David Ryan

Curriculum Vitae

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Education

2013 **Ph.D (Computer Vision)**, *Queensland University of Technology*, Brisbane, Australia, *Thesis – Crowd Monitoring Using Computer Vision*.

2008 **B.Eng Hons (Electrical and Computer)**, *Queensland University of Technology*, Brisbane, Australia, *GPA – 6.5/7.0*.

Doctoral Thesis

Title *Crowd Monitoring Using Computer Vision*

Supervisors Professor Sridha Sridharan & Associate Professor Clinton Fookes & Dr Simon Denman

Description Novel computer vision algorithms have been developed for automatic crowd monitoring in multi-camera networks. These techniques enable crowd counting, crowd flow monitoring, queue monitoring and abnormal event detection.

Experience

2013–Present **Project Coordinator**, Image and Video Laboratory (QUT), Brisbane, Australia.

Designed and implemented new computer vision algorithms for crowd monitoring, anomaly detection and automatic camera calibration using pedestrian detection.

Detailed achievements:

- Large scale evaluation of computer vision algorithms for crowd monitoring.
- High quality journal article publications.
- Developed GUIs for end-users to use crowd monitoring algorithms.
- Provided academic supervision for researchers and students.
- Served on the review panel for PhD confirmation seminars and final defence seminars.

2012 **Researcher (Traffic Monitoring)**, Image and Video Laboratory (QUT), Australia.

Developed a traffic monitoring application using computer vision techniques. Feature point tracking was used to monitor vehicle throughput at intersections automatically.

2009–2013 **Ph.D Candidate**, Queensland University of Technology, Brisbane, Australia.

Developed novel computer vision algorithms for automatic crowd monitoring in multi-camera networks. These techniques enable crowd counting, crowd flow monitoring, queue monitoring and abnormal event detection.

Detailed achievements:

- Experience using image processing algorithms: camera calibration, adaptive background modelling, feature detection, optical flow, texture analysis, pedestrian detection.
- Implemented machine learning algorithms: Gaussian mixture models (GMM), hidden Markov models (HMM), Gaussian process regression (GPR), neural networks, support vector machines (SVM), decision trees, random forests.
- Live demos and oral presentations of research.

2008 **Software Testing**, Leica Geosystems, Australia.

- Created and executed software testing plans for a mining vehicle tracking application
- Liaised with software developers to resolve faults
- Developed test documentation for future evaluations

2008 **Tutor (Advanced Digital Design)**, QUT, Australia.

Instructed tutorial classes and marked assessments. Designed problem worksheets and solutions.

2006 **Sales Consultant**, Telstra, Australia.

Communicated with customers: sale of telecommunications products, handling enquiries, resolving disputes, provisioning of broadband and landline connections.

Projects

2009–2013 **Airports of the Future**, *Australian Research Council*, Linkage LP0990135, Project value $9M.

A multi-disciplinary international collaborative research project exploring the complexity of modern airports and addressing conflicts between aviation security and the passenger experience.

- Live trials of crowd counting and virtual gate technologies to monitor queue parameters in real-time.
- Deployed at Brisbane International Airport for Australian Customs and Border Protection Service

2010–2012 **Intelligent Surveillance Research for Crowd Monitoring and Event Detection**, *National Security Science and Technology Unit (NSST) of the Department of Prime Minister and Cabinet*, Research Support for Counter-Terrorism Program, Project value $795K.

A three-year project targeted towards addressing the "smart surveillance" requirements of the Counter Terrorism community by creating "smart spaces" consisting of a distributed visual surveillance system suitable for outdoor environments and crowded situations. The project addressed nine key milestones, of which I was responsible for: Crowd counting (Milestone 7), Multi-camera crowd counting (Milestone 8), Estimating Queue Parameters (Milestone 9).

