Australasian Bayesian Network Modelling Society

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ABNMS Newsletter
September 2014

ABNMS 2014 Conference

24 – 27 November

Rotorua, New Zealand

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President's Report

ABNMS is a growing society and the last 12 months we have seen the society expand over "seas" in a number of ways. Our expansion has been through the location and attendees at our annual conferences and training courses. In 2013, the conference was held in Hobart and the 2014 conference will be held in Rotorua, New Zealand. This reflects our growing membership and the increasing number of applications of Bayesian Networks in professional applications. Our 2013 conference was a huge success. A big thank you to Regina Magierowski who organised the training course and conference which was held at the University of Tasmania. We had strong attendance at both events, and all enjoyed the formal and informal events of the conference. There was an increased international presence at our humble society with presentations from research in the Mediterranean, China and New Zealand all from international academics. We continued our international theme with Skype presentations from Anders Madsen talking about the Hugin software and Norman Fenton talking about developments in AgenaRisk.

In 2014, we will travel over the Tasman Sea to the "east islands". Steven Pawson from Scion Research is organising the conference in Rotorua, New Zealand. Preceding the conference will be our training course which will cover the basic theory and application of Bayesian Networks, as well as more in-depth consideration of spatial Bayesian networks, expert elicitation and a range of other topics. For more details, please check out the web page abnms.org/conferences/abnms2014/. We are very excited to announce our keynote speaker will be Dr Bruce Marcot of the US Forest Service who has made significant contributions to Bayesian Network applications particularly in the field of conservation biology. A comprehensive summary of Dr Marcot's Bayesian Network research can be found at spiritone.com/~brucem/bbns.htm.

We were very pleased to be able to offer student scholarships for attendance at the 2013 conference. Three scholarships were offered and we had a large number of applications. Two scholarships were awarded for research students attending and presenting at the conference. These were awarded to Panagiota Papakosta who presented her PhD research "Wildfire risk estimation by a Bayesian network — Example from a Mediterranean region", Sina Frank who presented "Integrating experts' knowledge into Bayesian Networks — The case of ecosystem services of urban and peri-urban vegetation in Xinjiang, NW China" and Jim Lewis who presented "Meeting the demands of network peak demand: Implementing a model of a complex socio-technical system using MS Excel". The third scholarship was awarded to a "student" of the 2012 ABNMS training course who returned to present at the conference. This was awarded to Lauren Cole who presented her work on Modelling the disappearance of floating algal wrack and its impact on marine invertebrate biodiversity in a future ocean. Similar scholarships are available in 2014.

In other matters, our website continues to be the public face for the society. After many years in the making we have finally launched the Bayesian Network repository (abnms.org/bnrepo/). The purpose of the repository is primarily to provide a public set of networks for people working in the developing methods for Bayesian Network. However, the repository is also useful for those publishing in journals requiring data to be made public, e.g. PLoS ONE. Please check out our repository and upload any networks you are happy to make available. There are a range of license conditions that can be selected to ensure you work is safe.

Thank you for your interest and support in our society and I look forward to seeing you in Rotorua for what promises to be an exciting conference, with a fascinating social program.

ABNMS 2014 Conference

abnms.org/conferences/2014

The 2014 ABNMS conference will be held in Rotorua, New Zealand from the 24-27th November. The modelling workshop 24-25th November will be followed by the ABNMS Symposium on the 26-27th November. Discounted accommodation is available at the Holiday Inn for the duration of the event with plenty of additional options located near to the symposium venue.

Pre-conference BN Tutorials

November 24 and 25 (Waiariki Polytech)

A two day basic introduction to Bayesian Networks (BNs). Includes an overview of BNs and software platforms, expert elicitation for parametising BNs, GIS integration, sensitivity analysis and an introduction to more complex BNs, e.g., object orientated, plus more.....

- Tutors from ABNMS and Bayesian Intelligence.
- Cost: $175 to $225 (see website for student, member and non-member prices).
- Limited to 40 participants.

ABNMS Conference

November 26 and 27 (Holiday Inn)

Keynote Speaker: Dr Bruce Marcot, USDA-Forest Service.

As a wildlife biologist Dr Marcot pioneered the application of Bayesian Networks (BNs) for land management and modelling the future habitat and population size of threatened species. His lecture "Of Confidence, Control, and Cause: Using Bayesian Networks for Management Decisions" will trace the evolution of BNs for natural resource management and their use in structured decision-making. He raises practical questions of denoting confidence in expert judgment used to develop probability structures, of identifying management control and influence of decisions, and of determining causality.

