Kyle Robert **Harrison**

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Curriculum Vitae

Education

2018 **Doctor of Philosophy, Computer Science.** University of Pretoria, South Africa
Thesis: *An Analysis of Parameter Control Mechanisms for the Particle Swarm Optimization Algorithm*
◇ Externally funded by the Natural Sciences and Engineering Research Council of Canada (NSERC) and the Department of Science and Innovation (DSI) and Council for Scientific and Industrial Research (CSIR) of South Africa Inter-Bursary Support Grant (IBS).

2014 **Master of Science, Computer Science.** Brock University, Canada
Thesis: *Network Similarity Measures and Automatic Construction of Graph Models using Genetic Programming*
◇ Received the Governor General's Academic Gold Medal and the Distinguished Graduate Student in Computer Science awards.
◇ Externally funded by the Ontario Graduate Scholarship (OGS) in Science and Technology.

2012 **(Hons) Bachelor of Science, Computer Science.** Brock University, Canada
Thesis: *Knowledge Transfer Strategies for Vector Evaluated Particle Swarm Optimization*
◇ Graduated with first class honours.
◇ Completed a minor in mathematics.

Academic Experience

09/2019 – Present **Research Associate.** School of Engineering and Information Technology, UNSW Canberra, Australia.
◇ Intelligent algorithms for portfolio selection in future force design – a collaborative research with the Australian Department of Defence via the Defence Science & Technology Group

09/2020 – Present **Adjunct Assistant Professor.** Department of Computer Science, Brock University, Canada.

Various **Course Lecturer.** School of Engineering and Information Technology, UNSW Canberra, Australia.
◇ IT Project 2 (ZEIT3101) – 2020, 2021

01/2019 – 08/2019 **Postdoctoral Fellow.** Department of Electrical, Computer, and Software Engineering, University of Ontario Institute of Technology, Canada.
◇ Image-based visualization for large-scale global optimization
◇ Applied industry research involving machine learning and expensive optimization

Various **Sessional Lecturer.** Department of Computer Science, Brock University, Canada.
◇ Introduction to Media Computation (APCO 1P00) – 2018, 2019
◇ Computer Systems (COSC 2P13) – 2017
◇ Advanced Object-Oriented Programming (COSC 3P91) – 2016

Various **Invited Lectures.** Department of Computer Science, Brock University, Canada.
◇ Introduction to Artificial Intelligence (COSC 3P71) – 2013, 2016, 2017, 2018, 2020
◇ Evolutionary Computation (COSC 5P74) – 2017, 2018

Academic Experience (continued)

09/2012 – 12/2018 **Teaching Assistant.** Department of Computer Science, Brock University, Canada.
◇ Various roles for a wide variety of courses including course coordinator, tutorial leader, lab demonstrator, general teaching assistant, and marker-grader

Publications

Journal Articles

1 **K. R. Harrison**, A. A. Bidgoli, S. Rahnamayan and K. Deb, 'Image-based benchmarking and visualization for large-scale global optimization,' *Applied Intelligence*, In Press, 2021.

2 **K. R. Harrison**, S. M. Elsayed, I. Garanovich *et al.*, 'A hybrid multi-population approach to the project portfolio selection and scheduling problem for future force design,' *IEEE Access*, vol. 9, pp. 83 410–83 430, 2021.

3 **K. R. Harrison**, S. M. Elsayed, I. Garanovich *et al.*, 'Portfolio optimization for defence applications,' *IEEE Access*, vol. 8, no. 1, pp. 60 152–60 178, 2020.

4 **K. R. Harrison**, B. M. Ombuki-Berman and A. P. Engelbrecht, 'A parameter-free particle swarm optimization algorithm using performance classifiers,' *Information Sciences*, vol. 503, pp. 381–400, 2019.

5 **K. R. Harrison**, A. P. Engelbrecht and B. M. Ombuki-Berman, 'Self-adaptive particle swarm optimization: a review and analysis of convergence,' *Swarm Intelligence*, vol. 12, no. 3, pp. 187–226, 2018.

6 **K. R. Harrison**, A. P. Engelbrecht and B. M. Ombuki-Berman, 'Optimal parameter regions and the time-dependence of control parameter values for the particle swarm optimization algorithm,' *Swarm and Evolutionary Computation*, vol. 41, pp. 20–35, 2018.

7 M. Ventresca, **K. R. Harrison** and B. Ombuki-Berman, 'The bi-objective critical node detection problem,' *European Journal of Operational Research*, vol. 265, no. 3, pp. 895–908, 2018.

