NEWSLETTER

BNVKI
AIABN

December 2009
Vol. 26, No. 6
ISSN 1566-8266

Anselm's Legacy

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Human-Factors Event 2009

News from the Benelux Association for Artificial Intelligence

Immersion

Editor-in-chief

When this issue appears on your desk, you maybe have seen the movie *Avatar* by James Cameron. If the film company's wild imaginations will come anywhere near reality, this will be a milestone in 3D computer animations. And indeed, that's just where this editorial is about: closing the gap between imagination and reality.

Back in 1996, James Cameron announced that he would be creating *Avatar*, a science-fiction epic that would feature photo-realistic, computer-generated characters. He had a complete treatment for the film, including the Na'vi – a primitive alien race standing ten feet tall with shining blue skin, living in harmony with their jungle-covered planet Pandora. Soon after, though, *Avatar* had to be shelved as the technology of the time was not able to bridge the gap between reality and the director's imaginations.

More than a decade later, the technology had advanced such that Cameron's ideas finally could be realized. Weta Digital, a New Zealand studio, is responsible for the visual effects shots. In addition to digital characters and environments they created the machines, vehicles, equipment and everything else that help blur the line between imagination and reality. As one of the technicians from Weta Digital said: "It's not just a movie, it's a universe!" Some people claim that the biggest achievement of Avatar is not the visualization, but what they call *immersion* – the feeling of being there, without any distracting clues that the world and its characters are computer-generated. "Bringing characters to life in a convincing manner is a daunting task. The reason is psychological: while the brain can interpret a simple stick figure as a human, as the complexity of the characters increases, perceived realism improves until a point where the character is almost – but not quite – alive. Such a character looks real but dead. This dread area is called the Uncanny Valley."

This hypothesis of the *uncanny valley* stems from the field of robotics and was introduced by Masahiro Mori. The theory holds that when robots and other facsimiles of humans look and act almost like actual humans, it causes a response of revulsion among human observers. The "valley" in question is a dip in a proposed graph of the positivity of human reaction as a function of a robot's lifelikeness. Mori's hypothesis states that as a robot is made more humanlike in its appearance and motion, the emotional response from a human being to the robot will become increasingly positive and empathic, until a point is reached beyond which the response quickly becomes that of strong revulsion. However, as the appearance and motion continue to become less distinguishable from a human being, the emotional response becomes positive once more and approaches human-to-human empathy levels. This uncanny-valley effect is not only a problem in robotics, but also seems to be the main reason of failure of many 3D movies so far.

Then how should Cameron and his team have overcome this hurdle? They use the term *performance capture* – that is capturing all the nuances, body language and feelings of an actor and translate them on the digital counterpart. For this they used innovative solutions, like adding helmet-mounted cameras in front of the actors' heads, capturing the facial expressions along with the whole body motions. Of course there is much more to be said. Please see literally hundreds of web pages on the making of *Avatar* already, and especially many fascinating videos on YouTube.

I'm anxious to see the movie soon. Though the storyline doesn't look that exciting, it is this feeling of immersion I hope to experience.

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Front cover and editorial: stills from James Cameron's movie *Avatar*.

The deadline for the next issue is: **February 1, 2010**.

BNVKI-Board News

Antal van den Bosch

As I am writing this, snow is building up around the house. Going out for a quick errand, I push the kitchen door against a mound of snow. Rare circumstances like this evoke rare feelings, such as the idea that one could be genuinely locked in and isolated, like a robot equipped with all kinds of intelligent subsystems, but with its motor systems and sensors shut down. Yet, a minute later I am back at the computer, connected to the world, watching the satellite images for more snow to come, Googling whether "mound of snow" is the proper expression to use.

Given the widespread and deep integration of the internet in our professional activities (and in our private life as well), and given our growing tendency to retreat to the small world of the computer screen, it is sometimes good to realize it is very healthy to go out ploughing through the snow sometimes seeking the company and minds of colleagues. Go out and do participate in a SIKS graduate course, go to that symposium celebrating a Ph.D. thesis defense, don't miss the inaugural address, and be sure to register for one of the Benelux AI events such as BNAIC-2010 in Luxembourg.

The BNVKI-AIABN board wishes you a prosperous 2010. May it be spotted with events marking all the progress we will make, and may we meet each other there in good health.

New Board Members

During the BNVKI/AIABN General Assembly of October 30, 2009 in Eindhoven, two new board members were welcomed. Below they introduce themselves shortly.

Richard Booth

Dr. Richard Booth is currently a post-doctoral researcher, working at the Interdisciplinary Lab for

Intelligent and Adaptive Systems at the University of Luxembourg. He is also an Adjunct Lecturer at Mahasarakham University in Thailand, where he worked full time from 2006-2009. Before that he spent time as a researcher in Germany and Australia. He holds a Ph.D. from his hometown university in Manchester, England. Richard's research interests are in logic-based approaches to Knowledge Representation, and especially in the areas of Belief Revision, Argumentation Theory and Reasoning about Preferences. He is delighted to join the BNVKI board, where his portfolio will encompass all matters "international", for example liaising with umbrella AI organizations such as IAI and ECCAI.

Koen Hindriks

Koen Hindriks (1971) is Assistant Professor at the Man-Machine Interaction group at the Faculty of Electrical Engineering, Mathematics and Computer Science of the Delft University of Technology. He studied computing science, and finished his Ph.D. at Utrecht University on agent programming languages. His research interests include common-sense reasoning, agent-oriented programming based on common-sense concepts like beliefs and goals, and the verification and specification of agent programs. He has designed and developed several agent programming languages, including 3APL and GOAL. He is also interested in the design and development of negotiating agents, which involves among others research on representation, strategies and learning techniques that can be usefully applied in the development of such agents.

Anselm's Legacy: the Ontological Proof and the Validation of Reason

Richard Starmans, Utrecht University

Few will have failed to notice that in 2009 both the 16th century theologian and church reformer John Calvin (1509-1564) and the 19th century biologist Charles Darwin (1809-1882) received extraordinary media attention. Both still have lots of dedicated followers, eager to memorize and celebrate their birthdays, and committed to uphold their legacies. For many of them the fortuitous fact that they are both honored in the same year, appeared a sufficient reason to contrast their works, proclaiming them champions of two entirely opposite worldviews and invoking many vigorous debates on (the tension between) science and faith.

Remarkably though, the 900th dying-day of the scholastic philosopher Anselm of Canterbury (1033-1109) received far less media attention. Still, he was

one of the founders and key representatives of scholastic philosophy, that eminently targeted the relationship between faith and reason. But to many, Anselm still owes his fame to his illustrious work *Proslogion*, being the first to develop an ontological argument for the existence of God. From the very start this argument encountered much theological resistance, but it has intrigued logicians and philosophers for centuries. Today, textbooks in modal logic usually get students in philosophy or artificial intelligence acquainted with the well-known 20th century modal ontological proof of Charles Hartshorne. But the authors of these textbooks nearly all rightly pay tribute to Anselm, who developed his purely conceptual, logical argument 800 years before with only Aristotelian / Boethian logic at his disposal. His reasoning roughly goes as follows. Anyone, believer or disbeliever, has a concept of God as "that than which nothing greater can be conceived". This means that God at least exists in the mind. Suppose that God exists only in the mind and not in reality. Then, there is something bigger conceivable, a God that exists in the mind and in reality. For existence in reality is greater than existence in the mind. This provides a contradiction. Therefore, God must exist.

In its deceptive simplicity, Anselm's argument started an impressive career throughout the course of the history of ideas. Descartes and Leibniz elaborated it, Hume scorned it, whereas Immanuel Kant – after careful analysis – tried to refute it once and for all. Then, Hegel launched the idea again, albeit from his own rather eccentric conception of logic. But, more importantly, and despite Kant's rigorous attempts, the argument was revitalized after the emergence of mathematical logic in the late 19th and early 20th century. Such divergent scholars as Kurt Gödel, Alvin Plantinga, the aforementioned Charles Hartshorne, Norman Malcolm and only recently Grahan Oppy developed new versions or analyses that invoked a burgeoning literature. The prevailing opinion on the argument is perhaps best expressed by Bertrand Russell, stating that although many people will have the unpleasant feeling that there is something wrong with the argument, it is much harder to identify what exactly.

Many of Anselm's contemporaries felt that this line of argument could open a Pandora-box with all kinds of unwanted derived entities or alleged facts, which might well be inconsistent with the Bible. Its apologetical influence was rather modest due to the fact that in scholastic philosophy, so-called natural theology was dominant, aimed at providing evidence for God's existence and other theological truths by referring to the structure of the cosmos and the complexity, beauty or functionality in nature. Leading scholastic philosopher and theologist Thomas Aquinas championed this tradition and used cosmological and teleological arguments, rather than giving credit to Anselm's ontological proof.

Be that as it may, Anselm obviously was not the first to address the many problems of the gap between existence in the mind on the one hand and "being" or existence in reality on the other. Parmenides struggled with it 500 years B.C., George Berkeley's idealism exploited it to the full, and in the philosophy of mathematics it is omnipresent. For example, in the 17th and 18th century polemics on the existence of infinitesimals were notorious. Kronecker's dictum that only the "natural" numbers were created by God didn't become famous for nothing; other numbers were labeled in a pejorative way: negative, irrational, imaginary numbers. Also the controversy between potential infinity (intuitionism) and actual infinity (realism) is one of many other examples on the (ontological) status of mathematical objects that could be added to the list. In fact, nearly all big issues in western metaphysics and epistemology can be situated somehow in the classical "Philosophical Triangle", built up by the notions of reality, mind/thoughts and language, and the subtle interplay between these concepts. But, Anselm really pulls the reader of *Proslogion* into this triangle very harshly, because now abstract and even transcendental entities are derived purely by reason, causing estrangement and intellectual contortions that seem a bridge too far for many. At least, that was the opinion of 17th century mathematician and philosopher Blaise Pascal, who was skeptical to all attempts to capture faith and belief by reason alone. In his famous "Wager" he intended to be rational in a different, utilitarian and probabilistic way, stating that it is rational to believe in God, as the revenues will most likely surpass the costs.

The persistency of the ontological argument in modern times – where apologetic implications look less relevant and advanced formal methods are available – seems remarkable. Interestingly so, it is no exception. In fact, many of the traditional issues and problems of natural theology and philosophical debates concerning rational belief, have been rethought, re-analyzed, improved, defended and attacked by systematic application of formal methods. These issues and problems include traditional cosmological and teleological arguments, the probability of miracles, the credibility of religious experiences and testimonies, the problems of evil, theism versus agnosticism, the problem of religious pluralism, foundations of morality, evolution versus intelligent design, and many more. They are now addressed by systematically applying

such divergent techniques as modal (epistemic, deontic) logics, probabilistic methods, decision-theory and Bayesian confirmation theory: all applied or further developed in formal epistemology or in foundational research in artificial intelligence (knowledge representation and belief revision). Among others, Richard Swinburne famously used Bayesian confirmation theory to defend theism and related doctrines, Alvin Plantinga developed much-discussed modal ontological theses, whereas John Earman refuted Hume's classical argument on miracles, using probabilistic methods. Others, like Dutch philosopher Herman Philipse, use the same formal techniques to attack the claims of theism.

As a result, there seems some mutual understanding now between formal epistemology and the philosophy of religion. Many philosophical disciplines experienced subsequently a logical, a probabilistic, and finally a computational turn. No doubt, the philosophy of religion took the first two steps graciously and experienced the emergence of a subfield, that could well be labeled the formal epistemology of rational belief. Reversely, formal epistemology has found a very fertile playground for the application and perhaps even further development of formal methods and theories. It may well supplement the realistic large-scale empirical domains provided by the sciences today, and the much-used isolated puzzles / "toy examples", that were persistent in logic, artificial intelligence and philosophy of science for a long time.

