

CHIST-ERA Projects Seminar 2016 – Bern, April 27-29

Book of Abstracts

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*From Data to New Knowledge (Call 2011)***CAMOMILE****Collaborative Annotation of multi-MOdal, multi-Lingual and multi-mEdia documents**

Responsible Coordinator :

LIMSI/CNRS	ANR	Claude Barras	France
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Partnership :

IMMI/CNRS	ANR	Joseph-Jean Mariani	France
Universitat Politècnica de Catalunya	MINECO	Francisco Javier Hernando Pericàs	Spain
Centre De Recherche Public - Gabriel Lippmann	FNR	Benoît Otjacques	Luxembourg
LIG/CNRS	ANR	Georges Quénot	France
Istanbul Technical University / Faculty of Computer and informatics	TUBITAK	Hazim Kemal Ekenel	Turkey

Abstract: Human activity is constantly generating large volumes of heterogeneous data, in particular via the Web. These data can be collected and explored to gain new insights in social sciences, linguistics, economics, behavioural studies as well as artificial intelligence and computer sciences.

In this regard, 3M (multimodal, multimedia, multilingual) data could be seen as a paradigm of sharing an object of study, human data, between many scientific domains. But, to be really useful, these data should be annotated, and available in very large amounts. Annotated data is useful for computer sciences which process human data with statistical-based machine learning methods, but also for social sciences which are more and more using the large corpora available to support new insights, in a way which was not imaginable few years ago.

However, annotating data is costly as it involves a large amount of manual work, and in this regard 3M data, for which we need to annotate different modalities with different levels of abstraction is especially costly. Current annotation framework involves some local manual annotation, with the help sometimes of some automatic tools (mainly pre-segmentation).

The proposal aims at developing a first prototype of collaborative annotation framework on 3M data, in which the manual annotation will be done remotely on many sites, while the final annotation will be localized on the main site. Furthermore, with the same principle, some systems devoted to automatic processing of the modalities (speech, vision) present in the multimedia data will help the transcription, by producing automatic annotations. These automatic annotations are done remotely in each expertise point, which will be then combined locally to produce a meaningful help to the annotators. In order to develop this new annotation concept, we will test it on a practical case study: the problem of person annotation (who is speaking?, who is seen?) in video, which needs collaboration of high level automatic systems dealing with different media (video, speech, audio tracks, OCR, ...). The quality of the annotated data will be evaluated through the task of person retrieval.

This new way to envision the annotation process, should lead to some methodologies, tools, instruments and data that are useful for the whole scientific community who have interest in 3M annotated data; to support this will, all the work will be supervised by a committee which will contain representatives from the main international organizations dealing with language resources and evaluation.

*From Data to New Knowledge (Call 2011)***MUCKE****Multimedia And User Credibility Knowledge Extraction**

Responsible Coordinator :

Vienna University of Technology, Information And Software Engineering Group	FWF	Allan Hanbury	Austria
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Partnership :

Bilkent University, Department of Computer Engineering	TUBITAK	Pinar Duygulu-Sahin	Turkey
Universitatea "Al. I. Cuza" Iasi, Facultatea de Informatica	UEFISCDI	Adrian Iftene	Romania
CEA LIST	ANR	Adrian Popescu	France

Abstract: Web3.0 has already appeared in the public vocabulary over 5 years ago. While its definition remains unclear, what has become clear in the last half decade is that the web has become a support for social media. Directly from cameras, phones, tablets or computers, users are pushing multimedia data towards their peers and the world at large. MUCKE addresses this stream of multimedia social data with new and reliable knowledge extraction models designed for multilingual and multimodal data shared on social networks. It departs from current knowledge extraction models, which are mainly quantitative, by giving a high importance to the quality of the processed data, in order to protect the user from an avalanche of equally topically relevant data. It does so using two central innovations: automatic user credibility estimation for multimedia streams and adaptive multimedia concept similarity. Credibility models for multimedia streams are a highly novel topic, which will be cast as a multimedia information fusion task and will constitute the main scientific contribution of the project. Adaptive multimedia concept similarity departs from existing models by creating a semantic representation of the underlying corpora and assigning a probabilistic framework to them. The utility of these two innovations will be demonstrated in an image retrieval system. Extensive evaluation will be performed in order to assess the reliability of the extracted knowledge against representative datasets. Additionally, a new, shared evaluation task focused on user credibility estimation will be proposed. The two core innovations rely on innovative text processing, image processing and fusion methods. Text processing will concentrate on tasks such as word sense disambiguation, concept recognition and anaphora resolution. Image processing will include parsimonious content description, large scale concept detection and detector robustness. Multimedia fusion will focus on a flexible combination of text and image modalities based on a probabilistic framework. All proposed methods will be designed to take advantage of the structural properties of the social networks. Particular focus will be placed on the proposition of scalable algorithms, which cope with large-scale, heterogeneous data.

The consortium is formed of four partners, three universities and one research institute with complementary competences that cover the scientific domains associated to the project.

Together, in MUCKE, they will introduce new models for processing noisy multimodal and multilingual data that will constitute the base for innovative services.

*From Data to New Knowledge (Call 2011)***READERS****Evaluation And DEvelopment of Reading Systems**

Responsible Coordinator :

Universidad Nacional de Educación a Distancia	MINECO	Anselmo Peñas	Spain
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Partnership :

UPV/EHU	MINECO	Eneko Agirre	Spain
Synapse Développement	ANR	Dominique Laurent	France
University of Edinburgh	EPSRC	Maria Mirella Lapata	United Kingdom

Abstract: The READERS project proposes new unsupervised computational models to automatically extract background knowledge after reading large amounts of unstructured text. This knowledge will be in the form of classes, categorized entities and predicates whose arguments are typified by probability distributions over classes. Classes themselves will be automatically organized into taxonomies related to the predicates in which they participate. In this way, new methods and models based on extensional definitions of concepts will be developed and deployed for the automatic creation of knowledge bases. Important, these will be closely related to textual representations and instrumental in enabling textual inferences. The extracted knowledge will be also linked to external human-made resources such as Freebase, DBPedia and WordNet, and the knowledge bases will be interfaced with several engines for performing disambiguation, relation extraction, term expansion, and measuring relatedness. A key part of the project will be the development of a reading matching that will use all these resources and tools. . The purpose of our reading machine is to answer queries about a given text. Texts are never self-contained and their interpretation always requires recovering large amounts of background knowledge. Thus, the Machine Reading technology under development must incorporate not only language processing but also the recovery and use of large amounts of background knowledge. This Machine Reading technology will be evaluated through Multiple-Choice Reading Comprehension tests (MRC) developed by humans over unseen documents. MRC tests enable objective and reproducible evaluation experiments, and will be 100% reusable as benchmarks available for the international community. Interestingly, the industrial partner in charge of the Machine Reading system development will apply the reverse technology to automatically generate MRC tests for the automatic assessment of children's reading abilities. This reading machine will work with at least two languages, English and French. The support and coordination of an international evaluation campaign for Machine Reading in multiple languages (English, Spanish, French, German, Italian, Romanian, Bulgarian and Arabic) is part of the proposal. This evaluation campaign will serve to measure the progress in the development of the Machine Reading technology in a comparative/competitive environment. Evaluation exercises in specific domains such as biomedicine will also provide a venue for technology transfer and allow us to assess the portability of the proposed technology.

*From Data to New Knowledge (Call 2011)***REFRAME****Rethinking the Essence, Flexibility and Reusability of Advanced Model Exploitation**

Responsible Coordinator :

Intelligent Systems Lab, University of Bristol	EPSRC	Peter Flach	United Kingdom
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Partnership :

Technical University of Valencia	MINECO	Jose Hernandez-Orallo	Spain
University of Strasbourg	ANR	Nicolas Lachiche	France

Abstract: Reuse of learnt knowledge is of critical importance in the majority of knowledge-intensive application areas, particularly because the operating context can be expected to vary from training to deployment. In machine learning this is most commonly studied in relation to variations in class and cost skew in classification. While this is evidently useful in many practical situations, there is a clear and pressing need to generalise the notion of operating context beyond the narrow framework of skew-sensitive classification. This project aims to address the challenge of redesigning the entire data-to-knowledge (D2K) pipeline in order to take account of a significantly generalised notion of operating context.

We will develop an innovative and principled approach to knowledge reuse which will allow a range of known machine learning and data mining techniques to deal with common contextual changes, including: (i) changes in data representation; (ii) the availability of new background knowledge; (iii) predictions required at a different aggregation level; and (iv) models to be applied to a different subgroup or distribution. The approach is based around the new notion of model reframing, which can be applied to inputs (features), outputs (predictions) or parts of models (patterns), in this way generalising, integrating and broadening the more traditional and diverse notions of model adjustment in machine learning and data mining.

