

Steven James

✉ steven.james@wits.ac.za | 🏠 sdjames.me | 🎓 Google Scholar | ☎ 0000-0003-4366-4125

Education

PhD

UNIVERSITY OF THE WITWATERSRAND

- Thesis: Learning portable symbolic representations
- Supervisors: Prof Benjamin Rosman and Prof George Konidaris

2017 – 2021

Johannesburg, South Africa

MSc (Computer Science) with distinction

UNIVERSITY OF THE WITWATERSRAND

- Dissertation: The effect of simulation bias on action selection in Monte Carlo tree search
- Supervisors: Dr Pravesh Ranchod, Prof Benjamin Rosman and Prof George Konidaris

2014 – 2016

Johannesburg, South Africa

BScHons (Computer Science) with distinction

UNIVERSITY OF THE WITWATERSRAND

2013

Johannesburg, South Africa

BSc (Computer Science, Computational & Applied Mathematics) with distinction

UNIVERSITY OF THE WITWATERSRAND

2010 – 2012

Johannesburg, South Africa

Work Experience

School of Computer Science & Applied Mathematics, University of the Witwatersrand

July 2023 –

SENIOR LECTURER

- COMS1018A: Introduction to Algorithms & Programming ± 350 students
- COMS4033A: Artificial Intelligence ± 80 students
- Postgraduate supervision of PhD students 1 graduated, 3 in-progress
- Postgraduate supervision of MSc students 3 graduated, 10 in-progress
- Postgraduate supervision of Honours students 10 graduated
- First-year coordinator
- Postgraduate presentation coordinator
- Various MSc and PhD proposal defence panels
- Supervision of 3rd year software design projects
- Internal/external reviewer for MSc dissertations
- External PhD examiner
- Selection Committee Member for Schools of CSAM and SBS

School of Computer Science & Applied Mathematics, University of the Witwatersrand

January 2022 – June 2023

LECTURER

- COMS1018A: Introduction to Algorithms & Programming ± 350 students
- COMS3035A: Advanced Analysis of Algorithms ± 200 students
- Co-lecturer for COMS4061A: Reinforcement Learning ± 40 students
- Postgraduate supervision of PhD students 2 in-progress
- Postgraduate supervision of MSc students 3 graduated, 13 in-progress
- Postgraduate supervision of Honours students 18 graduated, 11 in-progress
- First-year coordinator
- Postgraduate presentation coordinator
- Computer Science tutor coordinator
- Competitive programming interest group coordinator
- Various MSc and PhD proposal defence panels
- Wits integrated experience (WIE)
- WRC-2 member
- Supervision of 3rd year software design projects
- Internal/external reviewer for MSc dissertations
- External PhD examiner

School of Computer Science & Applied Mathematics, University of the Witwatersrand

September 2017 – December 2021

ASSOCIATE LECTURER

- COMS1018A: Introduction to Algorithms & Programming ± 350 students
- COMS3035A: Advanced Analysis of Algorithms ± 200 students
- Co-lecturer for COMS4047A: Special Topics (Reinforcement Learning) ± 40 students
- Postgraduate supervision of MSc students 3 graduated
- Postgraduate supervision of Honours students 14 graduated
- Supervision of 3rd year software design projects
- First-year coordinator (since 2021)
- Postgraduate presentation coordinator
- Computer Science tutor coordinator
- Wits integrated experience in science (WIES)
- Competitive programming interest group coordinator
- Various MSc proposal defence panels
- Internal/external reviewer for MSc dissertations

School of Computer Science & Applied Mathematics, University of the Witwatersrand

January 2017 – September 2017

SESSIONAL LECTURER

- COMS1018A: Introduction to Algorithms & Programming ± 250 students

Touchsides, Johannesburg

2015 – 2016

ANDROID DEVELOPER

- Responsible for delivering Android applications related to the insurance industry, and integrating said applications into the existing backend and proprietary hardware systems.

Associated Computer Solutions, Johannesburg

2014 – 2017

DEVELOPER

- Part of a small R&D team responsible for rewriting components of an ERP suite, including replacing the existing Telnet connection to the server with SSL, as well as providing a mechanism for session recovery should the connection be lost. Also responsible for rewriting the entire front-end in JavaFX to be used on multiple platforms.

