Australasian Bayesian Network Modelling Society

NEWSLETTER 2020

This issue includes

- President's Report
- ABNMS 2020 Virtual Conference
- News and Updates from members (including contact details), partners and collaborators
- Recent publication

Image by Alexandra Koch from Pixabay

JOIN THE ABNMS 2020 VIRTUAL CONFERENCE IN DECEMBER

President's Report

The Australasian Bayesian Network Modelling Society (ABNMS) has been founded 12 years ago by a core group of researchers among which Prof. Kevin Korb who kindly accepted to write a brief history of his involvement with ABNMS for this newsletter. ABNMS strives to be a multi- and inter-disciplinary, scholarly society that provides an open forum for those interested in understanding and using Bayesian networks (BNs) in their modelling. The ABNMS provides opportunities for BN modellers to exchange ideas and socialise, by organising conferences and (more recently) webinars, as well as maintaining e-mailing lists for discussion.

In November 2019, the society successfully ran its 11th annual conference (ABNMS 2019) in Wellington, New Zealand, jointly with the Society for Risk Analysis Australia-New Zealand's annual conference. The joint conference was held in partnership with Victoria University of Wellington. Prior to the conference we ran the (by now) traditional two-day tutorial which introduced participants to the basic theory behind BNs, common BN software packages, methods to build and parametrise BNs with experimental and/or expert elicited data, etc.

The conference theme was *Risk and Decision-Making: How different aspects of risk underpin responsible and culturally-appropriate decision-making*. The conference focused, among others, on weaving Mātauranga Māori for culturally appropriate decision-making. Mātauranga Māori can be understood as the Māori knowledge and understanding of everything visible and invisible in the universe. Dr. Dan Hikuroa of Ngāti Maniapoto, Tainui and Te Arawa, The University of Auckland, gave a keynote talk on the role of indigenous knowledge in risk analysis and decision-making. The second keynote was given by Emeritus Professor Marek Druzdzel, of the University of Pittsburgh, USA, and director of BayesFusion, a BN software company.

Around 100 people from Poland, the Netherlands, Canada, the USA and South Korea, and of course Australia and New Zealand participated, with 80 of them submitting abstracts across the topic areas, for talks or posters (accompanied by lightning talks). The conference concluded with a panel on *the future of risk-based decision-making*. Participants worked in government, academia, research and industry sectors and the conference was the perfect platform for people with different backgrounds, working on different topics to interact and exchange experiences.

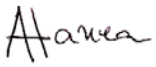
Apart from organising a hugely successful conference, the society has had several achievements during 2019 that are worth mentioning. In December 2019, Prof. Ann Nicholson organised and successfully ran a two-hour webinar on *BARD: A structured technique for group elicitation of Bayesian networks to support analytic reasoning*. Two new members have joined our board, and one returned after a long break, our membership was growing, and our collaborations resulted in many new professional applications of BNs. For details about new projects and publications, please continue reading this newsletter.

We are now looking forward to our 2020 annual conference, which will take place virtually, on the 9th and 10th of December. Even though the format will be slightly different, and it may challenge our ability to "socialise", we are hoping to still be able to offer a pleasant forum for collaboration and exchange of ideas. Pre- and post-workshops will be organised in on the 2nd and 3rd of December, and on the 11th respectively. For more details, please check out the next section and the website.

The ABNMS website continues to be the public face for the society. We plan to enrich the resources available by adding a database of pre-prints, posters, news about opportunities to publish your research, and an updated BN models' repository (abnms.org/bnrepo/). The latter provides a public set of networks for people working in the developing methods for BNs. However, the repository is also useful for those publishing in journals requiring data to be made public, e.g. PLoS ONE.

Thank you for your interest and support in our society and I look forward to keeping in touch.

Kind regards,



Anca Hanea
President of ABNMS 2020
Senior research fellow at the Centre of Excellence for Biosecurity Risk Analysis (CEBRA)

ABNMS 2020 Remote Conference

9 – 10 December 2020

We are excited to announce that we will be hosting our first ABNMS Virtual Conference.
The online meeting is free of cost to attend for members, but registration is required (payments is needed if membership need renewal). The meeting will take place on Zoom. Registrants must agree to adhere to the code of conduct and meeting rules. Please feel free to contact us if you have any questions.

