

Machine Learning in winter

Aston University, 16-17 January 2008

NCAF is trying to engage more with students – who are the future of our subject – and this meeting will feature a special event for PhD students.

The next NCAF meeting will be held at Aston University and will have machine learning as its theme. NCAF is trying to engage more with students – who are the future of our subject – and this meeting will feature a special event for PhD students.

The first day starts with a talk by me. Entitled 'Hidden Connections', it will cover some of the basic principles of machine learning with a particular focus on probabilistic methods and how they can be applied in practice. Iead Rezek (Imperial College) will then give a talk at a more advanced level on biomedical applications of machine learning.

After lunch we shall hear from Mike Tipping (Vector Anomaly) who has experience of incorporating machine learning methods into computer games. The day will finish with two NCAF institutions: 'Puzzle Corner' and a social event organised by Vicky Bond. This year she has lined up an excursion to the Black Country and I expect it will involve more pubs than coal mines!

On the second day (for those who have recovered from the social event), we will cover a wider range of topics. Peter Tino (Birmingham University) will tell us about an application of

machine learning in astronomy; Dan Cornford (Aston University) will update us on his work on large-scale stochastic modelling; and Richard Watson (Southampton University) will give his talk on compositional evolution that was postponed from the last NCAF meeting.

The NCAF AGM will also take place on the second day. This is your chance to find out the direction of the organisation and have your say in how it should be run.

We will finish the meeting with a new NCAF venture – a PhD student forum. Around six students will give talks about their research. The incentive for them is free attendance (including an excellent Aston lunch) and the chance of some feedback on their work and possible collaborations. The attraction for the rest of us is the opportunity to spot the rising stars of tomorrow. The opportunity is open to all PhD students; they should simply send a brief abstract of their talk to me (i.t.nabney@aston.ac.uk) so that I can make the final selection. NCAF members should encourage their students to apply.

Ian Nabney
Aston University

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2008 Annual General Meeting

As Ian Nabney mentions above, the AGM will take place at the Aston meeting in January. The Committee is always short of new blood to run NCAF so do please consider joining it. Existing Committee members can explain what we do, or contact the Chairman (see back cover for details).

Nick Granville, Editor

Going virtual in Loughborough

The environment was represented by a large number of computational nodes upon which the ecoli bugs and their sources of food, etc., were evenly distributed.

The September NCAF meeting was hosted by BAE Systems at the Systems Engineering Innovation Centre (SEIC), Loughborough University. Steve Whittle (BAE Systems) opened the meeting providing a brief overview of SEIC, its staff and areas of interest.

Graham Wallis (MBDA UK Ltd.) was the first speaker who presented his company's involvement and approach to the Ministry of Defence's (MOD) Grand Challenge. The MOD has based its challenge on the USA DARPA version where a \$1m dollar prize could be awarded to an autonomous vehicle that can travel 200 km across differing terrain. The MOD's version is to provide a trophy to the team that can identify the highest number of threats in an urban environment. A threat may be considered to be explosives, snipers, armed vehicles and armed people in military clothing. The aim is to develop an autonomous vehicle that can traverse the landscape and find as many of the targets as possible. MBDA's involvement in the MOD challenge is to provide an open systems environment and data integration facilities to each of the competitors to enable the integration of their vehicles into the software.

The second speaker was Paul Chung (Loughborough University) who used a hybrid case based reasoning (CBR) system to model estuaries. Currently fertile waters can change their status due to industrialisation. There is an environmental impetus to update their status and manage the estuary. The current difficulties that need to be solved include a requirement to have a good knowledge of estuarine science, difficulties in actually collecting the data and the time it takes for that collection. Paul proposed a hybrid approach to solving those problems by using CBR as a base and combining knowledge based techniques with fuzzy matching. His initial use of genetic algorithms did not provide any significant improvement over the more traditional techniques. However, adding domain knowledge into the chromosomes by crossing over entire sections and mutating three bits of the chromosomes greatly reduced computational time.

Bugs in SPACE

Lunch on the first day was followed by John Palmer (Rolls-Royce) who explored the use of grid based computation techniques to model an ecological environment populated with the ecoli virus resulting in his suggestion of a new title for his talk 'Bugs in SPACE'. The simulation consisted of an environment in which individual bugs interact both with each other and the environment. The environment was represented by a large number of computational nodes upon which the ecoli bugs and their sources of food, etc., were evenly distributed. John found that the nodes' complexity had an inverse effect on the computational speed. However, this was not quite the case with the number of processors when the benefits tailed off if more than four processors were used. This was due to the network overheads in dealing with the interactions. By reducing these overheads, the speed increased with the increase in processing power.