The ultimate goal of the project is to provide a much better understanding of the issues involved in the generation and deployment of a model for different contexts, as well as the development of tools which ease the extraction, reuse, exchange and adaptation of knowledge for a wide spectrum of operating contexts. The project will focus on three complex domain areas: geographical applications with spatio-temporal data, smart use of energy (resource production and consumption), and human genomics (genotype-phenotype relation analysis). These three demanding domains will ground the project by means of challenge problems and allow us to experimentally validate our methodologies, tools and algorithms.

*From Data to New Knowledge (Call 2011)***uComp****Embedded Human Computation for Knowledge Extraction and Evaluation**

Responsible Coordinator :

The University of Sheffield / Department of Computer Science	EPSRC	Wilhelmus Peters	United Kingdom
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Partnership :

LIMSI-CNRS / Man-Machine Communication Dept	ANR	Patrick Paroubek	France
MODUL University Vienna / Department of New Media Technology	FWF	Arno Scharl	Austria
Vienna University of Economics and Business / Research Institute for Computational Methods	FWF	Kurt Hornik	Austria

Abstract: The rapid growth and fragmented character of social media and publicly available structured data challenges established approaches to knowledge extraction. Many algorithms fail when they encounter noisy, multilingual and contradictory input. Efforts to increase the reliability and scalability of these algorithms face a lack of suitable training data and gold standards. Given that humans excel at interpreting contradictory and context-dependent evidence, the uComp project will address the above mentioned shortcomings by merging collective human intelligence and automated methods in a symbiotic fashion. The project will build upon the emerging field of Human Computation (HC) in the tradition of games with a purpose and crowdsourcing marketplaces. It will advance the field of Web Science by developing a scalable and generic HC framework for knowledge extraction and evaluation, delegating the most challenging tasks to large communities of users and continuously learning from their feedback to optimise automated methods as part of an iterative process. A major contribution is the proposed foundational research on Embedded Human Computation (EHC), which will advance and integrate the currently disjoint research fields of human and machine computation. EHC goes beyond mere data collection and embeds the HC paradigm into adaptive knowledge extraction workflows. An open evaluation campaign will validate the accuracy and scalability of EHC to acquire factual and affective knowledge. In addition to novel evaluation methods, uComp will also provide shared datasets and benchmark EHC against established knowledge processing frameworks. While uComp methods will be generic and evaluated across domains, climate change was chosen as the main use case for its challenging nature, subject to fluctuating and often conflicting interpretations. Collaborating with international organisations such as EEA, NOAA and NASA will increase impact, provide a rich stream of input data, attract and retain a critical mass of users, and promote the adoption of EHC among a wide range of stakeholders.

*From Data to New Knowledge (Call 2011)***ViSen****Tagging visual data with semantic descriptions**

Responsible Coordinator :

University of Surrey/Department of Electronic Engineering	EPSRC	Krystian Mikolajczyk	United Kingdom
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Partnership :

Institut de Robòtica i Informàtica Industrial	MINECO	Francesc Moreno-Noguer	Spain
University of Sheffield, Department of Computer Science	EPSRC	Prof Robert Gaizauskas	United Kingdom
Ecole Centrale de Lyon	ANR	Emmanuel Dellandréa	France

Abstract: Today a typical Web document will contain a mix of visual and textual content. Most traditional tools for search and retrieval can successfully handle textual content, but are not prepared to handle heterogeneous documents. The new type of content demands the development of new efficient tools for search and retrieval.

The visual sense project aims at mining automatically the semantic content of visual data to enable “machine reading” of images. In recent years, we have witnessed significant advances in the automatic recognition of visual concepts (VCR). These advances allowed for the creation of systems that can automatically generate keyword-based image annotations. The goal of this project is to move a step forward and predict semantic image representations that can be used to generate more informative sentence-based image annotations. Thus, facilitating search and browsing of large multi-modal collections. More specifically, the project targets three case studies, namely image annotation, re-ranking for image search, and automatic image illustration of articles. It will address the following key open research challenges:

1. To develop methods that can predict a semantic representation of visual content. This representation will go beyond the detection of objects and scenes and will also recognize a wide range of object relations.
2. To extend state-of-the-art natural language techniques to the tasks of mining large collections of multi-modal documents and generating image captions using both semantic representations of visual content and object/scene type models derived from semantic representations of the multi-modal documents.
3. To develop learning algorithms that can exploit available multi-modal data to discover mappings between visual and textual content. These algorithms should be able to leverage ‘weakly’ annotated data and be robust to large amounts of noise.

For this purpose, the current project will build on expertise from multiple disciplines, including computer vision, machine learning and natural language processing (NLP), and gathers four research groups from University of Surrey (Surrey, UK), Institut de Robòtica i Informàtica Industrial (IRI, Spain) , Ecole Centrale de Lyon (ECL, France), and University of Sheffield (Sheffield, UK) having each well established and complementary expertise in their respective areas of research.

*Green ICT, towards Zero Power ICT (Call 2011)***E-CROPS****Energy harvesting Communication netwoRks: OPTimization and demonStration**

Responsible Coordinator :

Imperial College, Electrical and Electronics Engineering Department	EPSRC	Deniz Gündüz	United Kingdom
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Partnership :

EURECOM / Mobile Communications Department	ANR	David Gesbert	France
Middle East Technical University / Electrical and Electronics Engineering Department	TUBITAK	Elif Uysal-Biyikoglu	Turkey
Middle East Technical University / Micro-Electro-Mechanical Systems	TUBITAK	Haluk Kulah	Turkey
Centre Tecnològic de Telecomunicacion de Catalunya (CTTC)	MINECO	Jesus Gomez-Vilardebo	Spain
Imperial College, Electrical and Electronics Engineering Department	EPSRC	Erol Gelenbe	United Kingdom

Abstract: “Anytime, anywhere, anything” has been the recent catch-phrase used by technology evangelists promising untethered wireless data flow not only among people, but also among devices of any imaginable sort. Trillions of autonomous devices are foreseen in this promise. While wireless sensor networks solve the wiring problem, we would still need to recharge or replace hundreds of batteries every day or supply the network infrastructure (e.g. base stations in the cellular world) with an ever increasing amount of power. Harvesting available ambient energy, such as solar, thermal or electromagnetic, to power wireless devices is the only viable solution to realize this promise in a sustainable manner. Building upon this requirement, in E-CROPS we study the design, optimization and implementation of a wireless network in which, nodes can harvest renewable energy and store the extra energy in their batteries, be it at the terminal or the network infrastructure side.

In our theoretical study, we aim to formulate a mathematical theory of communication for energy harvesting networks, considering the communication network jointly with the energy network consisting of the harvesters and the storage units. We propose to design the protocols enabling the adaption of the physical and network layer design to the temporal changes in the available energy as well as to the distribution of the energy within the network.

In parallel, we will study novel vibration and thermal energy harvesters as well as the appropriate storage units, and integrate these devices into a wireless sensor network application as a proof of concept for our scientific results. Bringing together researchers from theoretical and experimental backgrounds, we expect that both sides will benefit significantly from this interaction:

1. The design of the harvesting and storage units will be adapted to the needs of the specific communication scenarios
2. Practical energy and data profiles will be used to design and compare our algorithms, and finally
3. A proof-of-concept sensor network application will be implemented to test the practicality of our ideas in real world

*Green ICT, towards Zero Power ICT (Call 2011)***GEMSCLAIM****GreenEr Mobile Systems by Cross LAYer Integrated energy Management**

Responsible Coordinator :

University of Innsbruck/Institute of Computer Science	FWF	Thomas Fahringer	Austria
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Partnership :

RWTH Aachen University/Institute for Communication Technologies and Embedded Systems	-	Rainer Leupers	Germany
Politehnica University of Timisoara/Faculty of Automation and Computer Engineering	UEFISCDI	Marius Marcu	Romania
Queens University of Belfast/High Performance and Distributed Computing	EPSRC	Dimitrios Nikolopoulos	United Kingdom

Abstract: Personal computing currently faces a rapid trend from desktop machines towards mobile services, accessed via tablets, smartphones and similar terminal devices. With respect to computing power, today's handheld devices are similar to Cray-2 supercomputers from the 1980s. Due to higher computational load (e.g. via multimedia apps) and the variety of radio interfaces (such as WiFi, 3G, and LTE), modern terminals are getting increasingly energy hungry. For instance, a single UMTS upload or a video recording process on today's smartphones may consume as much as 1.5 Watts, i.e. roughly 50% of the maximal device power. In the near future, higher data rates and traffic, advanced media codecs, and graphics applications will ask for even more energy than the battery can deliver. At the same time, the power density limit might lead to a significant share of "Dark Silicon" at 22nm CMOS and below. Obviously, disruptive energy optimizations are required that go well beyond traditional technologies like DVFS (dynamic voltage and frequency scaling) and power-down of temporarily unused components. The GEMSCLAIM project aims at introducing novel approaches for reducing this "greed for energy", thereby improving the user experience and enabling new opportunities for mobile computing. The focus is on three novel approaches: (1) cross layer energy optimization, ranging from the compiler over the operating system down to the target HW platform, (2) efficient programming support for energy-optimized heterogeneous Multicore platforms based on energy-aware service level agreements (SLAs) and energy-sensitive tunable parameters, and (3) introducing energy awareness into Virtual Platforms for the purpose of dynamically customizing the HW architecture for energy optimization and online energy monitoring and accounting. GEMSCLAIM will provide new methodologies and tools in these domains and will quantify the potential energy savings via benchmarks and a HW platform prototype.

