RESEARCH CENTER
Paris - Rocquencourt

FIELD

Activity Report 2012

Section Contracts and Grants with Industry

Edition: 2013-04-24

ABSTRACTION Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Contracts with Industry

7.1.1. License agreement

7.1.1.1. Astrée

In February 2009 was signed an exploitation license agreement between CNRS, École Normale Supérieure, and AbsInt Angewandte Informatik GmbH for the industrialization of the ASTRÉE analyzer. ASTRÉE is commercially available from AbsInt since January 2010. Continuous work goes on to adapt the ASTRÉE static analyzer to industrial needs, in particular for the automotive industry. Radhia Cousot is the scientific contact.

7.2. Grants with Industry

7.2.1. FNRAE projects

7.2.1.1. Ascert

Title: Analyses Statiques CERTifiés

Type: 6th call: Verification methods for software and systems

Instrument: FNRAE grant

Duration: April 2009 - March 2012

Coordinator: Inria (France)

Others partners: Inria-Bretagne Atlantique, the Inria Rhône-Alpes, the Inria Paris-Rocquencourt, and the ENS.

See also: http://ascert.gforge.inria.fr/

Abstract: Although static analyzers have demonstrated their ability to prove the absence of large classes of errors in critical software, they are themselves large and complex software, so it is natural to question their implementation correctness and the validity of their output. The focus of the ASCERT project is the use of formal methods to ensure the correctness of an analyzer with respect to the abstraction interpretation theory. Methods to be investigated include the direct proof of the analyzer, the proof of a verifier for the analyzer result, and the validation of the inductive invariants generated by the analyzer, using the Coq proof assistant. These methods will be applied to the certification of several numerical abstract domains, of an abstract interpreter for imperative programs and its possible extensions to one of the formal semantics of the CompCert verified C compiler.

7.2.1.2. Sardanes

Title: Sémantique, Analyse et tRansformation Des Applications Numériques Embarqués Synchrones

Type: 6th call: Verification methods for software and systems

Instrument: FNRAE grant

Duration: February 2009 - September 2012

Coordinator: Université de Perpignan

Others partners: Université de Perpignan and the ENS.

See also: http://perso.univ-perp.fr/mmartel/sardanes.html

Abstract: SCADE is widely used to write critical embedded software, as a specification and verification language. The semantics of SCADE uses real arithmetics whereas it is compiled into a language that uses floating-point arithmetics. The goal of the SARDANES project is to use expression transformation so as to ensure that the numerical properties of the programs is preserved during the compilation. Patrick Cousot and Radhia Cousot are the principal investigators for this action.

AOSTE Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Thales ARCADIA/Melody

Participants: Frédéric Mallet, Robert de Simone.

In the remote context of ARTEMIS CESAR 8.3.1.1 we conducted a specific study of the functional expressiveness of the ARCADIA/Melody environment, developed and deployed internally inside several Thales divisions. A questionnaire was designed by us, according to the various semantic variation points that we identified into this Model-Driven Engineering (MDE) environment. It was then sent to potential users for feedback, and reporting was done together with colleagues from Thales TRT (R&D division) to their management. As a result a number of non-trivial redesign decisions were taken. Our findings were presented through a number of focused meetings held at Thales in the Saclay technopark. While most work was performed at this stage on purely data-flow functional description diagrams, there is an interest inside the company to extend this type of critical survey analysis to extended description models, including event-based control and modes.

CASCADE Project-Team (section vide)

CONTRAINTES Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Dassault-Systèmes, BioIntelligence project

- The OSEO Biointelligence project coordinated by Dassault-Systèmes, with EPI Orpailleur, Sobios, Aureus pharma, Ipsen, Pierre Fabre, Sanofi-Aventis, Servier, Bayer CropScience, INSERM, Genopole Evry (2009-2014).

7.2. KLS-Optim, Rules2Optim project

- DTI ITI support for the industrialization of our Rules2CP software and technological transfer to SME KLS-Optim (2011-2013).

7.3. General Electric Transportation, Cifre contract

- Cifre PhD accompanying contract with General Electric Transportation on urban railway time tabling optimization (2011-2014).

DEDUCTEAM Team (section vide)

FORMES Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

We obtained a contract of 100 000 Chinese RMB (12 500 Euros) with Nokia Research Center in Beijing to study formal proofs of security API's in Android mobile phones.

GALLIUM Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. The Caml Consortium

Participants: Xavier Leroy [correspondant], Xavier Clerc, Damien Doligez, Didier Rémy.