8 **K. R. Harrison**, A. P. Engelbrecht and B. M. Ombuki-Berman, 'Inertia weight control strategies for particle swarm optimization,' *Swarm Intelligence*, vol. 10, no. 4, pp. 267–305, 2016.

9 **K. R. Harrison**, M. Ventresca and B. M. Ombuki-Berman, 'A meta-analysis of centrality measures for comparing and generating complex network models,' *Journal of Computational Science*, vol. 17, no. 1, pp. 205–215, 2016.

Conference Proceedings

1 **K. R. Harrison**, S. Elsayed, R. A. Sarker, I. L. Garanovich, T. Weir and S. G. Boswell, 'Project Portfolio Selection with Defense Capability Options,' in *GECCO 2021 - Companion Publication of the 2021 Genetic and Evolutionary Computation Conference*, 2021, In Press.

2 **K. R. Harrison**, B. M. Ombuki-Berman and A. P. Engelbrecht, 'Visualizing and characterizing the parameter configuration landscape of particle swarm optimization using physical landform classification,' in *Proceedings of the 2021 IEEE Congress on Evolutionary Computation*, IEEE, 2021, In Press.

3 **K. R. Harrison**, S. Elsayed, I. Garanovich, T. Weir, R. Taylor and R. Sarker, 'An exploration of meta-heuristic approaches for the project portfolio selection and scheduling problem in a defence context,' in *Proceedings of the 2020 IEEE Symposium Series on Computational Intelligence*, IEEE, 2020, pp. 1395–1402.

4 **K. R. Harrison**, S. M. Elsayed, I. Garanovich *et al.*, 'Multi-period project selection and scheduling for defence capability-based planning,' in *Proceedings of the 2020 IEEE International Conference on Systems, Man, and Cybernetics*, IEEE, 2020, pp. 4044–4050.

5 **K. R. Harrison**, B. M. Ombuki-Berman and A. P. Engelbrecht, 'Visualizing and characterizing the parameter configuration landscape of differential evolution using physical landform classification,' in *Proceedings of the 2020 IEEE Symposium Series on Computational Intelligence*, IEEE, 2020, pp. 2437–2444.

6 **K. R. Harrison**, B. M. Ombuki-Berman and A. P. Engelbrecht, 'The parameter configuration landscape: A case study on particle swarm optimization,' in *Proceedings of the 2019 IEEE Congress on Evolutionary Computation*, IEEE, 2019, pp. 808–814.

7 **K. R. Harrison**, B. M. Ombuki-Berman and A. P. Engelbrecht, 'An analysis of control parameter importance in the particle swarm optimization algorithm,' in *Advances in Swarm Intelligence*, Y. Tan, Y. Shi and B. Niu, Eds., Springer International Publishing, 2019, pp. 93–105.

8 **K. R. Harrison**, B. M. Ombuki-Berman and A. P. Engelbrecht, 'Gaussian-valued particle swarm optimization,' in *Swarm Intelligence*, M. Dorigo, M. Birattari, C. Blum, A. L. Christensen, A. Reina and V. Trianni, Eds., Springer International Publishing, 2018, pp. 368–377.

9 **K. R. Harrison**, A. P. Engelbrecht and B. M. Ombuki-Berman, 'An adaptive particle swarm optimization algorithm based on optimal parameter regions,' in *Proceedings of the 2017 IEEE Symposium Series on Computational Intelligence*, IEEE, 2017, pp. 1–8.

10 **K. R. Harrison**, B. M. Ombuki-Berman and A. P. Engelbrecht, 'Optimal parameter regions for particle swarm optimization algorithms,' in *Proceedings of the 2017 IEEE Congress on Evolutionary Computation*, IEEE, 2017, pp. 349–356.

11 **K. R. Harrison**, A. P. Engelbrecht and B. M. Ombuki-Berman, 'The sad state of self-adaptive particle swarm optimizers,' in *Proceedings of the 2016 IEEE Congress on Evolutionary Computation*, IEEE, 2016, pp. 431–439.

12 **K. R. Harrison**, B. M. Ombuki-Berman and A. P. Engelbrecht, 'A radius-free quantum particle swarm optimization technique for dynamic optimization problems,' in *Proceedings of the 2016 IEEE Congress on Evolutionary Computation*, IEEE, 2016, pp. 578–585.

