

#### 7.1.1. Learning daily routines by observing activity in a smart home.

Members of the Pervasive interaction team are working with Orange Labs on techniques for observing activity and learning routines in a smart home. Activity is observed by monitoring use of electrical appliances and Communications media (Telephone, Television, Internet). Activities are described using Bayesian Situation Modeling techniques demonstrated in earlier projects. A log of daily activities is used to discover daily routines expressed as temporal sequences of contexts, where each context is expressed as a network of situations. Experiments will be performed using the Smart home living lab that has been constructed as part of the EquipEx Amiqual4home.

#### 7.1.2. IRT Silver Economy

Participants: James Crowley, Pierre Baret, Maxime Belgodere Partners: CEA, Schneider Electric.

Members of the Pervasive Interaction team are working with the CEA and Schneider Electric to develop environmental sensors that can detect when a hospital patient or elderly person has fallen and is unable to get up. The project uses an infrared Bolometric image sensor to observe human activity. Image processing and fall detection logic are to be performed by an embedded image processor on board.

## **RITS Project-Team**

## 7. Bilateral Contracts and Grants with Industry

### 7.1. Bilateral Contracts with Industry

**VALEO Group:** a very strong partnership is under reinforcement between VALEO and Inria. Several bilateral contracts were signed to conduct joint works on Driving Assistance, some of which VALEO is funding. This joint research includes:

- The PhD thesis of Pierre de Beaucorps and the post-doc of Thomas Streubel under the framework of VALEO project "Daring"
- SMART project: on the Design and development of multisensor fusion system for road vehicles detection and tracking. This project funds the internship of Alfredo Valle.
- A CIFRE like PhD thesis is ongoing between VALEO and Inria (Maximilian JARITZ), dealing with multisensor processing and learning techniques for free navigable road detection.
- VALEO is currently a major financing partner of the "GAT" international Chaire/JointLab in which Inria is a partner. The other partners are: UC Berkeley, Shanghai Jiao-Tong University, EPFL, IFSTTAR, MPSA (Peugeot-Citroën) and SAFRAN.
- Technology transfer is also a major collaboration topic between RITS and VALEO as well as the development of a road automated prototype.
- Finally, Inria and VALEO are partners of the PIA French project CAMPUS (Connected Automated Mobility Platform for Urban Sustainability) including SAFRAN, Invia and Gemalto. The aim of the project is the development of autonomous vehicles and the realization of two canonical uses-cases on highways and urban like environments.

**Renault Group**: Collaboration between Renault and RITS re-started in 2016. Different research teams in Renault are now working separately with RITS on different topics.

- A CIFRE like PhD thesis is ongoing between Renault and Inria (Farouk GHALLABI) The thesis deals with the accurate localization of an autonomous vehicle on a highway using mainly on-board low-cost perception sensors.
- Another CIFRE PhD thesis begun on November 2017 (Imane MATHOUT).

AKKA Technologies: Collaboration with AKKA since 2012 (for the Link & Go prototype).

- Inria and AKKA Technologies are partners in the COCOVEA and the VALET projects (ANR projects).
- A new CIFRE PhD thesis (Luis ROLDAO JIMENEZ) dealing with 3D-environment modeling for autonomous vehicles begun in October 2017.

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## **LINKMEDIA Project-Team**

## 8. Bilateral Contracts and Grants with Industry

### 8.1. Bilateral Contracts with Industry

Quai des Apps: one-shot 2-day contract for scientific counseling on visual image retrieval.

50 Vision, perception and multimedia interpretation - Contracts and Grants with Industry - Project-Team MAGRIT

## **MAGRIT Project-Team**

## 8. Bilateral Contracts and Grants with Industry

### 8.1. Bilateral Contracts with Industry

The partnership with GE Healthcare started in 1993. In the past few years, it bore on the supervision of CIFRE PhD fellows on the topic of using a multi-modal framework and augmented reality in interventional neuroradiology. The PhD thesis of Charlotte Delmas started in April 2013 and ended in November 2017 and was supervised by M.-O. Berger and E. Kerrien. In her work, C. Delmas developed methods to reconstruct the micro-tools in 3D from fluoroscopy imaging. This will help clinical gesture by providing the physician with a better understanding of the relative positions of the tools and of the pathology.