*Green ICT, towards Zero Power ICT (Call 2011)***SMARTER****Smart Multifunctional ARchitecture & Technology for Energy-aware wireless sensor**

Responsible Coordinator :

LAAS-CNRS	ANR	Jean-Marie Dilhac	France
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Partnership :

University of Barcelona	MINECO	Pere Miribel	Spain
Cranfield University	EPSRC	Meiling Zhu	United Kingdom

Abstract: The overall vision of the project is to develop comprehensive knowledge and an innovative methodology in the areas of energy autonomous wireless systems from a global system perspective, enabling self-powered, battery-free wireless sensing nodes to meet a wide range of structural health monitoring (SHM) applications. The research is multi-disciplinary, and designed to enable the emergence of innovative energy technologies suitable for transfer from laboratories to industries. The research vision builds on the project partners' complementary skills and strengths in the area of 'towards zero-power ICT' with the potential to lead to multiple scientific and technical breakthroughs.. The first breakthrough is to make use of the SHM sensing device itself to implement a single multifunctional device providing both structural health data and electrical energy harvested from mechanical vibrations. Another breakthrough will be to store the harvested energy in a fully integrated smart storage device, which adapts its storage capacity, according to the available energy in the environment and to the power consumption of the load. This adaptability will provide a constantly optimized matching between storage device and energy harvester to foster energy transfer. The energy storage itself will be a micro-ultracapacitor, so will have the desirable features of high specific energy, short time response, long lifetime and safe operation. This micro-ultracapacitor will be implemented in a silicon compatible technology so as to facilitate co-integration with other functions. A final innovation will be the co-location of the different devices (harvesting, sensing, storage, processing, data transmission) on the same flexible substrate, in order to enable conformal attachment of the device, a characteristic highly desirable in a SHM context where the surfaces to be monitored are seldom planar. Additionally, by this means the issue of the anisotropy of vibration harvesters is settled, the harvester being, by nature, properly oriented. More globally, the project aims at producing a device in which co-integration, co-location of functions, versatility of applications and energy autonomy are pushed to a maximum.

*Green ICT, towards Zero Power ICT (Call 2011)***STAR****SwiTching And tRansmission**

Responsible Coordinator :

University of Leeds, UK	EPSRC	Jaafar Elmirghani	United Kingdom
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Partnership :

INRIA	ANR	Laurent Lefevre	France
University of Cambridge	EPSRC	Richard Penty	United Kingdom
AGH University of Science and Technology, Department of Telecommunications	NCBR	Piotr Cholda	Poland

Abstract: In this project we adopt the Core Switching and Routing GreenTouch energy saving target of 100 and believe this ambitious target is achievable. A key observation in core networks is that most of the power is consumed in the IP layer while optical transmission and optical switching are power efficient in comparison, hence the inspiration for this project. Therefore we will introduce energy efficient optimum physical network topologies that encourage optical transmission and optical switching at the expense of IP routing whenever possible. Initial studies by the applicants show that physical topology choices in networks have the potential to reduce the power consumption by a factor of at least 20, however network optimization and the consideration of traffic and the opportunities afforded by large, low power photonic switch architectures will lead to further power savings. We will investigate a large photonic switch architecture in this project, minimize its power consumption and determine optimum network physical topologies that exploit this switch to minimize power consumption. We believe that a power saving by a factor of at least 10 in the photonic switch power consumption is possible through our new designs. We will design new large photonic switch fabrics, based on hybrid semiconductor optical amplifiers (SOA) / Mach Zehnder interferometers as gating elements to minimise the switching energy per bit, and plan to optimize the network architecture making use of these new switch architectures and introduce on chip (photonic switch) power monitoring to inform higher layer decisions. Networks are typically 3 to 5 times over provisioned at present to maintain quality of service. We will study optimum resource allocation to reduce the overprovisioning factor while maintaining the quality of service. Here power savings by a factor of at least 3 are possible. Protection is currently provided in networks through the allocation of redundant paths and resources, and for full protection there is a protection route for every working route. We will optimize our networks to minimize power wastage due to protection and will consider for the first time in core networks the impact of embodied energy (energy used to manufacture the network components) to reduce the overall carbon footprint of the network. The power savings due to optimum physical topology design, optimum resource allocation, power saving due to optical switching instead of IP routing and more efficient photonic switches and the power savings due to energy efficient protection can be combined and therefore the investigators and their industrial collaborators BT, Alcatel Lucent and Telekomunikacja Polska, believe that an ambitious factor of 100 power saving in core networks can be realised through this project with significant potential for impact.

*Context- and Content-Adaptive Communication Networks (Call 2012)***CONCERT****A Context-Adaptive Content Ecosystem Under Uncertainty**

Responsible Coordinator :

University College London / Department of Electronic and Electrical Engineering	EPSRC	George Pavlou	United Kingdom
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Partnership :

Ecole Polytechnique Fédérale de Lausanne / Electrical Engineering Institute	SNSF	Pascal Frossard	Switzerland
AAU Klagenfurt / Institute of Information Technology, Multimedia Communication Group	FWF	Hermann Hellwagner	Austria
University of Surrey (UniS) / Centre for Communication Systems Research	EPSRC	Ning Wang	United Kingdom

Abstract: The objective of CONCERT is to develop a content ecosystem encompassing all relevant players which will be able to perform intelligent content and network adaptation in highly dynamic conditions under uncertainty. This ecosystem will have as basis emerging information-/content-centric networking technologies which support intrinsic in-network content manipulation. The project will consider uncertainty aspects in the following two application domains: a) social media networks based on user generated content and b) CDN-like professional content distribution. Three dimensions of uncertainties will be addressed: heterogeneous and changing service requirements by end users, threats that may have adverse impacts on the content ecosystem, as well as opportunities that can be exploited by specific players in order to have their costs reduced.

In order to manage and exploit the uncertainty aspects, CONCERT defines a two-dimensional content and network adaptation framework that operates both cross-layer and cross-player. First, the decision on any single adaptation action needs to take into account context information from both the content application layer and the underlying network. Second, we consider joint content and network adaptation in order to simultaneously achieve optimised service performance and network resource utilisation. Finally, some complex uncertainty scenarios require coordinated content and network adaptation across different ecosystem players. In this case, inconsistent or even conflicting adaptation objectives and different levels of context knowledge need to be reconciled and are key research issues. In order to achieve adaptation solutions capable of coping with different uncertainties, the project will develop advanced learning, decision-making and negotiation techniques. Learning is required for deriving accurate system behavioural patterns according to the acquired context knowledge. This will then drive decision-making functions for taking the most appropriate adaptation actions to address these uncertainties. Negotiation techniques are required for resolving potential tussles between specific content/network adaptation objectives by different players in the content ecosystem. The project will consider both centralised and distributed approaches in which learning and decision-making processes on adaptation actions can be performed either at the central adaptation domain controller or in a decentralised manner across multiple network elements. In the latter case, emerging information-/content-centric networks will become much more intelligent, with content-aware devices performing self-adaptation according to their own context knowledge but through coordination in order to achieve global near-optimality and stability.

*Context- and Content-Adaptive Communication Networks (Call 2012)***DISEDAN****service and user-based Distributed SElection of content streaming source and Dual Adaptation**

Responsible Coordinator :

Politechnika Warszawska	NCBR	Jordi Mongay Batalla	Poland
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Partnership :

CNRS-LaBRI University of Bordeaux	ANR	Daniel Négru	France
Universitatea Politehnica din Bucuresti	UEFISCDI	Eugen Borcoci	Romania

Abstract: The DISEDAN project proposes an evolutionary solution to enhance the content delivery via Internet. It focuses on research in the area of multi-criteria content source (server) selection, considering user and server contexts and requested content.