Awards

2009–2013 Australian Postgraduate Award
ISI Top-Up Scholarship (Information Security Institute)

2005–2008 Dean's Scholars Award

2008 Undergraduate Prize (Defence Science and Technology Organisation - Intelligence, Surveillance and Reconnaissance Division)

2004 Gold Medallion - Dux of the College (Villanova College)

2004 Tertiary Entrance Statement - Overall Position (OP) 1

2004 Australian Student's Prize (awarded to top 500 students in Australia)

Computer skills

Languages C++, C, Python, MATLAB, Verilog, VHDL

Software Visual Studio, MATLAB, LaTeX, OpenCV

Environments Linux, Windows

Communication Skills

2009–2012 Oral Presentations at *The International Conference on Digital Image Computing: Techniques and Applications* (DICTA)

2011 Oral Presentation at *The 7th IEEE International Conference on Advanced Video and Signal-Based Surveillance* (AVSS)

2008 Oral Presentation at *2nd International Conference on Signal Processing and Communication Systems* (ICSPCS)

References

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Citation indices

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Publications

Journal articles

2014 **David Ryan**, Simon Denman, Clinton Fookes and Sridha Sridharan. An Evaluation of Crowd Counting Methods, Features and Regression Models. In *Computer Vision and Image Understanding*. Elsevier, 2014. (Accepted)

2013 **David Ryan**, Simon Denman, Sridha Sridharan and Clinton Fookes. Scene Invariant Multi Camera Crowd Counting. In *Pattern Recognition Letters*. Elsevier, 2013.

2013 Hajananth Nallaivarothayan, **David Ryan**, Simon Denman, Sridha Sridharan, Clinton Fookes and Andry Rakotonirainy. Detecting anomalous events at railway level crossings. In *Proceedings of the Institution of Mechanical Engineers, Part F: Journal of Rail and Rapid Transit*, 227(5), pp. 539-553.

Submitted **David Ryan**, Simon Denman, Sridha Sridharan and Clinton Fookes. Crowd Flow Monitoring Using Computer Vision: An Evaluation of Virtual Gate Algorithms. In *Image and Vision Computing journal*. Elsevier, 2014. (Submitted)

Book chapters

2012 **David Ryan**, Simon Denman, Sridha Sridharan and Clinton Fookes. Scene invariant crowd counting and crowd occupancy analysis. In *Video Analytics for Business Intelligence*, pages 161-198. Springer-Verlag, 2012.

Conference papers

2013 H. Nallaivarothayan, **D. Ryan**, S. Denman, S. Sridharan, Sridha, and C. Fookes. An evaluation of different features and learning models for anomalous event detection. In *Digital Image Computing: Techniques and Applications, 2013 International Conference on*, pages 1-8, 2013.

2013 S. Yang, E. Chung, M. Miska, **D. Ryan**, C. Fookes, S. Denman and S. Sridharan. An analysis of the KEEP CLEAR pavement markings effects on queuing vehicles dynamic performance at urban signalised intersections. In *Proceedings of the 36th Australasian Transport Research Forum (ATRF)*, pages 1-14, 2013.

2012 H. Nallaivarothayan, **D. Ryan**, S. Denman, S. Sridharan and C. Fookes. Anomalous event detection using a semi-two dimensional hidden markov model. In *Digital Image Computing Techniques and Applications, 2012 International Conference on*, pages 1-7, December 2012.

2011 **D. Ryan**, S. Denman, S. Sridharan, and C. Fookes. Scene invariant crowd counting. In *Digital Image Computing Techniques and Applications (DICTA), 2011 International Conference on*, pages 237-242, December 2011.

2011 **D. Ryan**, S. Denman, C. Fookes, and S. Sridharan. Textures of optical flow for real-time anomaly detection in crowds. In *Advanced Video and Signal-Based Surveillance (AVSS), 2011 8th IEEE International Conference on*, pages 230-235, September 2011.

2010 **D. Ryan**, S. Denman, C. Fookes, and S. Sridharan. Crowd counting using group tracking and local features. In *Advanced Video and Signal Based Surveillance (AVSS), 2010 Seventh IEEE International Conference on*, pages 218-224, September 2010.

2010 C. Fookes, S. Denman, R. Lakemond, **D. Ryan**, S. Sridharan, and M. Piccardi. Semi-supervised intelligent surveillance system for secure environments. In *Industrial Electronics (ISIE), 2010 IEEE International Symposium on*, pages 2815-2820, July 2010.

2009 **D. Ryan**, S. Denman, C. Fookes, and S. Sridharan. Crowd counting using multiple local features. *In Digital Image Computing: Techniques and Applications, 2009. DICTA '09.*, pages 81-88, December 2009.

2008 **D. Ryan**, S. Denman, C. Fookes, and S. Sridharan. Scene invariant crowd counting for real-time surveillance. In *Signal Processing and Communication Systems, 2008. ICSPCS 2008. 2nd International Conference on*, pages 1-7, December 2008.