Although one could hardly expect Anselm's achievements to make their way into public debate, like Darwin and Calvin did, a small tribute wouldn't seem inappropriate. His approach to philosophy, the cosmological and teleological arguments pursued by some natural theologists and Pascal's probabilistic strategy, did prelude and inspire much of current work in formal epistemology of religion and rational belief. And Anselm himself? Being a very smart thinker, he must have realized that his strategy would be of limited significance as a tool to bring people to faith. Moreover, a defense of the existence of God seems rather superfluous in an age when almost everyone was dedicated to Christian belief. Rather, he defended the use of reason in theological matters in a time when this was far from obvious and revelation was generally considered the main, if not only source of knowledge in these matters. By showing that the use of reason and logic would lead to a conclusion that everyone knew to be true, namely that God exists, Anselm could, so to speak, "validate" his method. One could say that what he essentially did in his famous argument, was not so much defending God by reason, but defending reason by God.

Impressions on BNAIC 2009

Toon Calders, Technical University Eindhoven, and Karl Tuyls, Maastricht University

The 21st Benelux Conference on Artificial Intelligence (BNAIC) was held at the conference center of the Eindhoven University of Technology on October 29 and 30, 2009. The conference was a very lively event, with a lot of internationally active and renowned researchers in, among others, multi-agent systems and simulation, games, logics in AI, machine learning, data mining, natural-language processing, semantic web, and evolutionary computing.

As most readers know, the main goals of BNAIC are two-fold: on the one hand to bring together AI researchers in the Benelux to meet and present research activities with oral and poster presentations, and on the other hand to present high-quality research results, possibly already published in international conferences or journals, complemented with renown international keynote speakers. The format of BNAIC is therefore a mixture of a meeting place and a forum for high-quality research results, forming a balance that has proven to be a successful formula throughout the past 21 editions.

PROGRAM

This year the program consisted of a research track, an industry track and three invited keynote talks: two in the research track and one in the industry track. These keynote talks were splendid and provided a nice summary on the current state of the art in robotics, machine learning and data mining. More precisely, Prof. Burgard gave a talk on *Reliable Life-long Navigation for Mobile Robots*, Prof. Flach presented a talk on *Machine Learning: Unity in Diversity* and Dr. van der Putten gave an invited talk in the industry track entitled *AI in the Wild: Decisioning, Predictive Analytics and Simulation for Customer Experience Optimization*.


Peter Flach during his invited talk.

Wolfram Burgard concluding his invited talk.

Authors could submit in three paper categories: A-type papers presenting original work, B-type papers summarizing the main results of papers accepted after June 1, 2008 for AI-related refereed conferences or journals, and C-type papers proposing for demonstrations. In total BNAIC received 117 submissions spread over the research track and industry track. Each track consisted of a number of A, B and C papers. The next table provides a summary of the submission division over these categories:

Research Track: 105		
A: 45	B: 54	C: 6
Industry Track: 12		
A: 5	B: 4	C: 3

Out of these 117 submissions 61 papers were accepted for oral presentation (A and B category) and 36 papers were accepted for poster presentation (A and B category). All demos were accepted. Of all A-type submissions, i.e., papers presenting new work, we accepted 36% as full paper and 46% as poster paper.

AWARDS

In total there were three Awards: one best-A-paper award, one best-B-paper award and a best-demonstration award (C type). The selection committee was chaired by Prof.dr. A. Nowé and Prof.dr. C. Witteveen.

The following were the best-A-paper nominees:

- *Local Sampling for Indoor Flight.* Guido de Croon, Christophe de Wagter, Bart Remes and Rick Ruijsink
- *Replicator Dynamics for Multi-agent Learning – An Orthogonal Approach.* Michael Kaisers
- **Winner:** ***Using a Satisfiability Solver to Identify Deterministic Finite State Automata.*** Marijn Heule and Sicco Verwer
- *A Step in the Right Direction: Botdetection in MMORPGs using Movement Analysis.* Marlieke van Kesteren, Jurriaan Langevoort and Franc Grootjen


Marijn Heule.


Sicco Verwer.

The following were the nominees in the category of established work:

- **Winner:** ***On Empirical Memory Design, Faster Selection of Bayesian Factorizations and Parameter-Free Gaussian EDAs.*** Peter Bosman (GECCO 2009)
- *Randomized Parallel Proof-Number Search.* Jahn-Takeshi Saito, Mark Winands and Jaap van den Herik (ACG 2009)
- *Code Patterns for Agent-Oriented Programming.* Peter Novak and Wojciech Jamroga (AAMAS 2009)


Peter Bosman receiving his best-paper award in the closing ceremony.

The best-demo award was won by Tom Van Bergen, Maarten Brugmans, Bart Dohmen and Niels Molenaar with the Cobes: The clean, safe and hospitable metro. The best-demo-award committee was headed by Prof.dr. Jaap van den Herik.


An impression of Cobes.


Best-demo-award ceremony.

SOME FINAL FACTS AND FIGURES

The proceedings of the conference are available both printed on paper and online on the BNAIC website (http://wwwis.win.tue.nl/bnaic2009/proc.html).

In total BNAIC welcomed 152 participants coming from 6 different countries: 116 from the Netherlands, 26 from Belgium 7 from Luxembourg, and 3 from outside of the Benelux countries.

BNAIC 2009: Further Session Reports

Applications II

Virginia Dignum
Delft University of Technology

This session consisted of 3 paper presentation and was attended by around 30 people. The applications presented included airport-gate planning, website authoring, and webservice-incompatibility resolution.

The first paper, presented by Jan Audenaert from the Free University Brussels reported on a master thesis research on optimizing the boarding process in airports as one way for the airline industry to reduce the cost of the total airplane turn time – i.e., the time between landing and take off. The authors presented different boarding strategies that manipulated the order of boarding for different types of passengers and seats. Their work evaluates these strategies in terms of passenger friendliness and robustness to all kinds of disturbances. They use a multi-agent-based simulation for the analysis of the strategies. Findings of this research suggest that characteristic based strategies can combine high performance with low overhead.

The second presentation, by Viktor de Boer from the CWI, focused on website-design processes. Specifically on the process of determining which information is to be included and how the information should be organized on the web site's pages. The presentation introduced the SiteGuide system that takes as input a set of user-selected web sites that are similar to the target website (typically 3 to 10). The system then creates an initial information architecture for a new site by efficiently and systematically comparing a set of example sites identified by the user. SiteGuide automatically searches the sites for topics and structures that the sites have in common. For example, in the soccer-club domain, it may find that most example sites contain information about youth teams or that pages about membership always link to pages about subscription fees. The tool then presents this found common information architecture to the user in both textual and visual form. SiteGuide can be used as a standalone tool or its output can serve as a starting point for further design refinement.

Finally, Ruud Stegers from the VU Amsterdam, introduced Free Speech, a new communication and interaction protocol for web services. It is designed to overcome incompatibilities that do not stem from business requirements as is often the case with many contemporary protocols as they are defined in for example WSDL. An initial prototype of a library was presented – the Free Speech Engine – on top of which a small set of clients and servers is built. The Free Speech protocol allows seamless interaction between all peers, regardless of their ignorance of each other's business requirements and without the protocol enforcing specific ordering requirements. The results of the small use case presented look promising and will be continued in future research.

Applications and Robotics

Jaap van den Herik
TiCC, UvT

The session Applications and Robotics consisted of four lectures, that formed an harmonious overview of the activities performed by AI researchers in the BeNeLux. All four lectures were interesting and ended in a lively discussion. The topics ranged from personalisation and modeling via retrieving emotions to indoor flights.

The first lecture was titled *A Personalized Tourist Trip Design Algorithm for Mobile Tourist Guides*, written by Wouter Souffriau, Pieter Vansteenwegen, Joris Vertommen, Greet Vanden Berghe and Dirk Van Oudheusden. The presenter was Wouter Souffriau. He took the centre of the city of Eindhoven as his example and started to describe the computer's aim to prepare an interesting and entertaining tour in which the Eindhoven points of interest (PoI) were included. First, we were given to understand which technical problems had to be overcome. For instance, even a full screen that could be enlarged at four sides would be still small on a mobile computer. So, providing an adequate overview of an entertaining walk faced many constraints. A second obstacle was the problem of orientation (an NP-hard problem). Then the speaker discussed many issues, such as trips of more than one day, opening hours, types of PoI (churches, statues, musea). Other topics of attention were changes of plan (based on observations), the recreational cyclist (the starting point was a walking tour, but biking was an additional possibility), and parking lots (when arriving from another city). Their program was called TTDP (Tourist Trip Design Problems). A comparison with other algorithms known in the literature was given. DTTP did well. The proceedings contain an abstract. The full paper is published in *Applied Artificial Intelligence*, Vol. 22, No. 10, pp. 964-985 (2008).

The second lecture was titled *Intelligent Agent Modeling as Serious Game*, written by Rick D.W.F. van Krevelen, who also presented the paper. The aim is to develop user-defined agent models. Three conditions were imposed: (1) allow more complex scenarios, (2) facilitate tutoring, and (3) make the models transferable to other studies. Important issues that were discussed are: negotiating, transparency, agents in simulation games, the concept of serious games, and future development. The main idea was: how do we build agents that can learn? The aim was a clear application. The message of the presentation was that agents may make complex models easy to understand. This may happen by interactive simulation. An example was given on an agent providing high-level reasoning in the area of military training. A second example was an application of neuro evolution. The proceedings contain a 2-page abstract. The full article will appear is the Post Proceedings of the AAMAS 2009 Workshop on Agents for Games and Simulation.

The third lecture was titled *Humanoid Robots are Retrieving Emotions from Motion Analysis*, written by Tino Lourens and Emilia Barakova. The presenter was Tino Lourens. Non-verbal communication is an intriguing area of research, in which hardware (robotics) and software (programs) play an equally important part. The authors took up the challenge of presenting a parallel framework. The idea is as follows. Observe the handwaving of Emilia Barakova (the spouse of Tino) and derive from the gestures whether she is happy, angry, sad, or polite. Each of the four handwavings has its own pattern and that should be recognized by a humanoid robot. This implies that the robot makes a picture of the handwaving and starts to analyze the structure of the pixels. The article discusses the data streams representing the skin color and the motion characteristics. In future work the authors would like to pay attention to questions as: could any type of waving be predicted? And, how to design imitation, such that it appears natural and distinctive in a humanoid robot? The article consists of eight pages and is well readable; moreover many figures explain details.

The fourth lecture was titled *Local Sampling for Indoor Flight*, written by Guido E.H.E. de Croon, Christophe de Wagter, Bart Remes and Rick Ruijsink. The presenter was Guido E.H.E. de Croon. The problem of achieving a vision-based autonomous indoor flight with Micro Air Vehicles turned out to be a quite practical research topic. The Delft University of Technology had faced an unexpected fire in the Faculty of Architectural Design and the financial losses were considerable. In the future, intelligent autonomous airplanes could be instrumental in communicating the state of affairs inside the building. So far, mobile walking robots have been given the task of entering a building in which a disaster has taken place. But in case of fire flying "agents" should be supplied. The research is still in its infancy, but the start is clearly there as are the ideas. The methods for the flying machines are biologically inspired and use advanced computer-vision techniques. De Croon discussed computational efforts and classification accuracies. On the question, what are we talking about? he answered that the algorithms were tested or a 15 gram ornithopter in an office room. Other experiments were performed with light-weighted, small Micro Air Vehicles of 3.07 gram and 10 cm length. The presentation was lively, the discussion short and to the point. The article (8 pages) is

illustrated by several figures, plots, and diagrams. Obviously, this is an interesting area of research. All in all, the session was pluriform, the presentations of good quality, and the teaching factor was adequate and entertaining.

Complex Systems

Martijn Schut
Vrije Universiteit Amsterdam

From the 4 scheduled talks, two were presented: *The Complex Dynamics of Sponsored Search Markets* by Valentin Robu, Han La Poutré and Sander Bohte (CWI) and *The Windmill Method for Setting up Support for Resolving Sparse Incidents in Communication Networks* by Duco N. Ferro, Catholijn M. Jonker and Alfons H. Salden (Almende, TUDelft). We briefly report on both presentations.

