Activity Report 2016

Section Contracts and Grants with Industry

ANTIQUE Project-Team (section vide)

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

Airbus CIFRE grant   This contract, started on March 2014, provides full support for the PhD thesis of
Cristian Maxim. The thesis concerns the statistical timing analysis while different variability factors
are taken into account. The proposed methods are built on top of existing statistical approaches while
proving appropriate programs for training these methods and thus learning from the history of the
execution.

CASCADE Project-Team (section vide)

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

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

8.1.1. *The Caml Consortium*

Participants: Xavier Leroy [**contact**], Damien Doligez, Didier Rémy.

The Caml Consortium is a formal structure where industrial and academic users of OCaml can support the development of the language and associated tools, express their specific needs, and contribute to the long-term stability of Caml. Membership fees are used to fund specific developments targeted towards industrial users. Members of the Consortium automatically benefit from very liberal licensing conditions on the OCaml system, allowing for instance the OCaml compiler to be embedded within proprietary applications.

The Consortium currently has 14 member companies:

- Aesthetic Integration
- Ahrefs
- Bloomberg
- CEA
- Citrix
- Dassault Aviation
- Esterel Technologies
- Facebook
- Jane Street
- Kernelyze
- LexiFi
- Microsoft
- OCamlPro
- SimCorp

For a complete description of this structure, refer to http://caml.inria.fr/consortium/. Xavier Leroy chairs the scientific committee of the Consortium.

8.1.2. *Scientific Advisory for OCamlPro*

Participant: Fabrice Le Fessant.

OCamlPro is a startup company founded in 2011 by Fabrice Le Fessant to promote the use of OCaml in the industry, by providing support, services and tools for OCaml to software companies. OCamlPro performs a lot of research and development, in close partnership with academic institutions such as IRILL, Inria and Univ. Paris Sud, and is involved in several collaborative projects with Gallium, such as the Bware ANR, the Vocal ANR and the Secur-OCaml FUI.

Since 2011, Fabrice Le Fessant is a scientific advisor at OCamlPro, as part of a collaboration contract for Inria, to transfer his knowledge on the internals of the OCaml runtime and the OCaml compilers.

MUTANT Project-Team (section vide)

PARKAS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

Technology Transfer Project, partly funded by the TETRACOM grant and by Kalray.

7.2. Bilateral Grants with Industry

Polly Labs initiative. Funded by ARM for 4 years with complementary support from Xilinx, in cooperation with ETH Zürich and Qualcomm.

PI.R2 Project-Team (section vide)

POLSYS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Grants with Industry

Until the mid 2000's, multivariate cryptography was developing very rapidly, producing many interesting and versatile public-key schemes. However, many of them were soon successfully cryptanalysed (a lot have been done in this group). As a consequence, the confidence in multivariate cryptography cryptosystems declined. It seems that there have emerged new important reasons for renewal of the interest in a new generation of multivariate schemes. In the past two years, the algorithms for solving the Discrete Logarithm Problem over small characteristic fields underwent an extraordinary development. This clearly illustrates the risk to not consider alternatives to classical assumptions based on number theory. In parallel, two of the most important standardization bodies in the world, NIST and ETSI have recently started initiatives for developing cryptographic standards not based on number theory, with a particular focus on primitives resistant to quantum algorithms. An objective here is then to focus on the design of multivariate schemes.

The team is now involved in the industrial transfer of post-quantum cryptography. The project is supervised by SATT-LUTECH. SATT-LUTECH specializes in the processing and transfer of technologies from research laboratories of its shareholders: Inria, CNRS, University of Technology of Compiègne, National Museum of Natural History, Institute Curie, Université Panthéon-Assas, Paris Sorbonne University and National School of Industrial Creation).

The team has recently developed, in partnership with a mobile application development company (WASSA), an Android app for smartphones (Samsung G5 type) that uses multivariate cryptography. The application has been tested mid-November in a series of experiments supervised by DGA and French Ministry of Defense. The experiment gathered a total of hundred participants from various operational units. This is a first milestone in the maturation project whose goal is to create a start-up.

PROSECCO Project-Team (section vide)

SECRET Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Grants with Industry

- **Thales** ($02/14 \rightarrow 01/17$)
  Funding for the supervision of Julia Chaulet's PhD.
  30 kEuros.