51 Vision, perception and multimedia interpretation - Contracts and Grants with Industry - Project-Team MORPHEO

## **MORPHEO Project-Team**

## 8. Bilateral Contracts and Grants with Industry

#### 8.1. Bilateral Grants with Industry

The Morpheo Inria team and Microsoft research set up a collaboration on the capture and modelling of moving shapes using multiple videos. Two PhD proposals will be part of this collaboration with the objective to make contributions on 4D Modeling. The PhDs will take place at Inria Grenoble Rhône-Alpes and will involve regular visits and stays at Microsoft in Redmond (USA) and Cambridge (UK). At Microsoft, Steve Sullivan, Andrew Fitzgibbon, Jamie Shotton and Marta Wilczkowiak will be participating to the project.

### 8.2. Bilateral Contracts with Industry

A collaboration with the French Start up Holooh started in 2017. Holooh aims at producing high quality holograms for VR and AR applications, especially for the fashion and music domains. Holooh's objective is to set up a multi-camera studio in Paris for that purpose. Edmond Boyer is involved in the collaboration.

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## **PERCEPTION Project-Team**

## 7. Bilateral Contracts and Grants with Industry

### 7.1. Bilateral Contracts with Industry

From December 2016 to November 2017 the PERCEPTION team had a collaborative project with Samsung's Digital Media and Communication R&D Center. The collaboration was fully funded by Samsung Electronics. The topic of this collaboration was *multi-modal approach to human-robot interaction*.

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## **SIROCCO Project-Team**

## 8. Bilateral Contracts and Grants with Industry

### 8.1. Bilateral Contracts with Industry

#### 8.1.1. CIFRE contract with Envivio/ Ericsson on LDR compatible HDR video coding

Participants: Christine Guillemot, David Gommelet, Aline Roumy.

- Title : LDR-compatible coding of HDR video signals.
- Partners : Envivio.
- Funding : Cifre Envivio/Ericsson.
- Period : Oct.2014-Sept.2017.

The goal of this Cifre contract is to design solutions for LDR-compatible coding of HDR videos. This involves the study of rate-distortion optimized tone mapping operators taking into account constraints of temporal coherency to avoid the temporal flickering which results from a direct frame-by-frame application of classical tone mapping operators. The goal is also to design a coding architecture which will build upon these operators, integrating coding tools tailored to the statistics of the HDR refinement signals.

#### 8.1.2. CIFRE contract with Harmonic on image analysis for HDR video compression

Participants: Maxime Rousselot, Olivier Le Meur.

- Title : image and video analysis for HDR video compression
- Partners : Harmonic, Univ. Rennes 1
- Funding: Harmonic, ANRT
- Period: April 2016-April 2019

This project (in collaboration with Rémi Cozot, FRVSense) aims to investigate two main axes. First, we want to assess whether the representation of High Dynamic Range signal has an impact on the coding efficiency. We will focus mainly on the Hybrid Log-Gamma (HLG) and Perceptual Quantizer (PQ) OETF (Opto-Electronic Transfer Function)approaches. The former defines a nonlinear transfer function which is display-independent and able to produce high quality images without compromising the director's artistic intent. The latter approach is based on Just Noticeable Difference curve. If it turns out that this representation has an impact, the coding strategy should be adjusted with respect to the representation. In addition, specific preprocessing tools will be defined to deal with the limitations of PQ and HLG approaches.

#### 8.1.3. CIFRE contract with Technicolor on image collection analysis

Participants: Dmitry Kuzovkin, Olivier Le Meur.

- Title : Spatiotemporal retargeting and recomposition based on artistic rules
- Partners : Technicolor, Univ. Rennes 1
- Funding: Technicolor, ANRT
- Period: Nov. 2015 Nov. 2018

The goal of the project (in collaboration with Rémi Cozot, FRVSense) is to take advantage of the huge quantities of image and video data currently available - captured by both amateur and professional users - as well as the multiple copies of each scene that users often capture, to improve the aesthetic appeal of content. Additionally, given Technicolor's unique position, we propose to take advantage of insights as well as content from professional artists and colorists to learn how different content types can be enhanced.

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#### 8.1.4. CIFRE contract with Technicolor on light fields editing

Participants: Christine Guillemot, Matthieu Hog.

- Title : Light fields editing
- Research axis : 7.1.5
- Partners : Technicolor, Inria-Rennes.
- Funding : Technicolor, ANRT.
- Period : Oct.2015-Sept.2018.

Editing is quite common with classical imaging. Now, if we want light-fields cameras to be in the future as common as traditional cameras, this functionality should also be enabled with light-fields. The goal of the PhD is to develop methods for light-field editing, and in 2017 we have introduced the the concept of super-ray which is a grouping of rays within and across views, and developed a fast algorithm for super-ray construction(see section 7.1.5).

#### 8.1.5. CIFRE contract with Technicolor on light fields compressed representation

Participants: Christine Guillemot, Fatma Hawary.

