Ethan Goan

Website: ethangoan.github.io
Brisbane, Queensland
Australia
Email: ethanjgoan@gmail.com
ORCID iD: orcid.org/0000-0002-3328-2054

Education

2018–Present

Doctor of Philosophy

Queensland University of Technology

Thesis Title: Reliable Uncertainty for Neural Networks

Signal, Audio, Image and Video Technology Laboratory

Bayesian Research and Applications Group

Australian Research Council Centre of Excellence for Mathematical and Statistical Frontiers

Expected Completion in 2021

2014–2017

Bachelor of Electrical Engineering (First Class Honours)

Queensland University of Technology

Major in Signal Processing

GPA: 6.8

Thesis Title: Automated Analysis in Digital Mammography

Research Experience

PhD. Studies 2018–Present
Queensland University of Technology
Topic: Investigating efficacy of Bayesian analysis for understanding inherent operation in deep neural networks.
Roles:

- Improving variational inference and Monte Carlo methods for neural networks
- Applying Piecewise Deterministic Markov Processes to perform approximate inference
- Obtaining uncertainty estimates to allow for informed predictions and decisions
- Communicating and visualising uncertainty for high dimensional classification tasks

Biomedical Data Science Team 2016–Present
Queensland University of Technology
Topic: Identification of digital biomarkers in accelerometer data to identify presence of Parkinsons Disease.
Roles:

- Signal processing methods to identify regions of interest within accelerometer data
- Data transformation to convert signal to real word coordinates
- Feature extraction of corrected accelerometer data
- Benchmarking of feature extraction against various machine learning models
- Competitor in global DREAM challenge organised by SAGE Bionetworks

Undergraduate Research Assistant 2015–2018
Commonwealth Scientific and Industrial Research Organisation (CSIRO)
Topic: Development of novel hyperspectral imaging device utilising digital micro-mirror device technology.
Roles:

- Development of electronic hardware for functional hyperspectal camera
- Leading software design for analysing hyperspectral data
- Design of 3-D printed camera enclosure
- Comparison of new device with commercially available cameras
- Presenting findings and publications at national and international academic conferences

Topic: Application of computer vision and machine learning systems for disease detection in agriculture.
Roles:

- Development of image processing tools to segment and locate artifacts in hyperspectral data
- Investigating probabilistic machine learning tools to model hyperspectral data
- Data collection
- Creation of scientific database for experimentation and analysis

Topic: Estimating water content in wheat samples using hyperspectral images.
Roles:

- Setup and control of hyperspectral cameras
- Software development of tool to visualise hyperspectral images
- Development of computer vision system to segment specimens in hyperspectral data
- Data collection and experimentation design

Honours Thesis and Vacation Research Experience Scheme 2016–2017
Queensland University of Technology
Topic: Development of a computer aided diagnostics system for mammography.
Roles:

- Correction, segmentation and preprocessing of digital mammograms
- Implementation of neural network for detection and localisation of suspicious lesions
- Extraction of texture features to be used for classification by machine learning algorithms
- Inclusion of non-mammographic metadata in automated classification
- Competitor in global DREAM challenge organised by SAGE Bionetworks
- Member of DREAM Challenge consortium and listed as co-author for manuscript to be submitted to Nature Biotechnology

Industry Experience

Machine Learning Engineer 2019–2020
3D One
Topic: Development of computer vision system to detect faults encountered during 3D-printing in real time.
Roles:

- Design of camera system and software to capture images from print progress
- Synchronisation of cameras with printing hardware
- Image processing to extract depth and geometric information
- Development of temporal convolutional neural network to perform classification of faults

Data Scientist 2018–2019
Healthy Land and Water
Topic: Statistical modelling and prediction of Enterococci in recreational water sites using meteorological data
Roles:

- Collation of meteorological and physical data
- Design of boosted regression tree and neural network models to perform prediction
- Deploy model into interactive web application for client

Awards and Scholarships

Deans Commendation for Academic Excellence (QUT)	2014 – 2017
Supervisor Scholarship (QUT)	2016
Vacation Research Experience Scholarship (QUT)	2016
Student Vacation Research Scholarship (CSIRO)	2015

Publications

[1] R. Arablouei, E. Goan, S. Gensemer, and B. Kusy, "Fast and robust pushbroom hyperspectral imaging via DMD-based scanning," in *Novel Optical Systems Design and Optimization XIX* (A. J. Davis, C. F. Hahlweg, and J. R. Mulley, eds.), SPIE, September 2016.