The project proposes two innovative concepts that improve the current streaming systems. The first one is a two-step server selection mechanism which allows for cooperation between Service Provider (an entity offering the content distribution service, but owning or not a network infrastructure) and End User (an entity which consumes the content) making use of innovative algorithms that consider context- and content-awareness. The second concept is a dual adaptation mechanism applicable during media session that combines the advantages of Media adaptation and content server handover in a single solution.

The proposed streaming system will be able to function as a standalone client application, without any modifications applied to the Service Provider, as long as the SP is able to provide a list of available and appropriate servers to the client. If, additionally, the SP is able to provide to the client some other additional information helpful for the initial client decision, then an optimised server selection results. Consequently, the project outlines a set of optional Provider side modifications (w.r.t. useful information and metrics provided by SP to the client) that can further optimize server selection. The design of the system takes backwards-compatibility into consideration, ensuring that both client and Service Provider side modifications work well with the other side using existing content distribution solutions.

The project aims to develop clear rules for deciding which adaptation action to perform based on the evaluated current delivery conditions. Possibilities of inferring the optimum adaptation decision by estimating network state from various client measurements will be researched. In the course of work, a prototype implementation of the DISEDAN system will be developed in (1) a form of a library allowing for easy creation of streaming clients that benefit from the introduced enhancements and (2) Multimedia Description server with advanced content source selection algorithm and extended Multimedia Description.

*Context- and Content-Adaptive Communication Networks (Call 2012)***MACACO****Mobile context-Adaptive CAching for COntent-centric networking**

Responsible Coordinator :

INRIA	ANR	Aline Carneiro Viana	France
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Partnership :

Federal University of Minas Gerais/DCC	-	Pedro Olmo Stancioli Vaz de Melo	Brazil
Consiglio Nazionale delle Ricerche (CNR)	-	Marco FIORE	Italy
University of Applied Science – SUPSI	SNSF	Silvia Giordano	Switzerland
University of Birmingham	EPSRC	Mirco Musolesi	United Kingdom
Institut National Polytechnique de Toulouse (INPT-ENSEEIH)/IRIT	ANR	Katia Jaffrès-Runser	France

Abstract: Finding new ways to manage the increased data usage and to improve the level of service required by the new wave of smartphones applications is an essential issue. MACACO project proposes an innovative solution to this problem by focusing on data offloading mechanisms that take advantage of context and content information. Our intuition is that if it is possible to extract and forecast the behaviour of mobile network users in the three-dimensional space of time, location and interest (i.e. 'what data', 'when' and 'where' users are pulling data from the network), it is possible to derive efficient data offloading protocols. Such protocols would pre-fetch the identified data and cache it at the network edge at an earlier time, preferably when the mobile network is less charged, or offers better quality of service. Caching can be done directly at the mobile terminals, but as well at the edge nodes of the network (e.g., femtocells or wireless access points).

Building on previous research efforts in the fields of social wireless networking, opportunistic communications and content networking, MACACO will address several issues. The first one is to derive appropriate models for the correlation between user interests and their mobility. Lots of studies have characterized mobile nodes mobility based on real world data traces, but knowledge about the interactions with user interests in this context is still missing. To fill this gap, MACACO proposes to acquire real world data sets to model mobile node behaviour in the aforementioned three-dimensional space. The second issue addressed is the derivation of efficient data-offloading algorithms leveraging the large-scale data traces and corresponding models. Firstly, simple and efficient prediction algorithms will be derived to forecast the node's mobility and interests. Then, MACACO has to output data pre-fetching mechanisms that both improves the perceived quality of service of the mobile user and noticeably offloads pick bandwidth demands at the cellular network. A proof of concept will be exhibited though a federated testbed located in France, Switzerland and in the UK.

The consortium was carefully constituted to gather partners that are pretty complementary and qualified to address the context-content correlation and related data offloading challenge. The partners of MACACO will combine research and experience in a wide set of areas to gain unique competence, which will be brought forward to other European partners through the dissemination and exploitation activities of the consortium.

*Intelligent User Interfaces (Call 2012)***eGlasses****eGLASSES – The interactive eyeglasses for mobile, perceptual computing**

Responsible Coordinator :

Gdansk University of Technology, FETI, Dept. of Biomedical Engineering	NCBR	Jacek Ruminski	Poland
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Partnership :

University of Lorraine / LCOMS	ANR	Benoît Martin	France
Hochschule Luzern/ iHomeLab	SNSF	Martin Biallas	Switzerland
University of Applied Sciences Upper Austria/ Media Interaction Lab (MIL)	FWF	Michael Haller	Austria
University of Luxembourg / Interdisciplinary Centre for Security, Reliability and Trust	FNR	Thomas Engel	Luxembourg

Abstract: The eGlasses project is focused on the development of an open platform in the form of multisensory electronic glasses and on the integration and designing of new intelligent interaction methods using the eGlasses platform. This is an initial development focused on long-term research and technological innovation in perceptual and super-perceptual (e.g. heart rate, temperature) computing. It is an emerging technology that is also focused on the creation of mobile, perceptual media. Perceptual media refers to multimedia devices with added perceptual user interface capabilities. These devices integrate human-like perceptual awareness of the environment, with the ability to respond appropriately. This can be achieved by using automatic perception of an object's properties and delivering information about the object's status as a result of reasoning operations. For example, using the eGlasses, it will be possible to control a device, which is recognized within the field of view using the interactive menu, associated with the identified device. Other examples include presentation of a recognized person name, recognition of people with abnormal physiological parameters, protection against possible head injuries, etc. The platform will use currently available user-interaction methods, new methods developed in the framework of this project (e.g. a haptic interface) and will enable further extensions to introduce next generation user-interaction algorithms. Furthermore, the goal of this project is to propose and evaluate new and intelligent user interactions, which are particularly useful for healthcare professionals, people with disabilities or at risk of exclusion, and to create and evaluate behavioural models of these mobile users. The main scientific and technological objectives of the project are to design and evaluate the following:

- eye-tracking hardware and algorithms for a user, who is mobile in a noisy real world environment,
- algorithms for perceptual media and for super perceptual computing,
- methods for locating objects and guiding vision towards the identified objects,
- methods of interactions with users and objects (menu of activities for the identified person or object),
- a haptic interface in a form of a peripheral proximity radar,
- methods for the recognition of the user's own gestures and recognition of gestures of the observed person,
- methods for context-aware behavioural studies,
- methods for reference applications.

The result of the project will be an open platform in the form of multisensory electronic multimedia glasses and a set of new methods for intelligent user interactions, especially in the context of perceptual media.

*Intelligent User Interfaces (Call 2012)***IMOTION****Intelligent Multimodal Augmented Video Motion Retrieval System**

Responsible Coordinator :

University of Basel	SNSF	Heiko Schuldt	Switzerland
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Partnership :

University of Mons	FNRS	Stéphane Dupont	Belgium
Koç University	TUBITAK	T. Metin Sezgin	Turkey

Abstract: Video is increasingly gaining importance as medium to capture and disseminate information. This is not only the case for personal use but also –and most importantly– for professional and educational applications. With the enormous growth of video collections, effective yet efficient content-based retrieval of (parts of) videos is becoming more and more essential. Conventionally, video retrieval relies on metadata such as manual annotations, or inherent features extracted from the video. However, the most decisive information that distinguishes video content from static content, the movement of individual objects across subsequent frames, so far is largely ignored. This is particularly the case for so-called augmented video where additional spatio-temporal data on the movement of objects (e.g., captured by dedicated sensors systems) is available in addition to the actual video content.

The IMOTION project will develop and evaluate innovative multi-modal user interfaces for interacting with augmented videos. Starting with an extension of existing query paradigms (keyword search in manual annotations), image search (query by example in key frames), IMOTION will consider novel sketch- and speech-based user interfaces. In particular, novel types of motion queries will be supported where users can specify motion paths of objects, via sketches, gestures, natural language interfaces, or combinations thereof. Several types of user interfaces (voice, tablets, multi-touch tables, interactive paper) will be supported and seamlessly combined so as to smoothly migrate a session from one type of user interface to another during the process of specifying and refining a query. This will be based on novel approaches to representation learning and the extraction of high-level motion descriptors from augmented videos, based on a motion ontology. In addition, IMOTION will develop novel index structures that jointly support traditional video features and the additional motion metadata.

A major contribution will be the quantitative and qualitative evaluation and user studies of the intelligent multi-modal interfaces and query paradigms developed in two concrete use cases – sample applications from which the project will select include, but are not limited to, augmented sports videos where users search on the basis of trajectories of player or ball movements, educational videos from the natural sciences where users search for animal movements inside a horde or a swarm, or sketch-based searches for currents in the sea captured by sensors integrated into buoys. The IMOTION consortium will openly publish the augmented video collections and the motion metadata created in the course of the project's evaluation activities.