Pre-conference workshop

The traditional two-day tutorial which introduces participants to the basics of BN modelling will have a slightly modified format. It will still stretch over two days (Dec. 2 and 3), but each day, tutorials will run for three hours (with appropriate breaks). The focus will be on BN basics, and introduction to Netica. Some of the material will be pre-recorded, while most of it will be live steamed. The BN pre-workshop will cost $150 for non-students and $50 for students.

ABNMS Conference

This virtual conference will be accessible via Zoom and include one plenary and four special sessions, focusing on three themes: environmental applications, defence and industry applications, and new developments in BN modelling and integration with risk and decision analysis. The agenda will allow for five sessions between 60 and 120 min with 30-minute breaks in-between, over two half days, allowing attendees the flexibility to manage work and family needs throughout the day. In addition to our live online sessions, attendees will also be granted access to the session slides post-conference.

This year, the conference will have a pre-set portfolio of presentations which are meant to showcase BNs, their flexibility and the wide range of potential applications. Hence, we are not expecting any abstracts this year, but rather expect participants to be inspired to start or continue modelling using BNs and maybe even start new collaborations.

The plenary session will appropriately be on COVID-19 and the **keynote speakers** Tom Snelling and Steven Mascaro will give insights on the project they are currently working on which involves building BN models for the diagnosis, prognosis and management of COVID-19.

Keynote Speakers:

Prof Tom Snelling is director of the Health and Clinical Analytics team in the School of Public Health at the University of Sydney, and an infectious diseases physician in the Sydney Children's Hospital Network. Tom is pioneering the application of Bayesian approaches to the design, coordination, implementation and analysis of public interest studies, and is successfully leading a suite of multi-institutional collaborative learning health projects across Australia. Working with a range of collaborative research groups across diverse clinical domain areas, these include Bayesian adaptive studies to improve the treatment and prevention of severe gastroenteritis in remote Aboriginal children, primary prevention of food allergies in children, SMS text messages to improve timeliness of routine immunisation, management of cystic fibrosis and, more recently, Bayesian network models for the diagnosis, prognosis and management of COVID-19.

Dr Steven Mascaro is a co-director of Bayesian Intelligence, a consulting company that specialises in Bayesian network research and applications, and also a research fellow at Monash University. Steven has worked on a variety of Bayesian network projects, starting in 2006 with a BN-based poker playing bot developed at Monash. Since then, he has been involved in the development of both Bayesian network models and software, including elicited and machine learned models, in domains covering ecology, defence (including anomaly detection, situation awareness, intelligence analysis and future technology assessment), biosecurity (including surveillance planning and pest risk analyses), fire risk management, rail maintenance and infectious diseases. He is currently working on causal models of COVID-19 pathogenesis to assist prognosis and diagnosis.

Post-conference Workshops

ABNMS will offer two three-hour post conference workshops, on the 11th of December. One workshop will be on BARD: A structured technique for group elicitation of Bayesian networks to support analytic reasoning, and one on structured elicitation protocols. Both workshops will require registration and have a $50 fee. For the BARD workshop a hands-on exercise will be worked out by teams of around four participants. Proposals for problems should be submitted ahead of time to check for suitability/scope.

Important (Closing) Dates

- Problem description submission for BARD post conference workshop: ***1 November 2020***
- Decision on problems to be modelled with BARD: ***5 December 2020***
- Registration for conference and workshops ***opened: 1 October 2020***
- Registration for conference and workshops ***closes: 1 December 2020***
- Pre-conference workshop: ***2-3 December 2020***
- Conference ***9 – 10 December 2020***
- Post – conference workshop ***11 December 2020***

We gratefully acknowledge the partnership with DST's Modelling Complex Warfare Strategic Research Initiative. We are looking forward to welcoming you in December.

News & Updates

Monash University

Dr. Kevin B. Korb, recently retired from Monash University, co-founded ABNMS. He continues to engage in research on the theory and practice of causal discovery of BNs, machine learning, evaluation theory, the philosophy of scientific method and informal logic. He generously responded to our call for a walk down the memory lane.

Being asked, I offer a brief history of my involvement with ABNMS.