Bohte gave the complex dynamics talk, which was originally published at the 2009 AAMAS Workshop on Agents and Data Mining Interaction (ADMI'09). The work concerns the complex systems analysis of a large dataset of sponsored search queries (from live.com obtained through a Microsoft Beyond Search grant). Two particular issued were researched: firstly, how the display rank of a URL link influences its click frequency; secondly, the market structure that emerges from these queries was studied. The presentation included some interesting examples of successful niche websites of which the success could be explained by the used analysis methods.

Ferro presented the windmill talk, which was originally published at the International Conference on Computational Aspects of Social Networks (CASoN 2009). The work includes a design method (based on a windmill metaphore) which can be used in so-called "Professional Task Settings with Incidents", which are subtly different from crisis/incident management settings (which concern large disasters while the former do not). The method is based on the idea that the set of aspects corresponds to the set of blades on a windmill – the centre of the blades represents the core of the problem, while moving up the blades, the knowledge is decreasingly relevant. The talk included a small experimental study that was undertaken with aid workers (police, firemen) in a small-incident management setting.

Games

Jos Uiterwijk
DKE, Maastricht University

The first presentation, by Marlieke van Kesteren, Jurriaan Langevoort, and Franc Grootjen, entitled *A Step in the Right Direction: Botdetection in MMORPGs using movement analysis*, discussed the problem that in the field of massively multiplayer online role playing games, which is becoming increasingly popular among humans, some players try to cheat by using a bot. This bot easily does the boring, time-consuming tasks for its "boss", who thereby undeservedly can make advances in the game. To tackle this abuse, botdetection in MMORPGs becomes increasingly important. The authors demonstrates a program for botdetection, based on analyzing movement behaviour of bots compared to humans. Their program reached a 100% botdetection rate on the test data.

Next, Frank Takes (with Walter Kosters) presented *Solving SameGame and its Chessboard Variant.* The contribution was twofold. First, he showed how a new solving method based on Monte-Carlo simulations improves on the best previous performance when solving SameGame puzzles. Second, he discussed a theoretical analysis on solvability for a subclass of SameGame, called Checkerboard positions.

The next speaker was Guy Van den Broek (with Kurt Driessens and Jan Ramon), who talked about *Monte-Carlo Tree Search in Poker using Expected Reward Distributions.* This was an extended abstract (B-paper). The full paper has been published meanwhile in *Lecture Notes in Computer Science*, Asian Conference on Machine Learning, Nanjing, China, 2-4 November 2009, volume 5828, pages 367-381. Most programs for the most popular Texas Hold'em Poker game are limited to the two-player (Heads Up) variant and/or to the Limit version of the game (in which the number and sizes of bet increases are limited). Van den Broeck described how their research tackled the multiplayer No-Limit variant. Their program uses a combination of search and opponent modelling, based on the increasingly popular Monte-Carlo Tree Search (MCTS) technique. To tackle non-determinism, they adapted both the selection and backpropagation steps of MCTS. He argued that the resulting program is the first one able to play a decent game of multiplayer No-Limit Texas Hold'em.

Finally, Mark Winands (with Jahn-Takeshi Saito and Jaap van den Herik) discussed *Randomized Parallel Proof-Number Search.* This again was an extended abstract (B-paper). The full paper will be published in the proceedings of the *Advances in Computer Games Conference 2009*, to appear in *Lecture Notes in Computer Science*. Winands presented work from Saito's Ph.D. research, focussing on solvers for games or positions. Well-known algorithms for solving are Proof-Number Search (PNS) and its 2-level variant PN^2. A difficult

subject is how these algorithms can best be parallelized when multiple processors with shared memory are used. Saito proposed variants based on the principle of randomized parallelisation. Experiments show a rather good scaling-up, synchronisation overhead being the major part of the total overhead.

Logics in AI

Koen Hindriks
Delft University of Technology

Preferential Model and Argumentation Framework, by Nico Roos.
In his talk, Nico discussed how to provide a preferential semantics for argumentation frameworks. The aim is relate to and define a preferential semantics in terms of some of the well-known concepts of argumentation semantics which define when an argument, for example, is acceptable. A notion of preferred state is introduced which then is used to define the preferential semantics. To relate this preferential semantics to arguments, the preference relation is constructed from the attack relation. There are some technical issues that need to be solved, in part due to the fact that a strict preference relation is constructed. In particular, self-attacking arguments are a problem to provide a well-defined semantics. In the discussion it is clarified that the preferential semantics proposed is not intended for reasoning about preferences but rather can be applied in cases where some arguments are preferred over others.

Code Patterns in Agent-Oriented Programming, by Peter Novak and Wojciech Jamroga.
Some of the existing agent programming languages fix various features of agents. According to Peter and Wojciech, this may make it difficult to introduce extensions of such languages and to do so might require making changes to the semantics of such languages. As an alternative, a generic language for reactive systems called Jazzyk is proposed that is independent of specific cognitive concepts. As this language does not directly support cognitive concepts, the question is whether some formal support can be provided for defining such concepts using the basic Jazzyk primitives and whether these macros can be verified using logic. A combination of dynamic and temporal logic is proposed as the tool to address these questions. It is argued that Dynamic CTL* is presented as an existing logic that is suitable to reason about Jazzyk BSM. This is not straightforward as a mapping from BSM to Dynamic CTL* assumes so-called annotations which need to be provided by a programmer. Some examples are provided such as a macro for adopting a goal.

Service Specification and Matchmaking using Description Logic, by M. Birna van Riemsdijk, Rolf Hennicker, Martin Wirsing, Andreas Schroeder.
In this talk the formal specification of semantic web services is discussed. The question is raised whether description logics – which provide a formal underpinning for semantic web languages – can also be used to specify services, which would be useful for, e.g., matchmaking. To this end, a description logic SHOIN is introduced (a particular instantiation of a so-called *institution*). Service specifications can be provided by means of pre- and post-conditions, and the semantics is provided in terms of labeled transition semantics with output, to model the output of the service. These formal tools provide a service-specification framework which can be used to formally study, e.g., matching of requests. The basic idea is that we can actually prove the existence of a match when a characterization exists where the pre-condition of the requester entails the pre-condition of the provider, whereas the post-condition of the provider should entail that of the requester.

Complete Extensions in Argumentation Coincide with Three-valued Stable Models in Logic Programming, by Martin Caminada and Yining Wu.
The talk presents a correspondence result which may facilitate the reuse of techniques established in logic programming for argumentation frameworks and vice versa. Some correspondence results between, e.g., stable extensions and stable models are well-known. The paper presents a formal result that establishes a correspondence between complete extensions and 3-valued stable models in logic programming. To this end, the notion of a complete labeling is introduced, which is illustrated by some examples. Each argument is labeled either in, out, or undecided. The way a labeling is constructed corresponds with various intuitive notions. The "in-set" of a complete labeling coincides with a complete extension, which is an earlier result of Caminada. The talk proceeds by showing that a complete labeling "in-set" coincides with 3-valued stable models. This shows that argumentation frameworks can be transformed into logic programs that produce same "models".

Multi-Agent Learning

Katja Verbeeck
Katholieke Hogeschool Sint-Lieven, Ghent

Three reinforcement-learning-based papers were grouped in the multi-agent learning session. Michael Kaisers from Maastricht University opened the session with an interesting new view on analyzing time-dependent replicator dynamics. A subsidy game, a variation on a pure coordination game to which an extra subsidy parameter was added, was used throughout the talk to illustrate the approach.

An analysis was made in case the value of the subsidy parameter changed over time. The underlying idea was that their technique offers a more systematic parameter-design methodology that will allow to make more grounded parameter choices for important parameters in a dynamical system, e.g., the temperature function in Q-learning with a Boltzmann exploration scheme. That reviewers were definitely convinced about the quality of this work was clear, since Michael and his co-author Karl Tuyls were nominated for the best-A-paper award.

Next speaker was Yann-Michael De Hauwere, who talked about learning in large state spaces and related to that, explained his approach that allows to learn when it is needed for an independent learning agent to consider the other agents in its environment and when it is perfectly ok to just ignore them. He showed nice experiments on difficult grid-world settings.

The last speaker, Mihail Mihaylov, presented his work entitled *Decentralized Learning in Wireless Sensor Networks*, a B-paper which he previously also presented at the ALA workshop at AAMAS09. Mihail had a warm message for its audience, namely: "Love your Neighbors" which in his context means that sensor nodes should seek to improve the efficiency of their neighborhood, instead of just being considered with their own, in order to improve the autonomous lifetime of the network and reduce its latency.

Thanks to three clear and interesting talks, this MAL session was certainly a nice opener for the BNAIC.

Natural Language Processing

Antal van den Bosch
Tilburg centre for Creative Computing

In this two-paper session, the audience was treated to two empirical, data-driven approaches to natural language. First, Herman Stehouwer (Tilburg University) presented joint work with Menno van Zaanen (Tilburg University) on *Token Merging in Language Model-Based Confusible Disambiguation*. The problem of confusible disambiguation is a vexing one: even trained writers occasionally write "your" instead of "you're", and as both words are normal, existing words, only the context may reveal the mistake. Hence, we need context-based spelling-correction technology. The most successful approaches have used data-driven methods, and use statistics. The case of "your" versus "you're" demands special attention, as "you're" is by most standard natural language processing approaches considered to consist of two tokens, "you" and "'re". Herman explained how to deal with merging the statistics of these two tokens to make them compatible with the single-token statistics of "your", and explained how his solution is generically applicable to stochastic language models.

The second talk, a duo presentation by Karina Van Dalen-Oskam (Huijgens Instituut) and Mike Kestemont (University of Antwerp), took the audience back to medieval times with their paper *Predicting the Past: Memory based copyist and author discrimination in medieval epics*. Aside from the fact that writers may be discovered by their distinct "linguistic fingerprint", as recent computational stylometrics research has suggested, it is important that some texts go through several hands, thereby making the author-attribution task harder. The puzzle becomes even larger when realizing that medieval texts used to be copied by scribes or copyists, who did not add so much to the content, but rather to the spelling, as Middle Dutch spelling was not regularized and tended to reflect regional dialect. Karina and Mike argued that by tuning machine-learning methods to low-level textual features (such as the occurrence of character combinations), distinctions can be made between parts of a text copied by different scribes. In contrast, by representing text more by higher-level features (such as the occurrence of specific words), authors could be identified. By the fact that the two tasks can be represented at largely complementary feature spaces, the authors argue that all is not lost for author discrimination even with texts copied by different scribes; author discrimination may not be hindered by the low-level differences induced by different scribes. The presentation drew many questions from the audience. The paper is exemplary for an emerging empirical approach in Middle Dutch literature research, and the link with machine learning is shown to be quite natural and helpful.

Impressions D-CIS Human-Factors Event 2009

Eefje Rondeel, D-CIS Lab, Delft, and
Gerda Speelman, Thales Nederland

'Equip the man, don't just man the equipment' is a key issue in the human-factors domain. Especially in defense systems, the cooperation between man and machine is crucial. In such systems, user friendliness can be a matter of life and death. Due to this increasing importance and interest in human-factors research, on the 13th and 14th of October the D-CIS Lab organized its second human-factors event in Delft, the Netherlands, together with the

recently established Thales Human Factors & Cognition Laboratory. Researchers from several countries and organizations presented their research and latest developments.

CONNECTING

The aim of the D-CIS Human-Factors Event 2009 was to connect scientific research and the industry in the human-factors domain. During the event, researchers got the opportunity to present their research to partners from the industry, as well as to technology developers. Technology developers and people from the industry got insight in the most recent research topics being conducted in the human-factors community. In addition, to boost interaction even more, challenge groups were organized on the second day of the event.

MODELING HUMAN PERFORMANCE

Keynote speaker Prof.dr. Adelbert Bronkhorst from TNO (the Netherlands) started the event with an excellent overview of human-factors research and discussed the most recent topics being worked on at TNO.

After the keynote speech, the day continued with more presentations. Some of these concerned human-performance modeling. Stirling Tyler (Thales Consulting & Engineering, UK), for example, presented the Integrated Performance Modelling Environment (IPME) Tool which he uses for determining the optimal occupation of future submarines. “The use of this highly technical instrument does demand some training, but it does make it possible to influence the design of a system in a very early stage”, says Stirling.