Abstracts are invited from a range of fields including environmental management, engineering, law, infrastructure and medicine.

Abstract deadline	September 30, 2014
Registration deadline	October 24, 2014
Cost	$150 to $250 NZD (see website for student, member and non-member prices)
Submissions: **abnms.org/conferences/2014/callfor.php**	

News & Updates

Monash

Xuhui Zhang has just completed his Honours Thesis "Learning Bayesian Networks with Latent Variables" for which he developed a front-end tool for CaMML (a machine learning program for learning causal Bayesian networks) for finding possible latent (unmeasured) variables using the conditional dependency properties in sample data. This can be used to aid CaMML discover more useful Bayesian networks even when important variables are unmeasured, although it has not yet been fully integrated with CaMML.

Alex Black has developed a new measure for CaMML which allows it to learn dynamic BNs in particular, yielding more efficiently discovered and better BNs for explaining time series.

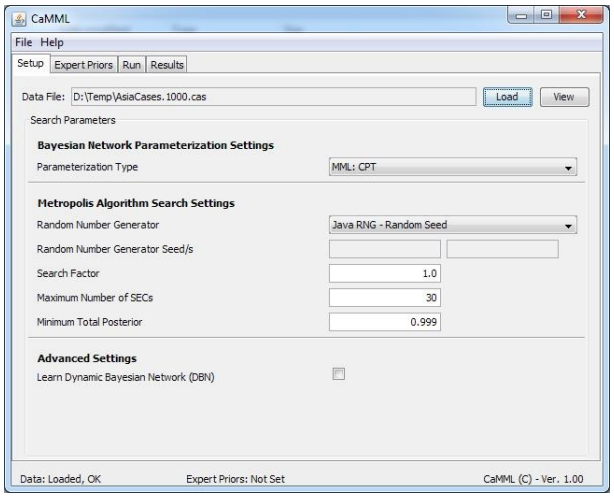

Figure 1: CaMML

Ann Nicholson was the General Chair of the 30th Conference on Uncertainty in Artificial Intelligence (UAI-2014, http://auai.org/uai2014/) was held in Quebec City, July 23-27, co-located with AAAI-14 and CogSci-14. UAI is the premier international conference on research related to representation, inference, learning and decision making in the presence of uncertainty within the field of Artificial Intelligence, including of course Bayesian networks. The invited speakers this year included Yann LeCun, Head of Research at Facebook and Andrew Ng, one of the founders of Coursera and the MOOC phenomena. The main forum for applications at UAI is through the Bayesian Modelling Applications Workshop, BMAW http://seor.gmu.edu/~klaskey/BMAW2014/agenda.html, which included financial, medical and environmental applications.

Bayesian Intelligence

Bayesian Intelligence has had a busy year, reflecting the growing interest in Bayesian networks across multiple disciplines, with projects ranging across biosecurity, ecological management, defence and bushfire management, amongst many others. A big focus for many of our projects has been GIS integration with BNs and decision support; this has been in addition to our more regular stream of work in model elicitation, sensitivity analysis, as well as training and support. In biosecurity, we've been helping to predict and prevent harmful pest outbreaks due to import and export activities in New Zealand and Australia (with SCION, PFR and MPI in New Zealand and CEBRA in Melbourne). In ecological management, we've created decision support tools for the management of species threatened by timber activities across eastern Victoria and land development in the Great Barrier Reef region (with DEPI and JCU). In defence, we've analysed pilot situational awareness and created a tool to assist in the detection of anomalous track behaviour (with DSTO). In bushfire management, we're developing models and support tools to predict and manage the impact of bushfires in the Barwon Otways region and developed a public web app to assist people in preparing their properties for bushfire.

We are also excited to announce that over the next year we will be developing BayesFinder, a user friendly data mining and analysis tool. BayesFinder will allow users to learn models from data (building on our existing CaMML

software), as well as providing a database for the storage and management of data sets and BNs. A key feature of the software will allow users to identify which of a set of BN models best describes a set of data — allowing the software to perform high level classification and identification of anomalous data. The software will also have special features for working with time series data in both batch and online modes, and will thus be suitable for monitoring applications such as fault monitoring, vehicle and animal tracking and health monitoring. As the project is at an early stage, we're keen to talk to people about how they might use such a tool. Please contact us if you have a project that might benefit from a collaboration.