I helped found ABNMS in 2009, together with Mark Burgman and Ann Nicholson and a bunch of others. Mark Burgman generously hosted our first meeting at unimelb under the auspices of his ACERA. There was a general feeling amongst Bayesian net modelers in Australia that it was time for a society to sustain and promote the technology – in some sense, it had "arrived" in Australia. I helped draft the constitution and incorporate it in Victoria. For those who haven't looked at it, perhaps the most important part is the Society's goals:

1. *To promote the understanding and use of Bayesian network (BN) models in scientific, industrial and research applications.*
2. *To further education and training in BN technology.*
3. *To further research in BNs and their application.*
4. *To provide opportunities for BN modellers to exchange ideas and socialize together.*
5. *To advertise opportunities in BN modelling, such as jobs, contracts, and research positions.*
6. *To promote ethical and responsible use of BN modelling.*

I think the Society has done, and continues to do, a good job of pursuing these goals, given its limitations in size and support. While Ann and I were, and are, researchers in the underlying technology and methods of Bayesian networks, we also are applied practitioners. From our point of view, ABNMS was intended to promote the application more than the technology per se. It has been very pleasing to see the Society promote the use of BNs in scientific applications of such great diversity.

At the first meeting the constitution was adopted and Ann Nicholson elected President, Mark Burgman elected President Elect, and I was elected Past President. As an ex-American, it seems fitting to be elected to a position which I couldn't possibly be qualified for; this has since become the norm in America.

I am now formally retired from Monash (and newly affiliated with the University of Melbourne's School of Historical and Philosophical Studies), but continue to do research related to BN technology, and especially the use of BNs as causal models. I expect to continue my association with ABNMS,

although out of both convenience and an interest in not promoting carbon pollution, I'm less likely than before to attend the annual conferences outside of Melbourne. May the Society live long and prosper!

by Kevin Korb

DST Group

Defence Science and Technology (DST) is expanding its application of BN to inform areas ranging from specific examples of emerging technologies through to whole-of-force problems such as capability modernisation and force generation. At the specific technology end of applications, DST is conducting two separate studies which apply BBN for Military Utility Assessment (MUA) of new concepts for the application of Directed Energy and Semi-Autonomous Systems within future warfare. In this context, we define MUA to be the evaluation of the relative contribution that the new technologies contribute to the effectiveness of the future combat team across a relevant scenario space. Elicited BN is employed to model the probabilistic effects of blue force future technology options and concepts of use (CONUSE) on red force fighting capability and to estimate MUA for each future technology/CONUSE option or combinations thereof. A third study is investigating technology trade-offs to inform the development of cooperative autonomous systems. At the other end of the spectrum, two studies are attempting to apply a BN approach to consider the impact of changes to Australian Defence Force's capability modernisation program and help design better processes to train and prepare the force.

by Andrew Coutts & Thang Cao

National Institute of Water and Atmospheric Research (NIWA)

NIWA has recently been involved in two projects that have made interesting use of BNs and expert judgement.

1. *Development of a Bayesian Network of estuarine ecosystem health*

New Zealand estuaries face multiple interacting stressors at a range of scales. While environmental managers may have limited ability to affect the pace of global climate change, significant drivers of stress in New Zealand are potentially within management capacity to address, such as sedimentation, nutrient inputs and urban contaminants. However, understanding the interactions among these stressors is a key research need for effective management.
Following workshops attended by a range of experts, NIWA researchers developed a Bayesian network to model estuarine ecosystem functioning in response to multiple interacting stressors under a variety of different management scenarios. Outputs from this model were used to inform a wider report being constructed by the PCE investigating the characteristics and values of estuarine coastal zones, including the ecosystem services they provide and their vulnerability to anthropogenic disturbance and climate change, as well as estuarine and coastal zone management in New Zealand.