In addition to the topic of modeling of behaviour, the measuring of human behaviour and human factors was discussed. Rolf Zon (National Aerospace Laboratory, the Netherlands) and Tobias Heffelaar (Noldus, the Netherlands) discussed how situational awareness of pilots can be assessed with the Observer XT, a software tool for integrating and coding of several behavioural measures. In addition, more theoretical issues were pointed out, such as the effect of arousal and processing fluency on aesthetic appraisal of new designs.

DEMONSTRATIONS

During the demonstration and poster session there was ample opportunity to show and see more research and additional software or hardware. Alex Dimov from BIOPAC Inc. (United States), for example, showed the possibilities of measuring workload with a band strapped around the forehead. Also software tools for aiding in human-factors research were demonstrated. Jared Freeman and Sylvain Bruni from Aptima Inc. (United States) demonstrated the potential of DDD (Distributed Dynamic Decision), a multi-user simulation manager software tool widely used in the United States. Lesley Jacobs from TNO (the Netherlands) demonstrated a test bed called IDEFIX, an Innovative Debrief Environment for fixing various challenges related to mission planning, briefing and debriefing. Additionally, several researchers got the opportunity to discuss and present their research with a poster.

CHALLENGE GROUPS

For the first time this year, the D-CIS Human-Factors Event included challenge groups. These brainstorming sessions aimed at connecting industrials and researchers with common interests in Human-Factors topics. The challenge groups allowed participants to exchange ideas and establish future research directions resulting in collaborations. T-Xchange facilitation techniques and the use of the SI-Lab, a room especially equipped for such brainstorm sessions and serious gaming, contributed to the progress of the discussions. The challenge groups provided insights in the decision-aiding area, but also on the US (NextGen) and European

(SESAR) air-traffic management policies and on enhancement of human interaction with robots in extreme environments.

MORE HUMAN FACTORS

In addition to the presentations, posters, demonstrations and challenge groups, there was also the opportunity to exchange thoughts and ideas in a more relaxed setting, during the conference dinner at the authentic and lovely restaurant Van der Dussen, in the city of Delft.

In summary, we can proudly say that the D-CIS Human-Factors Event 2009 continued the success of the first D-CIS Human Factors Event. And we warmly invite everyone to join us again during the D-CIS Human-Factors Event 2010!

Engineering Societies in the Agents' World X

Huib Aldewereld
Utrecht University

The tenth international workshop "Engineering Societies in the Agents' World" (ESAW 2009) was recently held in Utrecht, The Netherlands, during November 18-20, 2009. In the tradition of its predecessors, ESAW 2009 was committed top the idea of multi-agent systems (MAS) as highly interconnected *societies of agents*, paying particular attention to the social aspects, methodologies, and software infrastructures that tackle the emergent complexities of MAS.

This tenth workshop brought together researchers and contributions from both within and outside the Agents' field – from Software Engineering, Distributed Systems, Social Sciences, and others –, so as to promote cross-fertilisation among different research areas. By focussing on the social aspects of MAS, ESAW 2009 concentrated on the space of agent interaction, rather than on intra-agent issues, and on the technology and methodology issues rather than on the pure theoretical aspects.

Taking the notion of agents a step further, to include humans and robots, ESAW 2009 focussed on heterogeneous societies where humans, artificial agents and robots can interact in a transparent and seamless fashion. In this sense, ESAW 2009 was pleased to host the HART workshop on "Supporting Joint Activity in Human-Agent-Robot Teamwork" as a satellite event, on Saturday, November 21, 2009.

The focus on social aspects of agent societies was visible also in the two invited talks. Rosaria Conte, head of LABSS (Laboratory of Agent Based Social Simulation) at the ISTC (Institute for Cognitive Science and Technology) in Rome, gave a talk about *The Immergence of Norms in Agent Worlds*. Jacques Ferber, professor of Computer Science at the University of Montpellier II, introduced the idea of *Thinking Integral: How to Build Complex Systems that Live with People and Exhibit Collective Intelligence*.

Rosario Conte (right).

ESAW 2009 had a total of 13 paper presentations, 5 short paper presentations, and 6 demos. The workshop counted over 40 attendees, which gave it a communal sense. The discussions at the end of each of the paper sessions were lively and highly interactive.

Demo presentations.

The organisation of ESAW 2009 has been made possible with the financial help of several Dutch companies and research institutes, including BNVKI. The location and time of ESAW 2010 is not yet known at this moment.

‘Further Reading’ Symposium
December 8, 2009

Toine Bogers
Royal School of Library and Information Science
Copenhagen, Denmark

On Tuesday December 8, 2009, the ‘Further Reading’ symposium was held at Tilburg University. The symposium was held in advance of the public defense of the Ph.D. thesis of Toine Bogers entitled Recommender Systems for Social Bookmarking. The symposium marks the end of the Ph.D. project of Toine Bogers within the À Propos project, a SenterNovem IOP-MMI project jointly performed with the Language and Speech unit of Radboud University Nijmegen.

This symposium, sponsored by the SIKS graduate school, brings together leading experts in the newly arisen field of recommender systems, where the notion of “people finding objects” is complemented by the notion of “objects finding people”. Four speakers were invited to give a talk at the symposium on various aspects of recommender systems and information retrieval.

The first speaker of the day was dr. Birger Larsen of the Royal School of Library and Information Science in Copenhagen, Denmark. His talk, titled *Polyrepresentation 2009 – Principle or Theory?* talked about the experimental headway that has been made in verifying the polyrepresentation principle. This principle explains why combining different search engines and retrieval algorithms can significantly improve the quality of the search results. In polyrepresentation, each query or document representation, user, and retrieval model can be seen as a different representation of the same retrieval process.

The second speaker, Robert Jäschke, M.Sc. of the University of Kassel, Germany, talked about tag recommendation in BibSonomy, a social bookmarking system operated by the University of Kassel. BibSonomy allows its users to store their references and Web bookmarks online. These tags can then be described and tagged by the user and shared among other users. Robert talked about automatically recommending relevant tags to users whenever they post a new reference or bookmark to their online profile list.

The third speaker, drs. Frank Hofstede of the Search Expertise Centrum in the Netherlands, gave a talk titled *Recommendation Orchestration*. In it, he discussed the roles that information retrieval and recommender systems can play in knowledge-management processes in organizations, as well as giving his vision on the future of intelligent information processing and management.

The fourth and final speaker, prof.dr. Maarten de Rijke of the ISLA group at the University of Amsterdam, talked about the topic of expert search. Expert search involves the search for the relevant people who are knowledgeable about a certain topic, as opposed to regular document search, where the focus is on returning the relevant documents. Maarten presented an overview of the different experiments and user studies that have been conducted in this field by Maarten’s group in conjunction with the ILK workgroup at Tilburg University.

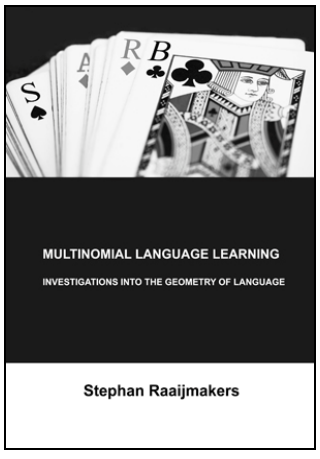
Maarten’s talk concluded a successful symposium that saw a good variety of interesting topics and speaker backgrounds that made for a great and inspirational morning session.

PH.D. THESIS ABSTRACTS

Multinomial Language Learning:
Investigations into the geometry of language

Ph.D. thesis abstract
Stephan Raaijmakers

Promotores: Prof.dr. W.M.P. Daelemans and Prof.dr. A.P.J. van den Bosch
Date of defense: December 1, 2009



For quite some time, learning systems have been applied to the analysis of language. Learning systems, part of the discipline of *machine learning*, learn to discriminate between objects of different

classes, on the basis of examples called *training data*. Machine-learning methods can be divided into roughly two types: memory-based methods, storing all examples in memory, and comparing new cases with these stored examples, and model-based methods, that concisely represent the set of examples in a succinct model in which, for instance, only the boundary cases representing the separation between classes are stored. A learning system is trained on its training data, after which it is capable of labeling – with a variable degree of success – new (*test*) cases with a classification. A trained learning system is called a *classifier*.

During both the learning stage and classification stage, learning systems deploy similarity measures. For instance, a memory-based system will measure the similarity of a test case with cases stored in memory. The set of stored cases that most closely resemble the test case determine the classification of the latter. This type of similarity can be expressed as a distance measure, according to which the data can be described through a vocabulary of properties (*features*) as a *feature space*. Every feature space comes equipped with corresponding distance measures that befit the intrinsic geometry of the space.

For the application of learning systems to the analysis of language, the so-called *vector space* is traditionally used for representations. In this space, linguistic objects such as texts are represented as vectors: points in a high-dimensional space. Characteristic of this space is the fact that it possesses a flat structure, in which distances are measured along straight lines. From a two-dimensional perspective, one can imagine this space as the space spanned by linear functions of the form $y = ax + b$. The vector-space model has proved to be quite successful for *document retrieval* (where distance plays a role in the process of finding documents that match a certain query) and machine learning. The corresponding distance measures are called *Euclidean* distance measures.

Recently, the set of distance measures for the application of learning systems to language has been extended with measures that assume a curved space: the so-called *geodesic* distance measures. These distance measures treat local distances as Euclidean, and measure global distance along curved lines. This can be compared to the practice of measuring distance on our globe: the curvature of the globe does not come into play when measuring the distance between two objects that are close to each other, but does play a role when measuring the distance between objects that are thousands of miles apart. Documents can be embedded into a geodesic space, through a simple transformation based on normalized frequencies of, e.g., words. For effective use of the resulting *probability distributions*, it is necessary that documents possess a certain length; otherwise, the notion of frequency would be meaningless. As it turns out, geodesic distance measures yield highly accurate classifiers.

In this thesis, we examine the conditions under which geodesic classifiers perform optimally. First, we carry out a number of experiments in which we assess the accuracy of these classifiers. We subsequently propose to extend the standard technology with two new facilities:

- A method to apply geodesic classifiers to very short texts, with an eventual sequential relation between the constituting parts. Examples are certain feature-based learning tasks with a limited length, such as the prediction of the attachment of prepositional phrases to preceding verbs or nouns, or the prediction of the diminutive suffix of a noun on the basis of a limited number of phonetic properties of its final syllables.
- A method to combine heterogeneous information (such as frequencies of separate words and frequencies of word combinations) within one classifier.

We demonstrate that the proposed modifications boost classifier performance, and that they correspond with standard formal operations on a geodesic space.

Next, we investigate in detail whether document data embedded in a geodesic space should be uniformly analyzed with geodesic distance measures. We show analytically that the inverse cosine, a crucial ingredient of geodesic distance measures, displays weak performance on some regions in its spectrum. We relate this phenomenon to the notion of *entropy*: flat probability distributions of embedded data lead to suboptimal performance of geodesic classifiers. On the basis of two empirical studies, we explain this observation from an inverse relationship between entropy and curvature: the higher the entropy of certain data, the lower the amount of curvature representing this data. Our conclusion is that textual data embedded in a geodesic space should not be uniformly analyzed with geodesic methods.

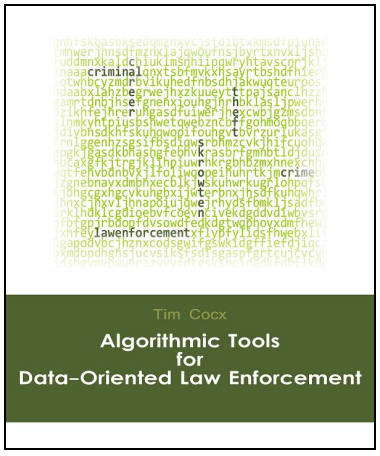
Subsequently, we propose a calibration technique for classifiers. This technique, based on the estimation on two thresholds on the class probabilities emitted by a classifier, allows the classifier to factor out hard cases it cannot classify with a pre-specified accuracy. We generalize this

technique to a method with which we can train a classifier to switch from geodesic distance measures back to Euclidean distance measures, depending on the entropy of the local neighborhood of test data. In this way, we create a *back-off* system that under certain conditions backs off from a more complex geodesic distance measure to a less complex Euclidean distance measure. We demonstrate the benefits of this method as compared to uncalibrated methods. In addition, we propose an alternative distance measure based on a method from cartography that is specifically well-suited for high-entropy data.