The Caml Consortium is a formal structure where industrial and academic users of Caml 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 12 member companies: CEA, Citrix, Dassault Aviation, Dassault Systèmes, Esterel Technologies, Jane Street, LexiFi, Microsoft, MLstate, Mylife.com, OCamlPro, and SimCorp.

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

MUTANT Project-Team (section vide)

PARKAS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

+ Google European Doctoral Fellowship of Tobias Grosser. $62000 per year over 3 years. Studying the interaction of affine loop transformations and vectorization, for multicore processors and hardware accelerators.

PI.R2 Project-Team (section vide)

POLSYS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Oberthur Technologies

Oberthur Technologies is the World second largest provider of security and identification solutions and services based on smart card technologies for mobile, payment, transport, digital TV and convergence markets. Since 2007, SALSA co-supervised 3 internships of first year master student on cryptology in smart-cards, and one internship of a 2nd year master student. The goal of this last internship was to study the feasibility of implementing multivariate schemes in constrained environments (typically a smart card). A new jointly supervised PhD thesis (PolSys/Oberthur) has start in march 2012.

7.2. Gemalto

Gemalto is an international IT security company providing software applications, secure personal devices such as smart cards and token, ... Governments, wireless operators, banks, and enterprises use Gemalto's software and personal devices to deliver mobile services, payment security, authenticated cloud access, identity and privacy protection, eHealthcare, eGovernment, transport ticketing and machine to machine (M2M) communications applications.

PolSys is currently working Gemalto – thanks to PhD grabt CIFRE – on the security analysis of code-based cryptosystems (participants J.-C. Faugère, L. Perret, F. Urvoy de Portzamparc).

PROSECCO Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Technology Transfer Grant

Inria CSATT Technology Transfer Action for Tookan. Following successful technology transfer projects around the Tookan software with Boeing and Barclays Bank, Inria have provided 12 months of funding for a software engineer (Romain Bardou) and 10 kEuros.

SECRET Project-Team

6. Bilateral Contracts and Grants with Industry

6.1. Bilateral Grants with Industry

- **Gemalto** ($01/10 \rightarrow 12/12$)
  CIFRE grant for Christina Boura.

CAD Team

7. Bilateral Contracts and Grants with Industry

7.1. EADS

We cooperate with EADS on geometric representation and FEM.

7.2. CAS-BEGCL Imaging Technology Corporation

We cooperate with CAS-BEGCL Imaging Technology Corporation on fluid simulation, object deformation and realistic rendering.

7.3. ANR/ NSFC AND SYSTEM@TIC: 2010-2013

The objectives of these Programs address Geometry Modeling and Computing, mainly Robustness and Tolerance as well as Geometric Uncertainties.

CLASSIC Project-Team

6. Bilateral Contracts and Grants with Industry

6.1. Students Paid by Industrial Partners / Contracts with Industry

- Gérard Biau finished supervising the PhD thesis of Benoît Patra, which took place till March 2012 within an industrial contract ("thèse CIFRE") with Lokad.com (http://www.lokad.com/).
- Gérard Biau has been supervising the PhD thesis of Baptiste Gregorutti since December 2011, within an industrial contract ("thèse CIFRE") with Safety Line (http://www.safety-line.fr/index.php/fr/)
- Gilles Stoltz has been supervising the PhD thesis of Pierre Gaillard, which takes place since September 2012 within an industrial contract ("thèse CIFRE") with EDF R&D (http://innovation.edf.com/).
- Gilles Stoltz supervised the M.Sc. internship of Charles-Pierre Astolfi, which took place within a collaboration with IFP Energies nouvelles (http://www.ifpenergiesnouvelles.fr/).

GAMMA3 Project-Team

4. Bilateral Contracts and Grants with Industry

4.1. Bilateral Contracts with Industry

- ANDRA, partenariat stratégique, projet 2, *Maillage adaptatif hexaédrique du milieu géologique multicouche avec prise en compte des ouvrages de stockage et des évolutions géodynamiques*, P. Laug et H. Borouchaki, 48 k-euros, 12/07/2011 - 12/09/2012.
- DASSAULT, *Maillage surfacique et topologie*, P. Laug et H. Borouchaki, 33 k-euros, 01/01/2010 - 31/12/2012.
- LECTRA, *Redéfinition des domaines de paramètres*, P. Laug et H. Borouchaki, 6 k-euros, 20/09/2011 - 19/09/2012.

4.2. Bilateral Grants with Industry

- Fondation EADS Grant, F. Alauzet, 150 k-euros, 2012-2015
- Fondation EADS Grant, A. Loseille, 140 k-euros, 2012-2015

MATHRISK Team

6. Bilateral Contracts and Grants with Industry

6.1. Bilateral Contracts with Industry

PREMIA consortium, presently composed of Crédit Agricole CIB, Société Générale, Natixis, and Pricing Partners.

