Welcome
by Michael Rovatsos
(University of Edinburgh)

I am very pleased to be presenting the second edition of our newsletter, packed full with interesting information about the ESSENCE Network and its current activities.

A lot has been happening since the last edition. We held our first network-wide workshop in Edinburgh in April, recruited new Fellows for most of the remaining positions, and are now just about to run our first ESSENCE School on Evolving Semantic Systems in Ischia, a highly interdisciplinary event that involves a host of tutorials and lectures from experts in various fields. We are all very excited about this, as it will be the first event that will be open to non-ESSENCE members, and will allow the network and people interested in its work to engage with the network. Co-located with the School, we will also hold the Second ESSENCE Workshop, which will provide an opportunity for all Fellows to showcase their work.

This newsletter introduces the new, recently recruited Fellows and includes progress reports for all Fellows that had been recruited earlier this year. It also reports on the First ESSENCE workshop, and presents the First ESSENCE School and Second Workshop. Besides, it provides a “behind the scenes” look into SONY Labs Paris, and contains an interview with Prof Enric Plaza, one of the key ESSENCE collaborators at CSIC-IIIA and Barcelona. We also include a brief presentation of Safer Scotland, one of our non-academic Associated Partners, which explains their interests in ESSENCE research.

As always, we invite feedback and contributions from people outside the network, please email us at essence-info@inf.ed.ac.uk to get in touch. If you want to receive regular updates on our work, please email the same address so we can subscribe you to our mailing list. I hope you will enjoy the newsletter!
Meet the Fellows – The new cohort

by Nicola Bova
(University of Edinburgh)

ESSENCE is a Marie Curie Initial Training Network (ITN). As such, its main focus is to train young researchers by giving them the opportunity to improve their research skills, join established research teams and enhance their career prospects.

Within ITNs, fellows are divided into Early-Stage and Experienced Researchers. The term Early-Stage Researcher (ESR) refers to researchers in the first four years of their research activity. ESSENCE ESRs will embark in a PhD programme at one of the network partners. Conversely, Experienced Researchers (ERs) are defined as researchers having at least four years of research experience normally already in possession of a doctoral degree.

In the previous issue we presented the first cohort, composed of five ESRs and two ERs. In this section, we present the second one, made up of five new ESRs, most of whom started in September 2014.

Kristof Kessler (UEDIN)

After obtaining my undergraduate degree in Business Information Systems in a cooperative mode of studies with the Baden-Württemberg Cooperative State University and IBM in 2005, I have been alternating between working in analytical and project management roles in the information technology industry and pursuing further studies in the area of information systems and technology. In 2010 I completed a Master of Science in Management and Information Systems with focus in development aid and change, particularly technology acceptance, at the University of Manchester. In the end this degree resulted in considering a career in academia. Confirming to pursuing this path I enrolled in a longer Master’s program in Library and Information Studies at the University of British Columbia (UBC) in 2011. Throughout the program I worked as a research assistant in interactive information retrieval projects, particularly in the area of E-Government [1] and expertise finding [2]. After completing the degree, I had the opportunity to join a pilot project in research data management at UBC as Business Analyst. The aim of this project was to discover common processes, structures and services required by researchers in data-intensive and interdisciplinary environments.

When I am not thinking about structuring data and ontologies, I do volunteer work and pursue digital photography and video recording, while trying to keep up with the ever-increasing speed in which events unfold and technology progresses on this planet.

Kristof’s research project Imagine situations in which lives depend on quickly and correctly connecting a wide variety of differently structured data sources from different organizations. Emergency responses to natural disasters constitute such a situation. The team coordinating response activities not only needs to gain access to pertinent information from a wide variety of organizations, but also needs to quickly make sense of its meaning, how it relates to their ontology, and map it. Employing Ontology Matching approaches, this project aims to provide a prototype for automated, dynamic, and focused mapping of data sources to support the decision-making processes in emergency response teams.

Mercedes Huertas (UNITN)

My name is Mercedes Huertas and I am an ESR at the University of Trento. I am from Spain and in Madrid I got my Bachelors Honours in Computer Science. Later I moved to Edinburgh where I obtained my MSc in Artificial Intelligence from Heriot Watt University. My thesis focused on diagnosing breast cancer using artificial immune systems and machine learning techniques. After that, I moved to Barcelona where I was involved in the Synergy-COPD project [3] where I was the responsible of the study, design and development of a simulation environment for physiology models to support bio-researchers in their understanding of certain physiology processes that are suffered by patients diagnosed with COPD, chronic obstructive pulmonary disease.

My research interests now focus in crowdsourcing, how people behave when performing an online task and how to encourage participation while ensuring high quality of results.

Mercedes’ research project There are many reasons that make people collaborate towards the same aim. They can do it voluntarily, for the sake of fun or for money. My project is focused on the use of different reputation techniques to measure the behaviour of the users collaborating in a crowdsourcing platform for a large entity-centric semantic knowledge base. Also I will observe how those techniques can influence the quality of the results and the performance of the users.
In the crowdsourcing platform there will be three types of users: the translator, who translates from English to his/her mother tongue; the first level validator, who ensures that the translation was properly done; and the second level validator, who checks that the job of the first level validator was correctly done. The reputation of these users can change dynamically upon their performance.

**Aimilios Vourliotakis (PLAY)**

My academic journey began at the Technological Educational Institute of Athens, where I earned my BSc in Informatics. My BSc thesis served as a means to familiarise myself with and develop a passion for Artificial Intelligence (AI).