2. *The utility of an expert-elicitation-informed Bayes decision net for Tasman Bay and Golden Bay scallop ecosystem management*

In New Zealand the implementation of Ecosystem Based Management (EBM) in the marine environment is difficult due to significant gaps in our understanding of coastal ecosystem responses

to degradative pressures such as sedimentation, eutrophication, benthic disturbance, over-fishing and climate change. Funded by Sustainable Seas National Science Challenge, a Bayes Decision Net decision support tool was
developed for Tasman Bay and Golden Bay scallop ecosystem management. Expert Elicitation played a key role in model development and validation. Trade-offs between fishing and biodiversity goals were investigated and restoration scenarios were explored.

by Fabrice Stephenson

US Forest Service

Predicting Productivity of Forests in the Pacific Northwest, USA

What contributes most to growth and production of timber on federal public lands in the Pacific Northwest of the USA? This question has direct relevance to meeting federal mandates in the U.S. National Forest Management Act, and maintaining sustainable forest resources and ecosystem services for local and regional communities and industries.

This question is being addressed by a diverse team using the U.S. Forest Service's Ecosystem Management Decision Support system (EMDS)[1] as recently enhanced with the inclusion of BayesFusion's Bayesian network (BN) modeling program GeNIe[2]. The team consists of researchers and modelers with the University of Lisbon, Portugal; the Pacific Northwest Research Station of the U.S. Forest Service; and Bialystok University of Technology, Bialystok, Poland.

The team is developing BN models[3] to predict and diagnose forest stand data on culmination of mean annual increment (CMAI) for a large set of regional inventory plots of the U.S. Department of Agriculture, Forest Inventory and Analysis Program. CMAI is the point in the growth of a forest stand, where forest growth and yield reach a peak, and is the economically optimal time to harvest trees where the purpose of management is timber production. Predicting CMAI is valuable for forest classification and projecting forest growth and timber yield[4]. The BN models are helping to identify which biogeoclimatic variables reflecting topography and climate, and environmental site conditions, best explain observed CMAI values.

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[1] Reynolds, K. M., P.F. Hessburg, and P.S. Bourgeron, P. S. 2014. Making transparent environmental management decisions. Berlin and Heidelberg: Springer. DOI: Https://Doi. Org/10.1007/978-3-642-32000-2.

[2] Marcot, B. G., and K. M. Reynolds. 2019. EMDS Has a GeNIe With a SMILE. Research Note PNW-RN-581. USDA Forest Service, Pacific Northwest Research Station and Pacific Northwest Region, Portland, Oregon. 4 pp. https://www.fs.usda.gov/treesearch/pubs/58510

[3] Marto, M., N. Povak, A. M. Reynolds, B. G. Marcot, P. F. Hessburg, A. Gray, and M. Druzdzel. In prep. Predicting timberland productivity in the Pacific Northwest US with Bayesian Networks. for: Forest Ecology and Management

[4] Gray, A. N., W. B. Cohen, Z. Yang, and E. Pfaff. 2019. Integrating TimeSync Disturbance Detection and Repeat Forest Inventory to Predict Carbon Flux. Forests 10(11):984.

The team is testing various approaches in structuring and parameterizing the BN models, including models based on tree-augmented naïve Bayes (TAN), the PC algorithm[5], and correlations (CB). They are using Bayesian Information Criterion (BIC), model calibration accuracy, and other model performance metrics to identify the best-performing and most parsimonious model which, to date, seems to be based on the PC algorithm using a subset of uncorrelated predictor variables, modeled in GeNIe.

GeNIe's SMILE engine (Structural Modeling, Inference, and Learning Engine) was recently integrated into the EMDS spatial decision support system (DSS)[6], which is being used to predict a wall-to-wall map of CMAI for the entire study domain. The GeNIe software integrated in EMDS has proven to be a highly useful DSS to help managers, researchers, and decision makers not only to analyze and visualize modeling results in spatially explicit maps, but also to model and predict delivery of ecosystem services in a transparent way[7]. SMILE readily accommodates knowledge expressed by means of equations and continuous distributions. A soon-to-be-released version of SMILE will include support for spatial inference, as commonly used in EMDS applications. Direct support of map calculations will improve the performance of map processing easily by a couple of orders of magnitude.
Further results are forthcoming and will be submitted to a forest ecology journal for publication.

by Bruce G. Marcot,
on behalf of all authors: Marco Marto, Nicholas Povak, Keith M. Reynolds, Bruce G. Marcot, Paul F. Hessburg, Andrew Gray and Marek J. Druzdzel