[2] S. K. Sieberts, J. Schaff, M. Duda, B. Á. Pataki, M. Sun, P. Snyder, J.-F. Daneault, F. Parisi, G. Costante, U. Rubin, P. Banda, Y. Chae, E. C. Neto, R. Dorsey, Z. Aydın, A. Chen, L. L. Elo, C. Espino, E. Glaab, E. Goan, F. N. Golabchi, Y. Görmez, M. K. Jaakkola, J. Jonnagaddala, R. Klén, D. Li, C. McDaniel, D. Perrin, N. M. Rad, E. Rainaldi, S. Sapienza, P. Schwab, N. Shokhirev, M. S. Venäläinen, G. Vergara-Diaz, Y. Zhang, , Y. Wang, Y. Guan, D. Brunner, P. Bonato, L. M. Mangravite, and L. Omberg, "Crowdsourcing digital health measures to predict parkinson's disease severity: the parkinson's disease digital biomarker dream challenge," *bioRxiv*, 2020.

[3] E. Goan and C. Fookes, "Bayesian neural networks – an introduction and review," in *Case Studies in Applied Bayesian Data Science* (K. Mengersen, P. Pudlo, and C. Robert, eds.), p. to appear, Springer, 2020.

[4] P. Moghadam, D. Ward, E. Goan, S. Jayawardena, P. Sikka, and E. Hernandez, "Plant disease detection using hyperspectral imaging," DICTA, December 2017.

Conferences and Presentations

Poster presentation at Bayes on the Beach, Gold Coast, 2019. Presenting "Visualising Uncertainty within Convolutional Neural Networks"

Delegate for the Bayesian Statistics and Big Data for Social Good, Marseille, 2018. Presenting "Uncertainty within Neural Networks" at the *Centre International de Rencontres Mathématiques*.

Delegate for the Proceedings of SPIE, San Diego, 2016. Presenting "Fast and Robust Pushbroom Hyperspectral Imaging via DMD-Based Scanning" for *Novel Optical Systems Designs and Optimizations XIX*.

Co-author for work presented in poster session for the 4^{th} International Plant Phenotyping Symposium, Mexico, 2016. Poster "Exploring the potential of spectral reflectance for detection of organ and canopy properties in wheat" was presented by first author Fernanda Dreccer.

Delegate for the CSIRO Big Day Out Conference, Sydney, 2016, Presenting "Development of 2D Hyperspectral Imaging Device"

Professional Memberships and Associations

Australian Research Council Centre of Excellence for Mathematical and Statistical Frontiers	2018 – Present
IEEE Member	2016 – Present
IEEE Signal Processing Society	2016 – Present
IEEE Society on Social Implications of Technology	2016 – Present
Engineers Australia	2014 – Present

Employment History

Sessional Academic - (QUT) 2018–Present

Tutor for CAB420 – Machine Learning. Introducing the application of statistical concepts to machine learning problems. Emphasis is placed on fundamentals of a complete machine learning process, such as data collation and cleaning, dimensionality reduction, regression models, support vector machines, graphical models and neural networks.

Tutor for EGH404 – Research In Engineering Practice. Unit covers fundamental topics in statistical analysis and language concepts essential to modern engineering practice. Provides students with skills to identify research topics within an engineering context, how to investigate these topics and how to communicate research and development findings.

Tutor for IFB102 – Computer Technology Fundamentals. Unit provides students with a thorough introduction to the important concepts required to begin understanding and developing new computational technologies.

Machine Learning Engineer - (3D One) 2019–2020

Roles as described above in industry experience

Data Scientist - (CSIRO) 2018–2019

Roles as described above in industry experience

Research Assistant - (CSIRO) 2015–2018

Roles as described above in research experience

Student Note Taker - (QUT) 2016

Producing lecture notes for students with disabilities. Asked to fulfill the role of student note taker for ENB342 - Signals, Systems and Transforms based on academic performance in prerequisite unit

Academic References

Prof. Clinton Fookes
Professor at Queensland University of Technology
School of Electrical Engineering and Computer Science
Vision and Signal Processing
Email: c.fookes@qut.edu.au
Phone: 3138 2458

Dr. Dimitri Perrin
Lecturer at Queensland University of Technology
School of Electrical Engineering and Computer Science
Data Science
Email: dimitri.perrin@qut.edu.au
Phone: 3138 1923

Dr. Branislav Kusy
Team Leader at Commonwealth Scientific and Industrial Research Organisation
Pervasive Computing Team
Email: brano.kusy@data61.csiro.au
Phone: 0434 575 339

Dr. Stephen Gensemer
Optical Systems Team Leader at Commonwealth Scientific and Industrial Research Organisation
Manufacturing
Email: stephen.gensemer@csiro.au
Phone: 0424 240 031

Additional references can be made available upon request.