After graduation, I worked as Research Assistant at the Environmental & Energy Management research unit at the National Technical University of Athens for 18 months, focusing primarily on two European-funded projects. Although my main tasks required my software engineering skills, I was able to obtain invaluable experience in collaborating with PhD students and researchers, as well as familiarising myself with the nature of scientific research.

My aforementioned desire to focus on AI urged me to enrol on an MSc in Artificial Intelligence at Heriot-Watt University. In my Master’s thesis I analysed how artificial agents can adapt to human cognitive limitations using Reinforcement Learning, combining techniques from cognitive modelling, game theory, machine learning and psychology.

In my free time I enjoy travelling, reading books, playing video games, watching movies and browsing the web for those instantaneous and random questions that pop into our mind from time to time.

**Aimilios’ research project** Knowledge can be defined as a collection of facts an individual has about a particular subject.

In most cases, these facts are formed by one’s experience and can differ from person to person, especially in terms of definition. In that sense, knowledge is dynamic and ambiguous. In order to build knowledge systems that are able to interact with users as well as other knowledge systems in rapidly changing environments, we need to comprehend and formulate the underlying interlinking and evolution of their content.

This project aims at designing, implementing and evaluating human-inspired learning methods for autonomous adaptation, disambiguation and evolution of knowledge over time within knowledge systems.

**Paula Chocorón (CSIC)**

I studied Computer Science at the University of Buenos Aires, graduating in March 2014. I have been interested in Logic since high school, so I focused on this area, taking every available course in the subject. I worked for some time as a developer, and then decided to give research a try, to find it was definitely what I wanted to do.

During my studies I took part in two internships, both related to computational logic and its applications.

**Paula’s research project** My project deals with allowing successful communication among agents that do not share a fixed terminology, even if they use different terms for the same concept, or assign distinct meanings to the same term. This problem is called semantic heterogeneity, and, being crucial in agent communication, there have been many solutions proposed to tackle it, along the years. I will work with the I-SSA technique that, unlike others, takes into account the context in which the interaction takes place. My goals are mainly to extend the I-SSA technique and to relate it to ontology matching techniques.

**Kemo Adrian (CSIC)**

I discovered the philosophy of language during high school, and I im-
mediately became fascinated by the work of authors like Austin, Pierce and Searle. Books like “Speech Acts” and “Verbal Behaviour” have greatly influenced my perception of our language. I started to consider communication as a dynamic and emergent phenomenon created by the need of a reliable system in social interactions of all species.

I started to question the meaning of “Meaning”, therefore I joined a bachelor degree in Cognitive Sciences at the Lille University. During these three years I discovered new disciplines: biology, philosophy and computer science for example. In particular, I realised that computer science is an amazing way to model dynamic systems and test psychological and linguistic hypotheses.

Due to my growing curiosity in dynamical systems, I joined the Cergy-Pontoise University’s Master degree in Computer Science. I focused my internships on the simulation of the pre-frontal brain area, which is closely linked to communication skills (Broca’s area).

I wonder how two humans, with their particular brain organisation and representations, can cooperate using a rich and complete communication system. I joined the ESSENCE project to answer this question using Case Based Reasoning, a method for computer reasoning based on human problem solving.

**Kemo’s research project** Concept Convergence aims at establishing the theoretical foundations and computational models of argumentation and agreement over meaning. This project takes the notion of meaning as a social contract or agreement, and focuses on the reasoning strategies for evaluating, modifying, and agreeing about the semantic content of concepts by communicative processes such as argumentation.

Its main objectives are (i) achieving a model of the process of interpersonal agreement on the meaning of concepts in social contexts and (ii) developing an argumentation-based interpersonal mechanism for negotiating and agreeing on semantics and meaning in social contexts.

The methodology for concept convergence will be inspired by notions from cognitive linguistic anthropology (like segregates and contrast sets). Concepts are not understood only in a logic-based sense, but also in a semiotic sense (the triad sign/concept/object), upon which individuals can engage in an argumentation process concerning meaning. In particular, the notions of ontology alignment, matching and interoperability will be reinterpreted by those of mutual intelligibility, contextual adaptation, and agreement on meaning.

**Interview with Enric Plaza**

by Nicola Bova

(University of Edinburgh)

Enric Plaza holds the position of Research Professor at the IIIA-CSIC (Artificial Intelligence Institute of the Spanish Council for Scientific Research), that he joined in 1988, where he is currently Head of the Learning Systems Department (LSD). He holds a title of Engineer in Computer Science from the Technical University of Catalonia (UPC) since 1984 and a Ph.D, in Artificial Intelligence from UPC in 1987. His research has spanned different areas of Artificial Intelligence, including knowledge acquisition and validation for expert systems, case-based reasoning, machine learning, and multiagent systems. His research is now focused on new techniques for case-based reasoning, learning in the framework of multiagent systems and argumentation. He is author or co-author of more than 150 scientific papers in journals and conferences, and has worked on 17 international projects and 29 Spanish projects in Artificial Intelligence. He is also an ECAI Fellow and has chaired several international conferences. He was the first President of the Catalan Association for Artificial Intelligence (ACIA) from 1994 to 1998.

