Benelux A.I. Newsletter

What's hot in... Evolutionary Computing?

Autumn 2015 Edition (No. 3)

BNVKI
BAIAI

Contents

Interview with... John-Jules Meyer

by Bas Testerink

Profile. Prof. John-Jules Meyer is professor at the department of Computer Science of Utrecht University since 1993. His research interests are artificial intelligent and agent technologies. He is currently also scientific director of the Alan Turing institute Almere that applies AI techniques for medical science. In 2005 he is appointed fellow of the European Coordinating Committee for Artificial Intelligence (ECCAI).

How did you start your academic career?

John-Jules Meyer

I have studied mathematics at Leiden University. After that I was subject to obligatory military service. However, there did not seem to be any position there that connected to my personal interests. Luckily scientists were exempt from service. In order to not waste time in the army I decided to work for Jan Bergstra at Leiden University as a temporary solution. Temporary, as I was not being paid. These months did prove to be a strong catalyst of my career. We produced eight journal papers in the same amount of months.

Of course you cannot live off papers, so I became a 'promovendus' eventually under Jaco de Bakker (VU). This theoretical informatics research concerned the semantics of programming languages. In particular we focused on the intrinsic challenges concerning concurrency and unbounded non-determinism that we encountered in languages of that time period. During my first week de Bakker was on vacation. To get me started Andy Tanenbaum, a colleague, handed over de Bakker's book on these topics, more or less saying "Well, good luck with that.". He himself was no fan of such theoretical work and the book was a bit infamous among students due to its dense technical content.

After my promotion things went pretty quickly. In '85 I got my PhD, in '86 I became a lecturer (UD), in '87 an associate professor (UHD) and in '88 a full professor both at the VU and the University of Nijmegen. Aside from academic positions I have, in parallel, also been the director of the SIKS research school for ten years and am currently also involved in industry.

When did A.I. come into the picture?

There was very distinct moment that this happened. I read Raymond Turner's "Logics for Artificial Intelligence" which was published in the same year as my promotion. During my promotion study I was completely focused on formalisms for computing science, in particular concurrency. This book contained various logics which were new and interesting to me, and touched upon concurrency as well. From that moment on I was hooked.

> "For me emotional and social robots can be a supplement on the healthcare workforce, and not a replacement."
>
> *John-Jules Meyer*

When I became full professor at the VU I chose to call my chair "Logic for Distributed Systems and Artificial Intelligence". In '93 I switched to Utrecht University to the chair "Programmatuurkunde" (rough English translation: the science of programming). When I requested to be given the freedom to research A.I. it was not granted immediately. It took a little bit of convincing.

Did movies at the time, such as 2001: A Space Odyssey and The Terminator any influence?
No, my interest was triggered by the theoretical/logical side of A.I., not by its Hollywood equivalent.

You mentioned you're involved in industry, can you elaborate?
I became involved in the company Emotional Brain. The initial focus was on using A.I. for diagnostics purposes. Later on this branch of the company got separated and became the Alan Turing Institute (ATIA) of which I am currently the scientific director. At ATIA we work on building medical diagnostic A.I. systems using for instance agent technology. I hope that in the future we can move from diagnostics to treatment using for example companion agents that are embodied in robots.

Should all researchers have a part time industry job?
I would not go that far. A good theoretician should not be forced to work on marketable products. However, for me personally it has enriched my career. Currently I am working one day a week at the ATIA and four at the university, which to me is a perfect balance. I believe my industry experience has made me a better promotor. For instance some of my recent PhD students such as Leo van Moergestel and Joost van Oijen had very practical aspects in their research, which twenty years ago I would not have appreciated as much as I do now.

> "A good theoretician should not be forced to work on marketable products. However, for me personally it has enriched my career."
>
> *John-Jules Meyer*

Do you have any goals left in your career?
For me my main contributions have been that I took part in initiating the computer science interest in the deontic logic and agent technology research areas. Also, I have been trying to push, together with others, artificial emotions as a research field as well. Now you can see that interest is being picked up. For instance at IJCAI artificially emotional agents is a valid research topic. Though I do not have concrete theoretical goals left in my career, I do hope to contribute to subjects such as emotion regulation.

