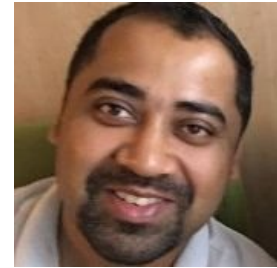


Thommen George Karimpanal



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Profile Summary

I am an Alfred Deakin Postdoctoral Research Fellow at the Applied Artificial Intelligence Institute at Deakin University, Australia. My current research focuses on context-aware training of reinforcement learning agents through human feedback, the autonomous inference of domain priors, as well as other mechanisms that contribute towards an agent's context-awareness.

Education

Doctor of Philosophy (2014-2019)

Engineering Product Development - Singapore University of Technology and Design

- Thesis title: *Towards Experience-Efficient Reinforcement Learning* (Supervised by Dr. Roland Bouffanais)
- **GPA:4.5/5**
- Visiting student at the Reinforcement Learning and Artificial Intelligence Laboratory (RLAI) at the University of Alberta (Jan-July, 2017) under the guidance of Dr. Richard Sutton
- Successfully completed the projects:
 - Optimal Path Planning of an Energy-Starved Micro-robot in a Known Environment
 - Environment Mapping and Path Planning Using a Mobile Micro-robot

Master of Science (2012-2013)

Mechatronics - National University of Singapore

- **GPA:4.25/5** (Ranked 2nd in a class of 21 students)
- Successfully completed the projects:
 - Neural Network based Automatic Waste Sorting – SmartBin
 - Face recognition using Neural Networks in MATLAB
 - Real time Speed and Position Control of a DC Motor using a Computer
 - Stepper Motor Interfacing and Control

Bachelor of Technology (2006-2010)

Mechanical Engineering - National Institute of Technology, Jalandhar, India

- **GPA: 8.05/10** (Ranked 5th in a class of 60 students)
- Final year major project - *Bond Graph Modeling and Simulation of the Dynamics of the Quick-Return Mechanism* (Supervised by Dr. Anand Vaz)

Academic Publications

- Buddhika Laknath Semage, **Thommen George Karimpanal**, Santu Rana, Svetha Venkatesh '*Fast Model-based Policy Search for Universal Policy Networks*' in International Conference on Pattern Recognition (ICPR), 2022 (accepted)
- Buddhika Laknath Semage, **Thommen George Karimpanal**, Santu Rana, Svetha Venkatesh '*Uncertainty Aware System Identification with Universal Policies*' in International Conference on Pattern Recognition (ICPR), 2022 (accepted)
- **Thommen George Karimpanal**, Hung Le, Majid Abdolshah, Santu Rana, Sunil Gupta, Truyen Tran, Svetha Venkatesh '*Reachability Traces for Curriculum Design in Reinforcement Learning*' (under review)
- Manisha Senadeera, **Thommen George Karimpanal**, Santu Rana, Sunil Gupta '*Sympathy based Reinforcement Learning*', Autonomous Agents and Multiagent Systems (AAMAS), 2022
- Hung Le, **Thommen George Karimpanal**, Majid Abdolshah, Truyen Tran, Svetha Venkatesh '*Model-Based Episodic Memory Induces Dynamic Hybrid Controls*', NeurIPS, 2021
- Majid Abdolshah, Hung Le, **Thommen George Karimpanal**, Sunil Gupta, Santu Rana, Svetha Venkatesh '*A New Representation of Successor Features for Transfer across Dissimilar Environments*', International Conference on Machine Learning (ICML), 2021
- **Thommen George Karimpanal**, Hung Le, Majid Abdolshah, Santu Rana, Sunil Gupta, Truyen Tran, Svetha Venkatesh '*Balanced Q-learning: Combining the Influence of Optimistic and Pessimistic Targets*', 2021 (Under review)
- Patrick Mannion, Fredrik Heintz, **Thommen George Karimpanal**, Peter Vamplew, '*Multi-Objective Decision Making for Trustworthy AI* in MODeM workshop, 2021
- Buddhika Laknath Semage, **Thommen George Karimpanal**, Santu Rana, Svetha Venkatesh, '*Intuitive Physics Guided Exploration for Sample Efficient Sim2real Transfer*, 2021 (Under Review)
- **Thommen George Karimpanal**, '*Intentionality in Reinforcement Learning*', 2021
- **Thommen George Karimpanal**, '*Neuro-evolutionary Frameworks for Generalized Learning Agents*', 2020
- **Thommen George Karimpanal**, Santu Rana, Sunil Gupta, Truyen Tran, Svetha Venkatesh, '*Learning Transferable Domain Priors for Safe Exploration in Reinforcement Learning*', International Joint Conference on Neural Networks, Glasgow, Scotland, July 2020.
- **Thommen George Karimpanal**, '*Towards Experience-Efficient Reinforcement Learning*', PhD thesis, Singapore University of Technology and Design, 2019
- **Thommen George Karimpanal**, Roland Bouffanais, '*Self-Organizing Maps for Storage and Transfer of Knowledge in Reinforcement Learning*', Adaptive Behavior, 2019
- **Thommen George Karimpanal**, '*A Self-Replication Basis for Designing Complex Agents*' In Proceedings of the Genetic and Evolutionary Computation Conference Companion (GECCO), July 15-19, 2018, pp. 45-46
- **Thommen George Karimpanal**, Roland Bouffanais, '*Self-Organizing Maps as a Storage and Transfer Mechanism in Reinforcement Learning*', ALA workshop, AAMAS, 14-15 July, 2018
- **Thommen George Karimpanal**, Roland Bouffanais, '*Experience Replay Using Transition Sequences*' Frontiers in Neurorobotics, 12 (2018) :32
- **Thommen George Karimpanal**, Erik Wilhelm, '*Identification and off-policy learning of multiple objectives using adaptive clustering*', Neurocomputing, Volume 263, 2017, Pages 39-47, ISSN 0925-2312, <http://dx.doi.org/10.1016/j.neucom.2017.04.074>
- **Thommen George Karimpanal**, Mohammadreza Chamanbaz, Wenzheng Li, Timothy Jeruzalski, Abhishek Gupta, Erik Wilhelm, '*Adapting Low-Cost Platforms for Robotics Research*' FinE-R Workshop Proceedings pp. 16-26., IROS, 2015