**Dear Prof. Plaza, what is your research about?**

I see myself as a researcher in Artificial Intelligence (AI). The core idea inside AI I’ve focused on can be described as “learning from experience”. This means I’ve mostly worked on symbolic inductive learning and CBR (case-based reasoning and learning). Learning for me is to be understood as a foundational aspect of intelligent systems research. However, in my view learning should not be approached in isolation (as in data analysis) but integrated with other fields of AI like reasoning and representation. CBR offers an example of this integrated approach, since reasoning, representation and learning need always to be addressed in some form.

In the last few years I became interested in symbolic multiagent learning (MAL). In MAL, my research has focused on how agents can communicate what they learn, and on how can they learn from communication with other individuals (in addition to their individual experiences). We have developed a methodology of learning from communication, based on argumentation, that allows agents to learn from each other on a particular concept or category. Arguments help to detect specific disagreements and provide a means to convey empirical evidence to support or attack the positions held by individual agents.

**What do you see as the main challenges in your area?**
Splintering of Artificial Intelligence into non-communicating compartments is the main challenge we are facing. Although nobody can work on or know about all topics, specialisation that borders on isolation tends to produce small delta increments in scientific contributions. Looking for connections between what you are doing and other fields of AI and cognitive sciences is essential. We should not continue in a paradigm where learning, knowledge discovery, knowledge revision, and knowledge representation are isolated topics within non-communicating communities.

The trick is defining a "research programme" that encompasses several aspects of AI that have to work together from the beginning. Research in CBR is an example of this approach: memory, learning, knowledge, representation, reasoning, all aspects have to be taken into account and integrated. In our work on MAL, we integrated seemingly unconnected aspects such as CBR, inductive learning, argumentation, non-monotonic reasoning, and agreement. Fortunately, ESSENCE's evolving semantics fits in this kind of research programme.

My newest research topic is called "the Web of Experience". The challenge here is how to learn not only from your own experience but also from the experiences of other people, expressed in the web, and taking into account that people's preferences and goals not necessarily agree. You can see this as trying to extend the CBR paradigm, and the MAL challenges, to the whole web. This can take years, and success will almost surely be partial. However, it forces the researcher to deal with a whole range of AI challenges: analysing text, discovering knowledge, dealing with ambiguity, pragmatics, etc. All in all, it's very good news that the partners have more in common that would appear at a first glance.

What potential outcomes do you see from addressing these issues in ESSENCE? I'd like to have a better understanding on how to represent context-dependent meanings of concepts and categories in AI. Traditional logic-based representations in AI are far away from cognitive science models of meaning construction like Fauconnier's Mental Spaces Theory, that we are exploring in the Concept Convergence project [4]. Ontologies are designed to be "reusable"; however, current theories assume that concepts have fixed meanings and ontology alignment is often viewed as an interoperability problem solved by engineers. In cognitive science, the meaning of a concept is less like a dictionary entry and more like an encyclopaedia of networked concepts. "Car" is not merely a "vehicle": all you know about cars is related to the meaning of "car".

I think communication among agents should be in the centre of our research. In this way, I hope we will understand better how individuals build conceptual bridges for mutual intelligibility and how they agree on what they mean in evolving environments. The ESR working on Concept Convergence will research how individual agents that communicate can detect disagreements in the meaning of concepts and in different categorisations of a domain of discourse. Moreover, this research is expected to determine that agents learning the intended meaning from each other and arguing about possible changes in the way they categorize a domain should allow the group of agents to resolve disagreements, and eventually achieve mutual intelligibility. I hope this will help us understand how the idea that "meaning of a concept/category is a form of social agreement" can also be applied to and integrated in computational environments.

Behind the Scenes – The Sony Computer Science Laboratory in Paris

by PAUL VAN EECKE
(SONY CSL PARIS)

The Sony Computer Science Laboratory Paris (Sony CSL Paris) was founded in 1996 by Luc Steels as a sister laboratory of the Sony Computer Science Laboratories in Tokyo, Japan. It is a fundamental research lab hosting around five permanent researchers and around fifteen temporary researchers on various projects. The lab engages in three
different research areas: language, music and sustainability. This article focuses on the research of the language team. More information can be found at [www.csl.sony.fr](http://www.csl.sony.fr) [5].

Since Luc Steels founded the lab almost twenty years ago, Sony CSL researchers have taken up the fundamental scientific challenge of unveiling a great unsolved mystery: the origins of human language. This vast research project directly tackles the question of how language evolved and tries to offer a possible answer. The lab investigates ways in which artificial agents can self-organize linguistic systems with natural language-like properties and how grammar can co-evolve with open-ended meaning. The research is based on the hypothesis that language is a complex adaptive system that emerges through adaptive interactions between agents and continues to evolve in order to remain adapted to the needs and capabilities of these agents. This hypothesis is explored by implementing the full cycle of speaker and hearer as they play situated language games and by observing the characteristics of the languages that emerge.