*Intelligent User Interfaces (Call 2012)***JOKER****JOKE and Empathy of a Robot/ECA: Towards social and affective relations with a robot**

Responsible Coordinator :

CNRS-LIMSI	ANR	Laurence Devillers	France
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Partnership :

Trinity College Dublin	IRC	Nick Campbell	Ireland
Koç University (KOC)	TUBITAK	Metin Sezgin	Turkey
UMONS	FNRS	Thierry Dutoit	Belgium
LIUM- University of Le Mans	ANR	Yannick Esteve	France

Abstract: This project will build and develop JOKER, a generic intelligent user interface providing a multimodal dialogue system with social communication skills including humor, empathy, compassion, charm, and other informal socially-oriented behavior.

Talk during social interactions naturally involves the exchange of propositional content but also and perhaps more importantly the expression of interpersonal relationships, as well as displays of emotion, affect, interest, etc. This project will facilitate advanced dialogues employing complex social behaviors in order to provide a companion-machine (robot or ECA) with the skills to create and maintain a long term social relationship through verbal and non verbal language interaction. Such social interaction requires that the robot has the ability to represent and understand some complex human social behavior. It is not straightforward to design a robot with such abilities. Social interactions require social intelligence and 'understanding' (for planning ahead and dealing with new circumstances) and employ theory of mind for inferring the cognitive states of another person.

JOKER will emphasize the fusion of verbal and non-verbal channels for emotional and social behavior perception, interaction and generation capabilities. Our paradigm invokes two types of decision: intuitive (mainly based upon non-verbal multimodal cues) and cognitive (based upon fusion of semantic and contextual information with non-verbal multimodal cues.) The intuitive type will be used dynamically in the interaction at the non-verbal level (empathic behavior: synchrony of mimics such as smile, nods) but also at verbal levels for reflex small-talk (politeness behavior: verbal synchrony with hello, how are you, thanks, etc). Cognitive decisions will be used for reasoning on the strategy of the dialog and deciding more complex social behaviors (humor, compassion, white lies, etc.) taking into account the user profile and contextual information.

JOKER will react in real-time with a robust perception module (sensing user's facial expressions, gaze, voice, audio and speech style and content), a social interaction module modelling user and context, with long-term memories, and a generation and synthesis module for maintaining social engagement with the user.

The research will provide a generic intelligent user interface for use with various platforms such as robots or ECAs, a collection of multimodal data with different socially-oriented behavior scenarios in two languages (French and English) and an evaluation protocol for such systems. Using the database collected in a human-machine context, cultural aspects of emotions and natural social interaction including chat, jokes, and other informal socially-oriented behavior will be incorporated.

*Adaptive Machines in Complex Environments (Call 2013)***AdaLab****Adaptive Automated Scientific Laboratory**

Responsible Coordinator :

Brunel University, Department of Information Systems and Computing	EPSRC	Larisa Soldatova	United Kingdom
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Partnership :

KU Leuven, Department of Computer Science	FWO	Jan Ramon	Belgium
University of Evry-Val-d-Essonnes, iSSB	ANR	Mohamed Elati	France
University Paris-Nord LIPN	ANR	Céline Rouveïrol	France
University of Manchester, Manchester Institute of Biotechnology	EPSRC	Ross D. King	United Kingdom

Abstract: Our proposal integrates the scientific method with 21st century automation technology, with the goal of making scientific discovery more efficient (cheaper, faster, better). A Robot Scientist is a physically implemented laboratory automation system that exploits techniques from the field of artificial intelligence to execute cycles of scientific experimentation. Our vision is that within 10 years many scientific discoveries will be made by teams of human and robot scientists, and that such collaborations between human and robot scientists will produce scientific knowledge more efficiently than either could alone. In this way the productivity of science will be increased, leading to societal benefits: better food security, better medicines, etc. The Physics Nobel Laureate Frank Wilczek has predicted that the best scientist in one hundred years time will be a machine. The proposed project aims to take that prediction several steps closer. We will develop the AdaLab (an Adaptive Automated Scientific Laboratory) framework for semi-automated and automated knowledge discovery by teams of human and robot scientists. This framework will integrate and advance a number of ICT methodologies: knowledge representation, ontology engineering, semantic technologies, machine learning, bioinformatics, and automated experimentation (robot scientists). We will evaluate the AdaLab framework on an important real-world application in cell biology with biomedical relevance to cancer and ageing. The core of AdaLab will be generic. The expected project outputs include:

- An AdaLab demonstrated to be greater than 20% more efficient at discovering scientific knowledge (within a limited scientific domain) than human scientists alone.
- A novel ontology for modelling uncertain knowledge that supports all aspects of the proposed AdaLab framework.
- The first ever communication mechanism between human and robot scientists that standardises modes of communication, information exchange protocols, and the content of typical messages.
- New machine learning methods for the generation and efficient testing of complex scientific hypotheses that are twice as efficient at selecting experiments as the best current methods.
- A significant advance in the state-of-the-art in automating scientific discovery that demonstrates its scalability to problems an order of magnitude more complex than currently possible.
- Novel biomedical knowledge about cell biology relevant to cancer and ageing.
- A strengthened interdisciplinary research community that crosses the boundaries between multiple ICT disciplines, laboratory automation, and biology.

Website:

<http://www.adalab.mib.manchester.ac.uk/>

*Adaptive Machines in Complex Environments (Call 2013)***ALOOF****Autonomous Learning of the Meaning of Objects**

Responsible Coordinator :

University of Rome La Sapienza, Dept. of Computer, Control and Management Engineering "Antonio Ruberti"	MIUR	Barbara Caputo	Italy
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Partnership :

Technische Universität Wien	FWF	Markus Vincze	Austria
School of Computer Science, University of Birmingham	EPSRC	Nick Hawes	United Kingdom
INRIA Sophia Antipolis, Wimmics team	ANR	Fabien Gandon	France

Abstract: The goal of ALOOF is to enable robots to tap into the ever-growing amount of knowledge available on the Web, by learning from there about the meaning of previously unseen objects, expressed in a form that makes them applicable when acting in situated environments. By searching the Web, robots will be able to learn about new objects, their specific properties, where they might be stored and so forth. To achieve this, robots need a mechanism for translating between the representations used in their real-world experience and those on the Web. We propose a meta-modal representation, composed of meta-modal entities and relations between them. A single entity is composed of modal features extracted from sensors or the Web. Amodal completion supports perception in the absence of a complete set of features. The combined features link to the semantic properties associated to each entity. All entities are organized into a structured ontology, supporting formal reasoning. This is complemented with methods for detecting gaps in the knowledge of the robot, for planning where to effectively obtain the knowledge, and for extracting relevant knowledge from Web resources. By situating meta-modal representations into the perception and action capabilities of robots, we will achieve a powerful mix of Web-supported and physical-interaction-based open-ended learning. Our scenario consists of a home setting where robots have to find/retrieve objects while understanding their meaning and relevance in the assigned task. Our measure of progress will be how many gaps, i.e. incomplete information about objects, can be resolved autonomously given specific prior knowledge. We will integrate results on different mobile robot platforms ranging from smaller mobile platforms, over Metralabs Scitos to a home service robot HOBbit.

*Adaptive Machines in Complex Environments (Call 2013)***COACHES****Cooperative Autonomous Robots in Complex and Humans Environments**

Responsible Coordinator :

University of Caen Basse-Normandie (UNICAEN)	ANR	Abdel-Ilhah Mouaddib	France
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Partnership :

Sabancı Universitesi, MDBF	TUBITAK	Esra Erdem	Turkey
Vrije Universiteit Brussel	FWO	Hichem Sahli	Belgium
Sapienza University of Rome	MIUR	Luca Iocci	Italy

Abstract: Public spaces in large cities are increasingly becoming complex and unwelcoming environments. Public spaces progressively become more hostile and unpleasant to use because of the overcrowding and complex information in signboards. It is in the interest of cities to make their public spaces easier to use, friendlier to visitors and safer to increasing elderly population and to citizens with disabilities. Meanwhile, we observe, in the last decade a tremendous progress in the development of robots in dynamic, complex and uncertain environments. The new challenge for the near future is to deploy a network of robots in public spaces to accomplish services that can help humans. Inspired by the aforementioned challenges, COACHES project addresses fundamental issues related to the design of a robust system of self-directed autonomous robots with high-level skills of environment modelling and scene understanding, distributed autonomous decision-making, short-term interacting with humans and robust and safe navigation in overcrowding spaces. To this end, COACHES will provide an integrated solution to new challenges on:

1. a knowledge-based representation of the environment,
2. human activities and needs estimation using Markov and Bayesian techniques,
3. distributed decision-making under uncertainty to collectively plan activities of assistance, guidance and delivery tasks using Decentralized Partially Observable Markov Decision Processes with efficient algorithms to improve their scalability and
4. a multi-modal and short-term human-robot interaction to exchange information and requests.

