Daniel **Selvaratnam**

Postdoctoral Scholar · Decision and Control Systems

School of Electrical Engineering and Computer Science

KTH Royal Institute of Technology, Malvinas Väg 10, 114 28 Stockholm, Sweden

selv@kth.se | www.kth.se/profile/selv/ | 0000-0003-3329-436X

Education

University of Melbourne

Parkville, VIC, Australia

Doctor of Philosophy, Electrical and Electronic Engineering — *Aug 2014 - Jan 2019*

- Contributions: time-varying convex optimisation with time-varying constraints, source localisation using single-bit measurements, connectivity-preserving control laws for multi-agent systems, security analysis of Bayesian estimators, SLAM
- Postgraduate coursework: Nonlinear Systems Theory, Linear Systems Theory, Advanced Topics in Engineering Mathematics, Introduction to Optimisation
- Thesis: *Efficient Algorithms for Autonomous Agents Facing Uncertainty*
- Supervised by Iman Shames, Jonathan Manton, and Branko Ristic

Monash University

Clayton, VIC, Australia

Bachelor of Aerospace Engineering (Hons.) — *Feb 2010 - July 2014*

- Graduated with H1 (first-class) honours, HD average
- Recognised in 2013 Faculty of Engineering Deans Honours List
- Final year project with Laboratory for Turbulence Research in Aerospace and Combustion (LTRAC)
- Achieved HD for thesis: *Statistical Analysis of the Streamwise-Spanwise Velocity Fields in a Turbulent Boundary Layer*

Melbourne High School

South Yarra, VIC, Australia

Victorian Certificate of Education — *Feb 2006 - Nov 2009*

- Subjects: Specialist Mathematics, Mathematical Methods, Physics, Chemistry, Biology, English
- Australian Tertiary Admission Rank (ATAR): 99.35

Employment

Academia

KTH Royal Institute of Technology

Stockholm, Sweden

Postdoctoral Scholar, Division of Decision and Control Systems, EECS — *Since August 2022*

- Topic: Secure control and estimation for networked cyber-physical systems
- RESili8 project: Strengthening resilience and security of electrical power distribution grid
- Industry collaborators include dLab, Austrian Institute of Technology, Weiner Netze, Solandeo, OFFIS
- PhD supervision of Kamil Hassan
- Supervised by Henrik Sandberg

University of Melbourne

Parkville, VIC, Australia

Postdoctoral Research Fellow in Autonomous Systems, Electrical and Electronic Engineering — *May 2020 - August 2022*

- Project: Trusted Autonomous Ground Vehicles for Electronic Warfare
- Focused on formal verification and control design under temporal logic specifications
- Funded via Defence Cooperative Research Centre on Trusted Autonomous Systems (TAS-DCRC)
- Partners: BAE Systems, DST Group, University of Adelaide
- Supervised by Chris Manzie

Inudstry

BAE Systems Australia

Richmond, VIC, Australia

Algorithm Engineer: Guidance, Navigation and Control (GNC) — *Oct 2018 - March 2020*

- Developed GNC algorithms for autonomous systems in the Aerospace & Defence industry
- Worked on simulation design and modelling of flight dynamics
- Responsible for verification and validation of system models

A. W. Bell

Dandenong South, VIC, Australia

Engineering Intern (Defence Engineering Internship Program) — *Nov 2012 - March 2013*

- Defence sponsored work placement co-ordinated by Defence Material Organisation (DMO) and AITEC
- Designed machine components using SolidWorks and AutoCAD and installed them on new machines
- Performed maintenance, modified electrical schematics and installed wiring on machines
- Designed and performed experiments on foundry ladle system to empirically model relationship between pouring angle and flow rate

Teaching

KTH Royal Institute of Technology
Stockholm, Sweden

EL2620 Nonlinear Control
Autumn, 2022 & 2023

- Graduate course for masters students
- Teaching assistant in autumn term of 2022 and 2023
- Lecturing duties: four 2h lectures on describing functions, stability of interconnections, sliding mode control, and nonlinear observers
- Other duties: conducting exercise and consultation sessions, writing and marking exam questions, correcting homework assignments

University of Melbourne
Parkville, VIC, Australia

ELEN30012 Signals and Systems
Semester 2, 2021

- Final-year undergraduate course
- Delivered three 1h lectures on the z-transform, transfer functions in the z-domain, and discrete-time approximations of continuous-time LTI systems, which were prepared from scratch.