This challenging project involves achieving other goals, including the demanding goal of formalising natural language. The challenge here is the extreme complexity of the whole of what makes up language. This includes speaking and hearing, parsing and production, dealing with incompleteness and error and dealing with innovation. A model can only be successful if it captures the dynamism and fluidity of language: the ways in which agents innovate, the ways in which they introduce new meanings and the ways in which these new meanings become shared. After more than a decade of research, CSL teams working together with the VUB AI laboratory (Brussels) have built Fluid Construction Grammar (FCG), a computational formalism that encompasses the features described above, and that is freely available to other researchers as open-source software ([www.fcgnet.org](http://www.fcgnet.org)) [6]. FCG allows researchers to write very flexible grammars that can then be used to parse meaning from utterances and to produce utterances expressing a given meaning. A second key achievement of Sony CSL has been the development of a framework called Incremental Recruitment Language (IRL), which relates the agents to the world through their sensory-motor apparatus and can serve as meaning representation to FCG.
The evolution of language experiments are grounded in robots. There are several good reasons for that. First of all, the robots can be set up with chosen parameters and start with a clean slate. They are able to act, interact and perceive, which is the basic situation of human beings prior to communication through language. All the aspects of their capacities can be modified by the experimenter, for example how they process sound and “hear”. This gives the opportunity for testing different hypotheses about what might be necessary for language to be possible. Second, there are two game-changing advantages of working with artificial agents: number and time. The communities of agents can be set up with hundreds of agents, to interact over thousands of cycles of interaction. This gives access to peering into the dynamics of change, which represents hundreds or thousands of years in human terms. We can truly turn back the clock. This is necessary to study many phenomena in language evolution. For example, the shift from the Old German case system to the Modern German system is a process that started around the year 1100 and is still continuing. With this methodology, we can run simulations to try and understand the forces at work that are bringing about this change. And crucially, these experiments are scientifically rigorous. Any other researcher can repeat them at any moment.

The research of the language team at Sony CSL benefits highly from advances in understanding complex systems in other disciplines, in particular evolutionary biology. Consider for example the recent understanding of how communities of ants can create nests and chains to transport food. There is no central organization or prior planning. Each individual ant makes simple iterative steps involving touching, leaving pheromones and moving. The goal is achieved through self-organization from the bottom up, not through imposition from above. Local alignment of individuals results in global coherence, in a giant act of collective bootstrapping. Human language evolves in the same bottom-up fashion. Simple interactions between agents lead to shared understandings. They can learn and can acquire new concepts from other agents. This is fundamental to what language actually is: a system of shared meanings, which make it possible to communicate.

Today, the language team consists of three people: Remi van Trijp (head of the team), Miquel Cornudella (PhD student) and Paul van Eecke (PhD student). They work closely together with the Artificial Intelligence Lab of the VUB (Brussels) and the Language Evolution Lab of the UPF (Barcelona).

**Industry perspective – Resilience Division, Scottish Government**

*by Kerry Jardine (Cyber Resilience)*

*Safer Scotland’s Resilience Division, part of the Scottish Government, is one of ESSENCE’s associated partners. It supports the frontline agencies that deliver emergency planning and response across Scotland. For this section, we asked Kerry Jardine to introduce Safer Scotland’s Resilience Division.*

We all want to live in a Scotland where people feel safe and are safe, where our communities are strong and resilient, and high quality public services are there when they are needed. One part of the Safer Communities Directorate which is helping to achieve that vision is the Resilience Division.

We’re made up of six units: Response and Risk; Strategy, Communications and Community Resilience; Critical Infrastructure Resilience; Cyber Resilience and Development Resilience Unit; Counter Terrorism Resilience; and Resources and Planning Unit.

What we do:

- Provide practical support to the frontline agencies that deliver emergency planning and response, as well as advice to Ministers and colleagues across the SG on all aspects of Resilience, Critical Infrastructure Resilience and Civil Contingencies policy.
- Take action to ensure key organisations work together to prepare for, respond to and recover from emergencies such as severe weather impacts, major incidents, public health outbreaks and the threat posed by terrorists. Our *Preparing Scotland* [7] guidance sets out the Scottish approach to emergency planning.
- The Scottish Government Resilience Room (SGoRR), based in St Andrew’s House (Edinburgh), is the co-ordination hub, with support facilities in Glasgow and Perth, for our response activity during times of crisis or emergency.
- Support the National Outcome where we have strong, resilient and supportive communities where people take responsibility for their own actions and how they affect others.

Our key stakeholders include: Police Scotland, Scottish Fire and Rescue Service, Transport Scotland, Local Authorities, The Met Office, SEPA, NHS Health Boards, utility companies, the voluntary sector. We have excellent working relationships with responders, agencies and stakeholders, founded on mutual respect and common goals.

Much of the Division’s activity takes place in either St Andrew’s House (above) in Edinburgh, or Atlantic Quay in Glasgow. But we also have a team based in Perth – the Scottish Resilience Development Service (ScoRDS) [8] – which supports the resilience community by
providing learning and development to enhance the knowledge, skills and behaviours required for effective multi-agency emergency planning, response and recovery.

Emergency preparation and response is all about information transfer. At the moment this occurs primarily between people, but, as the practice of resilience in Scotland evolves, our use of systems to support this process will increase. We need to ensure that the systems we use or implement across the resilience sector can communicate and transfer information and data effectively and be able to be interrogated to get accurate results.

We are very pleased to be providing support the ESSENCE Network and providing a government-level context for the network, thereby supporting the practice of developing intelligent systems for the future – applicable to all aspects of business and public sectors – at the ground level.

St Andrew's House, Edinburgh, headquarters of the Resilience Division of the Scottish Government

Summary of the ESSENCE First Workshop, Edinburgh – Exploring the ESSENCE space

by Michael Rovatsos and Nicola Bova (University of Edinburgh)

The First ESSENCE Workshop with the theme “Exploring the ESSENCE Space” was held from the 28th to the 30th April, 2014 at the Surgeons’ Hall [9] complex in Edinburgh, which hosts conference facilities as well as the Museum of the Royal College of Surgeons (established in 1505).