COACHES project will provide a modular architecture to be integrated in real robots. We deploy COACHES at Caen city in a mall called "Rive de l'orne". COACHES is a cooperative system consisting of fixed cameras and the mobile robots. The fixed cameras can do object detection, tracking and abnormal events detection (objects or behaviour). The robots combine these information with the ones perceived via their own sensor, to provide information through its multi-modal interface, guide people to their destinations, show tramway stations and transport goods for elderly people, etc.... The COACHES robots will use different modalities (speech and displayed information) to interact with the mall visitors, shopkeepers and mall managers. The project has enlisted an important end-user (Caen la mer) providing the scenarios where the COACHES robots and systems will be deployed, and gather together universities with complementary competences from cognitive systems (SU), robust image/video processing (VUB, UNICAEN), and semantic scene analysis and understanding (VUB), Collective decision-making using decentralized partially observable Markov Decision Processes and multi-agent planning (UNICAEN, Sapienza), multi-modal and short-term human-robot interaction (Sapienza, UNICAEN).

*Heterogeneous Distributed Computing (Call 2013)***DIONASYS****Declarative and Interoperable Overlay Networks, Applications to Systems of Systems**

Responsible Coordinator :

University of Neuchatel	SNSF	Etienne Rivière	Switzerland
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Partnership :

Université de Bordeaux	ANR	Laurent Réveillère	France
Universitatea Tehnica din Cluj-Napoca	UEFISCDI	Virgil Dobrota	Romania
University of Lancaster	EPSRC	Gordon Blair	United Kingdom

Abstract: An increasing number of different kinds of resources, including everyday objects, are interconnected to each other. Some analysts estimate that around 50 billions of devices should be interconnected at the horizon of 2020. This paves the way for new large-scale systems, and requires the need for novel architectures and design principles to support such a scale. Further, these resources may be very different at both the hardware and software layer, in terms of both functional and non-functional properties. This will lead to system of systems that federate highly heterogeneous distributed systems as already illustrated, for instance, by environmental and earth observation systems. Designing such large, interconnected and heterogeneous systems is a daunting task. A possible way to overcome the complexity of contemporary distributed systems is to leverage overlay networks and their higher level of abstraction. The virtualization of the underlying network resources allows providing a range of reusable network services. Many types of overlay networks have been proposed and developed in the previous years for a variety of networked systems, applications and services. However, the design and development of overlays remains a complex task, especially when dynamic adaptation, large-scale interoperability and composition are required. Adding interoperability, adaptation and composition capabilities often require huge and complex re-engineering of existing overlay implementations. In the context of overlay networks, it also requires appropriate abstractions and runtime support for allowing different type of overlays and structures to be linked, cooperate and provide adaptive interoperable end-to-end services in a dynamic fashion. In this project, we propose to raise the level of abstraction provided to designers of overlays and systems-of-systems. To this end, we are using a generative language approach to overlay design and composition. We will provide the corresponding new programming models, abstractions and tools. Our aim will be reached via the use of a high-level domain-specific language, declaring what should be achieved for the structure and functions of overlays, rather than by defining low-level nodes interactions. The proposed approach will be supported by a dedicated runtime implemented in a distributed systems development and deployment framework. The project follows a prototype-driven approach. It will feature a large-scale demonstrator linking heterogeneous overlays — networked systems and sensor networks—in an integrated manner, with support for adaptive and malleable end-to-end services and functionalities.

*Heterogeneous Distributed Computing (Call 2013)***DIVIDEND****Distributed Heterogeneous Vertically Integrated Energy Efficient Data centres**

Responsible Coordinator :

University of Edinburgh, School of Informatics	EPSRC	Michael O'Boyle	United Kingdom
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Partnership :

Universitatea Politehnica Timisoara	UEFISCDI	Alexandru Amaricai	Romania
Queen's University of Belfast	EPSRC	Dimitrios Nikolopoulos	United Kingdom
Lancaster University, School of Computing and Communications	EPSRC	Zheng Wang	United Kingdom
Ecole Polytechnique Federale de Lausanne	SNSF	Babak Falsafi	Switzerland
Advanced Micro Devices (AMD)	ANR	Mauricio Breternitz	France

Abstract: Our world is in the midst of a “big data” revolution, driven by the ubiquitous ability to gather, analyse, and query datasets of unprecedented variety and size. The sheer storage volume and processing capacity required to manage these datasets has resulted in a transition away from desktop processing and toward warehouse-scale computing inside data centres. State-of-the-art data centres, employed by the likes of Google and Facebook, draw 20-30 MW of power, equivalent to 20,000 homes, with these companies needing many data centres each. The global data centre energy footprint is estimated at around 2% of the world’s energy consumption and doubles every five years. Contemporary data centres have an average overhead of 90%, meaning that they consume up to 1.9 MW to deliver 1 MW of IT support; this is not cost-effective or environmentally sound. If the exponential data growth and processing capacity are to scale in the way that both the public and industry have come to rely upon, we must tackle the data centre energy crisis or face the reality of stagnated progress. With the semiconductor industry’s inability to further lower operating voltages in processor and memory chips, the challenge is in developing technologies for large-scale data-centric computation with energy as a first-order design constraint. The DIVIDEND project attacks the data centre energy efficiency bottleneck through vertical integration, specialisation, and cross-layer optimisation. Our vision is to present heterogeneous data centres, combining CPUs, GPUs, and task-specific accelerators, as a unified entity to the application developer and let the runtime optimise the utilisation of the system resources during task execution. DIVIDEND embraces heterogeneity to dramatically lower the energy per task through extensive hardware specialisation while maintaining the ease of programmability of a homogeneous architecture. To lower communication latency and energy, DIVIDEND leverages SoC integration and prefers a lean point-to-point messaging fabric over complex connection-oriented network protocols. DIVIDEND addresses the programmability challenge by adapting and extending the industry-led heterogeneous systems architecture programming language and runtime initiative to account for energy awareness and data movement. DIVIDEND provides for a cross-layer energy optimisation framework via a set of APIs for energy accounting and feedback between hardware, compilation, runtime, and application layers. The DIVIDEND project will usher in a new class of vertically integrated data centres and will take a first stab at resolving the energy crisis by improving the power usage effectiveness of data centres by at least 50%.

*Heterogeneous Distributed Computing (Call 2013)***HPDCJ****Heterogenous parallel and distributed computing with Java**

Responsible Coordinator :

University of Warsaw / ICM	NCN	Piotr Bala	Poland
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Partnership :

IBM Research Lab	SNSF	Costas Bekas	Switzerland
Bilkent University	TUBITAK	Gedik Bugra	Turkey
Queens University of Belfast / School of Electronics, Electrical Engineering and Computer Science	EPSRC	Dimitrios Nikolopoulos	United Kingdom

Abstract: Our proposal focuses on the ease of use and programmability of Java for distributed heterogeneous computing in order to make it exploitable by the huge user base of mainstream computing. Based on the previous work (PCJ library <http://pci.icm.edu.pl>), we will introduce and transparently expose parallelism in Java, with minimal change to the specifics of the language thus allowing programmers to focus on the application. We have demonstrated power and scalability of the PCJ library for the parallel systems and we will extend it for the cases where communication cost and latency could be higher. We will extend existing solution with the capability of running on the heterogeneous systems including GPU and mobile devices. The user will obtain possibility to execute computational intensive parts of the application on the multiple GPUs. Since our solution is based on Java it can be easily run on the mobile devices. Within project we will extend library capabilities with the optimised communication and scheduling mechanism necessary to use fully such devices. We will utilize potential of parallel Java library to process distribute data. The existing solution benefits from the parallel I/O performed by the multiple JVMs. We will use this solution to optimize process of data distribution and storage including streaming of the large data sets. We will address dependability and resilience by adding fault tolerance mechanisms to the parallel Java library including fault detection and rescheduling of the application execution. The mechanism will extend capabilities of the existing PCJ library and will be transparent to the users. We will show the applicability of our framework for distributed heterogeneous systems by a set of selected, key applications including data-intensive Big Data applications. Our potential success will create solution for Java programming that will be attractive to a wide mainstream user base and will thus have a game-changing influence on the European computing industry. We assembled a carefully selected team with complementary focuses and the right degree of overlap. Most of the partners have worked in close collaboration in previous (EU) projects with remarkable success. We believe this to become a key pilot project that can open the way for future research which will have a profound impact on mainstream computing.