13 M. R. Medland, **K. R. Harrison** and B. M. Ombuki-Berman, 'Automatic inference of graph models for directed complex networks using genetic programming,' in *Proceedings of the 2016 IEEE Congress on Evolutionary Computation*, IEEE, 2016, pp. 2337–2344.

14 **K. R. Harrison**, B. M. Ombuki-Berman and A. P. Engelbrecht, 'The Effect of Probability Distributions on the Performance of Quantum Particle Swarm Optimization for Solving Dynamic Optimization Problems,' in *Proceedings of the 2015 IEEE Symposium Series on Computational Intelligence*, IEEE, 2015, pp. 242–250.

15 **K. R. Harrison**, M. Ventresca and B. M. Ombuki-Berman, 'Investigating Fitness Measures for the Automatic Construction of Graph Models,' in *Lecture Notes in Computer Science*, vol. 9028, Springer, 2015, pp. 189–200.

16 M. Ventresca, **K. R. Harrison** and B. M. Ombuki-Berman, 'An Experimental Evaluation of Multi-objective Evolutionary Algorithms for Detecting Critical Nodes in Complex Networks,' in *Lecture Notes in Computer Science*, vol. 9028, Springer, 2015, pp. 164–176.

17 **K. R. Harrison**, B. M. Ombuki-Berman and A. P. Engelbrecht, 'Dynamic multi-objective optimization using charged vector evaluated particle swarm optimization,' in *Proceedings of the 2014 IEEE Congress on Evolutionary Computation*, IEEE, 2014, pp. 1929–1936.

18 M. Medland, **K. R. Harrison** and B. Ombuki-Berman., 'Incorporating expert knowledge in object-oriented genetic programming,' in *GECCO 2014 - Companion Publication of the 2014 Genetic and Evolutionary Computation Conference*, 2014, pp. 145–146.

19 M. R. Medland, **K. R. Harrison** and B. M. Ombuki-Berman, 'Demonstrating the power of object-oriented genetic programming via the inference of graph models for complex networks,' in *Proceedings of the 2014 Sixth World Congress on Nature and Biologically Inspired Computing*, IEEE, 2014, pp. 305–311.

20 **K. R. Harrison**, A. P. Engelbrecht and B. M. Ombuki-Berman, 'A scalability study of multi-objective particle swarm optimizers,' in *Proceedings of the 2013 IEEE Congress on Evolutionary Computation*, IEEE, 2013, pp. 189–197.

21 **K. R. Harrison**, B. Ombuki-Berman and A. P. Engelbrecht, 'Knowledge Transfer Strategies for Vector Evaluated Particle Swarm Optimization,' in *Lecture Notes in Computer Science*, vol. 7811 LNCS, Springer, 2013, pp. 171–184.

Articles Under Review

1 **K. R. Harrison**, S. M. Elsayed, I. L. Garanovich, T. Weir, S. G. Boswell and R. A. Sarker, 'A new model for the project portfolio selection and scheduling problem with defence capability options,' in *Evolutionary and Memetic Computing for Project Portfolio Selection and Scheduling*, **K. R. Harrison**, S. M. Elsayed, I. L. Garanovich, T. Weir, S. G. Boswell and R. A. Sarker, Eds., Springer Nature Switzerland AG, 2021.

2 R. A. Sarker, **K. R. Harrison** and S. M. Elsayed, 'Evolutionary approaches for project portfolio optimization: An overview,' in *Evolutionary and Memetic Computing for Project Portfolio Selection and Scheduling*, **K. R. Harrison**, S. M. Elsayed, I. L. Garanovich, T. Weir, S. G. Boswell and R. A. Sarker, Eds., Springer Nature Switzerland AG, 2021.

Awards and Distinctions

2015 **Governor General's Academic Gold Medal**. Brock University

2015 **Distinguished Graduate Student Award, MSc in Computer Science**. Brock University

2009 – 2012 **Dean's Honours List**. Brock University

2008 **Entrance Scholarship**. Brock University. Renewed for 3 subsequent years.

Research Funding

2017, 2018 **Department of Science and Innovation (DSI) and Council for Scientific and Industrial Research (CSIR) of South Africa Inter-Bursary Support Grant (IBS)**. University of Pretoria. R240,000

2017, 2018 **University of Pretoria Doctoral Research Bursary**. University of Pretoria. R28,000

2015 – 2017 **Natural Sciences and Engineering Research Council of Canada (NSERC) Postgraduate Scholarship (PGS D)**. University of Pretoria. C$63,000

2013 – 2014 **Ontario Graduate Scholarship (OGS) in Science and Technology**. Brock University. C$15,000

2013 **Dean of Graduate Studies Spring Research Fellowship**. Brock Univeristy. C$3,000

Invited Talks

10/2020 **Intelligent Algorithms for Portfolio Selection in Future Force Design.** Modelling Complex Warfare (MCW) Strategic Research Initiatives (SRI) Symposium, Virtual Event (hosted in Canberra, Australia).