Do you believe artificially social, emotional and/or sexual agents should be allowed to replace human jobs where those traits are necessary?
First, I would not proclaim that we will certainly achieve an emotional capacity in agents such that at some point this may for instance result in marriage with robots. I also would not rule it out. I have read with great interest David Levy's thesis "Intimate Relationships with Artificial Partners" that concerns this topic.

Second, I strongly believe that companion robots can be a much needed technology for helping various patients. We see in healthcare an increasing need to maintain patient autonomy so that they can live at home for as long as possible. A companion robot can help with clothing, washing, task reminders, etc. This way, when a caregiver comes by to check up on the patient, we can have more social interaction. Instead of having to do chores there is more time for conversation. For me emotional and social robots can be a supplement on the healthcare workforce, and not a replacement.

What's Hot... in Evolutionary Computing?

by A.E. Eiben (a.e.eiben@vu.nl), Faculty of Sciences, VU University Amsterdam

Evolutionary Computing has received major exposure this year. Nature, the top dog of scientific journals, devoted a full-length review article to this field [7]. Evolutionary algorithms have been around for about three decades, but so far they did not manage to obtain such high profile coverage, so what changed?

In my view the new interest is based on a new role of artificial evolutionary systems. Traditionally, artificial evolution equals evolutionary problem solving, that is, using evolutionary algorithms as heuristic methods for solving optimization, design, and modeling tasks [8]. In this context, evolutionary algorithms are seen as a special type of generate-and-test search methods, distinguished by the use of a population, recombination of multiple candidate solutions, and stochastic selection operators that allow poor solutions to survive and reproduce, albeit with a relatively little probability. Evolutionary algorithms have proven successful in solving hard problems in the face of challenging characteristics like non-differentiability, discontinuities, multiple local optima, noise and nonlinear interactions among the variables. There is also substantial and well-documented evidence of evolutionary algorithms producing measurably human-competitive results [10]. The annual Humies competition (`http://www.genetic-programming.org/combined.php`), which rewards human-competitive results from evolutionary computation, highlights the great variety of hard problems for which evolutionary methods have delivered excellent solutions.

Developments over the last couple of years boosted a latent opportunity of employing artificial evolution far beyond (ab)using it as an optimizer. The punchiest way to explain this potential is through the following two statements.

Evolution can produce intelligence.

Artificial evolution can produce artificial intelligence.

The first statement is proven by our own intelligence that is a result of evolution on Earth. The second one, then, is a reasonable expectation, a plausible working hypothesis if you wish.

It could be argued that there is no such thing as *artificial* evolution. As noted by Dennett "If you have variation, heredity, and selection, then you must get evolution" [4]. From this perspective man-made evolutionary systems are not some inferior emulations of 'real' evolution, but a new form of evolution. The substrate in which evolution takes place is different –digital entities in software vs. physical entities in wetware– but the underlying principles are the same. In a certain context it may make sense to contrast the artificial and natural variants, for instance in the two statements above, but in general evolution is evolution.[1]

To illuminate the new opportunities of utilizing evolution let me recall a fundamental relationship regarding artificial and natural agents, including robots, animals, and humans:

Environment + Body + Mind → Behavior

[1] This is not to say that there are no significant differences between the actual mechanisms of natural evolutionary systems and evolutionary algorithms, cf. Table 1 in [7].

The quest for artificial intelligence started with a narrow focus on the Mind. The bold dream in the 20th century was to create thinking machines. This was reflected by the Grand Challenge of creating a computer program that can beat the world champion of chess. As we all know, this was successfully accomplished before the end of the century. The modern view on intelligence acknowledges the role of the body and considers the integrated Body + Mind as the source of intelligent behavior, cf. [13, 14]. Thus, the focus on thinking machines has widened and the bold dream of the 21st century is to create acting machines, commonly known as robots. The corresponding Grand Challenge of embodied intelligence is that of creating a team of robots that can beat the world champion of football.