*Human Language Understanding: Grounding Language Learning (Call 2014)***AMIS****Access Multilingual Information opinions**

Responsible Coordinator :

University of Lorraine	ANR	Kamel Smaïli	France
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Partnership :

AGH University of Science and Technology	NCN	Mikolaj Leszczuk	Poland
DEUSTO	MINECO	Begoña García-Zapirain	Spain
University of Avignon	ANR	Juan-Manual Torres-Moreno	France

Abstract: With the growth of the information in different media such as TV programs or internet, a new issue arises. How a user can access to the information which is expressed in a foreign language? The idea of the project is to develop a multilingual help system of understanding without any human being intervention. What we would like to do, is to help people understanding broadcasting news, presented in a foreign language and to compare it to the corresponding one available in the mother tongue of the user. The concept of understanding is approached in this project by giving access to any information whatever the language in which it is presented. In fact, with the development of internet and satellite TV, tens of thousands shows and broadcasting news are available in different languages, it turns out that even high educated people, do not speak more than two or three languages while the majority speaks only one, which makes this huge amount of information inaccessible. Consequently, the majority of TV and radio programs as well as information on internet are inaccessible for the majority of people. And yet, one would like to listen to news in his own language and compare it to what has been said on the same topic in another language. For instance, how the topic of AIDS is presented in SAUDI-ARABIA and in USA? What is the opinion of The Jerusalem-Post about Yasser-Arafat? And how it is presented in Al-Quds ? To access to various information and to make available different and sometimes opposite information, we propose to develop AMIS (Access to Multilingual Information and Opinions). As a result, AMIS will permit to have another side of story of an event. The understanding process is considered here to be the comprehension of the main ideas of a video. The best way to do that, is then to summarize the video for having access to the essential information. Henceforth, AMIS will focus on the most relevant information by summarizing it and by translating it to the user if necessary. Another aspect of AMIS is to compare two summaries produced by this system, from two languages on the same topic whatever their support is: video, audio or text and to present the difference between their contents in terms of information, sentiments, opinions, etc. Furthermore, the coverage of the web and social media will be exploited in order to strengthen or weaken the retrieved opinions. AMIS could be incorporated in a TV remote control or such as software associated to any internet browser. In conclusion AMIS will address the following research points:

- Text, audio and video summarization
- Automatic Speech Recognition (ASR)
- Machine Translation
- Cross-lingual sentiment analysis
- Achieving successful synergy between the previous research topics

*Human Language Understanding: Grounding Language Learning (Call 2014)***ATLANTIS****ArTificial Language uNdersTanding In robotS**

Responsible Coordinator :

VUB	FWO	Ann Nowe	Belgium
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Partnership :

OFAI	FWF	Brigitte Krenn	Austria
IBE-UPF	MINECO	Luc Steels	Spain
LATTICE-CNRS	ANR	Thierry Poibeau	France
SONY France	ANR	Remi van Trijp	France

Abstract: ATLANTIS attempts to understand and model the very first stages in grounded language learning, as we see in children until the age of three: how pointing or other symbolic gestures emerge from the ontogenetic ritualization of instrumental actions, how words are learned very fast in contextualized language games, and how the first grammatical constructions emerge from concrete sentences. This requires a global, computational theory of symbolic development that informs us about what forces motivate language development, what strategies are exploited in learner and caregiver interactions to come up with more complex compositional meanings, how new grammatical structures and novel interaction patterns are formed, and how the multitude of developmental pathways observed in humans lead to a full system of multi-modal communication skills. This ambitious aim is feasible because there have been very significant advances in humanoid robotics and in the development of sensory-motor competence recently, and the time is ripe to push all this to a higher level of symbolic intelligence, going beyond simple sensory-motor loops or pattern-based intelligence towards grounded semantics, and incremental, long-term, autonomous language learning.

*Human Language Understanding: Grounding Language Learning (Call 2014)***IGLU****Interactive Grounded Language Understanding**

Responsible Coordinator :

University of Sherbrooke	FRQNT	Jean Rouat	Canada
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Partnership :

INRIA Bordeaux	ANR	Manuel Lopes	France
University of MONS	FNRS	Thierry Dutoit	Belgium
KTH Royal Institute of Technology	VR	Giampiero Salvi	Sweden
University of Zaragoza	MINECO	Luis Montesano	Spain
University of Lille 1	ANR	Olivier Pietquin	France

Abstract: Language is an ability that develops in young children through joint interaction with their caretakers and their physical environment. At this level, human language understanding could be referred as interpreting and expressing semantic concepts (e.g. objects, actions and relations) through what can be perceived (or inferred) from current context in the environment. Previous work in the field of artificial intelligence has failed to address the acquisition of such perceptually-grounded knowledge in virtual agents (avatars), mainly because of the lack of physical embodiment (ability to interact physically) and dialogue, communication skills (ability to interact verbally). We believe that robotic agents are more appropriate for this task, and that interaction is a so important aspect of human language learning and understanding that pragmatic knowledge (identifying or conveying intention) must be present to complement semantic knowledge. Through a developmental approach where knowledge grows in complexity while driven by multimodal experience and language interaction with a human, we propose an agent that will incorporate models of dialogues, human emotions and intentions as part of its decision-making process. This will lead anticipation and reaction not only based on its internal state (own goal and intention, perception of the environment), but also on the perceived state and intention of the human interactant. This will be possible through the development of advanced machine learning methods (combining developmental, deep and reinforcement learning) to handle large-scale multimodal inputs, besides leveraging state-of-the-art technological components involved in a language-based dialog system available within the consortium. Evaluations of learned skills and knowledge will be performed using an integrated architecture in a culinary use-case, and novel databases enabling research in grounded human language understanding will be released. IGLU will gather an interdisciplinary consortium composed of committed and experienced researchers in machine learning, neurosciences and cognitive sciences, developmental robotics, speech and language technologies, and multimodal/multimedia signal processing. We expect to have key impacts in the development of more interactive and adaptable systems sharing our environment in everyday life.

Human Language Understanding: Grounding Language Learning (Call 2014)

M2CR

Multimodal Multilingual Continuous Representation for Human Language Understanding

Responsible Coordinator :

University of Le Mans	ANR	Holger Schwenk	France
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Partnership :

University of Montreal	FRQNT	Yoshua Bengio	Canada
Computer Vision Center	MINECO	Carlo Gatta	Spain

Abstract: Communication is one of the necessary condition to develop intelligence in living beings. Humans use several modalities to exchange information: speech, written text, both in many languages, gestures, images, and many more. There is evidence that human learning is more effective when several modalities are used. There is a large body of research to make computers process these modalities, and ultimately, understand human language. These modalities have been, however, generally addressed independently or at most in pairs. However, merging information from multiple modalities is best done at the highest levels of abstraction, which deep learning models are trained to capture. The M2CR project aims at developing a revolutionary approach to combine all these modalities and their respective tasks in one unified architecture, based on deep neural networks, including both a discriminant and a generative component through multiple levels of representation. Our system will jointly learn from resources in several modalities, including but not limited to text of several languages (European languages, Chinese and Arabic), speech and images. In doing so, the system will learn one common semantic representation of the underlying information, both at a channel-specific level and at a higher channel-independent level. Pushing these ideas to the large scale, e.g. training on very large corpora, the M2CR project has the ambition to advance the state-of-the-art in human language understanding (HLU). M2CR will address all major tasks in HLU by one unified architecture: speech understanding and translation, multilingual image retrieval and description, etc. The M2CR project will collect existing multimodal and multilingual corpora, extend them as needed, and make them freely available to the community. M2CR will also define shared tasks to set up a common evaluation framework and ease research for other institutions, beyond the partners of this consortium. All developed software and tools will be open-source. By these means, we hope to help to advance the field of human language.

Human Language Understanding: Grounding Language Learning (Call 2014)

MUSTER

MULTImodal processing of Spatial and TEmporal expREssions

Responsible Coordinator :

University of Pierre and Marie Curie	ANR	Patrick Gallinari	France
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Partnership :

KU Leuven	FWO	Marie-Francine Moens	Belgium
ETH Zurich	SNSF	Luc Van Gool	Switzerland
University of the Basque Country	MINECO	Aitor Soroa	Spain

Abstract: The MUSTER project is a fundamental pilot research project which introduces a new multi-modal framework for the machine-readable representation of meaning. The focus of MUSTER lies on exploiting visual and perceptual input in the form of images and videos coupled with textual modality for building structured multi-modal semantic representations for the recognition of objects and actions, and their spatial and temporal relations. The MUSTER project will investigate whether such novel multi-modal representations will improve the performance of automated understanding of human language. MUSTER starts from the current state-of-the-work platform for human language representation learning known as text embeddings, but introduces the visual modality to provide contextual world knowledge which text-only models lack while humans possess such knowledge when understanding language. MUSTER will propose a new pilot framework for joint representation learning from text and vision data tailored for spatial and temporal language processing. The constructed framework will be evaluated on a series of HLU tasks (i.e., semantic textual similarity and disambiguation, spatial role labeling, zero-shot learning, temporal action ordering) which closely mimic the processes of human language acquisition and understanding.