12/2019 **Defence Portfolio Optimization: An Overview.** Modelling Complex Warfare (MCW) Strategic Research Initiatives (SRI) Symposium, Australian National University, Canberra, Australia.

10/2017 **Adaptive Particle Swarm Optimization Based on Optimal Parameter Regions.** Ostrava/Zlin/UP Workshop on Computational Intelligence, VSB – Technical University of Ostrava, Ostrava, Czech Republic.

04/2017 **Automatic Inference of Graph Models for Weighted Complex Networks using Genetic Programming.** Mapping the New Knowledges Conference, Brock University, St. Catharines, Canada.

08/2013 **Dynamic Multi-Objective Optimization using Particle Swarms Inspired by Atomic Models.** Second Brock-Kobe Bilateral Workshop On Scientific Computation, Brock University, St. Catharines, Canada.

12/2012 **Knowledge Transfer Strategies for Vector Evaluated Particle Swarm Optimization.** Computational Intelligence Research Group (CIRG) Workshop, University of Pretoria, Pretoria, South Africa.

Industry Experience

04/2013 – 01/2015 **Research Associate.** Agriculture & Environment Innovation Centre, Niagara College, Niagara-on-the-lake, Canada.

◇ Developed a geomorphometry system that processed digital elevation models (DEMs) to determine various landform features including hydrological flow directions, watershed formations, and landform classifications.

◇ Developed a tool to optimize soil placement based on various landscape features.

◇ Developed a prototype radar prediction system.

07/2012 – 03/2013 **Research Associate.** Research and Innovation Department, Niagara College, Niagara-on-the-lake, Canada.

◇ Designed and developed a subscription management and delivery coordination system in collaboration with The Organic General Store.

Industry Experience (continued)

07/2011 – 03/2012 ■ **Research Assistant.** Department of Computer Science, Brock University, St. Catharines, Canada.
◇ Developed a prototype of an emotionally intelligent, educational math game software (now titled Prodigy) targeting students in grades 1–8.
◇ Federal Economic Development Agency for Southern Ontario (FedDev Ontario) project in collaboration with SMARTeacher Inc.

Other Scholarly Activities

External Examiner

2020 ■ Mitchell D. Clark (MSc), Brock University, Canada

Special Session (Conference) Organization

2021 ■ **Adaptive Evolutionary Computation and Swarm Intelligence Algorithms**, IEEE Congress on Evolutionary Computation (Accepted)
2019 ■ **Adaptive Swarm Intelligence Algorithms**, IEEE Congress on Evolutionary Computation
2017 ■ **Adaptive Swarm Intelligence Algorithms**, IEEE Swarm Intelligence Symposium

Conference Program Committees

■ IEEE Congress on Evolutionary Computation (CEC)
■ International Conference on Machine Learning, Optimization and Data Science (LOD)
■ The Genetic and Evolutionary Computation Conference (GECCO), ACO-SI track

Reviewer (Date of First Review)

2021 ■ IEEE International Conference on Systems, Man, and Cybernetics (SMC)
2020 ■ Memetic Computing (Q1 journal)
2019 ■ International Conference on Machine Learning, Optimization and Data Science (LOD)
2019 ■ IEEE Access (Q1 journal)
2019 ■ Swarm and Evolutionary Computation (Q1 journal)
2019 ■ The Genetic and Evolutionary Computation Conference (GECCO)
2019 ■ IEEE Congress on Evolutionary Computation (CEC)
2019 ■ Complexity (Q1 journal)
2018 ■ Journal of Computational and Applied Mathematics (Q2 journal)
2017 ■ Operational Research (Q1 journal)
2017 ■ IEEE Symposium Series on Computational Intelligence (SSCI)
2017 ■ IEEE Transactions on Emerging Topics in Computational Intelligence (Q1 journal)
2017 ■ Engineering Applications of Artificial Intelligence (Q1 journal)
2017 ■ IEEE Transactions on Evolutionary Computation (Q1 journal)
2016 ■ Swarm Intelligence (Q2 journal)
2016 ■ Soft Computing (Q2 journal)