GNS Science

GNS Science is a Crown research institute and New Zealand's leading provider of earth, geoscience and isotope research and related consultancy services. In 2019 GNS was honoured to co-host the ABNMS annual meeting jointly with Victoria Business School, Wellington and co-organised with the Society for Risk Analysis Australia New Zealand. This provided a great opportunity to get more colleagues involved and exposed to Bayesian networks (BNs) and their suitability to address complex problems. The GNS theme leader for Environment and Climate chaired a session at the conference and started initiating projects involving BNs to model the probability of flooding in New Zealand and the South Pacific under a changing climate. Meanwhile work on using BNs to forecast volcanic eruptions is continuing, including using the web interface Bayesbox by BayesFusion to inform our regular expert elicitation for volcanic eruption forecast by a data-driven BN.

by Annemarie Christopherson

[5] Spirtes, P., and C. Meek. 1995. Learning Bayesian networks with discrete variables from data. Pp. 294–299 in: U. M. Fayyad and R. Uthurusamy, editors. KDD-95 Proceedings, The First International Conference on Knowledge Discovery and Data Mining, Montreal, Quebec, Canada. Association for the Advancement of Artificial Intelligence (AAAI).
[6] Marcot and Reynolds 2019, ibid
[7] Marcot and Reynolds 2019, Reynolds et al. 2014 ibid

Centre of Excellence for Biosecurity Risk Analysis (CEBRA)

CEBRA was commissioned by Cawthron Institute, New Zealand, to advise on a marine risk model.

Anthropogenic risk pathways for marine disease: modelling the transport of disease agents via marine vectors to New Zealand

The spread of marine disease is consequential for economic and ecological resources worldwide, including aquaculture systems. In New Zealand (NZ), novel pathogens have had major impacts on the shellfish aquaculture industry over the last decade, notably the mass mortalities of farmed Pacific oysters (*Crassostrea gigas*) caused by ostreid herpes virus (OsHV-1 µvar) since 2010, and of farmed flat oysters (Ostrea chilensis) since 2015, due to the OIE notifiable parasite *Bonamia ostreae*. As a result, environmental managers require decision tools and resources to implement policies to reduce risk of disease incursions and manage disease outbreaks.

This project is aimed at understanding the spread of pathogens through anthropogenic pathways (e.g. ship biofouling, ballast water, recreational boating, imported ornamental species, seafood). We use example pathogens and vector pathways from international sources to NZ as the overall model system. Specifically, we consider the interactions between two particular pathogens and marine vectors under the classic stepwise invasion model of source, entrainment, transport, discharge, and an existing model for establishment likelihood.

The project will use BNs to evaluate interactions of these organisms with marine vectors (transport mechanisms) at each stage of the anthropogenic pathway. Because data on the quantities and trajectory of pathogens in marine vectors is scarce or non-existent, an expert panel will be asked to provide numerical estimates and degrees of uncertainty around model components.

The output of the model will provide quantitative estimates of pathogen entrainment, transport, and discharge from global source regions to NZ. These, together with vector data (e.g. vessel traffic), will then inform the risk of incursion of the pathogens to NZ ports or other places.

by Anca Hanea & Ian Davidson (Cawthron Institute)

ConsenSys Software Inc.

ConsenSys is the leading Ethereum software company, enabling developers, enterprises, and people worldwide to build next-generation applications, launch modern financial infrastructure, and access the decentralized web. The product suite, composed of Infura, Quorum, Codefi, MetaMask, and Diligence, serves millions of users, supports billions of blockchain-based queries for our clients, and has handled billions of dollars in digital assets. Ethereum is the largest programmable blockchain in the world, leading in business adoption, developer community, and DeFi activity. On this trusted, open source foundation, ConsenSys is building the digital economy of tomorrow
http://consensys.net/

ConsenSys Software Inc has a well established and mature research and development section, developing novel technologies for decentralized applications for public and enterprise use cases. The research team contributes significantly on topics such as zero-knowledge proofs systems and applications, automated verification, cross-blockchains communication, as well as the new versions of Ethereum. The Stateless Ethereum project is developing a Bayesian network model based on the current release of Ethereum 1.0 and incorporates the changes being introduced by the concept of statelessness.

by Sandra Johnson

School of Ecosystem and Forest Sciences, University of Melbourne

The Bushfire Behaviour and Management Group in the School of Ecosystem and Forest Sciences at the University of Melbourne has continued to expand our fire risk management work using Bayesian Networks. Our projects focus on the central idea of improving fire management to protect human and environmental assets. Our work involves a range of fire and land managers in south-eastern Australia to ensure that the methods and results are usable.