MATHERIALS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Contracts and grants with Industry

Many research activities of the project-team are conducted in close collaboration with private or public companies: CEA, SANOFI, IRDEP, EDF, IFPEN. The project-team is also supported by the Office of Naval Research and the European Office of Aerospace Research and Development, for multiscale simulations of random materials. All these contracts are operated at and administrated by the École des Ponts.

MATHRISK Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

- Consortium PREMIA, Natixis - Inria
- Consortium PREMIA, Crédit Agricole CIB - Inria

8.2. Bilateral Grants with Industry

Chair Ecole Polytechnique-ENPC-UPMC-Société Générale "Financial Risks" of the Risk fondation : A. Alfonsi, B. Jourdain, B. Lapeyre

MOKAPLAN Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

8.1.1. Optimal Transport applied to altimetric CTH dynamic interpolation

(S. Legrand V. Duval L. Chizat J-D. Benamou).

This collaboration between CLS and and funded by CNES intends to test on Column of Tropospheric Humidity data Optimal transportation interpolation techniques for balanced and unbalanced data.

QUANTIC Project-Team (section vide)

SIERRA Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

Microsoft Research: "Structured Large-Scale Machine Learning". 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 challenges 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 (Paris and Grenoble) and four MSR sites (Cambridge, New England, Redmond, New York). Project website: http://www.msr-inria.fr/projects/structured-large-scale-machine-learning/.

7.2. Bilateral Grants with Industry

- A. d'Aspremont: AXA, "mécénat scientifique, chaire Havas-Dauphine", machine learning.
- A. d'Aspremont: Société Générale - fondation ENS, "mécénat scientifique".
- A. d'Aspremont: Projet EMMA at Institut Louis Bachelier. Collaboration with Euroclear on REPO markets.
- S. Lacoste-Julien (with J. Sivic and I. Laptev in Willow project-team): Google Research Award "Structured Learning from Video and Natural Language".
- F. Bach: Gift from Facebook AI Research.

ANGE Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

A contract has been made (120.000 euros) with SAUR, IAV (Institut d'Aménagement de la Vilaine) and Agence de l'eau Loire-Bretagne in collaboration with SciWorks Technologies. It deals with the modelling and the simulation of chlorides entry in the Vilaine reservoir.

The ANR project Hyflo-Eflu relies on a collaboration with the company "HydroTube Energie". It comprises the recruitment of a young engineer and regular meetings with industrial (Bordeaux) and academic partners (Nantes).

8.2. Bilateral Grants with Industry

P. Quémar's PhD thesis is funded by EDF ("thèse CIFRE"). His PhD is entitled "3D numerical simulations of environmental hydrolics: application to Telemac".

ARAMIS Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

8.1.1. Air-Liquide Medical Systems

Participants: Mario Chavez [Correspondant], Xavier Navarro.

Project title: Real-time characterisation of respiratory states from EEG

Funded in 2014

Amount: 370 K€

Coordinator: Thomas Similowski

Other partners: UPMC, Inserm UMR 1158

Abstract: The project aims at developing a real-time brain computer interface (BCI) for the monitoring of respiratory states from scalp EEG data of healthy volunteers and patients, recorded at the laboratory, hospital ward, operating room or intensive care units..

CLIME Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Grants with Industry

A new Iilab, Rain_Water, has been accepted in 2016. It concerns joint research with the company Weather Measures. Rain_Water aims to define a platform of local meteorology. Users are mainly farmers that will use the platform for monitoring the agricultural practices at the parcel level.

MAMBA Project-Team (section vide)

MYCENAE Project-Team (section vide)

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

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

8.1.1. *Air Liquide Santé International*

Participants: Céline Grandmont, Nicolas Pozin, Irene Vignon-Clementel.

CIFRE convention and contract with Air Liquide Santé International in the context of the ANRT on "Multiscale lung ventilation modeling in health and disease", for the PhD thesis of Nicolas Pozin (March 2014 - February 2017).

8.1.2. *Philips Research*

Participants: Miguel Ángel Fernández Varela, Jean-Frédéric Gerbeau, Alexandre This.