Rick Adderley (A E Solutions) gave a talk about the ability to prioritise the attendance at crime scenes in order to have the best opportunity to recover forensic evidence such as DNA, fingerprints and footwear marks. This work, undertaken with Northamptonshire Police, concentrated on volume crimes (domestic and commercial burglaries, theft of and from cars) as it was often possible for there to be

more crime scenes than Crime Scene Investigators available to attend. A multi layer perceptron (MLP) was used to model the geographical data variables relating to the crime scene and, using 10-fold cross validation, the accuracy of the model reached 63%. The model's output was a ranked list of crime scenes for attendance and its accuracy was validated against human experts who, at best, only achieved 41%. The variables used in the model are generic to policing and has been validated in four other Police Forces who use differing recording systems.

'Puzzle Corner' revolved around a probabilistic dice version of 'Rock, Paper, Scissors'. Fenella the Rottweiler, with two 'volunteers' from the group, performed a discourse in which a solution was illustrated.

The penultimate event for the day was a demonstration of the Concert Project by Brian Ford (BAE Systems). This involved a tour around the laboratory where aspects of the systems development kit were demonstrated in a multi-wheeled vehicle and a flying machine. The vehicles can locate targets, follow them, and map the terrain with a 270° laser.

Synthetic environments

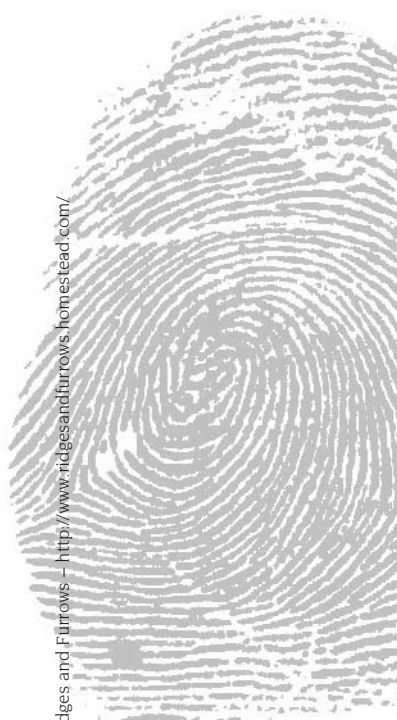
This was followed by Roy Kalawsky (Loughborough University) describing their Advanced Virtual Reality Research Centre. Their research themes include autonomous vehicles and the interaction with synthetic environments. All research is underpinned by Systems Engineering discipline including human factors. A tour of the centre followed where we saw their medical imaging system. This takes a set of grey scale CT images and transforms them into a 3D colour image. We were also shown the images on a PDA device. Thus medical personnel anywhere in the world can have access to them. This led onto a demonstration of software that can simulate air traffic flow and conditions with a view to reducing noise and pollution. Later we had an aerial tour of Jersey in a helicopter flight simulator piloted by NCAF member Clive Downes. The 4 metre dome gave a very effective and accurate portrayal of the Jersey countryside but the landing left a lot to be desired. The tour ended with a simulated walk and fly through an architectural project landscape in a large 5 metre dome.

The day wound up with a beer and skittles evening in a local pub. Steve Whittle gave a brief overview of the rules which seemed to change depending on the thrower or bowler. There were two teams and Steve awarded a bottle of wine to the person with the highest score in each team.

The second day started with Wen-Hua Chen (Loughborough University) talking about the real time implementation of genetic algorithms in dynamic environments. He discussed the issues in using this technique for real time implementations which are the computational burden, the dynamic states of an environment and possible incomplete information at the start of the modelling process. The solution space can be reduced by using the receding horizon concept. The benefits of this include less uncertainty in the dynamic environment, less variables and therefore a much smaller computational burden.

Eshan Rajabally (BAE Systems) spoke about using fuzzy decision support to compare systems modelling tools when there are multiple criteria to be considered. There may be several models, but which one is fit for purpose? Eshan stated that model

Is this fingerprint important?



Bridging the gap between mathematics and industry

Industrial Mathematics Internships create a new bridge between industry and the mathematical knowledge-base. The Smith Institute, in its role as manager of the Knowledge Transfer Network for Industrial Mathematics (KTN), and the Engineering and Physical Sciences Research Council (EPSRC) are injecting fresh energy into UK businesses by launching a programme to bring cutting-edge techniques to business innovation and to develop long-term working relationships between companies and universities.

An Industrial Mathematics Internship is a way for companies and university research groups to promote direct knowledge exchange and develop long-term working relationships, through engaging a dedicated postgraduate researcher to work on a specific industrial project over a period of three to six months. Each Internship is a collaboration between a host company, an Intern, and a research group within a university. Industrial Mathematics Internships are a new opportunity with a threefold advantage: for companies, university departments and the Interns themselves.