This brings us back to the working hypothesis above that identifies evolution as a potential approach to achieving intelligent behavior in entities with a mind and a body, i.e., in robots. The related field is known as evolutionary robotics, cf. [1, 12], that "applies the selection, variation, and heredity principles of natural evolution to the design of robots with embodied intelligence" [5]. In particular, evolutionary robotics aims to evolve the controllers, the morphologies, or both, for real and simulated autonomous robots [15]. Considering the complexity of interactions between environment, morphology and controller, evolution may be not just one approach, but *the* approach to designing intelligent robots for a range of circumstances. However, forced by technical constraints the usual modus operandi in evolutionary robotics is quite limited: evolve robot controllers in simulation and transfer the outcome to real hardware afterwards. Thus, even though the final goal is to obtain physical robots with evolved intelligence, the evolutionary process is still digital, which leads to the notorious reality gap problem [9].

The exciting new opportunity is to have physically embedded evolutionary processes on real –not simulated– robots. One option is to evolve controllers on-the-fly in a population of real robots (with fixed morphologies). This has been demonstrated in a handful of studies, for instance [2]. Another one is to evolve robot morphologies in real hardware by manually constructing each individual of the next generation. The only example I know of is the work of John Long described in his book [11] and elegantly summarized in [3]. The ultimate goal is of course a system where robots can reproduce themselves and evolve in real space and real time. To date this may seem far fetched, but advances in 3D printing and automated assembly are bringing a robotic EvoSphere within reach quickly [6]. The Evolution of Things may be closer than it seems.

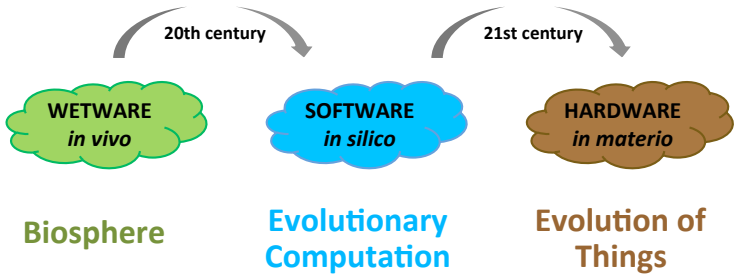

Figure 1: Illustration of the Evolution of Things after [6]. This picture shows two major transitions of evolutionary systems positioned from the perspective of the underlying substrate.

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Information about ECAI 2016 (The Hague)

As you probably already know, the European Conference on Artificial Intelligence 2016 will take place in The Hague from 29 August to 2 September. The organisation of ECAI2016 is supported by BNVKI and we aim at making it an event from and for all of us, AI researchers in Belgium, Luxembourg and the Netherlands. Together, we will make it an unforgettable event!!

There are plenty of possibilities to participate. Firstly, and most importantly, by submitting your research papers to the main track, or industry collaboration papers to PAIS! But you can also propose a workshop or tutorial, or, for students, participate in STAIRS! And, we also welcome all volunteers to help with the many tasks involved in organising such a large event. Send an email to contact@ecai2016.org if you want to help with the organisation.

New in 2016, is the AIckathon, a hackthon for development of AI related apps in collaboration with Dutch and international companies. More information on this will come soon! We are also organising a special track and a public event on "Artificial Intelligence for Human Values", linking to the status of The Hague as Peace and Justice City. ECAI2016 is collocated with the Collective Intentionality Conference, and participants of both conferences will have free access to all sessions of each conference.

We are planning many more exciting activities! Follow us on Twitter or Facebook to receive all the latest news!