CIFRE convention and contract with Philips Research for the PhD thesis of Alexandre This (January 2016 - December 2018) on fusion data/simulation for the assessment of mitral regurgitation.

8.1.3. *Kephalios & Epygon*

Participants: Miguel Ángel Fernández Varela, Jean-Frédéric Gerbeau, Ludovic Boilevin-Kayl, Marina Vidrascu.

REO is an academic partner of the industrial project MIVANA, dedicated to the development of new technologies for mitral valve treatment. It is led by the start-up company Kephalios, with the participation of the start-up company Epygon, by the company MDB Texinov and the research institute IFTH. In this framework, REO has two bilateral contracts with Kephalios and Epygon on the modeling and simulation of two medical devices for mitral valve repair.

8.1.4. *Instem/NOTOCORD*

Participants: Muriel Boulakia, Damiano Lombardi, Jean-Frédéric Gerbeau, Fabien Raphel, Eliott Tixier.

REO partners with the software company NOTOCORD in the framework of the LabCom "cardioXcomp" (see ANR projects section). In 2016, the ANR funding came to an end, and NOTOCORD was acquired by the company Instem. Our collaboration with Instem/NOTOCORD will continue as a bilateral partnership with the purpose of developing the software cardioXcomp dedicated to the safety pharmacology industry.

SERENA Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

- Three-parts contract Inria–EDF–Sciworks Technologies (November 2015–April 2016) on "Form-L for the formalization of constraints of complex systems".

- Contract Inria–IFP Energies Nouvelles (December 2016–December 2017) on "A posteriori error analysis for porous media flow problems with fractures".

- Numerous contracts accompanying Ph.D. theses and post-doc positions, see Section 1.

TAPDANCE Team (section vide)

ALPINES Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

- Contract with Total, February 2015 - February 2018, that funds the PhD thesis of Hussam Al Daas on enlarged Krylov subspace methods for oil reservoir and seismic imaging applications. Supervisor L. Grigori.

- Contract with IFPen, February 2016 - February 2019, that funds the Phd thesis of Zakariae Jorti on adaptive preconditioners using a posteriori error estimators. Supervisor L. Grigori.

- Contract with IFPen, October 2016 - October 2019, that funds the Phd thesis of Julien Coulet on the virtual element method (VEM). Supervisor F. Nataf and V. Girault.

- Contract with MentorGraphics, March 2016, that funds the internship of T. Freiman on circuit simulations. Supervisor F. Nataf.

DYOGENE Project-Team

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

8.1.1. CRE with Orange

One year CRE contract titled "Mise au point d'une méthode d'évaluation de la qualité de service pour le sens montant d'un réseau cellulaire LTE validée avec les mesures terrain" between Inria and Orange Labs have been signed in 2015 end realized in 2016. It is a part of the long-term collaboration between TREC/DYOGENE and Orange Labs, represented by M. K. Karray, for the development of analytic tools for the QoS evaluation and dimensioning of operator cellular networks. Arpan Chattopadhyay was hired by Inria as a post-doctoral fellow thanks to this contract.

8.1.2. Joint Research Lab with Nokia Bell Labs

Arpan Mukhopadhyay was hired by Inria as a post-doctoral fellow within this lab dedicated to the research on communication networks of the future; https://www.inria.fr/en/institute/partnerships/industrial-partnerships2/alcatel-lucent-bell-labs-france.

8.2. Bilateral Grants with Industry

8.2.1. CIFRE Nokia

PhD: Dalia-Georgiana Herculea, co-advised by B. Blaszczyszyn, E. Altman and Ph. Jacquet

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

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

8.1.1. CNES

Participants: Ines Khoufi, Pascale Minet, Erwan Livolant.

Partners: CNES, Inria.

Following the SAHARA project that ended in 2015, CNES decided to fund a study about the use of wireless sensor networks in space environment. This new project started in November 2015 and will end in November 2016.

For CNES we studied how to use a IEEE 802.15.4e TSCH (Time Slotted Channel Hopping) network in the space launch vehicles. We proposed new solutions and evaluated their performances with the NS3 simulation tool.

8.1.2. OpenMote

Participant: Thomas Watteyne.