- Title : Light fields compressed representation
- Research axis : 7.2.5
- Partners : Technicolor, Inria-Rennes.
- Funding : Technicolor, ANRT.
- Period : Feb.2016-Jan.2019.

The goal of this PhD is to study reconstruction algorithms from compressed measurements based on the assumption of sparsity in the Fourier domain. The goal is to apply these algorithms to scalable compression of light fields.

#### 8.1.6. CIFRE contract with Technicolor on cloud-based image compression

Participants: Jean Begaint, Christine Guillemot.

- Title : Cloud-based image compression
- Research axis : 7.2.1
- Partners : Technicolor, Inria-Rennes.
- Funding : Technicolor, ANRT.
- Period : Nov.2015-Oct.2018.

The goal of this Cifre contract is to develop a novel image compression scheme exploiting similarity between images in a cloud. The objective will therefore be to develop rate-distortion optimized affine or homographic estimation and compensation methods which will allow us to construct prediction schemes and learn adapted bases from most similar images retrieved by image descriptors. One issue to be addressed is the rate-distortion trade-off induced by the need for transmitting image descriptors.

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## **STARS Project-Team**

## 8. Bilateral Contracts and Grants with Industry

### 8.1. Bilateral Contracts with Industry

• **Toyota Europ**: this project with Toyota ran from the 1st of August 2013 up to 2017 (4 years). It aims at detecting critical situations in the daily life of older adults living home alone. We believe that a system that is able to detect potentially dangerous situations will give peace of mind to frail older people as well as to their caregivers. This will require not only recognition of ADLs but also an evaluation of the way and timing in which they are being carried out. The system is intended to help them and their relatives to feel more comfortable because they know potentially dangerous situations will be detected and reported to caregivers if necessary. The system is intended to work with a Partner Robot (to send real-time information to the robot) to better interact with older adults.

56 Vision, perception and multimedia interpretation - Contracts and Grants with Industry - Project-Team THOTH

## **THOTH Project-Team**

## 8. Bilateral Contracts and Grants with Industry

#### 8.1. MSR-Inria joint lab: scientific image and video mining

Participants: Cordelia Schmid, Karteek Alahari.

This collaborative project, which started in September 2008, brings together the WILLOW and Thoth project-teams with researchers at Microsoft Research Cambridge and elsewhere. It builds on several ideas articulated in the "2020 Science" report, including the importance of data mining and machine learning in computational science. Rather than focusing only on natural sciences, however, we propose here to expand the breadth of e-science to include humanities and social sciences. The project focuses on fundamental computer science research in computer vision and machine learning, and its application to archeology, cultural heritage preservation, environmental science, and sociology.

#### 8.2. MSR-Inria joint lab: structured large-scale machine learning

Participants: Julien Mairal, Alberto Bietti, Hongzhou Lin.

Machine learning is now ubiquitous in industry, science, engineering, and personal life. While early successes were obtained by applying off-the-shelf techniques, there are two main challeges faced by machine learning in the "big data" era : structure and scale. The project proposes to explore three axes, from theoretical, algorithmic and practical perspectives: (1) large-scale convex optimization, (2) large-scale combinatorial optimization and (3) sequential decision making for structured data. The project involves two Inria sites and four MSR sites and started at the end of 2013.

#### 8.3. Amazon

#### Participants: Grégory Rogez, Cordelia Schmid.

We received an Amazon Faculty Research Award end of 2016. The objective is 3D human action recognition from monocular RGB videos. The idea is to extend our recent work on human 3D pose estimation published at NIPS 2016 to videos and to develop an approach for action recognition based on temporal pose based on appropriate 3D features.

#### 8.4. Intel

Participants: Cordelia Schmid, Karteek Alahari.

The Intel Network on Intelligent Systems in Europe brings together leading researchers in robotics, computer vision, motor control, and machine learning. We are part of this network and have participated in the annual retreat in 2017. Funding will be provided on an annual basis, every year, as long as we are part of the network.

#### 8.5. Facebook

Participants: Cordelia Schmid, Jakob Verbeek, Karteek Alahari, Julien Mairal.

The collaboration started in 2016. The topics include image retrieval with CNN based descriptors, weakly supervised object detection and semantic segmentation, and learning structured models for action recognition in videos. In 2016, Pauline Luc started her PhD funded by a CIFRE grant, jointly supervised by Jakob Verbeek (Inria) and Camille Couprie (Facebook). THOTH has been selected in 2016 as a recipient for the Facebook GPU Partnership program. In this context Facebook has donated two state-of-the-art servers with 8 GPUs. In 2017, Alexandre Sablayrolles started his CIFRE grant, jointly supervised by Cordelia Schmid and Herve Jegou and Matthijs Douze at Facebook.