Algorithmic Tools for Data-Oriented Law Enforcement

Ph.D. thesis abstract
Tim Cocx

Promotor: Prof.dr. J.N. Kok
Copromotor: Dr. W. Kosters
Date of defense: December 2, 2009



This thesis is divided into two parts: one part about algorithms that can be employed for strategic purposes and one part about applications in the tactical domain.

Chapter 2, being the first chapter of the strategic part, describes a first analysis of a large database of criminal records (cf. Appendix B), that aims to relate different crimes to each other or to demographic data, based upon frequent co-occurrence in a record. To accomplish this, the existing and well-known APRIORI algorithm was adapted to search for this type of connections in this specific database, incorporating solutions to a variety of problems native to data on criminal activities. This file, that was available in an anonymized version, was also used for more fundamental analyses.

Because this file contains an enormous amount of "raw" data, standard methodologies to visualize data are often not very well suited to this task. Chapter 3 therefore describes a method that optimizes the visualization of relations between criminals in this database by using the domain knowledge of the analyst as a vital part of the clustering phase. Because this expert is able to directly manipulate a physical representation of this data, a high quality of visualization can be reached with a minimum amount of computational effort.

An important concept that can be evaluated using the criminal record database is that of the *criminal career*, which can be seen as a temporally ordered series of crimes committed by an individual throughout his or her life. An ad-hoc method is suggested in Chapter 4 that uses four important factors of such a career to calculate distances between different careers. These distances can then be visualized in a two-dimensional clustering. Chapter 5 proposes a number of enhancements of this method, that are proven to be functional in another domain. Next to that, some methods are discussed that could eventually lead to a prediction of new careers, further examined in Part II.

After the completion of a clustering and classifying system, a search for subcareers that occur often can be performed. An even more noteworthy endeavor is to find specific subcareers that are common in one class and are not in all others, taking the role of defining subcareers that can be used to identify certain classes. These opportunities are researched in Chapter 6, where an existing method for market basket analysis is adapted to suit the demands put forward by the search for common subcareers.

In the second part about tactical applications, the possibilities for predicting criminal careers are discussed in Chapter 7, where a method is described that employs the power of a visualization to create reliable predictions through simple mathematical calculations. This method is effectuated, expanded and tailored towards criminal data in Chapter 8, where the different variables of this method are tested on the actual data. Under certain conditions, this method can predict criminal careers with a high accuracy.

In Chapter 9, an investigation is described that strives to answer the question if files from confiscated computers from crime scenes can be an indication of which of these scenes are related to the same criminal organizations. For this purpose, a specific distance measure was developed that determines the chance that two computers were owned by the same organization. For this project, text mining software was employed that extracted

special entities from computers retrieved from synthetical drugs laboratories.

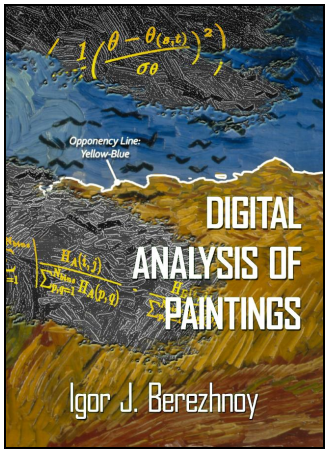
Chapter 10 describes how “online predators”, child sexual abusers on the internet, can be recognized automatically on social networking sites, like the Dutch “Hyves”. A genetic algorithm was designed that automatically selects groups that show a significant difference between predators and regular users in the amount of under-aged “friends” on their respective profiles. It turns out that in some specific cases this variable can be a strong indicator for danger classification of certain user groups.

This thesis ends in Appendix A with some considerations about statistics, law and privacy that play a pivotal role for everybody using, or intending to use (parts of) our work in the daily practice of police matters. It discusses the applicability, statistical relevance and insightfulness of and reservations to our methods in general and police usage in specific, focusing mostly on the methods in Part II, that deal with tactical policing. As an assurance our methods are viewed in the correct context and our tools are used in a concise way, a deliberation on their possibilities and limitations for use within society is both important and natural.

Digital Analysis of Paintings

Ph.D. thesis abstract
Igor Berezhnoy

Promotores: Prof.dr. E.O. Postma and Prof.dr. H.J. van den Herik
Date of defense: December 7, 2009



The subject of this thesis is the development of computer algorithms to support art historians and other art experts in their visual assessment of paintings. Chapter 1 provides an introduction to the world of visual art and artificial intelligence. The entrance of computers in the cultural heritage domain of art has started later than in other disciplines, such as medicine and law. Yet, the cultural heritage offers challenging research questions for computer science and artificial intelligence. In the first chapter a brief historical overview is given of previous attempts to apply computer-based techniques to analyze visual art. The overview gives rise to the following problem statement: *To what extent can recent advances in image processing and image analysis supplement art historians in their task of painting authentication?* To address this problem statement, the following three research questions are formulated. RQ1 *How and to what extent can color analysis of the digitalized reproductions facilitate the authentication process?* RQ2 *Which features of the brush work can be extracted effectively from the digital reproduction of a painting?* RQ3 *Are there visual features which could serve as a fingerprint of the master and reveal his identity independent of his style or the scene of his work?* These three questions will be addressed in chapters 4, 5, and 6, respectively.

Chapters 2 and 3 examine previous work on image processing in the cultural-heritage domain of visual art. Chapter 2 reviews studies in which digital analysis techniques are used in relation to paintings. Many ideas of the studies reviewed will be of relevance for supporting the art expert. We distinguish three main types of studies: (1) content-based painting retrieval, (2) digital restoration of paintings, and (3) digital painting analysis. Chapter 3 focuses on the review of previous work that may support art historians in their authentication of paintings. We show that early approaches to the digital analysis of paintings can be subdivided into two categories: implicit approaches and explicit approaches. Implicit approaches do not attempt to extract brush strokes or other meaningful objects, but measure the (statistical) properties of the image regions under consideration. Explicit approaches do attempt to segment brush strokes or other objects and measure the properties of the segmented objects. More recent work is reviewed by discussing color-analysis and texture-analysis approaches. For the texture-analysis approaches a distinction is made between local and global texture analysis. Local analysis is restricted to small regions (patches) of paintings, whereas global analysis applies to the entire painting.

Chapter 4 addresses the first research question, RQ1: How and to what extent can color analysis of the digitalized reproductions facilitate the authentication process? Our aim here is (1) to determine how successful the usage of complementary colors has been in Vincent van Gogh’s oeuvre and (2) whether this characteristic

has made his paintings identifiable in time. It is commonly acknowledged that, especially in his French period, Van Gogh started employing complementary colors to emphasize contours of objects or parts of scenes. In this chapter we propose a new method called MECOCO (Method for the Extraction of COmplementary COlours) to measure complementary-color usage in a painting by combining an opponent-color space representation with Gabor filtering. To achieve the aim, (1) we define a novel measure called the opponency value that quantifies the usage of complementary-color transitions in a painting, and (2) we study Van Gogh's painting style. MECOCO's analysis of a dataset of 145 digitized and color-calibrated oil-on-canvas paintings confirms the global transition pattern of complementary colors in Van Gogh's paintings as generally acknowledged by art experts. In addition, MECOCO also provides an objective and quantifiable way to support the analysis of colors in individual paintings.

Chapter 5 addresses the second research question, RQ2: Which features of the brush work can be extracted effectively from the digital reproduction of a painting? In this chapter we show that spatial characteristics play a major role in the human analysis of paintings. One of the main spatial characteristics is the pattern of brush work. The orientation, shape, and distribution of brush strokes are important clues for the analysis. This chapter focuses on the automatic extraction of the orientation of brush strokes from digital reproductions of paintings. We present a novel technique called the POET (Prevailing Orientation Extraction Technique). The technique is based on two stages: a circular filter stage and an orientation-extraction stage. Experimental evaluation of the POET reveals that it performs on a level indistinguishable from that of humans. From our results we may conclude that the POET supports the automatic extraction of the spatial distribution of oriented brush strokes. Such an automatic extraction will aid art experts in their analysis of paintings.

Chapter 6 addresses the third research question, RQ3: Are there visual features which could serve as a fingerprint of the master and reveal his identity independent of his style or the scene of his work? In this chapter we present two different methods for extracting brush-stroke features from paintings: the EXPRESS method and the IMPRESS method. The EXPRESS (EXPlicit REpresentation of StrokeS) method employs the circular filter described in chapter 5 to extract objects from a painting. The objects are assumed to correspond to (parts of) the brush strokes. Hence, they form an explicit representation of the strokes. The IMPRESS (IMPlicit REpresentation of StrokeS) method employs a filter-based approach that transforms a region containing brush strokes into a vector of filter coefficients that constitute a feature-space representation. The coefficients contain information on the brush strokes and surrounding texture and therefore form an implicit representation of the brush strokes. Both methods are evaluated on four painting-classification tasks requiring the identification of the single painting not created by Van Gogh in a set of 5 to 6 paintings. The EXPRESS method succeeds on one task only and the IMPRESS method succeeds on two out of the four tasks. To improve the performance of the IMPRESS method, the IMPRESS2D method is presented. The IMPRESS2D method relies on the second-order statistics of filter responses and succeeds on all four tasks. Here we may conclude that second-order features offer a viable basis for identifying Van Gogh's specific visual features.

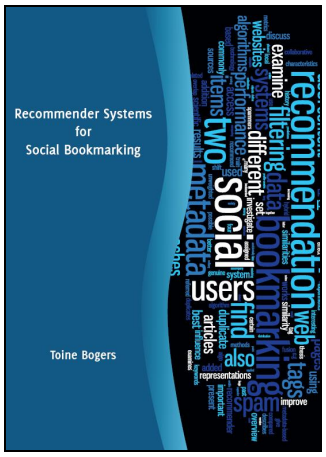
Chapter 7 answers the three research questions and the problem statement. The *to what extent* part of RQ1 is answered as follows: provided that color-calibrated digital representations are available, the analysis of complementary colors by MECOCO can facilitate the authentication process. (The *how* part of RQ1 is contained in the answer to RQ3, below.) The answer to RQ2 is that the prevailing orientation of brush work can be extracted effectively from the digital reproductions of paintings using the POET. The third research question, RQ3, is answered as follows: combinations of brush-stroke orientations as used by IMPRESS2D are able to serve as a fingerprint and may reveal a painter's identity. Finally, the problem statement is answered as follows. From our results we may conclude that image processing and image analysis are able to supplement art historians in their task of painting authentication. The methods presented in this thesis show that image processing and analysis techniques can (i) confirm established knowledge (cf. chapter 4), (ii) perform on a par with human observers (cf. chapter 5), and (iii) detect visual features that are diagnostic for the authenticity of paintings (cf. chapter 6).

The thesis concludes with a review of future research in which three lines of future research are identified: (1) improving the quality of the digital reproductions of paintings, (2) the identification of the full set of diagnostic Van Gogh features in addition to combinations of brush stroke orientations, and (3) the development of multifaceted software incorporating the methods described in the thesis for supporting art historians.

Recommender Systems for Social Bookmarking

Ph.D. thesis abstract
Toine Bogers

Promotor: Prof.dr. A.P.J. van den Bosch
Date of defense: December 8, 2009



Recommender systems belong to a class of personalized information-filtering technologies that aim to identify which items in a collection might be of interest to a particular user. Recommendations can be made using a variety of information sources related to both the user and the items: past user preferences, demographic information, item popularity, the metadata characteristics of the products, etc. Social-bookmarking websites, with their emphasis on open collaborative information access, offer an ideal scenario for the application of recommender-systems technology. They allow users to manage their favorite bookmarks online through a web interface and, in many cases, allow their users to tag the content they have added to the system with keywords. The underlying application then makes all information sharable among users. Examples of social bookmarking services include Delicious, Diigo, Furl, CiteULike, and BibSonomy.