MICMAC Project-Team

6. Bilateral Contracts and Grants with Industry

6.1. Contracts and Grants with Industry

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

SIERRA Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Grants with Industry

Participant: Francis Bach.

Google Research Award: “Large scale adaptive machine learning with finite data sets”.

BANG Project-Team (section vide)

CLIME Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

- Clime is partner with INERIS (National Institute for Environmental and Industrial Risks) in a joint cooperation devoted to air quality forecast. This includes research topics in uncertainty estimation, data assimilation and ensemble modeling.

  Clime also provides support to INERIS in order to operate the Polyphemus system for ensemble forecasting, uncertainty estimations and operational data assimilation at continental scale.
- Clime is partner with IRSN, the French national institute for radioprotection and nuclear safety, for inverse modeling of emission sources and uncertainty estimation of dispersion simulations. The collaboration aims at better estimating emission sources, at improving operational forecasts for crisis situations and at estimating the reliability of forecasts. The work is derived at large scale (continental scale) and small scale (a few kilometers around a nuclear power plant).
- Clime takes part to a joint Ilab with the group SETH (Numtech). The objective is to (1) transfer Clime work in data assimilation, ensemble forecasting and uncertainty estimation, with application to urban air quality, (2) identify the specific problems encountered at urban scale in order to determine new research directions.

POMDAPI Project-Team

4. Bilateral Contracts and Grants with Industry

4.1. Bilateral Contracts with Industry

Agence Nationale pour la gestion des Déchets RAdioactifs (Andra) Pomdapi takes part in 2 projects in the framework of the Andra–Inria research agreement;

- Ph. Hoang–Thi–THao is preparing a PhD (surpervised by J. E. Roberts, C. Japhet and M. Kern) on space–time domain decomposition methods for modeling transport in porous media.
- M. Kern is advising Andra in the choice of high performance linear algebra solvers for the heterogeneous problems encountered in flow simulations.

4.2. Bilateral Grants with Industry

Martin Vohralík, conjointement avec Vivette Girault (Université Pierre et Marie Curie), dirigent le projet **ERT (Equipe de Recherche Technologique)** entre le Laboratoire Jacques-Louis Lions (LJLL) et l'Institut Français du Pétrole Energies Nouvelles (IFPEN) sur la *Récupération d'huile assistée et séquestration géologique du* CO_2*: adaptation de maillage, contrôle d'erreur a posteriori et autres techniques avancées*. Projet mené en partenariat avec des industriels afin de « lever des blocages technologiques ». 9 chercheurs du LJLL, 6 chercheurs de l'IFPEN, 2 doctorants, stagiaires.

REO Project-Team (section vide)

SISYPHE Project-Team

6. Bilateral Contracts and Grants with Industry

6.1. Renault contract: Modeling, Control, Monitoring and Diagnosis of Depollution Systems

Participants: Pierre-Alexandre Bliman, David Marie-Luce, Michel Sorine.

This work is done in cooperation with Renault in the framework of a CIFRE contract. The issue of depollution has become a central preoccupation for the automotive industry, and the increased severity of the emission norms necessitates tight modeling and control solutions. We have worked on simple models for two devices, namely the NOx-trap and the SCR (Selective catalytic reduction). Observers have been obtained and tested against real-world data. See [16].

Based on the later, a control law has been obtained this year, for the control of the NOx-trap. This control law is defined by setting thresholds for the estimated NOx coverage fraction, to switch between storage mode and purge mode. These thresholds are optimal in stationary conditions, in the sense that they minimize the gas consumption under given pollutant emission constraint. Adequate moving window is fitted to define the switching values in non-stationary conditions. The algorithm has led to successful numerical tests.

6.2. CARMAT SAS contract: Modeling and control of a Total Artificial Heart

Participants: Julien Bernard, Michel Sorine.

This is a cooperation with CARMAT SAS (Suresnes, France) on the development of a Total Artificial Heart.

This fully implantable artificial heart is designed to replace the two ventricles, possibly as an alternative to heart transplant from donors. In a first time, it will be used as a end-of-life treatment for patients waiting for a transplant. The first patients may receive this artificial organ in less than three years.

Compared with the mechanical hearts used up today, that are mainly LVAD (left ventricular assist devices) or with its main concurrent, the Abiocor implantable replacement heart system (Abiomed), the present artificial heart is designed to be highly reliable and with a low thromboembolism rate. It will allow longer waiting periods for heart transplants and even, in a next future, may be an alternative to these transplants.