School of Computer Science, University of the Witwatersrand

2012 – 2014

TUTOR

- Responsible for setting and conducting tutorials and lab sessions as well as marking test scripts.

Academic Service and Memberships

ICRA@40 Africa, Johannesburg, South Africa

2024

LOCAL CHAIR

- For more information, see <https://icra40.ieee.org/icra-2024/icra40-africa/>

Bridging the Gap Between AI Planning and Reinforcement Learning Workshop @ ICAPS, Banff, Canada

2024

ORGANISER

- For more information, see <https://prl-theworkshop.github.io/prl2024-icaps/>

Neuro-Symbolic Agents Workshop, Macau

2023

ORGANISER

- For more information, see <https://nsa-wksp.github.io/>

Deep Learning IndabaX, Durban, South Africa

2019

ORGANISER

- For more information, see <https://indabax.co.za/archive/indabax2019/>

Membership

ASSOCIATION FOR THE ADVANCEMENT OF ARTIFICIAL INTELLIGENCE (AAAI)

2017 –

Journal and Conference Reviewing

2017 –

AREA CHAIR / ASSOCIATE EDITOR

- International Conference on Machine Learning (2025)
- Neural Information Processing Systems (2024)
- Reinforcement Learning Conference (2025)
- International Conference on Development and Learning (2025)

REVIEWER AND PROGRAMME COMMITTEE

• International Conference on Machine Learning	(2018, 2019, 2020, 2022, 2023, 2024)
• International Joint Conference on Artificial Intelligence	(2017, 2018)
• International Conference on Learning Representations	(2018, 2021)
• Neural Information Processing Systems	(2017, 2018, 2019, 2020, 2021, 2022, 2023)
• Reinforcement Learning Conference	(2024)
• International Conference On Autonomous Agents and Multi-Agent Systems	(2017)
• International Conference on Development and Learning	(2018)
• Conference on Robot Learning	(2019)
• International Conference on Robotics and Automation	(2019, 2020, 2022, 2023)
• IEEE Robotics and Automation Letters	(2020, 2021, 2023)
• Journal of AI Research	(2019, 2021, 2022, 2023)
• Elsevier Information Sciences	(2020, 2021)
• Humanoids	(2022)
• Southern African Conference for Artificial Intelligence Research	(2022, 2023, 2024)
• South African Institute for Computer Scientists and Information Technologists	(2022, 2023, 2024, 2025)
• South African Computing Journal	(2023)
• European Conference on Artificial Intelligence	(2023)
• Robotics: Science and Systems	(2024)

Funding and Grants

2024 – 2026	National Geographic , Level II Grant	\$100 000
2019 – 2021	NRF Thuthuka Grant , PhD track	± R687 000
2018 – 2020	Google Africa PhD Fellowship , in the domain of machine learning	\$30 000

Awards and Scholarships

2022	CS PhD Thesis Prize , awarded for the best PhD thesis in computer science
2018	Google Africa PhD Fellowship , in the domain of machine learning
2017	PV Tobias Educational Bursary , awarded to academically excellent candidates
2013	Chancellor's Gold Medal , most distinguished graduate of the year
2013	Samuel Goodman Memorial Medal , most distinguished Honours graduate in the Faculty of Science
2013	Liberty Life Gold Medal , outstanding performance in Computer Science Honours
2012	Liberty Life Gold Medal , outstanding performance in Computer Science III
2012	Computer Science School Prize , highest mark in Computer Science III
2011	Liberty Life Silver Medal , outstanding performance in Computer Science II
2011	Computer Science School Prize , highest mark in Computer Science II
2011	Computational & Applied Mathematics School Prize , outstanding achievement in Computational & Applied Mathematics II
2010	Liberty Life Bronze Medal , outstanding performance in Computer Science I
2010	Computer Science School Prize , highest mark in Computer Science I

Training

2021	SIMS Training
2019	Presented at PoT mini-symposium (STLC)
2018	Professionalisation of Teaching Course (STLC)
2018	Huawei Certified Network Associate (HCNA-Cloud Computing)
2016	Science Teaching & Learning Induction (STLC)

Select Presentations

ICBINB Workshop at RLC

IS THERE SAFETY IN (LARGE NEGATIVE) NUMBERS?