In my Ph.D. thesis I describe the work I have done on item recommendation for social bookmarking, i.e., recommending interesting bookmarks to users based on the content they bookmarked in the past. In my experiments I distinguish between two types of information sources. The first one is usage data contained in the folksonomy, which represents the past selections and transactions of all users, i.e., who added which items, and with what tags. The second information source is the metadata describing the bookmarks or articles on a social-bookmarking website, such as title, description, authorship, tags, and temporal and publication-related metadata. I compare and combine the content-based aspect with the more common usage-based approaches. I evaluate my approaches on four data sets constructed from three different social bookmarking websites: BibSonomy, CiteULike, and Delicious. In addition, I investigate different combination methods for combining different algorithms and show which of those methods can successfully improve recommendation performance.

Finally, I consider two growing pains that accompany the maturation of social-bookmarking websites: spam and duplicate content. I examine how widespread each of these problems are for social bookmarking and how to develop effective automatic methods for detecting such unwanted content. Finally, I investigate the influence spam and duplicate content can have on item recommendation.

Technology for Justice: How information technology can support judicial reform

Ph.D. thesis abstract
Dory Reiling

Promotores: Prof.mr. A. Oskamp and Prof.dr. A. Harding
Date of defense: December 11, 2009

Technology for Justice examines impacts of information technology on the administration of justice. It contributes to knowledge of information and IT in court processes. World wide, court users complain about long delays, lack of access to justice and court corruption. This study examines how IT can help remedy these complaints.

Its methodology for each of the complaints is as follows: After an overview of existing knowledge, it examines actual court practice, drawing on a broad variety of sources: comparative studies, statistics,

case law and jurisprudence, studies on IT use and on court usage. The study uses a matrix visualizing court case loads, disposition times and groups of court users, relevant for targeting IT development. It then draws conclusions on information use, and corresponding IT needs.

Its main conclusions:

- Office technology, while improving accuracy, has mainly supported the courts' paper processes. Automated case registration systems, however, have revolutionized thinking about case management. This shift has significantly reduced court disposition times.
- Internet technology's potential for increasing access to legal information, predicted by Richard Susskind in 1996, holds promise for self-help with settlement and support for court access.
- Introducing IT can be an incentive to reducing corruption by improving court processes. Increased transparency induced by the Internet can be a factor in reducing court corruption.

The study concludes by examining how new IT developments will impact courts, and how governance and processes for judiciaries will require major changes to make those impacts work to improve the administration of justice.

Acceleration

Jaap van den Herik
TiCC, Tilburg

Our scientific research is subject to a paradigm shift. In the last five years we have seen that the topics of scientific investigation have changed and also the methodology. For instance, information retrieved with the help of Internet has affected the nature of literature research. This change implies that there are pros and cons. An advantage is that relevant information is almost directly available. A drawback is that the amount of knowledge is abundant, and therefore difficult to browse through so that it takes time to find the relevant information. The emphasis on open-source publications is another relevant issue that may speed up the current length of a Ph.D. research period, bringing it down from four to three years. In our overviews (from 1994 to 2009) we have neither paid any attention to the duration of the Ph.D. study by a researcher nor to the size of the thesis (i.e., the number of pages). What counts for us is: (1) the contents of a thesis (preferably a breakthrough) and (2) the numbers of successful defences. For breakthroughs we do not have a set of relevant criteria (although in peer review, such as Veni-Vidi-Vici, we understand what we mean by a breakthrough). The number of successful defences is a task of counting. As usual we count all our announcements and besides we reproduce the 2009 SIKS list of Ph.D. defences. An overview of the scores and grand total of both are given in Figure 1.

Year	# of Theses	# of SIKS Theses
1994	22	-
1995	23	-
1996	21	-
1997	30	-
1998	21	5
1999	28	8
2000	19	11
2001	25	11
2002	33	17
2003	37	18
2004	45	20
2005	45	21
2006	54	28
2007	46	25
2008	55	35
2009	**76**	**46**
Grand Total	**580**	**245**

Figure 1: Scores and grand total.

OBSERVATIONS AND CONCLUSIONS

The 76 Ph.D. thesis announcements are related to the following domains: (1) Artificial Intelligence, (2) AI and Law, (3) AI and Medicine, (4) AI and Economy, (5) AI and Civil Engineering, (6) AI and Computer Science, (7) AI and Information Sciences, (8) AI and Logic, (9) AI and NBIC, and (10) AI and Humanities.

In comparison to 2008 we may note that AI and Humanities has been added to the list. The contributions by ToKeN and CATCH are significant and in particular the Cultural Heritage domain has strengthened its relations to AI and Exact Sciences considerably in the last five years, resulting in a number of Ph.D. theses.

From figure 1, we may derive two prevailing conclusions on the increase of numbers over 2009. First, we may observe in both cases an increase of the increase, i.e., an acceleration. For SIKS we noticed a jump in 2008 (in comparison to 2007) of ten theses, bringing the total number from 25 to 35. That was not unexpected because we had reached before the number of 28. Now we overstep the increase of ten by 1 and arrive at 46 theses in total over 2009. A compliment to all SIKS professors is fully deserved. The compliment also holds for (a) the copromotors and daily advisors, as well as (b)

the SIKS course managers and (c) the SIKS director and managers. Well done. My sincere compliments. The second conclusion is that the scientific field related to AI is widening and deepening. There are many, many research topics and we see that the incorporation of AI techniques in the research of these topics continues to find its way. Whatever the case, an increase from 55 to 76 shows a considerable acceleration, since the previous increase was "only" nine. In this increase of 21 we have not included the NBIC theses. They are listed separately after the new announcements.

PREDICTIONS

The title of this section should be: "Predictions confirmed and revisited as well as new predictions". However the proper BNVKI newsletter reader knows that I like short titles. So, I prefer *Acceleration* above *Increasing the increases*.

In 2006, I predicted for 2012 the following numbers: for the general announcements 100 Ph.D. theses, and for SIKS 50 Ph.D. theses. Having seen the current trend and having faced the enthusiasm in the last SIKS courses I stay at that prediction.

In 2007, I stated to expect 80 general announcements for 2009. With the number of 76 I feel that I did not do a bad job. The result is within the 5 per cent error interval, which makes me confident. Moreover in the same year 2007 I then stated for SIKS for 2009: "I would optimistically like to go for 40 Ph.D. students, since SIKS is growing and the number of Ph.D. students per chair is growing". As the reader may understand, I am very pleased with the current result.

Reaching a sub goal does not necessarily imply that the main goal will be reached successfully. So, I reiterate my prediction for 2012, namely arriving at (2012: 100, 50), I foresee the following path: (2009: 76, 46), (2010: 86, 48), (2011: 96, 49) and (2012: 100, 50).

Below we honour our 76 successful Ph.D. defenders who completed their theses in 2009. We list them together with the date of promotion. Thereafter we reproduce the SIKS promovendi 2009 list, followed by a list of new announcements. Finally, we provide you with the dates of four inaugural addresses and one valedictory address.

Lucian Buşoniu (January 13, 2009), **Muhammad Subianto** (January 14, 2009), **Rasa Jurgelenaite** (January 19, 2009), **Willem Robert van Hage** (January 19, 2009), **Hans Stol** (January 21, 2009), **Rogers wod'Olobo Okot-Uma** (February 6, 2009), **Jeroen Geertzen** (February 11, 2009), **Niels Landwehr** (February 12, 2009), **Sander Canisius** (February 13, 2009)**, Maarten Mariën** (February 19, 2009), **Josephine Nabukenya** (March 3, 2009), **Abrice Colas** (March 4, 2009), **Ronald Poppe** (April 2, 2009), **Volker Nannen** (April 16, 2009), **Benjamin Kanagwa** (April 21, 2009), **Peter Massuthe** (April 21, 2009), **Sietse Overbeek** (April 24, 2009), **Richard Notebaart** (May 6, 2009), **Rick Goud** (May 8, 2009), **Saied Eslami** (May 15, 2009), **Miranda Tromp** (May 20, 2009), **Meinou de Vries** (May 21, 2009), **Hans Fokker** (June 2, 2009), **André de Vries** (June 3, 2009), **Steven de Jong** (June 4, 2009), **Anan Gaval** (June 8, 2009), **Fabian Groffen** (June 10, 2009), **Jan Wielemaker** (June 12, 2009), **Fritz Reul** (June 17, 2009), **Maksym Korotkiy** (June 18, 2009), **Serge Smeets** (June 22, 2009), **Laurens van der Maaten** (June 23, 2009), **Pavel Serdyukov** (June 24, 2009), **Alexander Boer** (June 25, 2009), **Stijn Vanderlooy** (July 1, 2009), **Valentin Robu** (July 2, 2009), **Bob van der Vecht** (July 6, 2009), **Khiet Truong** (August 27, 2009), **Andreas Witzel** (September 3, 2009), **Inge van de Weerd** (September 9, 2009), **Sofiya Katrenko** (September 10, 2009), **Annerieke Heuvelink** (September 11, 2009), **Marcin Zukowski** (September 11, 2009), **Alex van Ballegooij** (September 17, 2009), **Rinke Hoekstra** (September 18, 2009), **Christian Glahn** (September 18, 2009), **Sander Evers** (September 25, 2009), **Fernando Koch** (October 5, 2009), **Rik Farenhorst and Remco de Boer** (October 5, 2009), **Rui Li** (October 6, 2009), **Peter Hofgesang** (October 8, 2009), **Hendrik Drachsler** (October 16, 2009), **Marco Kalz** (October 16, 2009), **Stanislav Pokraev** (October 22, 2009), **Dragoş Datcu** (October 27, 2009), **Zhenke Yang** (October 29, 2009), **Koen Haziël van Dam** (October 30, 2009), **Wouter Koelewijn** (November 4, 2009), **Virginia Nunes Leal Franqueira** (November 13, 2009), **Riina Vuorikari** (November 13, 2009), **Mounia Belmamoune** (November 17, 2009), **Igor Nikolic** (November 18, 2009), **Stephan Raaijmakers** (December 1, 2009), **Christian Stahl** (December 1, 2009), **Tim Cocx (**December 2, 2009), **Merel Pannebakker** (December 3, 2009), **Nelleke van Wouwe** (December 3, 2009), **Roberto Santana Tapia** (December 4, 2009), **Igor Berezhnoy** (December 7, 2009), **Toine Bogers** (December 8, 2009), **Andries Stam** (December 8, 2009), **Dory Reiling** (December 11, 2009), **Jilles Vreeken** (December 15, 2009), **Loredana Afanasiev** (December 18, 2009), **Jeroen Laros** (December 21, 2009).

SIKS PROMOVENDI 2009

2009-01. **Rasa Jurgelenaite** (RUN) (January 19, 2009). *Symmetric Causal Independence Models*. Radboud University Nijmegen. Promotor: Prof.dr. T.M. Heskes (RUN).

2009-02. **Willem Robert van Hage** (VU) (January 19, 2009). *Evaluating Ontology-Alignment Techniques.* Vrije Universiteit Amsterdam. Promotor: Prof.dr. G. Schreiber (VU).

2009-03. **Hans Stol** (UvT) (January 21, 2009). *A Framework for Evidence-Based Policy Making Using IT*. Tilburg University. Promotor: Prof.dr. H.J. van den Herik (UvT).

2009-04. **Josephine Nabukenya** (RUN) (March 3, 2009). *Improving the Quality of Organisational Policy Making using Collaboration Engineering*. Radboud Universiteit Nijmegen. Promotores: Prof.dr. E. Proper (RUN), Prof.dr.ir. G.-J. de Vreede, University of Nebraska at Omaha, USA, Copromotor: Dr. P. van Bommel (RUN).