All information is also available at `www.ecai2016.org`

Frank van Harmelen
General Chair

Virginia Dignum and Frank Dignum
Organisation co-chairs

Event Reports

How much does it help to know what she knows you know?

by Harmen de Weerd

On the occasion of the defense of Harmen de Weerd's PhD thesis on Friday October 2nd, the Institute of Artificial Intelligence and Cognitive Engineering (ALICE) of the University of Groningen, in collaboration with the BNVKI, organized a symposium on models of theory of mind entitled "How much does it help to know what she knows you know?" Prof. dr. Rineke Verbrugge of the University of Groningen opened the symposium with an introductory talk about theory of mind. She explained how theory of mind concerns the ability to reason about mental states of others, including beliefs, knowledge, and intentions. In an example, Verbrugge showed how knowledge states of different agents can be analyzed using dynamic epistemic logic.

Andrés Perea - Forward induction reasoning versus equilibrium reasoning In the first presentation of the symposium, dr. Andrés Perea of Maastricht University contrasted rationalizability concepts with equilibrium concepts. Through a number of examples, Perea showed how in two-player games, rationalizability concepts are separated from equilibrium concepts by the assumption of correct beliefs. However, Perea argued, common strong belief in rationality, the rationalizability concept corresponding to forward induction, has no equilibrium concept. When a player interprets each of the previous actions of his opponent as being rational with respect to some belief, this belief is generally not correct. In fact, the class of games for which common strong belief in rationality is inconsistent with the correct beliefs assumption is very small.

Virginia Dignum – Social agents In her presentation on social agents, dr. Virginia Dignum of Delft University of Technology argued that artificial agents that interact with humans should exhibit social intelligence. That is, agents should exhibit behavior that show that the agent is an individual self, and recognize intentionality and rationality of expressions of others. Such "partner" agents combine the intentionality of BDI agents with the social awareness of IVAs. To exhibit this social intelligence in the context of social practices, Dignum argued for the use of social roles. These social roles allow both artificial and human agents to construct expectations of the behavior of unfamiliar others more easily. For example, merely by recognizing an other as a nurse, an agent can already form expectations about the behavior of this other. Using the example of a soccer match, Dignum showed that social practices involve not only physical materials (e.g. a field, goal, ball, and participants), but also meanings in the form of social interpretations of roles and materials (e.g. referee, keeper, and off-side), and competences that make individuals more of less suitable to fulfill certain social roles. Dignum concluded that intelligent systems need socio-cognitive abilities that are conceptualized as services and engineered in a structured way based on a formalization of social science theories.

Niels Taatgen - Learning theory of mind in negotiation Prof. dr. Niels Taatgen of the University of Groningen presented experimental results that show how participants could learn to negotiate more effectively by interacting with a metacognitive model of a negotiating agent. Taatgen used the paradigm of the Game of Nines, in which two agents negotiate about how to divide up nine points. Taatgen distinguished two basic types of agents in this setting. An aggressive agent would try to get as many points for itself as possible, while a cooperative agent would insist on a fair split and punish participants for

perceived uncooperative behavior. In addition, Taatgen constructed a meta-cognitive agent, which uses an instance-based learning approach to both determine its own actions, as well as interpret the actions of others as aggressive or cooperative. Experimental results showed that while the behavior of most participants could be classified as aggressive negotiation, the participants that were most successful in negotiation were well-described as meta-cognitive agents. Additional experiments revealed that participants could also be taught to negotiate more effectively through training with this meta-cognitive agent.

Harmen de Weerd - If you know what I mean

Harmen de Weerd presented an overview of his PhD research, in which he investigated the evolutionary origins of human higher-order theory of mind. De Weerd presented results from agent-based simulation experiments, in which agents of different orders of theory of mind interacted in a variety of situations. De Weerd argued that while simulations show that higher-order theory of mind can be very useful in strictly competitive and strictly cooperative settings, it is more likely that mixed-motive situations, in which cooperative and competitive motives are combined, have been the main contributor to the development of higher-order theory of mind. However, De Weerd concluded, since higher-order theory of mind is useful in a wide variety of scenarios, it may be that theory of mind evolved to allow humans to handle complex and dynamic social situations, which are sometimes cooperative, sometimes competitive, and sometimes a mixture of the two.