This workshop was the first network-wide training event organised by ESSENCE, and its primary purpose was to bring all network members together for the first time. The goal was exposing participants to the different scientific fields and methods involved, and also for Fellows to present their projects and (very preliminary) work on them so far.

The workshop was a great success, overall. It succeeded in exposing, for the first time and in a systematic way, the various partners coming from different research areas to each other's fields, and establishing common ground for the future collaboration activities of the network.

A pre-workshop social activity was organised on from the 25th to the 27th April, which involved the Fellows spending a weekend at the University of Edinburgh’s Firbush Point Outdoor Activity Centre on Loch Tay, in the Scottish Highlands. Accompanied by some of the senior staff, the Fellows spent a weekend engaging in outdoor activities (watersports, hiking, mountain biking etc) to support team-building. The weekend involved many informal discussions of ESSENCE work and it helped lay the foundations for building a joint identity among the ESSENCE Fellows, and facilitate establishing collaborative links for the future.

Other social activities included the visit to the Surgeon’s Hall Museum and a social dinner held at the Scotch Malt Whisky Society [10] in the north of Edinburgh on the first evening of the Workshop.

The workshop consisted of a 2.5-day long formal programme, where each day had a different focus. Day one was dedicated to talks from senior network staff, which introduced relevant research methods from various areas together with current re-
search challenges. While these talks included a summary of previous work done at the partner institutions in their respective fields of work, their main aim was to describe the state of the art in relevant areas, and to highlight important research questions that are relevant for ESSENCE.

The recorded sessions of these talks are available at the ESSENCE YouTube Channel [11].

The second day was reserved for presentations by the Fellows on their individual sub-projects. This gave them the opportunity to discuss their topics with the entire consortium as early as possible, both to explain objectives, methods, and challenges to partners not directly involved in those projects, but also to obtain advice from senior network scientists across various areas.

The slides used at the workshop, including both Fellows and senior staff presentations, are available on the ESSENCE Virtual Research Lab website [12].

The third day included separate meetings for senior staff and the Fellows. While the former group discussed administration and coordination issues, the latter engaged in a two-hour brainstorming session on integration, led by the two Experienced Researchers Nicola Bova (UEDIN) and Mlađan Jovanović (UNITN) who are responsible for the ESSENCE Platform and Challenge, respectively. At the end of the morning, both groups reconvened to discuss the outcomes of the brainstorming session in order to make decisions regarding the platform architecture and domain scenarios.

Finally, in the afternoon, Prof. Alan Bundy delivered the First Public ESSENCE Lecture on the topic of “Can Computers Change their Mind?”. This was presented in a large auditorium of the Informatics Forum, and widely advertised across University departments and public libraries in Edinburgh, as well as through social media outlets. The lecture aimed at explaining why representational change is important for computer systems and what this process has to do with meaning evolution. It illustrated these complex processes with simple examples from everyday life from domains such as physics and electronic commerce. The lecture attracted around 100 participants, included lively audience discussion, and was followed by a drinks reception, throughout which informal discussion continued for almost two hours after the end of the lecture.

The contributions of this workshop were mostly twofold. On the one hand, it greatly contributed to the dissemination and outreach of the ESSENCE network. On the other
hand, participants were able to identify overlaps and potential synergies among very different fields of research. In the ESSENCE case, this is extremely important as participants included a diverse set of researchers, such as theoretical linguists with a strong interest in formal models of dialogue and decision making, AI researchers focusing mostly on computational models of communication and rational planning and learning, scientists with a strong Semantic Web and knowledge integration focus, researchers interested in language evolution, and practitioners from various fields including the defence industry, knowledge management, and emergency response.

As initial discussions showed, identifying overlaps and potential synergies among these areas is a highly non-trivial undertaking. While some researchers in the network are interested in fundamental theoretical issues that are normally explored within reductionist mathematical models or small-scale contrived experiments, others are concerned with the development of effective algorithms that are commonly evaluated through simulation experiments against computational performance criteria. Another distinction among different sub-groups of the network concerns a focus on human vs. artificial agent communication, and the methodological implications this has on empirical study, focusing either on simulation, corpora-based analysis, or human-based experimentation. Finally, different groups place different emphasis on explanation and analysis vs. theory development, systems engineering, and practical application.

However, after three days of intensive discussions, it was clearly evident that the alignment between projects had started to emerge. An important step toward this was the focus on integration during the final day of the workshop. There, a number of possible candidate application scenarios were identified, and a principled, longer-term discussion is currently taking place to make further decisions. Once ESSENCE Platform and Challenge structure have been clarified, they will function as a strong integrative force across the network. We plan to present these choices in the Second ESSENCE Workshop in late October.

ESSENCE First Autumn School and Second Workshop, Ischia – Ad Hoc Approaches to ESSENCE problems

by Mladan Jovanović (University of Trento)

ESSENCE is excited to be holding our first Autumn School on Evolving Semantic Systems. The School brings together researchers and practitioners interested in strengthening the scientific foundations of shared semantics, its evolution in computing systems, and the intersection between different Artificial Intelligence disciplines around these common goals.