Bayesian Network modelling has become a key part of our fire risk research, with a diverse range of projects aimed at helping land and fire managers to identify areas of highest risk and developing and testing mitigation strategies to try to reduce these risks. Several of our PhD students have also started using BNs in their research. A few of our key projects from the last twelve months are briefly outlined below. More information about these projects can be found at https://www.bushfire.school/home.

Quantifying catastrophic bushfire consequences from powerline ignitions

Understanding the vulnerabilities of energy networks to bushfires is essential for the development of strategies and initiatives aimed at building and sustaining resilience in the energy sector. In particular, the ability to predict where the highest risks are to (and from) the network and surrounding assets is important for determining where management actions can be implemented in an attempt to reduce those vulnerabilities. The overarching aim of this project was to develop a national, standardised methodology for assessing potential costs to electricity networks from major bushfires by combining fire simulation, economic analyses and decision analyses. This methodology enables users to identify the assets contributing most to the bushfire risk for each region; the spatial location of the assets at risk and the source of ignition risk. Spatial outputs enable end-users to assess risk and provide an important first step in guiding risk-mitigation efforts and future investment opportunities for energy companies. Spatialised results are important from a management perspective as they help to identify locations where an ignition from a powerline in an area could, under certain conditions, cause the greatest consequences. These results could be used by energy companies to inform their risk position and help build resilience in the networks.

Quantifying risk reduction from roadside fire management strategies

Roadsides are managed for a range of different values and risks, posing a complex and challenging task for land and fire managers. A better understanding of roadside vegetation and its role in fire prevention and management will be important for managing multiple objectives. Particularly, reducing the risk of fires spreading from roadside ignitions; the use of roads as strategic fire breaks to suppress or disrupt the spread of fire; facilitation of safe access and egress of emergency service workers and community members; and protection of high conservation value native vegetation along roadsides.

The project developed a methodology for determining high-risk roadside vegetation areas to better inform management of these landscape features to reduce risk, especially on days of high fire danger. This project was developed in consultation with many different stakeholders and was based on concerns raised by local communities. The project was undertaken using multiple methods including: community consultation; visual amenity assessments; expert elicitation; fire simulation modelling; desktop roadside vegetation assessments; Bayesian Network modelling and spatial representations of risk.

Spatialisation of the BN model enabled us to identify high-risk roadside locations, such that management may be undertaken to help reduce this risk. The results from the project will help inform better management of existing roadsides and guide future plantings. By combining fire behavior simulations and BN modelling, we have come up with a risk modelling approach for including roadside vegetation management within a broader risk management context. This will be important for considering trade-offs for investment in prescribed burning and other non-fire fuel treatments (such as mulching, slashing or thinning).

Modelling faunal communities' response to landscape pattern

In this project, we used Bayesian Networks to determine how different sources of landscape spatial pattern influenced each other and in turn particular mammal and reptile communities of south-western Victoria, Australia. Biodiversity losses are occurring globally as humans modify environments and alter fire regimes. As a result of these changes, landscape spatial pattern is being modified. Understanding how spatial pattern changes with land use and fire history and the relationship this has with fauna can help inform management plans for species and communities. Not only do changing disturbance regimes and human modified landscapes influence fauna, but so do patterns in topography, climate, vegetation productivity and habitat structure. We used BNs to integrate spatial measures of topography, climate, soils, vegetation and fire to predict the influence of patterns in these variables on species richness. Delineating the influence and relative effect of spatial pattern in this way is essential for land management and the successful application of management programs such as prescribed burning.

by Kate Parkins & Trent Penman

Meet the Board

Our board members rotate quickly, and we strive to get new members each year. For short bios of our members and links to their institutions, please visit the recently updated page of our website http://abnms.org/contact. The table below should help to put a face to the name.