MUSTER will rely on recent advances in multiple research disciplines spanning natural language processing, computer vision, machine learning, representation learning, and human language technologies, working together on building structured machine-readable multi-modal representations of spatial and temporal language phenomena.

Human Language Understanding: Grounding Language Learning (Call 2014)

ReGROUND

Relational symbol grounding through affordance learning

Responsible Coordinator :

KU Leuven	FWO	Luc De Raedt	Belgium
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Partnership :

Koc University	TUBITAK	Deniz Yuret	Turkey
Örebro University	VR	Alessandro Saffiotti	Sweden

Abstract: The problem of symbol grounding attempts to associate symbols from language with a corresponding referent in the environment. Traditionally, research has focused on identifying single objects and their properties. Similarly, affordances learning in robotics tend to focus on single objects. These approaches often do not consider the full context of the environment, which contains multiple different objects and their properties as well as relationships among the objects. Furthermore, the state of the environment (e.g., which relationships are true, etc.) affords (i.e., permits executing) certain actions. This project hypothesizes that the grounding process must consider the full context of the environment in order to perform symbol grounding and to better adapt to a new language and a new environment.

This project aims to develop a novel approach to grounding that lifts it to the relational level, where an agent reasons about the relationships between multiple symbols in the language and between multiple referents in the environment and it is able to learn affordances that capture the relationship between objects and their properties, actions, and the environment. Learning such relationships will require combining information from different modalities such as language and perception. We will evaluate our approach with a robot that operates in a kitchen-like environment. The robot will be trained by being presented with a series of demonstrations involving inputs from multiple modalities (language and perception). Then, it will be evaluated by being placed in an unseen environment where it will be forced to adapt to its new setting and interpret, possibly unimodal input (i.e., only language or only perception), in order to correctly carry out the requested tasks.

*Resilient Trustworthy Cyber-Physical Systems (Call 2014)***COPEs****COConsumer-centric Privacy in smart Energy grids**

Responsible Coordinator :

KTH Royal Institute of Technology	VR	Tobias Oechtering	Sweden
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Partnership :

Imperial College London	EPSRC	Deniz Gunduz	United Kingdom
INRIA Grenoble	ANR	Cedric Lauradoux	France
ETH Zurich	SNSF	Gabriela Hug	Switzerland

Abstract: Smart meters have the capability to measure and record consumption data at a high time resolution and communicate such data to the energy provider. This provides the opportunity to better monitor and control the power grid and to enable demand response at the residential level. This not only improves the reliability of grid operations but also constitutes a key enabler to integrate variable renewable generation, such as wind or solar. However, the communication of high resolution consumption data also poses privacy risks as such data allows the utility, or a third party, to derive detailed information about consumer behavior. Hence, the main research objective of COPES is to develop new technologies to protect consumer privacy, while not sacrificing the “smartness”, i.e., advanced control and monitoring functionalities. The core idea is to overlay the original consumption pattern with additional physical consumption or generation, thereby hiding the consumer privacy sensitive consumption. The means to achieve this include the usage of storage, small scale distributed generation and/or elastic energy consumptions. Hence, COPES proposes and develops a radically new approach to alter the physical energy flow, instead of purely relying on encryption of meter readings, which provides protection against third party intruders but does not prevent the use of this data by the energy provider. In order to efficiently hide consumption information, intelligent decisions and strategies on when to charge/discharge the storage, which energy source to tap into, need to be made in real time. Therefore, in this project, algorithms based on and extending upon differential privacy, information and detection theoretic first principles that allow efficient use of physical capabilities to alter the overall consumption measured by the smart meters will be developed. Since these resources can also be used to minimize the electricity bill or increase the integration of renewables, trade-offs between these objectives and privacy will be studied and combined into a holistic privacy guaranteeing house energy management system. Implementations on multiple small test systems will serve as a proof of concept of the proposed methods.

*Resilient Trustworthy Cyber-Physical Systems (Call 2014)***DYPOSIT****Dynamic Policies for Shared Cyber-Physical Infrastructures under Attack**

Responsible Coordinator :

Lancaster University	EPSRC	Awais Rachid	United Kingdom
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Partnership :

KU Leuven	FWO	Wouter Joosen	Belgium
University College Cork	IRC	Simon Foley	Ireland

Abstract: The DYPOSIT project tackles the problem of large, shared CPS infrastructures under attack. In particular, the project responds to the critical need for dynamically formulating and adapting security policies, rapidly and on-demand, in the face of unfolding attacks on a shared CPS fabric integrating multiple applications run by a variety of stakeholders. DYPOSIT tackles this fundamental research problem through a novel dynamic policies approach rooted in a socio-technical understanding of the complexity and dynamics of shared CPS fabrics under attack. DYPOSIT's approach is unique and transformative as it takes an inter-disciplinary view of reasoning about the security state of a CPS and formulating responses to CPS coming under attack. This is in sharp contrast to other approaches that remain largely focused on technical measures to provide security or solutions that cater for the resource-constrained nature of the devices employed in a CPS. Furthermore, DYPOSIT's approach to dynamic policies offers a new perspective on the role of policies in large-scale CPS settings – transforming policies from simply a means to enforce pre-defined security properties to policies as living, evolving objects that play a central role in reasoning about the security state of such a CPS and responding to unfolding attacks. Managing the complexity of formulating and adapting policies dynamically in such a setting, while resolving conflicts, is a fundamental advance towards resilient shared CPS fabrics. DYPOSIT's scientific advances are validated in an available realistic testbed, which is used to provide application scenarios depicting CPS under attack across a spectrum: highly-managed CPS such as those found in industrial control systems or future factories through to dynamically aggregated CPS, as in smart cities, large manufacturing plants or intelligent transportation systems.

*Resilient Trustworthy Cyber-Physical Systems (Call 2014)***I-DRESS****Assistive interactive robotic system for support in dressing**

Responsible Coordinator :

CSIC	MINECO	Carme Torras	Spain
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Partnership :

IDIAP Research Institute	SNSF	Sylvain Calinon	Switzerland
University of the West of England	EPSRC	Sanja Dogramadzi	United Kingdom

Abstract: The main objective of the project is to develop a system that will provide proactive assistance with dressing to disabled users or users such as high-risk health-care workers, whose physical contact with the garments must be limited during dressing to avoid contamination. The proposed robotic system consists of two highly dexterous robotic arms, sensors for multi-modal human-robot interaction and safety features.

The system will comprise three major components, each of radical impact to the field of assistive service robotics: (a) intelligent algorithms for user and garment detection and tracking, specifically designed for close and physical human-robot interaction, (b) cognitive functions based on the multi-modal user input, environment modelling and safety, allowing the robot to decide when and how to assist the user, and (c) advanced user interface that facilitates intuitive and safe physical and cognitive interaction for support in dressing. The consortium consisting of three partners provides the expertise for the main lines of research required by the project: CSIC-UPC will work on perception and human-robot interaction, IDIAP will contribute to robot learning, and UWE-BRL will provide the expertise in safety and interface design.

The developed interactive system will be integrated on commercial WAM robotic arms and validated through experimentation with users and human factor analysis in two assistive-dressing scenarios. Additionally, developed robot safety features and the learning by demonstration algorithms will be implemented on a Baxter robot, thus ensuring general applicability and easier acceptance of the project results by both industry and scientific community.

*Resilient Trustworthy Cyber-Physical Systems (Call 2014)***SECODE****Secure Codes to Thwart Cyber-physical Attacks**

Responsible Coordinator :

Institut Mines Telecom / Telecom Paris-Tech	ANR	Jean-Luc Danger	France
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Partnership :

Paris 8 University	ANR	Claude Carlet	France
INRIA	ANR	Erven Rohou	France
Université Catholique de Louvain	FNRS	François-Xavier Standaert	Belgium
Sabanci University	TUBITAK	Cem Güneri	Turkey

Abstract: In this project, we specify and design error correction codes suitable for an efficient protection of sensitive information in the context of Internet of Things (IoT) and connected objects. Such codes mitigate passive attacks, like memory disclosure, and active attacks, like stack smashing. The innovation of this project is to leverage these codes for protecting against both cyber and physical attacks. The main advantage is a 360° coverage of attacks of the connected embedded systems, which is considered as a smart connected device and also a physical device. The outcome of the project is first a method to generate and execute cyber-resilient software, and second to protect data and its manipulation from physical threats like side-channel attacks. These results are demonstrated by using a smart sensor application with hardened embedded firmware and tamper-proof hardware platform.