Self-Employed
Glen Waverley, VIC, Australia

VCE Mathematics Tutor
April 2013 - March 2015

- Taught VCE Mathematical Methods and Specialist Mathematics to Y11-12 high school students

Academic Visits

Lund University
Lund, Sweden

Department of Automatic Control, Faculty of Engineering
Planned 16 April - 3 May, 2024

- Inivted visiting scholar to ELLIIT Symposium and Focus Period on Security and Fault Tolerance of Cyber-Physical Systems

Imperial College London
London, UK

Control and Power Group, Electrical and Electronic Engineering
19 Feb - 11 March, 2024

- Hosted by Prof. Thomas Parisini
- Topic: Fault localisation in infinite-dimensional dynamical systems

Austrian Institute of Technology
Vienna, Austria

Center for Energy
12-16 Feb, 2024

- Hosted by Dr. Filip Pröstl Andrén
- Topic: Resilient Control of Power Inverter Networks

KTH Royal Institute of Technology
Stockholm, Sweden

Department of Automatic Control
August 2016

- Hosted by Prof. Dimos Dimarogonas
- Topic: Connectivity-preserving control laws for multi-agent systems

Scholarships & Awards

Australian Postgraduate Award / Research Training Program Scholarship
VIC, Australia

Australian Government via University of Melbourne
Jan 2015 - Feb 2018

- $ 25 000 - $ 30 000 p.a. living allowance to support doctoral research

DSI PhD Support Grant
Carlton, VIC, Australia

Defence Science Institute (DSI)
April 2015 - April 2018

- $ 5 000 p.a. living allowance to support doctoral research

Melbourne School of Engineering Travelling Scholarship
Parkville, VIC, Australia

University of Melbourne
April 2016

- $ 1 250 for travel to Germany and Sweden

Scholarship (Project-Based) Funding Agreement
Fishermans Bend, VIC, Australia

Defence Science and Technology Group (DSTG)
April 2015

- $ 5 000 towards professional development and overseas travel

Dean's Honours List
Clayton, VIC, Australia

Monash University
2013

- Included in Faculty of Engineering 2013 Dean's Honours List for outstanding results.

Engineering Excellence Award
Clayton, VIC, Australia

Monash University
Feb 2010 - July 2014

- $ 6 000 p.a. towards undergraduate studies in engineering

Publications

Journal Papers

- M. Ramirez, D. Selvaratnam, and C. Manzie, "Kinodynamic Motion Planning via Branch-and-Cut over Probabilistic Roadmaps", to appear in *IEEE Robotics and Automation Letters*. doi: 10.1109/LRA.2023.3330050.
- D. Selvaratnam, M. Cantoni, J. M. Davoren, and I. Shames, "Sampling Polynomial Trajectories for LTL Verification", *Theoretical Computer Science*, vol. 897, pp. 135–163, Jan. 2022. doi: 10.1016/j.tcs.2021.10.024.
- I. Shames, D. D. Selvaratnam, and J. H. Manton, "Online Optimization Using Zeroth Order Oracles", *IEEE Control Systems Letters*, Vol. 4, No. 1, pp 31-36, 2020. doi: 10.1109/LCSYS.2019.2921593