President-elect	Dr Trent Penman president-elect@abnms.org University of Melbourne	
President	Dr Anca Hanea University of Melbourne president@abnms.org	
Past President	Dr Annemarie Christophersen GNS Science past-president@abnms.org	
Members at large (3 years)	Dr Kate Parkins University of Melbourne kate.parkins@unimelb.edu.au	
	Dr Sandra Johnson ConsenSys Software Inc sandra.johnson@abnms.org	
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	Dr Andrew Coutts Defence Science and Technology Group andrew.coutts@dsto.defence.gov.au	
Members at large (1 year)	Dr Bruce Marcot USDA Forest Service bruce.marcot@usda.gov	
	Dr Fabrice Stephenson National Institute of Water & Atmospheric Research	
Public & Membership Secretary; Website Manager	Dr Steven Mascaro Bayesian Intelligence steven.mascaro@bayesian-intelligence.com	
Treasurer	Dr Owen Woodberry Bayesian Intelligence owen.woodberry@bayesian-intelligence.com	

Recent publications

Cronin, J. P., B. E. Tirpak, L. L. Dale, V. L. Robenski, J. M. Tirpak, J. Gore, and B. G. Marcot. In press. Strategic habitat conservation for beach mice: estimating habitat objectives and the efficiency of management scenarios. Journal of Wildlife Management

Marcot, B. G. In press. The science and management of uncertainty: dealing with doubt in natural resource management. Taylor & Francis a CRC Press Book, Oxfordshire, U.K

Cirulis B, Clarke H, Boer M et al. Quantification of inter-regional differences in risk mitigation from prescribed burning across multiple management values. International Journal of Wildland Fire, 29:414-26, 2020

Bayesian Networks for understanding human-wildlife conflict in conservation.
J Davis, K Good, V Hunter, S Johnson, KL Mengersen, Case Studies in Applied Bayesian Data Science, 347-370, 2020

Workplace health and workplace wellness: synergistic or disconnected?
G Davis, E Moloney, M da Palma, KL Mengersen, F Harden, Case Studies in Applied Bayesian Data Science, 303-326, 2020

Marcot, B. G., and A. Hanea. 2020. What is an optimal value of k in k-fold cross-validation in discrete Bayesian network analysis? Computational Statistics (Online first): https://doi.org/10.1007/s00180-020-00999-9

Marcot, B. G., I. Woo, K. Thorne, C. Freeman, and G. R. Guntenspergen. 2020. Habitat of the endangered salt marsh harvest mouse (*Reithrodontomys raviventris*) in San Francisco Bay. Ecology and Evolution 10(2):662-677.
http://www.plexusowls.com/PDFs/habitat_saltmarsh_harvestmouse.pdf

Martin, C. D., S. D. Jewell, M. H. Hoff, C. E. Givens, and B. G. Marcot. 2020. Comparing invasive species risk screening tools FISRAM, ERSS, FISK, and AS-ISK, as a response to Hill et al. (2020). Management of Biological Invasions 11(2):342-355.
http://www.plexusowls.com/PDFs/comparing_invasive_species_tools.pdf

Penman, T. D., B. Cirulis, and B. G. Marcot. 2020. Bayesian decision network modeling for environmental risk management: a wildfire case study. Journal of Environmental Management 270:110735.
http://www.plexusowls.com/PDFs/bayesian_decision_wildfire.pdf

Sundar, K. S. G., R. Koju, B. Maharjan, B. G. Marcot, S. Kittur, and K. R. Gosai. 2019. First assessment of factors affecting breeding success of storks in lowland Nepal using Bayesian Network models. Wildfowl 69:45-69.
http://www.plexusowls.com/PDFs/bayesian_decision_wildfire.pdf; Supplements:
http://www.plexusowls.com/PDFs/first_assessment_storks_supp.pdf

Marcot BG, Penman TD. Advances in bayesian network modelling: Integration of modelling technologies. Environmental Modelling & Software, 2019; 111:386-93.

Penman TD, Cirulis BA. Cost effectiveness of fire management strategies in southern australia. International Journal of Wildland Fire, 2019; 29 (5):427-39.

Combining Opinions for Use in Bayesian Networks: A Measurement Error Approach
A Charisse Farr, K Mengersen, F Ruggeri, D Simpson, International Statistical Review, 2019.

Contact

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For more details (board and all) see
http://abnms.org/contact