To reach this objective, we have put together a strong programme of speakers being top experts in AI and related fields. Topics of the School include ontology matching; learning; theory repair; knowledge resources; and dialogue, decision, and agreement in multi-agent systems. With respect to training, the
School offers three kinds of lectures – short talks, tutorials and training workshop. Short talks are organised as one-hour lectures on the latest achievements in semantic systems. Tutorials are organised as half-day events that provide in-depth knowledge of the respective fields. In addition to scientific training, we also have half-day workshop in research project management for young researchers.

The school will take place on October 27th – 30th in the Hotel Terme Tritone, on the island of Ischia, Italy. The island, together with its gorgeous beaches, atmospheric villages, and striking wilderness, provides a wonderful environment and all facilities for making the School a great event.

To promote ESSENCE research outside and beyond the consortium, we offer a number of bursaries for attending the School. Finally, it is important to mention that the ESSENCE fellows will also enjoy a one-day island excursion on Sunday 26th October. More information about the School can be found on our web site [13].

ESSENCE Autumn School Speakers and Topics

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The second ESSENCE Workshop – *Ad hoc approaches to ESSENCE problems* – will follow the School, running from the 30th – 31st October, 2014. It will feature poster presentations from fellows of the first cohort (recruited in early 2014). The posters will be exhibited in the conference room and the fellows will present them in short talks. The second day is dedicated to the second cohort fellows, recruited during Summer 2014. These fellows will present plans for their research activities. Each talk will be followed by a discussion about the plan and ideas put forward by the student, involving both senior staff and fellows.

We are looking forward to an exciting event that will bring together the ESSENCE fellows, senior staff, and leading experts. We are confident that the Autumn School along with the second workshop will play a key role in shaping the future of our network.

**Sociolinguistics and network games – Julian J. Schlöder (ILLC)**

**Reports from the Fellows**

by Nicola Bova
(University of Edinburgh)

The fellows from ESSENCE first cohort started in February 2014. After eight months, they report about the work carried out within their respective research lines. This section is devoted to present a short summary of their reports.

People have different mental states, and through communicating their beliefs and intentions these mental states are (incrementally, partially) aligned. My research so far has led me to take this as a general notion...
of agreement: Conversational success (i.e. agreement) is the alignment of mental states. The goal of my further investigation is therefore to describe how this conversational success, called grounding in the dialogue research community, is achieved in normal conversation.

An important tool that conversing humans have at their disposal are clarification requests: Questions that are intended to resolve misunderstandings. I have begun an exploration of what I now call uptake-level clarification requests: Questions like "why?" and "how?" that occur after a speech event has been transmitted and received. In a poster session at SemDial 2014 I have outlined a basic classification of such requests and related them to preparatory conditions of joint projects.

In general, humans in conversation show a noticeable preference for agreement over disagreement. Accordingly, dialogue exhibits mechanisms to avoid disagreement—clarification requests being just one of them. To investigate this, it is first necessary to be able to distinguish acceptances from rejections. My SIGDIAL 2014 paper investigates the (maybe unexpected) difficulty of this task, and offers a solution for one of the associated problems.

Communication Planning – Tânia Marques (UEDIN)

I am currently working over a simplistic scenario where two agents negotiate with each other. In these settings, both agents have a specific task that cannot be accomplished without each other’s help. However, the agents’ interests will not necessarily coincide. In this situation, how can agents use dialogue in order to reach a solution that will benefit both of them?

Our initial prototype incorporates a two-level planner into the agents: a domain level and a communicative level. At the domain level, the agent will create a set of plans that allows it to achieve its goal. Then, it will use these plans as input for the communicative level to produce a communicative plan: a set of utterances that it will attempt to reach an agreement with the other agent. If this fails, then the agent will have to come up with new domain plans and the respective communicative plans based on the previous interaction.

In the next months, I will focus on understanding this scenario better as well as the tools that can be used to model this problem.

Co-evolution of grammar with open-ended meaning – Paul van Eecke (SONY)

My recent research has focused on the meaning and use of nominal modifier-head constructions such as ‘garbage truck’, ‘paper scissors’ or ‘panda mountain’. These expressions raise a number of fascinating and unresolved issues that are particularly puzzling given that human speakers seemingly comprehend and employ them effortlessly. Amongst other things, I’m interested in their range of interpretative variability, the non-monotonic property transfer from their constituents to the whole expression and in whether or not they establish (sub)categories.

All of the above (and much more!) calls for an account that can roughly be modularized into (i) a representation of lexical meaning and their modes of combination, (ii) an account of contextual, sentential
and discursive influence, (iii) as well as one of the role played by convention in shaping categories and admissible nominal relations. Currently, I’m refining, enriching and testing my assumptions with a focus on the representation of lexical meaning and the heuristics used, on a semantic level, to determine what relation underlies a given noun pair.

Open-ended robot interaction – Yanina Knight (VUB)

Over the last few months, I have completed a grammar of Russian aspect with motion verbs and a paper on this topic will shortly be published. I have also started language game experiments in which agents learn about aspect and directionality of Russian motion verbs. One of my main achievements has been finding a possible way to implement Fluid Construction Grammar (FCG) in neural networks. It involves translating FCG to vector representations and then implementing this translation in spiking neurons. I have identified a way to represent feature structures, which are key elements in FCG, in vectors and am currently working on ideas for implementing core FCG operations such as match and merge. I am working with a neural simulator called Nengo, which allows me to construct neural populations and test out different ideas. I have presented this approach at a recent conference in Complex Systems in Brighton and currently I am in the process of writing a paper on this topic. This is a very exciting and promising direction!