The prosthesis uses two controlled pumps that are not in direct contact with the blood, eliminating hemolysis risk and is equipped with miniature sensors in order to have a full control of the heart rate and arterial blood pressure. Our objective is to improve the control strategies by mimicking the physiological feedback loops (Starling effect, baroreflex loop, ...) to allowing patients to live as normally as possible. In a first step, this year we have modeled the prosthesis with its present controller and its testbed, a “mock circulation system” (MCS). This year we have tried some control algorithms with the MCS.

6.3. LK2 contract: TIght glycemic control for Intensive Care Units

Participants: Alexandre Guerrini, Michel Sorine.

This work on tight glycaemic control (TGC) for ICU started in Septembrer 2008 in the framework of the CIFRE contract of Alexandre Guerrini with the small medtech company LK2 (Tours, France). It is in collaboration with the Intensive Care Unit (ICU) of Chartres Hospital headed by Dr Pierre Kalfon. For the medical context of this study, see [90].

Blood glucose has become a key biological parameter in critical care since publication of the study conducted by van den Berghe and colleagues [104], who demonstrated decreased mortality in surgical intensive care patients in association with TGC, based on intensive insulin therapy. However, two negative studies were recently reported, which were interrupted early because of high rates of severe hypoglycaemia, namely the VISEP study [85] and the Glucontrol trial.

After having studied a possible origin of the failure of the recent study NICE-SUGAR, we have worked on more robust control algorithms based on a database of representative "virtual patients" [87].

In this study, we have developed efficient monitoring and control tools, now marketed by LK2 that will help clinicians and nursing staff to control blood glucose levels in ICU patients, in particular to avoid hyperglycaemia superior to 10 mmol/l and hypoglycaemia episodes. Our first controller has been assessed in the study CGAO-REA (see 4.3) with more than 3500 included patients. The controller determines the insulin infusion rate on the basis of the standard available glycaemia measurements despite their irregular sampling rate.

ARLES Project-Team (section vide)

GANG Project-Team

5. Bilateral Contracts and Grants with Industry

5.1. Bilateral Contracts with Industry

5.1.1. Peer-to-peer for high quality Internet radio

Participant: Fabien Mathieu.

A contract has been signed between Inria, RadioCeros and the ARITT Center. Gang is to provide a feasibility study on the subject of the use of Peer-to-peer mechanisms for high quality Internet radio.

5.1.2. Manipulability of voting systems and applications to networks

Participants: Fabien Mathieu, François Durand.

Alcatel grants ADR LINCS to study applicability of voting systems to loosely connected networks (Peer-to-peer, social networks...).

5.1.3. Extension of PageRank for Social Networks

Participants: Fabien Mathieu, The-Dang Huynh.

ALCATEL is funding a CIFRE PhD for carrying PageRank techniques to Social Networks.

HIPERCOM Project-Team (section vide)

RAP Project-Team

5. Bilateral Contracts and Grants with Industry

5.1. Contracts

- CRE with Orange Labs " Dynamical Optical Networking in the Internet". Contract on bandwidth allocation algorithm in optical networks. Duration 2 years starting from 01/01/12.
- CELTIC-Plus Saser "Safe and Secure European Routing" submitted. RAP participates in the section on optical networks. Participants include Orange labs, Alcaltel-Lucent, Telecom Institute, ENSSAT as well as a number of German laboratories. Duration three years.
- ANR Project "CONNECT: Content-Oriented Networking: a New Experience for Content Transfer". The proposal submitted to the VERSO programme has been accepted. The planned starting date is January 2011 and the project is scheduled to last 2 years. The lead partner is Alcatel-Lucent Bell Labs France and the other partners are RAP, Inria/PLANETE, Orange LAbs, TelecomParisTech, UPMC.
- The ANR Boole contract (Models for random Boolean functions and applications) has been transferred from the Algorithms project, and the funding will last until August 2013.
- PhD grant CJS (Contrat Jeune Scientifique) Frontières du vivant of INRA for Emanuele Leoncini.

5.2. Bilateral Grants

- A bilateral project PHC Tournesol funded by Campus France (formerly Egide) will cover the costs of exchanges between *Nicolas Broutin* and Stefan Langerman (FNRS, UL Brussels). The topic of the collaboration is coloration of random hypergraphs for channel assignment in networks.

REGAL Project-Team (section vide)

TREC Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Laboratoire Commun Alcatel-lucent Bell Labs / Inria

Participant: Anne Bouillard.

