Paulius Dilkas

Research Interests

- Model counting
- Knowledge compilation
- Probabilistic inference
- Logic and automated reasoning
- Experimental algorithmics

Education

2019–2023 **PhD in Robotics and Autonomous Systems**, *University of Edinburgh & Heriot-Watt University*, UK

Thesis: Generalising Weighted Model Counting (Supervisor: Vaishak Belle)

2014–2019 **MSci in Computing Science**, *University of Glasgow*, UK, Honours of the First Class

Research projects:

- Variational Inference for Inverse Reinforcement Learning with Gaussian Processes
  - Supervisor: Bjørn S. Jensen
- Algorithm Selection for Maximum Common Subgraph
  - Supervisors: Ciaran McCreesh and Patrick Prosser

Research Experience

2024–2025 **Postdoctoral Fellow**, *University of Toronto*, Canada, Supervisor: Kuldeep S. Meel

2024–2025 **Faculty Affiliate Researcher**, *Vector Institute*, Toronto, Canada

2022–2024 **Research Fellow**, *National University of Singapore*, Supervisor: Kuldeep S. Meel

Internships

2019 **Research Engineering Internship**, *University of Glasgow*, UK, Supervisor: Richard McCreadie

Developed a simulation engine for assessing distributed application performance on various cloud configurations.

2018 **Nondeterministic Bigraphical Reactive Systems for Markov Decision Processes**, *University of Glasgow*, UK, Supervisor: Michele Sevegnani

Extended the BigraphER tool to support Markov decision processes and implemented an interactive interface using Jupyter Notebooks.

2017 **Clique-Based Encodings for Graph Edit Distance**, *University of Glasgow*, UK, Supervisor: Ciaran McCreesh

Developed novel clique-based encodings for the graph edit distance problem and optimised algorithms for their solution.

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Teaching Experience

Supervision

2024 **Internship Supervisor**, *National University of Singapore*
- Project 1: Lifting the Unliftable: Combining First-Order and Propositional Model Counting
- Project 2: A Randomised Algorithm for Weighted First-Order Model Sampling
- Students: Harsh Jakhar and Sanskar Shaurya

2023 **Research Project Supervisor**, *IIT Bombay*, Mumbai, India
- Project: Combining First-Order and Propositional Model Counting
- Students: Ananth K. Kidambi and Guramrit Singh

2023 **Internship Supervisor**, *National University of Singapore*
- Project: Recursive Functions That Count
- Students: Ananth K. Kidambi and Guramrit Singh

Teaching

2019–2022 **Teaching Support**, *University of Edinburgh*, UK
- Discrete Mathematics and Mathematical Reasoning (a 2nd year course)
- Informatics Project Proposal (a postgraduate course)
- Introduction to Algorithms and Data Structures (a 2nd year course)
- Introduction to Computation (a 1st year course)
- Introduction to Software Engineering (a 2nd year course)
- Introduction to Theoretical Computer Science (a 3rd year course)
- Object Oriented Programming (a 1st year course)

2017–2019 **Demonstrator**, *University of Glasgow*, UK
- Artificial Intelligence (a 4th year course)
- Programming (a 1st year course)
- Systems Programming (a 3rd year course)

2012–2017 **Distance Learning Teacher (Mathematics)**, *National Student Academy*, Lithuania
Taught advanced mathematics to gifted 7th and 8th-grade students through distance learning programmes.

Papers

Refereed

[1] Ananth K. Kidambi, Guramrit Singh, **Paulius Dilkas**, and Kuldeep S. Meel. "Towards Practical First-Order Model Counting". In: *SAT*. Vol. 341. LIPIcs. Schloss Dagstuhl - Leibniz-Zentrum für Informatik, 2025, 6:1–6:19.

[2] **Paulius Dilkas**. "Generating Random Instances of Weighted Model Counting - An Empirical Analysis with Varying Primal Treewidth". In: *CPAIOR*. Vol. 13884. Lecture Notes in Computer Science. Springer, 2023, pp. 395–416.

[3] **Paulius Dilkas** and Vaishak Belle. "Synthesising Recursive Functions for First-Order Model Counting: Challenges, Progress, and Conjectures". In: *KR*. 2023, pp. 198–207.

[4] **Paulius Dilkas** and Vaishak Belle. "Weighted Model Counting with Conditional Weights for Bayesian Networks". In: *UAI*. Vol. 161. Proceedings of Machine Learning Research. AUAI Press, 2021, pp. 386–396.

[5] **Paulius Dilkas** and Vaishak Belle. "Weighted Model Counting Without Parameter Variables". In: *SAT*. Vol. 12831. Lecture Notes in Computer Science. Springer, 2021, pp. 134–151.

[6] **Paulius Dilkas** and Vaishak Belle. "Generating Random Logic Programs Using Constraint Programming". In: *CP*. Vol. 12333. Lecture Notes in Computer Science. Springer, 2020, pp. 828–845.

Preprints

[7] Jonathan Feldstein, **Paulius Dilkas**, Vaishak Belle, and Efthymia Tsamoura. "Mapping the Neuro-Symbolic AI Landscape by Architectures: A Handbook on Augmenting Deep Learning Through Symbolic Reasoning". In: *CoRR* abs/2410.22077 (2024).

Presentations

Plenary

2023 **Model Counting: Logic, Probability, Combinatorics, and Recursion**, *Meeting of Early Career Mathematicians*, Vilnius, Lithuania

Invited

2023 **Synthesising Recursive Functions for First-Order Model Counting**, *Computer Science Research Institute of Lens*, France

2023 **Synthesising Recursive Functions for First-Order Model Counting**, *The Declarative Languages and AI Section of Computer Science*, KU Leuven, Belgium

2020 **Generating Random Logic Programs Using Constraint Programming**, *Formal Analysis, Theory and Algorithms Research Section*, University of Glasgow, UK

Workshop

2022 **Generating Random Weighted Model Counting Instances: An Empirical Analysis with Varying Primal Treewidth**, *Workshop on Counting and Sampling*, Haifa, Israel

2022 **Recursive Solutions to First-Order Model Counting**, *Workshop on Counting and Sampling*, Haifa, Israel

2021 **Generating Random Logic Programs Using Constraint Programming**, *Third International Workshop on Formal Methods in AI*, Online

2019 **Maximum Common Subgraph: Algorithms and Algorithm Portfolios**, *Meeting of Early Career Mathematicians*, Kaunas, Lithuania

Awards

2023 Best UAI Reviewers

2019 EPSRC CDT Scholarship in Robotics and Autonomous Systems

2016, 2017, 2019 Class Prizes

2017, 2018 EPSRC Vacation Scholarships

2018 Level 4 Project with Best Product

2015 Best Overall Performance in Assessed Coursework in Level 1 Computing Science

2015 Lorimer Bursary Prize

Professional Service

Co-organising

2025 **International Workshop on Counting, Sampling, and Synthesis**, Glasgow, UK

2024 **International Workshop on Counting, Sampling, and Synthesis**, Pune, India

2023–2024 **AlgoTheory Seminar**, *National University of Singapore*

Reviewing

2023–Present **Reviewer**, *AIJ 2023, IJCAR 2024, JAIR 2023–24, KR 2023*

2021–Present **Program Committee Member**, *AAAI 2023–25, ECAI 2024–25, UAI 2021–25*

Miscellaneous

2023 **Session Chair**, *CPAIOR*, Nice, France

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