Daniel van der Post - Evolving models of social cognition

In the final presentation of the symposium, Dr. Daniel van der Post contrasted top-down models, such as the models by De Weerd, with bottom-up models. These bottom-up models are more detailed implementations of an organism's behavior and environment, without a specific focus on the social challenges of an organism. These models, sometimes known as "killjoy" models, often give rise to emergent behavior that could be interpreted as socially intelligent behavior, but actually stems from interaction between the organism and environmental factors. These models are a "killjoy" because they can explain away socially intelligent behavior of animals. Van der Post argued that top-down models, which explicitly define the "games" that organisms play, risk overestimating the need for cognitively complex reasoning by abstracting away from the most basic . However, bottom-up models also abstract away from reality, and thereby risk underestimating the role of cognitive complexity. To reduce these risks, Van der Post argued that simulated agents should be properly embedded in an environment, as well as be embodied, to interact with this environment, to create more elaborate models that can show this emergent behavior.

PhD Abstracts

Ubiquitous Technology for Lifelong Learners

by Bernardo Tabuenca

General Information

Bernardo Tabuenca (Open University of The Netherlands)
Ubiquitous Technology for Lifelong Learners
Promotor: prof.dr. M. Specht (OUN)
Copromotor: Dr. M.Kalz (OUN), Dr. S. Ternier (OUN)
Promotion: 10 July 2015

Abstract Nowadays, most people change their career throughout their lives, many times independently on what they learned during their formal education period. Therefore, the necessity to continually keep our skills sharp and up-to-date becomes increasingly important in a rapidly changing job market. The European Commission stressed the importance of lifelong learning as a key challenge for the knowledge society to adapt to the pace in which digital technology is transforming every aspect of people's lives. Later on, the Commission published a reference framework comprising eight competences to flexibly adapt to a rapidly changing and highly interconnected world. In this thesis, we aim at supporting learners to understand the way they can better learn in-context using technology, therefore we focus on two specific competences, namely, learning to learn and digital competence.

Bernardo is currently an Assistant Professor at Open University of The Netherlands in Heerlen.

Using Culture and Values to Support Flexible Coordination

by Loïs Vanhée

General Information

2015-19 Loïs Vanhée (Utrecht University)
Using Culture and Values to Support Flexible Coordination
Promotors:
- Prof.dr. J.-J. Ch. Meyer (UU)
- Prof. dr. J. Ferber, Université de Montpellier (Montpellier)
Copromotor: Dr. F. Dignum (UU)
Promotion: 22 September 2015

Abstract This thesis proposes a method for supporting flexible coordination in multi-agent systems (MASs). In other words, we aim at influencing societies of artificial agents such that they can handle com-

plex and evolving environments and collective goals (emergency rescue robots capable of handling various hazards, climatic conditions, statuses of victims). Towards acheving this goal, we investigated why humans manage to coordinate relatively flexibly in comparison with their artificial counterparts (agents). We discovered that culture is a key factor of this relative success. Briefly, when humans share a cultural background, they share a common idea about what "working together" means, supporting flexible coordination. Artificial agents miss this aspect, leading to coordination failures. As a goal, we want to better understand how culture can be integrated within and used for coordinating artificial societies. This goal raises this research question: (how) can human-like culture be used for supporting coordination in artificial societies?

As a preliminary step, we need to answer that question: (how) can the influence human-like cultures be integrated within artificial societies? In turn, this question raises a third one: how does culture influence coordination in human societies? As a first step, we conceptualize the influence of culture on coordination, based on available theories. From a generic perspective, we explain that culture influences individual decisions, supporting matching expectations and coherent interaction patterns, leading in turn to (generally) better collective performance. More specifically, we specify how the core acknowledged patterns of the influence of culture (cultural importance given to power status, to rules) apply in the context of coordination (culture influences whether leaders are (made) responsible for giving order vs propositions to subordinates).