The joint laboratory was lauched on 2008. The objective of this collaboration is to contribute to the autonomic networking trend. On Inria's side, the research for this ADR (*action de recherche*) is mainly located at DISTRIBCOM team-project. On TREC's side, it involves the co-supervision of the thesis of Aurore Junier and has led to one publication [30] and a patent application [57].

7.2. CIFRE Grant of Technicolor

Participants: Mathieu Leconte, Marc Lelarge, Laurent Massoulié.

The CIFRE grant of Mathieu started in January 2011. The topic bears on information dissemination and recommendation in social networks. The distribution of multimedia content and the use of social networks like Facebook, Orkut, etc. are booming in today's networks. These social networks are also increasingly used for dissemination and recommendation of content. The objective of the thesis will be to develop an understanding of how information disseminates in social networks based on the type of information, user tastes, and the topological structure of these networks. This study will result in developing methods for more effective dissemination of content.

7.3. CIFRE Grant of Orange

Participants: Bartłomiej Błaszczyszyn, Miodrag Jovanović.

The CIFRE grant of Miodrag started in 2012. The topic bears on the evaluation and optimization of the QoS for new services in cellular networks. This year a work on feasible bit-rates in the MIMO LTE (Long Term Evolution) cellular networks has been presented in [39]. We have been also studying real-time streaming (like mobile TV) in wireless cellular networks. This work is reported in [50] submitted for the publication.

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, specific collaboration agreements have been set up with Verbatim Analysis (license agreement and "CIFRE" PhD, see section 4.3), Lingua et Machina (DTI-funded engineer, see section 4.4), Viavoo, and Diadeis (the "Investissements d'Avenir" project PACTE has started in 2012, see section 4.5).

AXIS Project-Team (section vide)

IMARA Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

In 2012, a new bilateral collaboration between Valeo and IMARA started involving the development of advanced driving assistance systems. The first topic was in the development of an advanced docking system using vision based perception and automatic control of the vehicle. The second topic has just started around driver monitoring using vision. Two bilateral contracts where signed as well as an associated NDA between both institutions.

IMEDIA2 Team (section vide)

SMIS Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. Bilateral Contracts with Industry

The SMIS project has a long lasting cooperation with Axalto, recently merged with Gemplus to form Gemalto, the world's leading providers of microprocessor cards. Gemalto provides SMIS with advanced hardware and software smart card platforms which are used to validate numbers of our research results. In return, SMIS provides Gemalto with requirements and technical feedbacks that help them adapting their future platforms towards data intensive applications. Meanwhile, we are developing partnerships with SMEs capable of building ad-hoc hardware prototypes conforming to our own design. We cooperate also with Santeos, an Atos Origin company developing software platforms of on-line medical services. Santeos is member of the consortium selected by the French Ministry of Health to host the French DMP (the national Personal Medical Folder initiative). This cooperation helps us tackling one of our targeted applications, namely the protection of medical folders.

7.2. DMSP Yvelines District grant (Nov 2010 - Apr. 2012)

Partners: Inria-SMIS (coordinator), Gemalto, UVSQ, Santeos
SMIS funding : 75k€
http://www-smis.inria.fr/_DMSP/accueil.php
Electronic Health Record (EHR) projects have been launched in most developed countries to increase the quality of care while decreasing its cost. Despite their unquestionable benefits, patients are reluctant to abandon their control of highly sensitive data to a distant server. The objective of the DMSP project is to complement a traditional EHR server with a secure and mobile personal medical folder (1) to protect and share highly sensitive data among trusted parties and (2) to provide a seamless access to the data even in disconnected mode. The DMSP architecture builds upon the technology designed in the PlugDB project (see above). It is currently experimented in the context of a medical-social network providing care and services at home for elderly people. The experiment in the field started in September 2011 with a targeted population of 120 volunteer patients and practitioners in the Yvelines district.

WILLOW Project-Team

7. Bilateral Contracts and Grants with Industry

7.1. EADS (ENS)

Participants: Jean Ponce, Josef Sivic, Andrew Zisserman.

The WILLOW team has had collaboration efforts with EADS via tutorial presentations and discussions with A. Zisserman, J. Sivic and J. Ponce at EADS and ENS, and submitting joint grant proposals. In addition, Marc Sturzel (EADS) is doing a PhD at ENS with Jean Ponce and Andrew Zisserman.

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

Participants: Jean Ponce, Josef Sivic, Ivan Laptev.

This collaborative project, already mentioned several times in this report, 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.

7.3. Google: Learning to annotate videos from movie scripts

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.