UMass Amherst

August 2024

IndabaX Sotuh Africa

CONCURRENT AND TEMPORAL COMPOSITION FOR ZERO-SHOT TRANSFER IN REINFORCEMENT LEARNING

University of the Witwatersrand

July 2024

Autonomy Talks

MULTITASK LEARNING WITH COMPOSITION

ETH Zürich

October 2023

IndabaX Uganda

LEARNING WITH REINFORCEMENT

Online

October 2022

Deep Learning Indaba

MONTE CARLO 101

Tunis, Tunisia

August 2022

IndabaX Namibia

PANEL DISCUSSION: CURRENT AND FUTURE RESEARCH IN MACHINE LEARNING

Online

October 2021

International Conference on Machine Learning

LEARNING PORTABLE REPRESENTATIONS FOR HIGH-LEVEL PLANNING

Online

July 2020

Lab Talk

LEARNING PORTABLE REPRESENTATIONS FOR HIGH-LEVEL PLANNING

MIT

June 2020

Publications

Peer-Reviewed Journals

- [1] G. Nangue Tasse, **S. James**, and B. Rosman. Composition and zero-shot transfer with lattice structures in reinforcement learning. *Journal of Artificial Intelligence Research*, 2025.
- [2] V. Cohen, G. Nangue Tasse, N. Gopalan, **S. James**, M. Gombolay, R. Mooney, and B. Rosman. Compositional instruction following with language models and reinforcement learning. *Transactions on Machine Learning Research*, 2024.
- [3] D. Torpey, M. Parkin, J. Alter, R. Klein, and **S. James**. MiDaS: a large-scale Minecraft dataset for non-natural image benchmarking. *Journal of Electronic Imaging*, 2024.
- [4] M. Beukman, M. Fokam, M. Kruger, G. Axelrod, M. Nasir, B. Ingram, B. Rosman, and **S. James**. Hierarchically composing level generators for the creation of complex structures. *IEEE Transactions on Games*, 2023.
- [5] A. Pacheck, **S. James**, G. Konidaris, and H. Kress-Gazit. Automatic encoding and repair of reactive high-level tasks with learned abstract representations. *The International Journal of Robotics Research*, 42(4-5):263–288, 2023.
- [6] N. Kooverjee, **S. James**, and T. Van Zyl. Investigating transfer learning in graph neural networks. *Electronics*, 11(8):1202, 2022.
- [7] A. Pretorius, E. Van Biljon, B. van Niekerk, R. Eloff, M. Reynard, **S. James**, B. Rosman, H. Kamper, and S. Kroon. If dropout limits trainable depth, does critical initialisation still matter? A large-scale statistical analysis on relu networks. *Pattern Recognition Letters*, 2020.