- **Thommen George Karimpanal**, Harit Maganlal Gadhia, Ruben S/O Sukumar, John-John Cabibihan, 'Sensing discomfort levels of standing passengers in public rail transportation systems through a smart phone' 10th IEEE International Conference on Control and Automation (IEEE ICCA 2013), HangZhou China, June 12-14, 2013, pp. 1509-1513
- **Thommen George Karimpanal**, Anand Vaz, 'Modeling and Simulation of the Dynamics of the Quick Return Mechanism: A Bond Graph Approach', in the Proceedings of 10th National Conference on Industrial Problems on Machines and Mechanisms (IPRoMM 2010), MNIT, Jaipur, Rajasthan, December 17-18,2010, paper No. IPRoMM 2010-34, p. 23-30

Other Academic Activities

Grant Writing:

- "Learning transferable domain priors for safe and efficient reinforcement learning", for the Alfred Deakin Postdoctoral Research Fellowship grant, 2020 (Successful)
Grant amount:A\$225000 approx., Role: Lead Investigator

Invited Talks:

- 'Deep Reinforcement Learning with applications to Transportation Systems', 178th Taoyaka Program Seminar, Hiroshima University, 26 November, 2021.
- 'Priors for Artificial Learning Agents', Postdoc Jam, 6 December, 2018, Singapore University of Technology and Design

Academic Services:

- Workshop chair, *Human-aligned Reinforcement Learning for Autonomous Agents and Robots*, Francisco Cruz, **Thommen George Karimpanal**, Miguel Solis, Pablo Barros, Richard Dazeley, at the IEEE International Conference on Development and Learning (ICDL), 2021, Beijing, China.
- *Guest editor* for special issue on Human-aligned reinforcement learning in Neural Computing and Applications (Springer), 2021
- Served as *Program Committee member*, AAAI (Association for the Advancement of Artificial Intelligence), (2021 & 2022) and Multi-Objective Decision Making Workshop (MODeM) 2021, Adaptive and Learning Agents (ALA) Workshop, 2022
- Served as a reviewer for ICML, AAAI, ICRA, PLOS ONE, Adaptive Behavior, IJCNN, ICPR, Neural Computing and Applications, ROSE, MRS, CoDIT

Academic Videos:

- 'What's so great about autonomous vehicles?', James Fu Guo Ming, Karl Damkjær Hansen, Riccardo Incaini, Volkan Sezer, Pedro Vaz Teixeira, Katarzyna Anna Marczuk, Scott Pendleton, Tawit Uthaicharoenpong, Marcello Scarnecchia, Chong Zhuang Jie, **Thommen George Karimpanal**, Valerio Varricchio, Qin Baoxing, Tirthankar Bandyopadhyay, Daniela Rus, Marcelo H. Jr Ang, Emilio Frazzoli :Presented at the AAAI Video Competition, 2014, Québec, Canada.