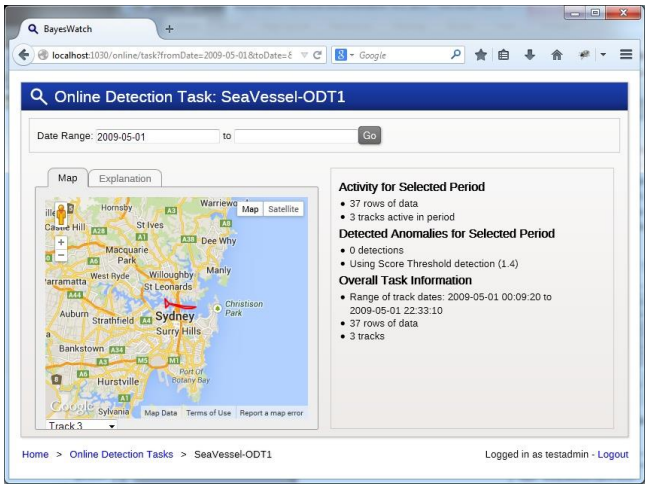

Figure 2: BayesFinder

Finally, we have two day training sessions planned for February next year, covering both introductory and advanced BN topics including decision networks, object-oriented BNs, dynamic BNs and knowledge engineering. See http://bayesian-intelligence.com/training/ for more details.

QUT

There are three PhD candidates at QUT who have BN modelling as a substantive part of their thesis:

Charisse Farr developed a BN for effective wayfinding at airports, Jim Lewis is using BNs to better understand and plan for peak electricity demand, and Denise Beaudequin is developing a BN to model the microbial health risk of reusing wastewater.

Jegar Pitchforth and Kerrie Mengersen tackled the problem of validating a BN model which has primarily been developed using expert opinion. Paul Wu, Jegar and Kerrie applied this validation framework to a working airport terminal BN. Vikas Reddy, Paul and others also developed a dashboard in C++ for Bayesian Inference.

Laurie Buys, Kerrie & Sandra worked with Dairy Australia on a sustainability scorecard which has now also been published in book form by Chartridge Books, Oxford.

We have also developed a BN to weight expert opinion, which is then used as input to a BN model of the risk of ground collision by an unmanned aircraft (technical report)

In collaboration between AIMS, QUT, ECU and UWA, the research team at QUT are developing a Dynamic Bayesian Network (DBN) model of marine species vulnerability and its evolution over time with the added pressures of dredging.
References:

Buys, L., Mengersen, K., Johnson, S., van Buuren, N. & Chauvin, A. (2014). Creating a Sustainability Scorecard as a predictive tool for measuring the complex social, economic and environmental impacts of industries, a case study: Assessing the viability and sustainability of the dairy industry. *Journal of Environmental Management*, 133, 184-192.

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Farr, A.C., Kleinschmidt, T., Johnson, S., Yarlagadda, P.K.D.V. & Mengersen, K. (2014). Investigating effective wayfinding in airports: a Bayesian network approach. *Transport*, 29, 90-99.

Pitchforth, J., Wu, P. & Mengersen, K. (2014). Applying a validation framework to a working airport terminal model. *Expert Systems with Applications*, 41, 4388-4400.

Reddy, V., Farr, A.C., Wu, P., Mengersen, K. & Yarlagadda, P.K.D.V. (2014). An Intuitive Dashboard for Bayesian Network Inference. *Journal of Physics: Conference Series*, 490, 012023.

University of Melbourne & University of Wollongong

Recent research in fire using Bayesian Networks has shifted from the University of Wollongong to the Department of Forest and Ecosystem Science with the shift of Trent Penman. Research collaborations will continue between the two research groups with Bayesian Networks forming a key component of the risk management toolkit being developed.

The research team has been developing a fire danger rating system based on a Bayesian Network approach. Development of the tool has occurred over the last two years and the resulting model will be tested in an operational setting over the 2014/15 fire season in NSW and Victoria.

Broader risk management fire research continued over the last 12 months, including the publication of a number of BN based papers. These studies examined trade-offs in investment in management with the risk of loss from wildfires. In addition, BN methods have been used as the basis of a household risk assessment tool which is soon to be released by the NSW Rural Fire Service. This project was a collaboration between University of Wollongong, Bayesian Intelligence and the NSW Rural Fires Service.