Benefits

- As an **industrialist**, you will explore new horizons or improve existing operations by bringing mathematical expertise and cutting-edge techniques into your innovation activities.
- As a **university faculty member**, you will use the internship as a seed for growing new industrial collaborations and relationships.
- As an **intern**, you will demonstrate your knowledge and insight in addressing industrial challenges, and gain first-hand experience of the business environment.

We believe that Industrial Mathematics Internships will develop into a major engine for innovation. A pilot phase of the initiative started in September 2007 and will run until August 2008. It will establish six

selection would benefit from multiple criteria decision support (MCDS). The benefits of this approach include the formation of structured arguments to assist customer buy-in, an aid to comparing models in future applications, better understanding of model limitations and a more logical approach to model selection. In addition, the knowledge of the domain expert is captured.

Duncan Priestley (BAE Systems) continued the talks by presenting a systems integration framework for an application within the Integrated Wing Aerospace Technology Validation Programme (IWATVP). The framework has been designed to assist in the integration of complex systems and technologies within the various workpackages and to work practically within the MODAI framework. The overall aim is to examine technologies that can be used to develop a more environmentally friendly aircraft wing. The outcome has been to establish an approach for developing a project route map which is robust, coherent and quantitative with an additional benefit of its ability to identify stakeholder involvement and responsibilities.

Just before lunch Andy Pryke (The Data Mine Ltd.) presented an introduction of 'R'. This is open source software for statistics, visualisation and modelling. There are over 400 additional libraries available to download which add functionality to the base system. The system can be used for the full development cycle of data import and pre-processing, statistics and graphics, modelling and data mining, reports and the

internships. The launch of the Industrial Mathematics Internships was held at the Institute of Engineering and Technology (IET) on the evening of 18 September. Industrialists, academics, along with representatives from government and the public sector joined the Industrial Mathematics KTN at the launch of this initiative.

Each internship will be supported by one of the KTN's Technology Translators, who will assist in establishing the projects, building the relationships, exploiting follow-on opportunities and disseminating a final case study through the Industrial Mathematics community.

Please find further details on Industrial Mathematics Internships on the KTN web site. If you would like to apply for an Internship or simply discuss a project idea, please contact me at the Smith Institute.

Dr Tim Bradshaw, Head of innovation, Science and Technology, at the CBI, said, "The Industrial Mathematics Internships programme is an excellent example of how business and universities can collaborate for mutual benefit - helping businesses become more innovative and successful by making effective use of skills and knowledge developed in universities while at the same time providing extremely valuable experience for postgraduate researchers. The critical component is that researchers will work on finding solutions to real business problems, something for which the Smith Institute already has an excellent reputation." You can also visit the blog by Trevor Maynard from Lloyd's Exposure Management for an alternative view of the initiative.

Dr Claudia Centazzo
(claudia.centazzo@smithinst.co.uk)

The web site: www.ktn-internships.net
Trevor's blog: <http://riskblog.lloyds.com/trevormaynard/september2007/mathsphtd.htm>

integration into other systems. Whilst presenting, Andy demonstrated the ease in which various aspects of 'R' can be utilised, and identified several very good libraries which can be used to speed development.

The meeting was concluded by Paul Kimber (SELEX Sensors and Airborne Systems Ltd.). His talk related to the research and implementation challenges to understanding and realising hardware analogues of natural distributive information processing systems. There are many challenges for distributed information processing, some of which include the building of architectures and their subsequent behaviour. For example, are they explicitly designed or self built, or is their behaviour affected by physical or temporal connectivity and the processing power at each node? Paul also discussed a number of wider research areas including autonomous data and information exchange, management and fusion, understanding and controlling the stability of the information, pattern discovery as opposed to pattern recognition, development of and common information language or ontology and even reverse engineering the brain!

Another excellent meeting finally came to an end: two days of interesting and thought provoking talks complemented by absorbing demonstrations in a relaxed atmosphere. This is the norm for all NCAF meetings. Long may they continue.

Rick Adderley
A E Solutions

PUZZLE CORNER

Number 37

At a recent cocktail party thrown by the fabulously wealthy Fontainebleau Plantagenet VII, Lisa noticed that all the invitees were either world-renowned academics or captains of industry, with no-one falling into both camps. Indeed, as the evening wore on, several other coincidences became apparent.

For example, all the gregarious academics drank copiously (perhaps not so much of a coincidence) whereas all the gregarious industrialists tucked into the avocado spread. It was also very noticeable that all the academics who avoided avocados were constantly talking about football. Similarly, all the copious drinkers who were partial to a bit of avocado were also lamenting the demise of Derby County FC and looking forward to future Champions League victories for their respective teams. Her final observation was that the entire group of industrial philanthropists avoided avocados like the plague.