Peer-Reviewed Conferences

- [8] M. Nasir, **S. James**, and J. Togelius. GameTraversalBenchmark: evaluating planning abilities of large language models through traversing 2D game maps. In *Thirty-eighth Conference on Neural Information Processing Systems (Datasets and Benchmarks Track)*, 2024.
- [9] M. Nasir, S. Earle, J. Togelius, **S. James**, and C. Cleghorn. LLMatic: neural architecture search via large language models and quality diversity optimization. In *Genetic and Evolutionary Computation Conference*, 2024.
- [10] G. Nangue Tasse, D. Jarvis, **S. James**, and B. Rosman. Skill machines: temporal logic skill composition in reinforcement learning. In *International Conference on Learning Representations*, 2024.
- [11] M. Beukman, D. Jarvis, R. Klein, **S. James**, and B. Rosman. Dynamics generalisation via adaptive policies. In *Advances in Neural Information Processing Systems*, 2023.
- [12] E. Rosen, **S. James**, S. Orozco, V. Gupta, M. Merlin, S. Tellex, and G. Konidaris. Synthesizing navigation abstractions for planning with portable manipulation skills. In *7th Annual Conference on Robot Learning*, 2023.
- [13] N. Michlo, R. Klein, and **S. James**. Overlooked implications of the reconstruction loss for VAE disentanglement. In *Proceedings of the 32nd International Joint Conference on Artificial Intelligence*, 2023.
- [14] M. Nasir, M. Beukman, **S. James**, and C. Cleghorn. Augmentative topology agents for open-ended learning. In *Genetic and Evolutionary Computation Conference, Companion Volume*, 2023.
- [15] M. Beukman, C. Cleghorn, and **S. James**. Procedural content generation using neuroevolution and novelty search for diverse video game levels. In *Genetic and Evolutionary Computation Conference*, 2022.
- [16] N. Muir and **S. James**. Combining evolutionary search with behaviour cloning for procedurally generated content. In *Proceedings of 43rd Conference of the South African Institute for Computer Scientists and Information Technologists*, 2022.
- [17] **S. James**, B. Rosman, and G. Konidaris. Autonomous learning of object-centric abstractions for high-level planning. In *International Conference on Learning Representations*, 2022.
- [18] G. Nangue Tasse, **S. James**, and B. Rosman. Generalisation in lifelong reinforcement learning through logical composition. In *International Conference on Learning Representations*, 2022.
- [19] G. Nangue Tasse, **S. James**, and B. Rosman. A Boolean task algebra for reinforcement learning. In *Advances in Neural Information Processing Systems*, 2020.
- [20] **S. James**, B. Rosman, and G. Konidaris. Learning portable representations for high-level planning. In *International Conference on Machine Learning*, 2020.
- [21] M. Cockcroft, S. Mawjee, **S. James**, and P. Ranchod. Learning options from demonstration using skill segmentation. In *2020 International SAUPEC/RobMech/PRASA Conference*. IEEE, 2020.
- [22] N. Kooverjee, **S. James**, and T. Van Zyl. Inter- and intra-domain knowledge transfer for related tasks in deep character recognition. In *2020 International SAUPEC/RobMech/PRASA Conference*. IEEE, 2020.

- [23] K. Paupamah, **S. James**, and R. Klein. Quantisation and pruning for neural network compression and regularisation. In *2020 International SAUPEC/RobMech/PRASA Conference*. IEEE, 2020.
- [24] B. van Niekerk, **S. James**, A. Earle, and B. Rosman. Composing value functions in reinforcement learning. In *International Conference on Machine Learning*, pages 6401–6409, 2019.
- [25] **S. James**, G. Konidaris, and B. Rosman. An analysis of Monte Carlo tree search. In *Thirty-First AAAI Conference on Artificial Intelligence*, 2017.