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### 8.6. Xerox Research Center Europe

Participants: Cordelia Schmid, Vasileios Choutas, Philippe Weinzepfel [Naver].

The collaboration with Xerox has been on-going since October 2009 with two co-supervised CIFRE scholarships (2009–2012; 2011-2014). Starting June 2014 we signed a third collaborative agreement for a duration of three years. The goal is to develop approaches for deep learning based image description and pose estimation in videos. Jakob Verbeek (Inria) and Diane Larlus (XRCE) jointly supervise a PhD-level intern for a period of 6 months in 2016-2017. XRCE then became Naver in 2017 and the collaboration is still on-going, see next paragraph.

#### 8.7. Naver

Participants: Karteek Alahari, Vladyslav Sydorov, Cordelia Schmid, Julien Mairal, Jakob Verbeek.

A one-year research contract on action recognition in videos started in Sept. 2017. The approach developed by V. Choutas implements pose-based motion features, which are shown to be complementary to state-of-the-art I3D features.

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## 8. Bilateral Contracts and Grants with Industry

# 8.1. Facebook AI Research Paris: Weakly-supervised interpretation of image and video data (Inria)

Participants: Jean Ponce, Minsu Cho, Ivan Laptev, Josef Sivic.

We will develop in this project (Facebook gift) new models of image and video content, as well as new recognition architectures and algorithms, to address the problem of understanding the visual content of images and videos using weak forms of supervision, such as the fact that multiple images contain instances of the same objects, or the textual information available in television or film scripts.

#### 8.2. Google: Learning to annotate videos from movie scripts (Inria)

Participants: Josef Sivic, Ivan Laptev, Jean Ponce.

The goal of this project is to automatically generate annotations of complex dynamic events in video. We wish to deal with events involving multiple people interacting with each other, objects and the scene, for example people at a party in a house. The goal is to generate structured annotations going beyond simple text tags. Examples include entire text sentences describing the video content as well as bounding boxes or segmentations spatially and temporally localizing the described objects and people in video. This is an extremely challenging task due to large intra-class variation of human actions. We propose to learn joint video and text representations enabling such annotation capabilities from feature length movies with coarsely aligned shooting scripts. Building on our previous work in this area, we aim to develop structured representations of video and associated text enabling to reason both spatially and temporally about scenes, objects and people as well as their interactions. Automatic understanding and interpretation of video content is a key-enabling factor for a range of practical applications such as content-aware advertising or search. Novel video and text representations are needed to enable breakthrough in this area.

#### 8.3. Google: Structured learning from video and natural language (Inria)

Participants: Simon Lacoste-Julien, Ivan Laptev, Josef Sivic.

People can easily learn how to change a flat tire of a car or assemble an IKEA shelve by observing other people doing the same task, for example, by watching a narrated instruction video. In addition, they can easily perform the same task in a different context, for example, at their home. This involves advanced visual intelligence abilities such as recognition of objects and their function as well as interpreting sequences of human actions that achieve a specific task. However, currently there is no artificial system with a similar cognitive visual competence. The goal of this proposal is to develop models, representations and learning algorithms for automatic understanding of complex human activities from videos narrated with natural language.

# 8.4. MSR-Inria joint lab: Image and video mining for science and humanities (Inria)

**Participants:** Guilhem Cheron, Ivan Laptev, Maxime Oquab, Jean Ponce, Josef Sivic, Cordelia Schmid [Inria Lear].

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This collaborative project brings together the WILLOW and LEAR project-teams with MSR researchers in Cambridge and elsewhere. The concept builds on several ideas articulated in the "2020 Science" report, including the importance of data mining and machine learning in computational science. Rather than focusing only on natural sciences, however, we propose here to expand the breadth of e-science to include humanities and social sciences. The project we propose will focus on fundamental computer science research in computer vision and machine learning, and its application to archaeology, cultural heritage preservation, environmental science, and sociology, and it will be validated by collaborations with researchers and practitioners in these fields.

In October 2013 a new agreement has been signed for 2013-2017 with the research focus on automatic understanding of dynamic video content. Recent studies predict that by 2018 video will account for 80-90% of traffic on the Internet. Automatic understanding and interpretation of video content is a key enabling factor for a range of practical applications such as organizing and searching home videos or content aware video advertising. For example, interpreting videos of "making a birthday cake" or "planting a tree" could provide effective means for advertising products in local grocery stores or garden centers. The goal of this project is to perform fundamental computer science research in computer vision and machine learning in order to enhance the current capabilities to automatically understand, search and organize dynamic video content.