Given that Lisa's observations were correct, what is the simplest conclusion that can be drawn about the group of gregarious philanthropists?

The answer will be given at the next NCAF meeting (16–17 January 2008, Aston University).

Fenella the Rottweiler

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MEMBERS' NEWS AND VIEWS

Deadline for contributions for the next edition – 1 February 2008.

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NEXT EDITION

Review of Aston meeting
Preview of the Spring meeting

British Computer Society 50th Anniversary

Both Networks and the British Computer Society (BCS) have reached 50 this year. In the last edition, we celebrated Networks' half century. This time, Claire Davenport, BCS 50th Anniversary Programme Manager, provides a potted history of the BCS as its anniversary year comes to an end. Editor

On 31 May 1957, the British Computer Society was formed as a single national body to



BCS

50 YEARS

represent UK Computing, with Maurice Wilkes as the first President. By the end of 1957, seven BCS branches had been formed and 22 study groups (later called specialist groups) had been set up by members. The first BCS annual conference held in 1959 was so popular that closed-circuit TV coverage to an overflow room had to be laid on. The event included 60 delegates from outside the UK, a sign of the international standing it was gaining. Within two years, membership had leapt to 1,900. This was at a time when all the business computers installed (or on order) in the UK totalled 109.

The BCS contributed to national bodies such as the British Standards Institution and provided expert opinion on a range of issues. When the United Nations ran the first International Conference on Information Processing through UNESCO in Paris, President Maurice Wilkes was invited to be the opening speaker. The event led to the formation of IFIP, the International Federation for Information Processing, in 1960, with the BCS invited to be the UK representative.

Over the following decades, BCS membership and groups grew steadily to reflect the increasing numbers of IT professionals and the diversity of computing-related subjects that needed representation. BCS became a nominated body of the Engineering Council, a Chartered Engineering Institution, and became licensed to award Chartered Scientist status.

BCS influence at the highest levels has become greater than ever. In 2004, President Wendy Hall was appointed by Prime Minister Tony Blair to his advisory body on technology, engineering and science, and BCS Director, Mike Rodd, was asked to join a Home Office group advising on whether technology was being exploited effectively. Bill Gates, Microsoft founder, was awarded BCS Distinguished Fellow in

2005, and said "I'm an honorary member of the BCS and proud of that. Microsoft is also pleased to be working with the

BCS on its very important Professionalism in IT programme".

To celebrate 50 years, the BCS 50th Anniversary Programme was launched in January 2007. There have been high-profile speakers, such as Sir Tim Berners-Lee, a BCS Fellow, who gave the Lovelace lecture in May 2007. The official 50th Anniversary dinner was held on 31 May at St. James's Palace, London, in the presence of our patron HRH Duke of Kent.

Looking to the future there are new ventures with academic establishments such as the sponsorship of attendance bursaries for ITiCSE 2007. Professor Dave Cliff, FBCS, University of Bristol has delivered a lecture entitled 'The Best is yet to come' to invited school children at Newcastle, Leeds, Southampton, Glasgow and Oxford Universities during the autumn. These universities have 50 year old Computer Science departments. 'IT in 2057' a short film of predictions looking to the future by leading IT professionals in their subject area, was sponsored by the BCS IT Management Forum and premiered in September.

Over the last 50 years, there have been unimaginable developments in IT. Now with over 50,000 members, the BCS remains a stable focal point for discussion, information, and increasingly, the passionate promotion of professionalism.

This article has been written using excerpts from the BCS publication, The British Computer Society: Celebrating 50 Years.
www.bcs.org/books/50thhistorybook

Remember that NCAF and the BCS have agreed members of one group can attend conferences organised by the other group at a reduced price. The AI series of conferences that take place in December are always worth attending. Editor

DIARY DATES 2008

26–28 March – EVOBIO 2008, 6th European Conference on Evolutionary Computation, Machine Learning and Data Mining in Bioinformatics. Naples, Italy.
<http://www.cs.vu.nl/~elena/evobio08.html>

23–25 April – ESANN 2008, European Symposium on Artificial Neural Networks, Advances in Computational Intelligence and Learning. Bruges, Belgium.
<http://www.dice.ucl.ac.be/esann/>

11–15 May – ICINCO 2008, 5th International Conference on Informatics in Control, Automation

and Robotics. Funchal, Portugal.
<http://www.icinco.org/>

Mid-May – NCAF meeting (theme and venue to be confirmed).
For information, email enquiries@ncaf.org.uk or telephone +44 (0)1332 246989

1–6 June – WCCI 2008, IEEE World Congress on Computational Intelligence. Hong Kong.
<http://www.wcci2008.org/>

5–8 August – ALIFE, Artificial Life XI. Winchester, UK.
<http://www.alifexi.org/>