Conference Proceedings

- D. Selvaratnam, A. Das, H. Sandberg, "Electrical Fault Localisation Over a Distributed Parameter Transmission Line," in *Proc. of the 62nd IEEE Conference on Decision and Control*, Singapore, December 13-15, 2023. doi: 10.1109/CDC49753.2023.10383452
- D. Selvaratnam, F. Farokhi, I. Shames, and H. Sandberg, "Manipulating the Posterior Support of a Discrete Bayesian Estimator Under Full Sensor Control," in *Proc. of the 22nd World Congress of the International Federation of Automatic Control*, Yokohama, July 9-14, 2023. doi: 10.1016/j.ifacol.2023.10.1577
- D. Selvaratnam, M. Cantoni, J. M. Davoren, and I. Shames, "MITL Verification Under Timing Uncertainty," in *Proc. of the 20th International Conference on Formal Modeling and Analysis of Timed Systems*, Warsaw, September 13-15, 2022. doi: 10.1007/978-3-031-15839-1_8
- D. D. Selvaratnam, I. Shames, J. H. Manton, M. Zamani, "Numerical Optimisation of Time-Varying Strongly Convex Functions Subject to Time-Varying Constraints", in *Proc. of the 57th IEEE Conference on Decision and Control (CDC)*, Fontainebleau, Miami Beach, FL, USA, December 17 - 19, 2018. doi: 10.1109/CDC.2018.8619392
- F. Farokhi, D. D. Selvaratnam, I. Shames, "Security Analysis of Quantized Bayesian Estimators", in *Proc. of the 23rd International Symposium on Mathematical Theory of Networks and Systems (MTNS)*, Hong Kong, July 16 - 20, 2018.
- D. D. Selvaratnam, I. Shames, D. V. Dimarogonas, J. H. Manton, and B. Ristic, "Co-operative Estimation for Source Localisation using Binary Sensors," in *Proc. of the 56th IEEE Conference on Decision and Control (CDC)*, Melbourne, VIC, Australia, December 2017. doi: 10.1109/CDC.2017.8263875
- B. Ristic, D. Angley, D. Selvaratnam, B. Moran and J. L. Palmer, "A random finite set approach to occupancy-grid SLAM," in *Proc. of the 19th International Conference on Information Fusion (FUSION)*, Heidelberg, Germany, July 2016.
- D. D. Selvaratnam, I. Shames, B. Ristic, and J. H. Manton, "The Effect of Sensor Modality on Posterior Cramer-Rao Bounds for Simultaneous Localisation and Mapping," in *Proc. of the 9th IFAC Symposium on Intelligent Autonomous Vehicles (IAV)*, Leipzig, Germany, July 2016. doi: 10.1016/j.ifacol.2016.07.746

Professional Development

Leadership in a Technological Environment Program

Clayton, VIC, Australia

Monash University

Feb 2010 - Nov 2012

- Selected for 3-year engineering leadership program
- Modules covered: personality typing, communication skills, critical thinking and problem solving, sustainability, people skills, ethics, innovation and entrepreneurship, globalisation, change management

Reviewer

Journals and conference proceedings

IEEE Conference on Control Technology and Applications, IEEE Open Journal of Control Systems, IFAC World Congress, Transactions on Automatic Control, IET Control Theory and Applications, Automatica, American Control Conference, Results in Control and Optimisation, UKACC Conference on Control, IFAC Conference on Modelling, Identification and Control of Nonlinear Systems, International Symposium on Distributed Autonomous Robotic Systems.

Invited Seminars

6 March 2024	**University of Oxford**, OXCAV, Department of Computer Science	*Oxford, UK*
15 Dec 2022	**Uppsala University**, Department of IT, Division of Systems and Control	*Uppsala, Sweden*
3 October 2022	**KTH Royal Institute of Tech.**, Division of Robotics, Perception and Learning	*Stockholm, Sweden*
20 July 2022	**Australian National University**, College of Engineering & Computer Science	*Canberra, ACT*
20 May 2022	**University of Pennsylvania**, GRASP Lab	*Online*
July 2019	**University of Oxford**, Oxford Control Group	*Oxford, UK*
July 2018	**Mathematical Theory of Networks and Systems**,	*Clear Water Bay, Hong Kong*
Feb 2018	**Australian Applied Dynamics Workshop**,	*Port Stephens, NSW*
Nov 2017	**Australian National University**, College of Engineering & Computer Science	*Canberra, ACT*
Aug 2016	**KTH Royal Institute of Technology**, Department of Automatic Control	*Stockholm, Sweden*
Aug 2015	**DST Group**, National Science Week	*Melbourne, VIC*

Service

10 July 2023	**Session Co-Chair**, Open Invited Session: Modeling and Design of Secure and Resilient Control Systems I, IFAC World Congress 2023	*Yokohama, Japan*
30 March 2023	**Organising Committee**, 2nd Stockholm Workshop on Emerging Topics in Systems and Control	*Stockholm, Sweden*
Dec 2017	**Conference Volunteer**, 56th IEEE Conference on Decision and Control	*Melbourne, VIC, Australia*

Professional Memberships

Since 2021	**HxA**, Member of Heterodox Academy
Since 2018	**CSS**, Member of IEEE Control Systems Society
Since 2014	**IEEE**, Member of Institute of Electrical and Electronics Engineers
Since 2013	**Engineers Australia**, Professional Member of Engineers Australia

Skills and Interests

Coding MATLAB, SIMULINK, Python, Mathematica, LaTeX

Sport Intermediate tennis player in University of Melbourne Internal Doubles Competition (2018)

Music Keyboardist for International Reformed Evangelical Church, Stockholm (since 2022), Chorister in The Royal Melbourne Philharmonic Choir (2019-2020), Violinist for Combined Colleges of Sri Lanka Choir (2017)