2009-05. **Sietse Overbeek** (RUN). (April 24, 2009). *Bridging Supply and Demand for Knowledge Intensive Tasks – Based on Knowledge, Cognition, and Quality*. Rijksunversiteit Nijmegen. Promotor: Prof.dr. E. Proper (RUN).

2009-06. **Muhammad Subianto** (UU). (January 14, 2009). *Understanding Classification*. Utrecht University. Promotor: Prof.dr. A.P.J.M. Siebes (UU).

2009-07. **Ronald Poppe** (UT) (April 2, 2009). *Discriminative Vision-Based Recovery and Recognition of Human Motion.* University of Twente. Promotor: Prof.dr.ir. A. Nijholt (UT), Copromotor: Dr. M. Poel (UT).

2009-08. **Volker Nannen** (VU) (April 16, 2009). *Evolutionary Agent-Based Policy Analysis in Dynamic Environments*. Vrije Universiteit Amsterdam. Promotores: Prof.dr. J. van den Bergh (VU), Prof.dr. A.E. Eiben (VU).

2009-09. **Benjamin Kanagwa** (RUN) (April 21, 2009). *Design, Discovery and Construction of Service-oriented Systems.* Radboud University Nijmegen. Promotor: Prof.dr.ir. Th. van der Weide (RUN).

2009-10. **Jan Wielemaker** (UVA) (June 12, 2009). *Logic Programming for Knowledge-Intensive Interactive Applications.* Universiteit van Amsterdam. Promotores: Prof.dr. B.J. Wielinga (UvA), Prof.dr. A.Th. Schreiber (VU).

2009-11. **Alexander Boer** (UvA) (June 25, 2009). *Legal Theory, Sources of Law & the Semantic Web*. Universiteit van Amsterdam. Promotor: Prof.dr. T.M. van Engers (UvA), Copromotores: Prof.dr. J.A.P.J. Breuker (UvA), Dr. R.G.F. Winkels (UvA).

2009-12. **Peter Massuthe** (TU/e, Humboldt-Universitaet zu Berlin) (April 21, 2009). *Operating Guidelines for Services.* Technische Universiteit Eindhoven. Promotores: Prof.dr. Kees van Hee (TU/e), Prof.dr. W. Reisig (Humboldt-Universitaet zu Berlin), Copromotor: Prof.dr. K. Wolf (Universitaet Rostock).

2009-13. **Steven de Jong** (UM) (June 4, 2009). *Fairness in Multi-Agent Systems.* Maastricht University. Promotor: Prof.dr. H.J. van den Herik (UvT), Prof.dr. E.O. Postma (UvT), Copromotor: Dr. K. Tuyls (TU/e).

2009-14. **Maksym Korotkiy** (VU) (June 18, 2009). *From Ontology-Enabled Services to Service-Enabled Ontologies (making ontologies work in e-science with ONTO-SOA).* Vrije Universiteit Amsterdam. Promotor: Prof.dr. J. Top (VU).

2009-15. **Rinke Hoekstra** (UvA) (September 18, 2009). *Ontology Representation – Design Patterns and Ontologies that Make Sense.* Universiteit van Amsterdam. Promotor: Prof.dr. J.A.P.J. Breuker (UvA), Copromotores: Prof.dr. T.M. van Engers (UvA), Dr. R.G.F. Winkels (UvA).

2009-16. **Fritz Reul** (UvT) (June 17, 2009). *New Architectures in Computer Chess*. Tilburg University. Promotor: Prof.dr. H.J. van den Herik (UvT), Copromotor: Dr. J.W.H.M. Uiterwijk (UM).

2009-17. **Laurens van der Maaten** (UvT) (June 23, 2009). *Feature Extraction from Visual Data*. Tilburg University. Promotores: Prof.dr. E.O. Postma (UvT), Prof.dr. H.J. van den Herik (UvT), Copromotor: Dr. A.G. Lange (RACM).

2009-18. **Fabian Groffen** (CWI) (June 10, 2009). *Armada, An Evolving Database System.* Centrum voor Wiskunde en Informatica. Promotor: Prof.dr. M.L. Kersten (CWI-UvA), Copromotor: Dr. S. Manegold (CWI).

2009-19. **Valentin Robu** (CWI) (July 2, 2009). *Modeling Preferences, Strategic Reasoning and Collaboration in Agent-Mediated Electronic Markets*. Centrum voor Wiskunde en Informatica. Promotor: Prof.dr. H. La Poutré (CWI-TU/e).

2009-20. **Bob van der Vecht** (UU) (July 6, 2009). *Adjustable Autonomy: Controling Influences on Decision Making.* Utrecht University. Promotor: Prof.dr. J.-J.Ch. Meyer (UU), Copromotor: Dr. F. Dignum (UU).

2009-21. **Stijn Vanderlooy** (UM) (July 1, 2009). *Ranking and Reliable Classification.* Maastricht University. Promotores: Prof.dr. H.J. van den Herik

(UvT), Prof.dr. Th.A. de Roos (UM), Prof.dr.rer.nat. E. Hüllermeier (Philipps-University of Marburg, Germany).

2009-22. **Pavel Serdyukov** (UT) (June 24, 2009). *Search For Expertise: Going beyond direct evidence*. University of Twente. Promotor: Prof.dr. P.M.G. Apers (UT), Copromotor: Dr. D. Hiemstra (UT).

2009-23. **Peter Hofgesang** (VU) (October 8, 2009). *Modelling Web Usage in a Changing Environment*. Vrije Universiteit Amsterdam. Promotor: Prof.dr. A.E. Eiben (VU), Copromotor: Dr. W. Kowalczyk (VU).

2009-24. **Annerieke Heuvelink** (VU) (September 11, 2009). *Cognitive Models for Training Simulations*. Vrije Universiteit Amsterdam. Promotor: Prof.dr. J. Treur (VU), Copromotores: Dr. K. van den Bosch (TNO), Dr. M.C.A. Klein (VU).

2009-25. **Alex van Ballegooij** (CWI) (September 17, 2009). *RAM: Array Database Management through Relational Mapping*. Centrum voor Wiskunde en Informatica. Promotor: Prof.dr. M.L. Kersten (CWI/UvA), Copromotor: Prof.dr. A.P. de Vries (TUD).

2009-26. **Fernando Koch** (UU) (October 5, 2009). *An Agent-Based Model for the Development of Intelligent Mobile Services*. Utrecht University. Promotores: Prof.dr. J.-J.Ch. Meyer (UU), Prof.dr. E. Sonenberg (University of Melbourne), Copromotor: Dr. F. Dignum (UU).

2009-27. **Christian Glahn** (OU) (September 18, 2009). *Contextual Support of Social Engagement and Reflection on the Web*. Open Universiteit Nederland. Promotores: Prof.dr. E.J.R. Koper (OU), Prof.dr. M. Specht (OU).

2009-28. **Sander Evers** (UT) (September 25, 2009). *Sensor Data Management with Probabilistic Models*. University of Twente. Promotor: Prof.dr.ir. P.M.G. Apers (UT). Copromotor: Prof.dr. L. Feng, Tsinghua University (China).

2009-29. **Stanislav Pokraev** (UT) (October 22, 2009). *Model-Driven Semantic Integration of Service-Oriented Applications*. University of Twente. Promotor: Prof.dr.ir. R.J. Wieringa (UT), Copromotor: Prof.dr. M. Reichert (University of Ulm), Assistent promotor: Dr.ir. M.W.A. Steen (Novay).

2009-30. **Marcin Zukowski** (CWI) (September 11, 2009). *Balancing Vectorized Query Execution with Bandwidth-Optimized Storage*. Centrum voor Wiskunde en Informatica. Promotor: Prof.dr. M.L. Kersten (CWI/UvA), Copromotor: Dr. P.A. Boncz (CWI).

2009-31. **Sofiya Katrenko** (UvA) (September 10, 2009). *A Closer Look at Learning Relations from Text*. Universiteit van Amsterdam. Promotor: Prof.dr. P.W. Adriaans (UvA).

2009-32. **Rik Farenhorst** (VU) and **Remco de Boer** (VU) (October 5, 2009). *Architectural Knowledge Management: Supporting Architects and Auditors***.** Vrije Universiteit Amsterdam. Promotor: Prof.dr. J.C. van Vliet (VU), Copromotor: Dr. P. Lago (VU).

2009-33. **Khiet Truong** (UT) (August 27, 2009). *How Does Real Affect Affect Affect Recognition In Speech?* University of Twente. Promotores: Prof.dr. F.M.G. de Jong (UT), Prof.dr.ir. D.A. van Leeuwen (RU).

2009-34. **Inge van de Weerd** (UU) (September 9, 2009). *Advancing in Software Product Management: An Incremental Method Engineering Approach*. Utrecht University. Promotor: Prof.dr. S. Brinkkemper (UU), Copromotor: Dr.ir. J. Versendaal (UU).

2009-35. **Wouter Koelewijn** (UL) (November 4, 2009). *Privacy en Politiegegevens; Over geautomatiseerde normatieve informatie-uitwisseling*. Leiden University. Promotores: Prof.dr. H.J. van den Herik (UvT/UL), Prof.mr. A.H.J. Schmidt (UL), Copromotor: Dr. L. Mommers (UL).

2009-36. **Marco Kalz** (OU) (October 16, 2009). *Placement Support for Learners in Learning Networks*. Open Universiteit Nederland. Promotor: Prof.dr. E.J.R. Koper (OU), Copromotor: Dr. J.M. van Bruggen (OU).

2009-37. **Hendrik Drachsler** (OU) (October 16, 2009). *Navigation Support for Learners in Informal Learning Networks*. Open Universiteit Nederland. Promotores: Prof.dr. E.J.R. Koper (OU), Copromotor: Dr. H.G.K. Hummel (OU) .

2009-38. **Riina Vuorikari** (OU) (November 13, 2009). *Tags and Self-Organisation: A Metadata Ecology for Learning Resources in a Multilingual Context*. Open Universiteit Nederland. Promotor: Prof.dr. E.J.R. Koper (OU).

2009-39. **Christian Stahl** (TU/e, Humboldt-Universitaet zu Berlin) (December 1, 2009). *Service Substitution – A Behavioral Approach Based on Petri Nets*. Technische Universiteit Eindhoven.

Promotores: Prof.dr. K. van Hee (TU/e), Prof.dr. W. Reisig (Humboldt-Universitaet zu Berlin), Copromotor: Prof.dr. Karsten Wolf (Universitaet Rostock).

2009-40. **Stephan Raaijmakers** (UvT) (December 1, 2009). *Multinomial Language Learning: Investigations into the Geometry of Language*. Tilburg University. Promotores: Prof.dr. W. Daelemans (UvT), Prof.dr. A.P.J. van den Bosch (UvT).

2009-41. **Igor Berezhnoy** (UvT) (December 7, 2009). *Digital Analysis of Paintings*. Tilburg University. Promotores: Prof.dr. E.O. Postma (UvT), Prof.dr. H.J. van den Herik (UvT).

2009-42. **Toine Bogers** (UvT) (December 8, 2009). *Recommender Systems for Social Bookmarking*. Tilburg University. Promotor: Prof.dr. A.P.J. van den Bosch (UvT).

2009-43. **Virginia Nunes Leal Franqueira** (UT) (November 13, 2009). *Finding Multi-Step Attacks in Computer Networks using Heuristic Search and Mobile Ambients*. University of Twente. Promotor: Prof.dr. R.J. Wieringa (UT), Copromotor: Dr. P. van Eck (UT) .

2009-44. **Roberto Santana Tapia** (UT) (December 4, 2009). *Assessing Business-IT Alignment in Networked Organizations*. University of Twente. Promotor: Prof.dr. R.J. Wieringa (UT).

2009-45. **Jilles Vreeken** (UU) (December 15, 2009). *Making Pattern Mining Useful*. Utrecht University. Promotor: Prof.dr. A.P.J.M. Siebes (UU).