Teaching and Mentorship Experience

Teaching

- Graduate teaching assistant for the graduate course '30.501: Modeling of Multi-energy systems' during the period September-December, 2014
- Co-instructor and mentor for 7 multi-disciplinary teams for the two term undergraduate course '1.400 Capstone' during the period January-August, 2016

PhD (co-) supervision:

- Mr. Buddhika Laknath Semage, Thesis Topic: Learning physics based models for reinforcement learning, Deakin University
- Ms. Manisha Senadeera, (Thesis Topic: Empathy based models for reinforcement learning, Deakin University)
- Mr. Kishan Nagidrela (TBD)
- Mr. Maxence Hussonnois (TBD)

Honors project supervision:

- Bachelors Honors Project supervision: Mr. Duc Minh La, Reinforcement learning for robotics using UR5 (Since March 2021), Deakin University

Internship co-supervision:

- Mr. Surya Palaniswamy, Online Reinforcement Learning for Robotics Applications (Jan-Jul 2020), Deakin University
- Mr. Samuel Alexander, Reinforcement learning in multiagent scenarios using Duckietown (Jul 2019-Apr 2021), Deakin University

Others

- Panel Member for the confirmation of PhD candidatures of: Mr Gavan Bernard Muller (November, 2021), Mr. Trung Tin Pham (June, 2019), Mr. Dung Nguyen (November, 2019), Mr. Thao Le (November, 2019) at Deakin University
- Completed the *Fast Track Supervision training workshops* organized by the Graduate Research Academy at Deakin University (October 2019-July 2020)
- Actively participated in advertising and shortlisting PhD positions. Participated in more than 50 PhD interviews till date.

Employment History

Full-Time Engagements

Apr 2019 - Applied Artificial Intelligence Institute (A2I2), Deakin University, Australia
Till date *Alfred Deakin Postdoctoral Research Fellow, Reinforcement Learning*

- Lead high quality research projects in the area of safe/context-aware/human-aligned reinforcement learning
- Supervision of PhD students, Honors students and interns
- Grant writing for Human-aligned/context-aware reinforcement learning (Total grant procured as PI: A\$225000 approx.)
- Setting up the robotics laboratory
- Participate in recruitment process for PhD students and interns
- Delivering regular presentations to communicate state-of-the-art papers in reinforcement learning

Aug 2010 - Tata Motors Ltd., Pantnagar, Uttaranchal, India

Apr 2012 *Assistant Manager, Tool Engineering*

- Actively experienced job rotations in production, tool engineering (design and maintenance), customer service and material pricing functions of the company over a period of one year
- Designed and released a number of fixture designs and drawings using CATIA in the Tool Engineering Department
- Actively participated in Integrated Cost Reduction programs (for 'Magic Iris' and 'Ace Zip')
- Was selected to take part in the Kaizen event 'To Identify and Eliminate all Abnormalities from Every Stage of Main Line (Venture)', organized in TATA MOTORS, in association with Shingijutsu Global Consulting USA Inc., which has helped improve the production efficiency and quality

Part-Time Engagements

Aug - Singapore University of Technology and Design

Dec 2013 *Research Engineer at the Motion, Energy and Control (MEC) Lab*

- Exploring the applications of genetic programming for evolving the behavior and morphology of a swarm of micro-robots
- Design and development of the EvoBots, a micro-robotics platform intended for research in machine learning and evolutionary algorithms

May - Singapore-MIT Alliance for Research and Technology (SMART)

Jul 2013 *Graduate Student Researcher, Future Urban Mobility group*

- Worked on Autonomous Navigation (Mapping, Localization and path planning) for indoor environments as part of the Future Urban Mobility group.

Feb 2011 The Ann Foundation

Jul 2012 *Volunteer Design Consultant, United Nations online volunteer service*

- Worked as a part of 'The Wheelchair Design Team' along with volunteers from Bangladesh, USA and India
- Designed, fabricated and tested an inexpensive (under US\$100) wheelchair intended for use in developing nations

Internships and Professional Training

- Underwent a 'Value Engineering workshop' in Tata Motors in 2011
- Successfully completed a project in Mechanical Design at IDACS (Information Data Acquisition and Control Solutions), Bangalore during the period May-July, 2009
- Industrial training in Moog Controls (I) Pvt Ltd., Bangalore in June 2008

Scholarships and Awards

- Alfred Deakin Postdoctoral Research Fellowship, 2020 (total award amount ~A\$225000, including A\$15000 research support funding)
- Graduate Teaching Excellence Award, 2017, Singapore University of Technology and Design

- President's Graduate Fellowship - Awarded for the period 2014-2019 to pursue my doctoral studies at the Singapore University of Technology and Design (total award amount ~S\$200000)
- Awarded certificate of merit for proficiency in Physics for the year 2005, Christ PU College, Bangalore
- Awarded certificate of merit for proficiency in Physics for the year 2006, Christ PU College, Bangalore

Additional Skills

- **Computer software**

Python, Keras, Pytorch, OpenAI gym, MATLAB, CATIA, Autodesk Inventor, Latex, Lyx, git

- **Languages**

English, Hindi, Malayalam

Referees

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Name Anand Vaz
Company NIT Jalandhar, India
Position Professor
Contact anandvaz@nitj.ac.in

Name Svetha Venkatesh
Company Deakin University, Australia
Position Professor
Contact svetha.venkatesh@deakin.edu.au