The ESSENCE Platform: Architecture – Nicola Bova (UEDIN)

In the last months I have been working on the design of a general architecture for the ESSENCE project. After several meetings and discussions with other ESSENCE members, along with attending conferences and workshops, I envisioned an architecture inspired by humans, both at the individual and society levels. In this architecture a set of artificial, situated agents collaborates to perform a given task. Each agent is lead by its own controller and possesses its own knowledge, constructed on the basis of several existing sources. According to some conditions, an agent can decide to share/request its knowledge with/from its peers or humans. The architecture intends to decouple as much as possible the application logic from the components dealing with the sharing of semantics, ESSENCE core interest. A possible first scenario of application is the solution of Winograd schemas [14], a recently proposed alternative to the Turing test.

From the beginning, I have been actively involved in the construction of the Virtual Research Lab. It is an online platform that provides the ESSENCE community with a broad range of services to ease collaboration among its members. In particular, it integrates a content management system, a network wiki, software, dataset, and publication repositories, and researcher blogs together with communications tools such as chat, videoconferencing, shared desktops, and collaborative authoring tools. After performing appropriate preliminary studies, I designed, configured, tested, deployed, documented, released, and administered the platform.

Finally, I was actively involved in outreach activities such as preparing the ESSENCE newsletters, attending the Researchers’ night [15] and several other related tasks.

The ESSENCE Challenge – Mladen Jovanović (UNITN)

Regarding the ESSENCE Challenge, the analysis of the state of the art was carried out, together with requirement observations from the project’s work packages. Research findings for the ESSENCE Challenge brought us to the scenario in which evolution of shared meaning will be demonstrated in an open data context. The bottom-line idea is to get relevant, up-to-date travel and tourism information by combining open and closed data. The challenge sets the problem that combines different information sources in a way to provide appropriate answer to a hypothetical query. An example would be to organise family trip subject to constraints such as season, weather, region, accommodation, transportation, price, and individual preferences. The directions in which semantics evolve in this scenario are different and provide enough scope that covers ESSENCE sub-project technologies, including planning (dialogues and negotiation between humans and agents), persuasion and argumentation (among agents), crowdsourcing on open data, ontology matching and language evolution. We will proceed to formulate specific requirements for the scenario. In particular, we will provide available data sets, metrics for measuring solution’s success, suggested and available tools and technologies.
## ESSENCE Factsheet

- **Official Title**: Evolution of Shared SEmaNtics in Computational Environments
- **Duration**: 1/11/2013 – 31/10/2017 (48 months)
- **Funding**: Marie Curie Initial Training Network (European Commission 7th Framework Programme, FP7-PEOPLE-2013-ITN Grant no. 607062)
- **Budget**: €3,990,183

## ESSENCE Events with tentative date

<table>
<thead>
<tr>
<th>Date</th>
<th>Events</th>
<th>Name</th>
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<tbody>
<tr>
<td>Apr 2014</td>
<td>1&lt;sup&gt;st&lt;/sup&gt; Workshop</td>
<td>Exploring the ESSENCE space</td>
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<tr>
<td>Oct 2014</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt; Workshop</td>
<td>Ad Hoc Approaches to ESSENCE problems</td>
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<tr>
<td>Oct 2014</td>
<td>1&lt;sup&gt;st&lt;/sup&gt; Autumn School</td>
<td>Theoretical Foundations/ESSENCE problems</td>
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<td>Jun 2015</td>
<td>1&lt;sup&gt;st&lt;/sup&gt; Coding Camp</td>
<td>ESSENCE Hackathon</td>
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<td>Aug 2015</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt; Summer School</td>
<td>Computational Models/IPR &amp; Ethics</td>
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<tr>
<td>Aug 2015</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt; Workshop</td>
<td>Algorithms for Processing Meaning</td>
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<tr>
<td>Jun 2016</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt; Coding Camp</td>
<td>Components &amp; Benchmarks</td>
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<tr>
<td>Aug 2016</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt; Summer School</td>
<td>Man-Machine Meaning/Proposal Writing</td>
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<tr>
<td>Aug 2016</td>
<td>4&lt;sup&gt;th&lt;/sup&gt; Workshop</td>
<td>Integration of ESSENCE Methods</td>
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<tr>
<td>Feb 2017</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt; Coding Camp</td>
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<td>Feb 2017</td>
<td>5&lt;sup&gt;th&lt;/sup&gt; Workshop</td>
<td>ESSENCE Challenge Competition</td>
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<td>Aug 2017</td>
<td>Final conference</td>
<td>The ESSENCE conference</td>
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## List of key investigators for all institutions