Inria-EVA has signed an long-standing Memorandum of Understanding with OpenMote Technology.

8.2. Bilateral Grants with Industry

8.2.1. Gridbee CIFRE

Participants: Jonathan Muñoz, Thomas Watteyne.

- Title: km-scale Industrial Networking
- Type: CIFRE agreement
- Period: Nov 2015 - Oct 2018
- Coordinator: **Thomas Watteyne**
- Goal: CIFRE agreement with Gridbee (http://www.gridbeecom.com/) to apply 6TiSCH-style scheduling on top of long-range IEEE802.15.4g radios. Implementation of those solutions on OpenWSN.

<div align="center" style="color:red">**GANG Project-Team**</div>

7. Bilateral Contracts and Grants with Industry

7.1. Collaboration with Nokia Bell Labs

Gang has a strong collaboration with Bell Labs (Nokia). We notably collaborate with Fabien Mathieu who is a former member of GANG and Nidhi Hegde. An ADR (joint research action) is dedicated to content centric networks and forwarding information verification. The PhD thesis of Leonardo Linguaglossa was funded by this contract.

This collaboration is developed inside the Alcatel-Lucent and Inria joint research lab.

MIMOVE Team (section vide)

MUSE Team   (section vide)

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

5. Bilateral Contracts and Grants with Industry

5.1. Bilateral Contracts with Industry

- Contrat de recherche externalisé avec ORANGE SA "Scheduling Global OS". Duration three years 2014-2016.
- *Christine Fricker* is the leader of PGMO project "Systèmes de véhicules en libre-service: Modélisation, Analyse et Optimisation" with G-Scop (CNRS lab, Grenoble) and Ifsttar. From 1 to 3 years. From 1/10/2013 to 30/9/2016.
- PhD grant CJS (Contrat Jeune Scientifique) Frontières du vivant of INRA for Renaud Dessalles.
- PhD grant from Fondation Sciences Mathématiques de Paris for Wen Sun.
- PhD grant from Brazilian Government for Guilherme Thompson.
- CELTIC+ Contract "SENDATE".

REGAL Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

7.1.1. Joint industrial PhD with Renault

- Renault, 2014-2016, 45 000 euros. The purpose of this contract is to develop solutions for running a mix of real-time and best-effort applications on a small embedded multicore architecture. Our goal is to optimize the usage of the processor resource. The PhD of Antoine Blin is supported by a CIFRE fellowship with Renault.

7.1.2. Joint industrial PhD with Scality SA: CRDTs for Large-Scale Storage Systems

This year, we continued the joint CIFRE (industrial PhD) research of Tao Thanh Vinh, with the French start-up company Scality, as described above (under "Large-Scale File Systems").

The objective of this research is to design new algorithms for file and block storage systems, considering both the issues of scaling the file naming tree to a very large size, and the issue of conflicting updates to files or to the name tree, in the case of high latency or disconnected work.

A new CIFRE agreement with Scality is awaiting the agreement from ANRT and will start ASAP. The PhD student is Dimitrios Vasilas, and his topic is "Scalable indexing for large-scale distributed storage systems."

7.1.3. Joint industrial PhDs: data sharing in mobile networks and automatic resizing of shared I/O caches, with Magency

Magency organizes large events during which participants can use mobile devices to access related data and interact together.

The thesis of Lyes Hamidouche concerns efficient data sharing among a large number of mobile devices. Magency brings traces captured during real events (data accesses and user mobility). We are jointly working on the design of algorithms allowing a large number of mobile devices to efficiently access remote data.

Magency also runs servers. A server is used before an event in order to be prepared and tested, and then, during the event to serve the numerous mobile devices accesses. Many servers are run on a single physical machine using containers. Using this configuration, the memory is partitioned, leading to poor performances for applications that need a large amount of memory for caching purpose. In the context of Damien Carver's PhD thesis, we are designing kernel-level mechanisms that automatically give more memory to the most active containers, leveraging the expertise acquired during Maxime Lorrillere's PhD thesis.

7.1.4. EMR CREDIT, with Thales

Franck Petit and Swan Dubois participate to the creation of the EMR (Equipe Mixte de Recherche) *CREDIT*, (Compréhension, Représentation et Exploitation Des Interactions Temporelles) between LIP6/UPMC and Thales.