As a second step, we study how to replicate human-like influences of culture on coordination within artificial societies. First, we investigate the core aspects of culture that impact the most (flexible) coordination in human societies. We discover that values, what people consider as "good" of "important" (honesty, obedience, autonomy), constitute such an aspect, by deeply supporting a wide range of (interaction-related) decisions. Then, for illustrating how to replicate influence of culture within artificial societies, we build an value-sensitive agent decision architecture capable of making culturally-sensitive coordination-related decisions. Finally, we illustrate that our architecture can replicate the influence of culture on coordination through two simulations that replicate core known coordination-related cultural phenomena. As a third step, we study how human-like values can be used for coordinating artificial societies. We investigate for which coordination problems values can offer an operational means for supporting coordination. We discover that values are particularly adequate for solving problems involving complex and dynamic environments, requiring agents to make coordination-related decisions. Then, towards concretely implementating values, we study the technical details to consider for supporting flexible coordination with values (concretely designing values, integrating them within agents).

In sum, this thesis highlights that key aspects of the influence of culture on coordination can be replicated within artificial societies. Furthermore, we show that this influence can be handled for using culture as a means for supporting flexible coordination in artificial societies.

Using Peer-Support to Expand and Stabilize Online Learning

by Sibren Fetter

Abstract Online learning networks and open educational resources depend on the participation and interaction between their users. It is however no given that these connecting behaviors actually emerge and sustain over time. For example, a new user might be too daunted by the size of the network to ask a question. Or, most users might be connected to the same core users, making the network prone to instability

General Information

2015-19 Sibren Fetter (Open University of the Netherlands)
Using Peer-Support to Expand and Stabilize Online Learning
Promotor: Prof.dr. P. Sloep (OUN)
Promotion: 11 September 2015

if a core user would fall away. In this thesis we focus on alleviating these problems (and others) by focusing on spreading out connections, making users feel connected, and finally making sure these connections are used in mutual activity. Or, in other words, we want to foster the Social Capital in the network.

Co-occurrence Rate Networks - Towards separate training for undirected graphical models

by Zhemin Zhu

General Information

2015-19 Zhemin Zhu (University of Twente)
Co-occurrence Rate Networks - Towards separate training for undirected graphical models
Promotor: Prof.dr.P.M.G. Apers (UT)
Copromotor: Dr. ir. D. Hiemstra (UT)
Promotion: 16 Oktober 2015

Abstract Dependence is a universal phenomenon which can be observed everywhere. In machine learning, probabilistic graphical models (PGMs) represent dependence relations with graphs. PGMs find wide applications in natural language processing (NLP), speech processing, computer vision, biomedicine, information retrieval, etc. Many traditional models, such as hidden Markov models (HMMs), Kalman filters, can be put under the umbrella of PGMs. The central idea of PGMs is to decompose (factorize) a joint probability into a product of local factors. Learning, inference and storage can be conducted efficiently over the factorization representation.

In this thesis, we propose a novel framework motivated by the Minimum Shared Information Principle (MSIP): We try to find a factorization in which the information shared between factors is minimum. In other words, we try to make factors as independent as possible. The benefit by doing this is that we can train factors separately without paying a lot of efforts to guarantee consistency between them. To achieve this goal, we develop a theoretical framework called co-occurrence rate networks (CRNs) to obtain such a factorization. Experimental results on three important natural language processing tasks show that our separate training method is two orders of magnitude faster than conditional random fields, while achieving competitive quality (often better on the overall quality metric F1).