Peer-Reviewed Workshops and Symposia

- [26] G. Nangue Tasse, T. Love, M. Nemecek, **S. James**, and B. Rosman. ROSARL: reward-only safe reinforcement learning. In *Reinforcement Learning Safety Workshop at RLC*, 2024.
- [27] S. Rosen, A. Mfougouon Njupoun, G. Nangue Tasse, **S. James**, and B. Rosman. Optimal task generalisation in cooperative multi-agent reinforcement learning. In *Coordination and Cooperation in Multi-Agent Reinforcement Learning Workshop at RLC*, 2024.
- [28] W. Hill, I. Liu, A. De Mello Koch, D. Harvey, N. Kumar, G. Konidaris, and **S. James**. MinePlanner: A benchmark for long-horizon planning in large Minecraft worlds. In *6th ICAPS Workshop on the International Planning Competition*, 2024.
- [29] T. Bester, G. Nangue Tasse, **S. James**, and B. Rosman. Counting reward automata: sample efficient reinforcement learning through the exploitation of reward function structure. In *Workshop on Neuro-Symbolic Learning and Reasoning in the Era of Large Language Models at AAAI*, 2024.
- [30] V. Cohen, G. Nangue Tasse, N. Gopalan, **S. James**, R. Mooney, and B. Rosman. End-to-end learning to follow language instructions with compositional policies. In *Workshop on Language and Robot Learning @ CORL*, 2022.
- [31] G. Nangue Tasse, D. Jarvis, **S. James**, and B. Rosman. Skill machines: Temporal logic composition in reinforcement learning. In *Lifelong Learning of High-level Cognitive and Reasoning Skills Workshop at IROS*, 2022.
- [32] M. Nasir, M. Beukman, **S. James**, and C. Cleghorn. Augmentative topology agents for open-ended learning. In *Lifelong Learning of High-level Cognitive and Reasoning Skills Workshop at IROS*, 2022.
- [33] T. Love, D. Jarvis, G. Nangue Tasse, B. Ingram, **S. James**, and B. Rosman. Facilitating safe sim-to-real through simulator abstraction and zero-shot task composition. In *Lifelong Learning of High-level Cognitive and Reasoning Skills Workshop at IROS*, 2022.
- [34] G. Nangue Tasse, **S. James**, and B. Rosman. World value functions: Knowledge representation for learning and planning. In *Bridging the Gap Between AI Planning and Reinforcement Learning Workshop at ICAPS*, 2022.
- [35] **S. James**, B. Rosman, and G. Konidaris. Learning abstract and transferable representations for planning. In *The Multi-disciplinary Conference on Reinforcement Learning and Decision Making*, 2022.
- [36] G. Nangue Tasse, **S. James**, and B. Rosman. World value functions: knowledge representation for multitask reinforcement learning. In *The Multi-disciplinary Conference on Reinforcement Learning and Decision Making*, 2022.
- [37] N. Michlo, D. Jarvis, R. Klein, and **S. James**. Accounting for the sequential nature of states to learn representations in reinforcement learning. In *The Multi-disciplinary Conference on Reinforcement Learning and Decision Making*, 2022.
- [38] M. Beukman, M. Mitchley, D. Wookey, **S. James**, and G. Konidaris. Adaptive online value function approximation with wavelets. In *The Multi-disciplinary Conference on Reinforcement Learning and Decision Making*, 2022.
- [39] G. Nangue Tasse, **S. James**, and B. Rosman. Generalisation in lifelong reinforcement learning through logical composition. In *Deep RL Workshop at NeurIPS*, 2021.
- [40] V. Cohen, G. Nangue Tasse, N. Gopalan, **S. James**, M. Gombolay, and B. Rosman. Learning to follow language instructions with compositional policies. In *AAAI Fall Symposium on AI for Human-Robot Interaction*, 2021.
- [41] **S. James**, B. Rosman, and G. Konidaris. Learning object-centric representations for high-level planning in Minecraft. In *Object-Oriented Learning: Perception, Representation, and Reasoning. Workshop at ICML*. 2020.
- [42] G. Nangue Tasse, **S. James**, and B. Rosman. Logical composition for lifelong reinforcement learning. In *4th Lifelong Learning Workshop at ICML*, 2020.
- [43] G. Nangue Tasse, **S. James**, and B. Rosman. A Boolean task algebra for reinforcement learning. In *Beyond “Tabula Rasa” in Reinforcement Learning: Agents that remember, adapt, and generalize. Workshop at ICLR*. 2020.
- [44] **S. James**, B. Rosman, and G. Konidaris. Learning to plan with portable symbols. In *ICML/IJCAI/AAMAS 2018 Workshop on Planning and Learning*, 2018.

- [45] B. van Niekerk, **S. James**, A. Earle, and B. Rosman. Will it blend? Composing value functions in reinforcement learning. In *The 2nd Lifelong Learning: A Reinforcement Learning Approach Workshop, FAIM*. 2018.
- [46] **S. James**. Learning portable symbolic representations. In *2018 IJCAI Doctoral Consortium*, 2018.
- [47] **S. James**, B. Rosman, and G. Konidaris. An investigation into the effectiveness of heavy rollouts in UCT. In *General Intelligence in Game-Playing Agents (GIGA’16) Workshop at IJCAI*, 2016.

Technical Reports and Theses

- [48] M. Beukman, **S. James**, and C. Cleghorn. Towards objective metrics for procedurally generated video game levels. *arXiv preprint arXiv:2201.10334*, 2022.
- [49] **S. James**. *Learning portable symbolic representations*. PhD thesis, University of the Witwatersrand, Johannesburg, South Africa, 2021.
- [50] C. Bester, **S. James**, and G. Konidaris. Multi-pass Q-networks for deep reinforcement learning with parameterised action spaces. *arXiv preprint arXiv:1905.04388*, 2019.
- [51] **S. James**. *The effect of simulation bias on action selection in Monte Carlo tree search*. Master’s thesis, University of the Witwatersrand, Johannesburg, South Africa, 2016.