Nowadays, networks are the field of temporal interactions that occur in many settings networks, including security issues. The amount and the speed of such interactions increases everyday. Until recently, the dynamics of these objects was little studied due to the lack of appropriate tools and methods. However, it becomes crucial to understand the dynamics of these interactions. Typically, how can we detect failures or attacks in network traffic, fraud in financial transactions, bugs or attacks traces of software execution. More generally, we seek to identify patterns in the dynamics of interactions. Recently, several different approaches have been proposed to study such interactions. For instance, by merging all interactions taking place over a period (e.g. one day) in a graph that are studied thereafter (evolving graphs). Another approach was to built meta-objects by duplicating entities at each unit of time of their activity, and by connecting them together.

The goal of the EMR is to join both teams of LIP6 and Thales on these issues. More specifically, we hope to make significant progress on security issues such as anomaly detection. This requires the use of a formalism sufficiently expressive to formulate complex temporal properties. Recently, a vast collection of concepts, formalisms, and models has been unified in a framework called Time-Varying Graphs. We want to pursuit that way. In the short run, the challenges facing us are: (1) refine the model to capture some interaction patterns, (2) design of algorithms to separate sequences of interactions, (3) Identify classes of entities playing a particular role in the dynamics, such as bridges between communities, or sources and sinks.

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

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

- Renault, 2014-2016, 45 000 euros. The purpose of this contract is to develop solutions for running a mix of real-time and best-effort applications on a small embedded multicore architecture. Our goal is to optimize the usage of the processor resource. The PhD of Antoine Blin is supported by a CIFRE fellowship with Renault.

- Orange Labs, 2016-2017, 60 000 euros. The purpose of this contract is to apply the techniques developed in the context of the PhD of Antoine Blin to the domain of Software Defined Networks where network functions are run using virtual machines on commodity multicore machines.

- Thales Research, 2016-2018, 45 000 euros. The purpose of this contract is to enable the usage of multicore architectures in avionics systems. More precisely, our goal is to develop optimizations for a software TDMA hypervisor developed by Thales that provides full time-isolation of tasks. The PhD of Cédric Courtaud is supported by a CIFRE fellowship with Thales Research.

- OSADL, 2016-2017, development of the Prequel patch query language, 20 000 euros. OSADL is an organization headquartered in Germany that promotes and supports the use of open source software in the automation and machine industry. The project is in the context of the OSADL project SIL2LinuxMP bringing together various companies in automotive and embedded sytems with the goal of developing methodologies for certifying the basic components of a GNU/Linux-based RTOS.

ALPAGE Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Contracts with Industry

Alpage has developed several collaborations with industrial partners. Apart from grants described in the next section and informal discussions, specific collaboration agreements have been set up with the following companies:

- Verbatim Analysis (license agreement, transfer agreement, "CIFRE" PhD (contract ended in Dec 2014), see section 5.20),
- Yseop ("CIFRE" PhD of Raphael Salmon started in 2012 about automatic text generation)
- Agence France-Presse (on-going discussions aimed at a renewal of a long-lasting collaborations, involving several joint projects and a CIFRE PhD)

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

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 Bario.

- A CIFRE like PhD thesis is ongoing between VALEO and Inria (M. 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 CAMPUS project (PIA french project) 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.

TATA Motors European Technical Centre (TMETC): a new partnership was born in 2016 with the aim of developing a highly automated vehicle. Technology transfer from Inria to TATA Motors includes localization and mapping as well as control-command codes.

Renault Group: Collaboration between Renault and RITS re-started in 2016 and is expected to know a major growth in 2017. Three different research teams in Renault are now working separately with RITS on different topics.

A first concrete action was the beginning of a CIFRE PhD thesis funded by Renault and the French ANRT. The thesis deals with the accurate localization of an autonomous vehicle on a highway using mainly on-board low-cost perception sensors.

<div align="center">**WILLOW Project-Team**</div>

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: Leon Bottou [Facebook], Ivan Laptev, Maxime Oquab, Jean Ponce, Josef Sivic, Cordelia Schmid [Inria Lear].

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 2013-2016 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.