The second contribution of this thesis is applying PGMs to a real-world NLP application: open relation extraction (ORE). In open relation extraction, two entities in a sentence are given, and the goal is to

automatically extract their relation expression. ORE is a core technique, especially in the age of big data, for transforming unstructured information into structured data. We propose our model SimpleIE for this task. The basic idea is to decompose an extraction pattern into a sequence of simplification operations (components). The benefit by doing this is that these components can be re-combined in a new way to generate new extraction patterns. Experimental results on three benchmark data sets show that SimpleIE boosts recall and F1 by at least 15% comparing with seven ORE systems.

Ontology-based Software Architecture Documentation

by Klaas Andries de Graaf

General Information

Klaas Andries de Graaf (Vrije Universiteit Amsterdam)
Ontology-based Software Architecture Documentation
Promotor: prof.dr. H. van Vliet (VU)
Copromotors:
- dr. A. Tang (Swinburne University of Technology)
- dr. P. Liang (Wuhan University)
Promotion: 11 May 2015

Abstract A common approach to software architecture documentation in industry projects is the use of file-based documents. This approach offers a single-dimensional arrangement of the architectural knowledge. Knowledge retrieval from file-based architecture documentation is efficient if the organisation of knowledge supports the needs of the readers; otherwise it can be difficult.

In this thesis, we compare the organisation and retrieval of architectural knowledge in a file-based documentation approach and an ontology-based documentation approach. The ontology-based approach offers a multi-dimensional organisation of architectural knowledge by means of a software ontology and semantic wiki, whereas file-based documentation typically uses hierarchical organisation by directory structure and table of content.

We investigated whether the efficiency and effectiveness of architectural knowledge retrieval can be improved using ontology-based documentation. We first studied how architectural knowledge is retrieved from file-based documentation in practice and theory. We then introduced an ontology-based approach for retrieving architectural knowledge from software architecture documentation. Next, we proposed and applied an approach to build an ontology for software architecture documentation in a software project. We conducted experiments to compare the efficiency and effectiveness of architectural knowledge retrieval between file-based and ontology-based documentation. Finally we compared architectural knowledge retrieval between two ontologies in ontology-based documentation.

We found that the use of better knowledge organisation correlates with the efficiency and effectiveness of architectural knowledge retrieval. Professionals who used the knowledge organisation found this beneficial.

Klaas is currently a lecturer in software engineering at Windesheim University of Applied Science in Zwolle, The Netherlands.

BNVKI Membership Fees

In the table below you can find the BNVKI membership fees.

	2015
Regular members	€ 20,-
PhD students	€ 10,-
Master students	€ 10,-

Table 1: BNVKI Registration Fees

Becoming a BNVKI member makes you automatically an ECCAI member and allows you register at a reduced registration rate for certain major events, such as ECAI and ACAI. By increasing the number of BNVKI members, our AI community can also nominate more colleagues to become ECCAI fellows, as the maximum number of fellows we are allowed to have is proportional to the number of members. Finally, it might be good to know that ECCAI has decided to sponsor international events through invited speakers and these invited speakers need to be an ECCAI member over the past years.

If you want to know where our members are currently located, check out http://wilma.vub.ac.be/ dvandeun/mapje.html, if your affiliation is not represented, or you would like to see a larger dot, become a member and convince you colleagues to join as well.

BNAIC 2015

The 27th Benelux conference on Artificial Intelligence (BNAIC 2015) will take place on 5-6 November in Hasselt (Belgium). BNAIC 2015 will be held at the city campus of Hasselt University, in the unique setting of the former prison of Hasselt. BNAIC 2015 will include invited speakers, research presentations, posters and demonstrations. Authors are invited to submit papers on all aspects of artificial intelligence.

One of the keynote speakers is Dr. Elpiniki I. Papageorgiou. She is assistant Professor at the Department of Computer Engineering of the Technological Education Institute (TEI) of Central Greece, Lamia, Greece. She has been working for over thirteen years as researcher in several research projects related with the development of novel computational intelligence methodologies for decision support systems, intelligent algorithms for decision making, data analysis and mining and expert systems.

Please visit bnaic2015.org for more information.

Board Members BNVKI

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