Dushyant Rao

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Current position

Oxford Robotics Institute, University Of Oxford
Postdoctoral Research Associate, Jan 2016 - present
Research areas: Multimodal object detection, inverse reinforcement learning, end-to-end tracking with RNNs, adversarial learning, continual learning.
Responsibilities: assisting with supervision of students, setting and pursing research directions, industrial engagement and project work.

Education

University of Sydney
Ph.D., Faculty of Engineering and Information Technologies, 2016.
Thesis: "Multimodal learning from visual and remotely sensed data"
Fields: Machine Learning, Deep Neural Networks, Robotics
Australian Postgraduate Award and University of Sydney Merit Award

University of Illinois at Urbana-Champaign
M.S., Aerospace Engineering, 2012.
Thesis: "CurveSLAM: Utilising higher level structure in stereo vision-based navigation"
GPA: 3.95/4.0

University of Sydney
B.Eng. (Mechatronics - Space) / B. Sc. (Adv) (Nanoscience), 2009.
Thesis: "Path Planning for an underwater glider in ocean current fields"
Graduated with 1st Class Honours

Previous Positions

Australian Centre for Field Robotics, University of Sydney
Postgraduate Research Student, Jul 2012 - Dec 2015
Description: PhD research on multimodal deep learning from visual and sonar data for marine robotics applications
Responsibilities: Development and analysis of deep learning techniques, field work and deployment of marine platforms

Aerospace Robotics Lab, University of Illinois at Urbana-Champaign
Graduate Research Assistant, Aug 2010 - Jul 2012
Description: Master's thesis research on vision-based techniques for localisation of micro-aerial vehicles
Responsibilities: Algorithm development, aerial vehicle deployment and data collection, management of 2012 UAS challenge team

ResMed - Sydney, Australia
Research Engineer, Jan 2010 - Aug 2010
Description: Graduate position developing machine learning algorithms to detect anomalies in sleep apnea treatment
Responsibilities: Algorithm development, analysis of patient data

CSIRO - Brisbane, Australia
Research Intern, Dec 2008 - Feb 2009
Description: Research project on stereo vision-based detection and localisation
Responsibilities: Algorithm development, deployment of marine vehicles

Publications

Journal articles

D. Rao, M. De Deuge, N. Nourani-Vatani, S. B. Williams, and O. Pizarro, "Multimodal learning and inference from visual and remotely sensed data," *The International Journal of Robotics Research*, vol. 36, pp. 24 – 43, 2016

J. Dequaire, D. Rao, P. Ondruska, D. Wang, and I. Posner, "Deep tracking in the wild: End-to-end tracking using recurrent neural networks," *Accepted for publication in The International Journal of Robotics Research*, 2017

M. Wulfmeier, D. Rao, D. Wang, P. Ondruska, and I. Posner, "Large scale cost function learning for path planning using deep inverse reinforcement learning," *Accepted for publication in The International Journal of Robotics Research*, 2017

C. Gurău, D. Rao, C. H. Tong, and I. Posner, "Learn from experience: Probabilistic prediction of perception performance to avoid failure," *Accepted for publication in The International Journal of Robotics Research*, 2017

Conference papers

M. Engelcke, D. Rao, D. Z. Wang, C. H. Tong, and I. Posner, "Vote3Deep: Fast object detection in 3D point clouds using efficient convolutional neural networks," *Accepted for publication in IEEE International Conference on Robotics and Automation (ICRA)*, 2017

M. Lahijanian, M. Svorenova, A. A. Morye, D. Rao, I. Posner, P. Newman, H. Kress-Gazit, and M. Kwiatkowska, "Resource-performance trade-off analysis for mobile robot design," *Under review for IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2017

M. Wulfmeier, D. Rao, and I. Posner, "Incorporating human domain knowledge into large scale cost function learning," in *NIPS workshop on Deep Reinforcement Learning*, 2016

J. Dequaire, D. Rao, P. Ondruska, D. Wang, and I. Posner, "Deep tracking on the move: Learning to track the world from a moving vehicle using recurrent neural networks," *arXiv preprint arXiv:1609.09365*, 2016

D. Rao, A. Bender, S. B. Williams, and O. Pizarro, "Multimodal information-theoretic measures for autonomous exploration," in *IEEE International Conference on Robotics and Automation (ICRA)*, pp. 4230–4237, 2016

D. Rao, M. De Deuge, N. Nourani-Vatani, S. Williams, and O. Pizarro, "Multi-modality learning from visual and remotely sensed data," in *IROS Workshop on Alternative sensing for robot perception*, 2015

M. Bewley, N. Nourani-Vatani, D. Rao, B. Douillard, O. Pizarro, and S. B. Williams, "Hierarchical classification in AUV imagery," in *Field and Service Robotics*, pp. 3–16, 2015

D. Rao, M. De Deuge, N. Nourani-Vatani, B. Douillard, S. B. Williams, and O. Pizarro, "Multimodal learning for autonomous underwater vehicles from visual and bathymetric data," in *IEEE International Conference on Robotics and Automation (ICRA)*, pp. 3819–3825, 2014

D. Rao, S.-J. Chung, and S. Hutchinson, "CurveSLAM: An approach for vision-based navigation without point features," in *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pp. 4198–4204, 2012

J. Yang, D. Rao, S.-J. Chung, and S. Hutchinson, "Monocular vision based navigation in GPS-denied riverine environments," in *Infotech@ Aerospace 2011*, p. 1403, 2011

D. Rao and S. B. Williams, "Large-scale path planning for underwater gliders in ocean currents," in *Australasian Conference on Robotics and Automation (ACRA)*, 2009

Patents

M. Engelcke, D. Rao, D. Wang, C. H. Tong, and I. Posner, "A neural network and method of using a neural network to detect objects in an environment," Sep 2016. UK Patent App

D. Rao, J. P. Armitstead, and D. Ramanan, "Methods and devices with leak detection," July 2011. US Patent App. 13/812, 253

Teaching

Department of Engineering Science, University of Oxford
Tutor, 2016-present
Machine Learning (2 terms); Machine Learning Project, Mobile Robotics, Object-Oriented Programming in Python/C++, MATLAB (1 term each)

Dept of Aerospace, Mechanical, and Mechatronic Engineering, University of Sydney
Tutor, 2009, 2012-2015
Experimental Robotics, Control Systems Theory (2 semesters each); Introduction to Computing/MATLAB, Guidance and Control (1 semester each)

Department of Aerospace Engineering, University of Illinois at Urbana-Champaign
Teaching Assistant, 2010-2012
Senior design project: removal of space debris (2 semesters) and deep space manned mission (1 semester)

Awards

Australian Postgraduate Award, 2012-2015
University of Sydney Merit Award, 2012-2015
Research/Teaching Assistant Scholarship, University of Illinois, 2010-2012
Engineering Dean's List for High Academic Achievement – 2006-2009
CSIRO Summer Research Scholarship, 2008-09

Computing Skills

Languages: C/C++, Python, MATLAB/Octave, assembly languages, LaTeX
Operating systems: Linux (Ubuntu, Debian, SUSE, DSL), Mac OS X, Windows
Libraries/Other: STL/Boost, Tensorflow, Theano, GPU programming with OpenCL