2009-46. **Loredana Afanasiev** (UvA) (December 18, 2009). *Querying XML: Benchmarks and Recursion*. Universiteit van Amsterdam. Promotor: Prof.dr. M. de Rijke (UvA), Copromotor: Dr. M.J. Marx (UvA).

NEW ANNOUNCEMENTS 2009

Below we add four announcements to our list of new announcements 2009. The first two are SIKS PhD. defences. They escaped our attention. The third and fourth announcement involved the participation of the professors Brazier and Jonker (both TUD) in the assessment committee. The theses are agent oriented. The actual list starts at December 1 and continues to December 21 (13 defences). Thereafter we list new announcements 2010.

Muhammad Subianto (UU) (January 14, 2009). *Understanding Classification*. Utrecht University. Promotor: Prof.dr.A.P.J.M. Siebes (UU).

Peter Massuthe (TU/e, Humboldt-Universitaet zu Berlin) (April 21, 2009). *Operating Guidelines for Services***.** Technische Universiteit Eindhoven. Promotores: Prof.dr. Kees van Hee (TU/e), Prof.dr. W. Reisig (Humboldt-Universitaet zu Berlin), Copromotor: Prof.dr. K. Wolf (Universitaet Rostock).

Koen Haziël van Dam (TUD) (October 30, 2009). *Capturing Socio-Technical Systems with Agent-Based Modelling*. Delft University of Technology. Promotor: Prof.dr.ir. M.P.C. Weijnen, Copromotor: Dr.ir. Z. Lukszo.

Igor Nikolic (TUD) (November 18, 2009). *Co-Evolutionary Process For Modelling Large Scale Socio-Technical Systems Evolution.* Delft University of Technology. Promotor: Prof.dr.ir. M.P.C. Weijnen.

Stephan Raaijmakers (UvT) (December 1, 2009). *Multinomial Language Learning: Investigations into the Geometry of Language*. Tilburg University. Promotores: Prof. dr. W. Daelemans (UvT), Prof.dr. A.P.J. van den Bosch (UvT).

Christian Stahl (TU/e, Humboldt-Universitaet zu Berlin) (December 1, 2009). *Service Substitution – A Behavioral Approach Based on Petri Nets*. Technische Universiteit Eindhoven. Promotores: Prof.dr. K. van Hee (TU/e), Prof.dr. W. Reisig (Humboldt-Universitaet zu Berlin), Copromotor: Prof.dr. Karsten Wolf (Universitaet Rostock).

Tim Cocx (UL) **(**December 2, 2009), *Algorithmic Tools for Data Oriented Law Enforcement.* Leiden University. Promotor: Prof.dr. J.N. Kok (UL).

Merel Pannebakker (UL) (December 3, 2009). *Limitations in Dual-Task Performance*. Leiden University. Promotores: Prof.dr. B. Hommel, Prof.dr. R. Ridderinkhof (UvA).

Nelleke van Wouwe (UL) (December 3, 2009). *Cognitive Control and Binding in Context-Based Decision-Making*. Leiden University. Promotores: Prof.dr. B. Hommel, Prof.dr. R. Ridderinkhof (UvA).

Roberto Santana Tapia (UT) (December 4, 2009). *Assessing Business-IT Alignment in Networked Organizations.* University of Twente. Promotor: Prof.dr. R.J. Wieringa (UT).

Igor Berezhnoy (UvT) (December 7, 2009). *Digital Analysis of Paintings.* Tilburg Universitiy. Promotores: Prof.dr. E.O. Postma (UvT), Prof.dr. H.J. van den Herik (UvT).

Toine Bogers (UvT) (December 8, 2009). *Recommender Systems for Social Bookmarking*. Tilburg University. Promotor: Prof.dr. A.P.J. van den Bosch (UvT).

Andries Stam (UL) (December 8, 2009). *Interaction Protocols in PARADIGM*. Leiden University. Promotor: Prof.dr. J.N. Kok. (UL).

Dory Reiling (VU) (December 11, 2009) *Technology for Justice.* Vrije Universiteit Amsterdam. Promotor: Prof.mr. A. Oskam (VU), Copromotor: Prof. A.J. Harding (VU).

Jilles Vreeken (UU) (December 15, 2009). *Making Pattern Mining Useful*. Utrecht University. Promotor: Prof.dr. A.P.J.M. Siebes (UU).

Loredana Afanasiev (UvA) (December 18, 2009). *Querying XML: Benchmarks and Recursion*. Universiteit van Amsterdam. Promotor: Prof.dr. M. de Rijke (UvA), Copromotor: Dr. M.J. Marx (UvA).

Jeroen Laros (UL) (December 21, 2009). *Metrics and Visualisation for Crime Analysis and Genomics*. Leiden University. Promotor: Prof.dr. J.N. Kok (UL).

NEW ANNOUNCEMENTS 2010

Olga Kulyk (UT) (January 14, 2010). *Do You Know What I Know? Situational Awareness of Co-located Teams in Multidisplay Environments*. University of Twente. Promotores: Prof.dr.ir. A. Nijholt (UT), Prof.dr. G.C. van der Veer (OU), Copromotor: Dr. E.M.A.G. van Dijk (UT).

Ingo Wassink (UT) (January 14, 2010). *Work flows in Life Science*. University of Twente. Promotores: Prof.dr.ir. A. Nijholt (UT), Prof.dr. G.C. van der Veer (OU), Copromotor: Dr. P. van der Vet (UT).

P. van der Putten (UL) (January 19, 2010). *On Data Mining in Context: Cases, Fusion and Evaluation.* Promotor: Prof.dr. J.N. Kok (UL).

E.M.W. Lameijer (UL) (January 28, 2010). *Interactive Evolutionary Algorithms and Data Mining for Drug Design.* Promotores: Prof.dr. A.P. IJzerman, Prof.dr. J.N. Kok (UL).

Claudia Hauff (UT) (January 29, 2010). *Predicting the Effectiveness of Queries and Retrieval Systems.* University of Twente. Promotor: Prof.dr. F.M.G. de Jong (UT), Copromotor: Dr.ir. D. Hiemstra (UT).

Joost Geurts (CWI) (February 3, 2010). *A Document Engineering Model and Processing Framework for Multimedia Documents.* Centrum voor Wiskunde en Informatica. Promotor: Prof.dr. L. Hardman (CWI-TU/e), Copromotor: Dr. J. van Ossenbruggen (CWI).

Matthijs van Leeuwen (UU) (February 9, 2010). *Patterns that Matter*. Utrecht University. Promotor: Prof.dr. A.P.J.M. Siebes (UU).

Frans Oliehoek (UvA) (February 12, 2010). *Value-Based Planning for Teams of Agents in Stochastic Partially Observable Environments.* Universiteit van Amsterdam. Promotor: Prof.dr.ir. F.C.A.. Groen (UvA).

Sander Bakkes (UvT) (March 3, 2010). *Rapid Adaptation of Video Game AI.* Tilburg University. Promotor: Prof.dr. H.J. van den Herik (UvT), Copromotor: Dr.ir. P.H.M. Spronck (UvT).

Wim Fikkert (UT) (March 11, 2010). *A Gesture Interaction at a Distance*. University of Twente. Promotores: Prof.dr.ir. A. Nijholt (UT), Prof.dr. G.C. van der Veer (OU), Copromotor: Dr. P. van der Vet (UT).

Susan van den Braak (UU) (March 15, 2010). *Sensemaking Software for Crime Analysis.* Utrecht University. Promotores: Prof.dr. J.-J.Ch. Meyer (UU), Prof.dr. H. Prakken (UU/RUG).

THE NBIC LIST

As a sequel to last year's contribution we again have the pleasure to offer you the NBIC Ph.D. thesis list. Owing to organisational matters the list is not complete. Yet, as a service to our readers we offer you an incomplete list. So, the integration of the NBIC theses has not been continued. Merging and counting still have their challenges. Meanwhile we congratulate NBIC with their own result.

NBIC Ph.D. announcements

Fabrice Colas (March 4, 2009), **Richard Notebaart** (May 6, 2009), **André de Vries** (June 3, 2009), **Anand Gavai** (June 8, 2009), **Serge Smeets** (June 22, 2009), **Pieter Neerincx** (September 14, 2009), **Yunlei Li** (September 20, 2009), **Suzanne Smit** (September 22, 2009).

INAUGURAL ADDRESSES

With much pleasure we announce the following 4 inaugural addresses.

Dr. R. Leenes (April 16, 2010). *Title to be announced.* Tilburg University.
Dr. R. Verbrugge (May 25, 2010). *Title to be announced.* Groningen University.
Dr. A. Plaat (June 11, 2010). *Title to be announced.* Tilburg University.
Dr. M. Diocaretz (June 18, 2010). *Title to be announced.* Tilburg University.

VALEDICTORY ADDRESS

Prof.dr. H. de Swart (May 21, 2010). *Title to be announced.* Tilburg University.

Section Editor
Richard Starmans

Advanced SIKS Course on Computational Intelligence

INTRODUCTION

On March 11 and 12, 2010, the School for Information and Knowledge Systems (SIKS) will organize an advanced course on Computational Intelligence. The course takes two days, will be given in English and is part of the so-called Advanced Components Stage of the Educational Program for SIKS-Ph.D. students. Although these courses are primarily intended for SIKS-Ph.D. students, other participants are not excluded. However, their number of passes will be restricted and depends on the number of students taking the course. The course is given by experienced lecturers actively involved in the research areas related to the topics of the course.

Location: Hotel Mitland, Utrecht

Date: 11-12 March 2010

Scientific Directors:
- Dr. Ad Feelders (UU)
- Prof.dr. Tom Heskes (RUN)
- Prof.dr. Arno Siebes (UU)

PROGRAM

The program is not known yet, but may contain the following topics:
- machine learning
- neural and evolutionary computing
- datamining / intelligent data analysis
- adaptive / self-organising / fuzzy systems
- quantitative / statistical empirical research
- probabilistic reasoning / Bayesian networks
- pattern and image recognition
- intelligent search algorithms / games

REGISTRATION

In the conference center there is a limited number of places and there is interest from other groups in the topic as well. Therefore, an early registration is required.

Deadline for registration for SIKS-Ph.D. students: February 24, 2010
After that date, applications to participate will be honoured in a first-come first-serve manner. Of course, applications to participate from other interested groups are welcome already. They will receive a notification whether they can participate as soon as possible.

For registration you are kindly requested to fill in the registration form.

HOW TO SUBSCRIBE

The BNVKI-AIABN Newsletter is a direct benefit of membership of the BNVKI-AIABN: Benelux Association for Artificial Intelligence. Membership dues are € 40 for regular members; € 25 for doctoral students (AIO's); and € 20 for students. In addition, members will receive access to the electronic version of the European journal *AI Communications*. The Newsletter appears bimonthly and contains information about conferences, research projects, job opportunities, funding opportunities, etc., provided enough information is supplied. Therefore, all members are encouraged to send news and items they consider worthwhile to the editorial office of the BNVKI/AIABN Newsletter. Subscription is done by payment of the membership due to Postbank no. 3102697 in The Netherlands (IBAN: NL 74 PSTB 0003 1026 97; BIC: PSTBNL21). Specify *BNVKI/AIABN* as the recipient, and please do not forget to mention your name and address. Sending of the BNVKI/AIABN Newsletter will only commence after your payment has been received. If you wish to conclude your membership, please send a written notification to the editorial office before December 1, 2009.

COPY

The editorial board welcomes product announcements, book reviews, product reviews, overviews of AI education, AI research in business, and interviews. Contributions stating controversial opinions or otherwise stimulating discussions are highly encouraged. Please send your submission by E-mail (MS Word or text) to newsletter@maastrichtuniversity.nl.

ADVERTISING

It is possible to have your advertisement included in the BNVKI/AIABN Newsletter. For further information about pricing etc., see elsewhere in the Newsletter or contact the editorial office.

CHANGE OF ADDRESS

The BNVKI/AIABN Newsletter is sent from Maastricht. The BNVKI/AIABN board has decided that the BNVKI/AIABN membership administration takes place at the editorial office of the Newsletter. Therefore, please send address changes to:

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