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<tr>
<th>Institution</th>
<th>Code</th>
<th>Principal Investigator</th>
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<tbody>
<tr>
<td>University of Edinburgh</td>
<td>UEDIN</td>
<td>Michael Rovatsos, Alan Bundy, Ewan Klein, Simon Kirby, Subramanian Ramamoorthy, Alex Lascarides</td>
</tr>
<tr>
<td>University of Trento</td>
<td>UNITN</td>
<td>Fausto Giunchiglia, Gábor Bella</td>
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<tr>
<td>Spanish National Research Council</td>
<td>CSIC</td>
<td>Marco Schorlemmer, Enric Plaza</td>
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<tr>
<td>Free University of Brussels</td>
<td>VUB</td>
<td>Luc Steels, Katrien Beuls</td>
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<tr>
<td>Institute for Logic, Language and Computation (University of Amsterdam)</td>
<td>ILLC</td>
<td>Robert Van Rooij, Frank Veltman, Jelle Zuidema, Raquel Fernandez</td>
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<tr>
<td>Playence</td>
<td>PLAY</td>
<td>Carlos Ruiz, Sinuhe Arroyo</td>
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<tr>
<td>SONY</td>
<td>SONY</td>
<td>Remi Van Trijp</td>
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<td>Selex ES</td>
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<td>Neil Cade, Donald Taylor</td>
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<td>Engineering Ingegneria Informatica SpA</td>
<td>ENG</td>
<td>Francesco Saverio Nucci, Stefano De Panfilis, Ricardo Zanetti</td>
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<td>DSTL</td>
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<td>Tom McCutcheon</td>
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<tr>
<td>Safer Scotland (Scottish Government)</td>
<td>RESIL</td>
<td>Kerry Jardine, Gregor Lindsay, Peter Winstanley</td>
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<tr>
<td>Heriot-Watt University</td>
<td>HWU</td>
<td>Fiona McNeill</td>
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## List of Fellows’ projects and current Fellows

<table>
<thead>
<tr>
<th>Project title</th>
<th>Fellow name</th>
<th>Host</th>
<th>Start date</th>
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<tr>
<td>Communication planning</td>
<td>Tânia Marques</td>
<td>UEDIN</td>
<td>Feb 2014</td>
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<tr>
<td>Dynamic &amp; focussed data matching</td>
<td>Kristof Kessler</td>
<td>UEDIN</td>
<td>Sep 2014</td>
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<td>The ESSENCE Platform: Architecture</td>
<td>Nicola Bova</td>
<td>UEDIN</td>
<td>Feb 2014</td>
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<td>A collaborative platform for domain knowledge</td>
<td>TBD</td>
<td>UNITN</td>
<td>Sep 2014</td>
</tr>
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<td>An entity-centric crowdsourcing pipeline for large-scale up-to-date high quality knowledge</td>
<td>Mercedes Huertas</td>
<td>UNITN</td>
<td>Sep 2014</td>
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<tr>
<td>The ESSENCE Challenge</td>
<td>Mladen Jovanović</td>
<td>UNITN</td>
<td>Feb 2014</td>
</tr>
<tr>
<td>Concept convergence: argumentation and agreement over meaning</td>
<td>Adrian Kemo</td>
<td>CSIC</td>
<td>Sep 2014</td>
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<tr>
<td>Advanced interaction-situated semantic alignment</td>
<td>Paula Chocrón</td>
<td>CSIC</td>
<td>Sep 2014</td>
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<td>The ESSENCE Platform: Integration</td>
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<td>Sep 2015</td>
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<td>The social construction of conceptual space</td>
<td>Thomas Brochhagen</td>
<td>ILLC</td>
<td>Feb 2014</td>
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<td>Sociolinguistics and network games</td>
<td>Julian J. Schlöder</td>
<td>ILLC</td>
<td>Feb 2014</td>
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<tr>
<td>The ESSENCE Model</td>
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<td>Sep 2015</td>
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<tr>
<td>Open-ended robot interaction</td>
<td>Yanina Knight</td>
<td>VUB</td>
<td>Feb 2014</td>
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<tr>
<td>Robust communication and alignment of concept extensions</td>
<td>Aimilios Vourliotakis</td>
<td>PLAY</td>
<td>Sep 2014</td>
</tr>
<tr>
<td>Co-evolution of grammar with open-ended meaning</td>
<td>Paul van Eecke</td>
<td>SONY</td>
<td>Feb 2014</td>
</tr>
</tbody>
</table>

### ESSENCE partners

- The University of Edinburgh
- UEDIN
- UNITN
- CSIC
- ILLC
- VUB
- PLAY
- SONY

### Associated partners

- Selex ES
- Engineering
- Sony CSL
- DSTL
- University of Trento
- Heriot-Watt University
- Safer Scotland
- TEXACO
- Wipro
- Drake

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www.essence-network.com  +44 (0) 131 651 5610  essence-info@inf.ed.ac.uk
Scientific Objectives

The network will build a sustainable European research base for future training, research collaboration and commercial exploitation of novel techniques in the area, and establish strong collaborative links with third parties. It will also promote interest in the broader area through targeted public engagement and outreach activities. To achieve this overall aim, we will pursue the following more specific objectives:

1. Bridging the gap between the sub-areas involved through a joint programme of research that will produce novel integrated results to enable a step change in the state of the art.

2. Expanding European research capacities in the area that will grow beyond the duration of the project by seeding the people pipeline with experts trained in appropriate skills.

3. Improving cross-sectorial collaboration in the area by bringing stakeholders from different domains together and addressing technological challenges driven by their business needs.

4. Developing a holistic approach to research training in the area by establishing training links among partners with key expertise and improving collaborative ties among them.

ESSENCE will achieve these goals by following a principled methodology that will enable a crossover between existing bottom-up and top-down approaches, training a cadre of top-quality young researchers within this scientific context. The transnational virtual research lab it will create will have sufficient critical mass to foster the development of an international ESSENCE community, and to lay the foundations for future industrial exploitation of ESSENCE technologies.

Webliography

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