DJORDJE ZIKELIC (ĐORĐE ŽIKELIĆ)

PERSONAL INFORMATION

Email: dzikelic@smu.edu.sg
Website: https://djordjezikelic.github.io/

CURRENT POSITION

Singapore Management University *Jan 2024 - Present*
School of Computing and Information Systems (SCIS)
Assistant Professor of Computer Science

EDUCATION

Institute of Science and Technology Austria (ISTA) *2018 - 2023*
Ph.D. in Computer Science
Advisors: Krishnendu Chatterjee, Petr Novotný
Thesis: *Automated Verification and Control of Infinite State Stochastic Systems*
Outstanding PhD Thesis 2024 and **Outstanding Scientific Achievement 2023** awards

University of Cambridge, UK *2014 - 2018*
Mathematical Tripos, Gonville & Caius College
Bachelor of Arts (BA) and Master of Mathematics (MMath)
Part III essay: *Lagrangians of Hypergraphs*

Mathematical Grammar School, Belgrade, Serbia *2010 - 2014*

PRIOR EMPLOYMENT

Amazon, UK *Aug 2022 - Oct 2022*
Applied Scientist Intern
Team: Prime Video Automated Reasoning
Project: On-line Automated Threshold Analysis for Time-series Anomaly Detection

Amazon, UK (virtual) *Oct 2020 - Jan 2021*
Applied Scientist Intern
Team: Prime Video Automated Reasoning
Project: Differential Cost Analysis in Programs
Results featured in the **Amazon Science blog**, invited for presentation at the **Infer Practitioners Workshop 2021** organized by Meta and published at **PLDI 2022**, the premier venue in programming languages research.

PUBLICATIONS

* equal contribution, † authors ordered alphabetically

Conference proceedings
(26 in total, 18 A*, 6 A, 1 B according to CORE conference rankings)

1. *Sound and Complete Witnesses for Template-based Verification of LTL Properties on Polynomial Programs.*
   Krishnendu Chatterjee, Amir Kafhsdar Goharshady, Ehsan Kafshdar Goharshady, Mehrdad Karrabi, Đorđe Žikelić†.
   27th International Symposium on Formal Methods (**FM 2024**)

2. *Certified Policy Verification and Synthesis for MDPs under Distributional Reach-Avoidance Properties.*
   S. Akshay, Krishnendu Chatterjee, Tobias Meggendorfer, Đorđe Žikelić†.
   33rd International Joint Conference on Artificial Intelligence (**IJCAI 2024**)

3. *Solving Long-run Average Reward Robust MDPs via Stochastic Games.*
   Krishnendu Chatterjee, Ehsan Kafshdar Goharshady, Mehrdad Karrabi, Petr Novotný, Đorđe Žikelić†.
   33rd International Joint Conference on Artificial Intelligence (**IJCAI 2024**)

4. *Equivalence and Similarity Refutation for Probabilistic Programs.*
   Krishnendu Chatterjee, Ehsan Kafshdar Goharshady, Petr Novotný, Đorđe Žikelić†.
   46th ACM SIGPLAN Conference on Programming Language Design and Implementation (**PLDI 2024**)

5. *Fully Automated Selfish Mining Analysis in Efficient Proof Systems Blockchains.*
   Krishnendu Chatterjee, Amirali Ebrahim-Zadeh, Mehrdad Karrabi, Krzysztof Pietrzak, Michelle Yeo, Đorđe Žikelić†.
   43rd ACM Symposium on Principles of Distributed Computing (**PODC 2024**)
6. *Quantitative Bounds on Resource Usage of Probabilistic Programs.*
   Krishnendu Chatterjee, Amir Kafshdar Goharshady, Tobias Meggendorfer, Đorđe Žikelić†.
   ACM Conference on Object-Oriented Programming, Systems, Languages, and Applications (**OOPSLA 2024**)
7. *Compositional Policy Learning in Stochastic Control Systems with Formal Guarantees.*
   Đorđe Žikelić*, Mathias Lechner*, Abhinav Verma, Krishnendu Chatterjee, Thomas A. Henzinger.
   37th Conference on Neural Information Processing Systems (**NeurIPS 2023**)
8. *Learning Provably Stabilizing Neural Controllers for Discrete-Time Stochastic Systems.*
   Matin Ansaripour, Krishnendu Chatterjee, Thomas A. Henzinger, Mathias Lechner, Đorđe Žikelić†.
   21st International Symposium on Automated Technology for Verification and Analysis (**ATVA 2023**)
9. *Reachability Poorman Discrete-Bidding Games.*
   Guy Avni, Tobias Meggendorfer, Suman Sadhukhan, Josef Tkadlec, Đorđe Žikelić†.
   26th European Conference on Artificial Intelligence (**ECAI 2023**)
10. *MDPs as Distribution Transformers: Affine Invariant Synthesis for Safety Objectives.*
    S. Akshay, Krishnendu Chatterjee, Tobias Meggendorfer, Đorđe Žikelić†.
    35th International Conference on Computer Aided Verification (**CAV 2023**)
11. *A Learner-Verifier Framework for Neural Network Controllers and Certificates of Stochastic Systems.* (invited)
    Krishnendu Chatterjee, Thomas A. Henzinger, Mathias Lechner, Đorđe Žikelić†.
    29th International Conference on Tools and Algorithms for the Construction and Analysis of Systems (**TACAS 2023**)
12. *Learning Control Policies for Stochastic Systems with Reach-avoid Guarantees.*
    Đorđe Žikelić*, Mathias Lechner*, Krishnendu Chatterjee, Thomas A. Henzinger.
    37th AAAI Conference on Artificial Intelligence (**AAAI 2023**), **oral presentation**
13. *Quantization-aware Interval Bound Propagation for Training Certifiably Robust Quantized Neural Networks.*
    Mathias Lechner, Đorđe Žikelić, Krishnendu Chatterjee, Thomas A. Henzinger, Daniela Rus.
    37th AAAI Conference on Artificial Intelligence (**AAAI 2023**), **oral presentation**
14. *Bidding Graph Games with Partially-Observable Budgets.*
    Guy Avni, Ismaël Jecker, Đorđe Žikelić†.
    37th AAAI Conference on Artificial Intelligence (**AAAI 2023**), **oral presentation**
15. *Algorithms and Hardness Results for Computing Cores of Markov Chains.*
    Ali Ahmadi, Krishnendu Chatterjee, Amir Kafshdar Goharshady, Tobias Meggendorfer, Roodabeh Safavi, Đorđe Žikelić†.
    42nd IARCS Annual Conference on Foundations of Software Technology and Theoretical Computer Science (**FSTTCS 2022**)
16. *Sound and Complete Certificates for Quantitative Termination Analysis of Probabilistic Programs.*
    Krishnendu Chatterjee, Amir Kafshdar Goharshady, Tobias Meggendorfer, Đorđe Žikelić†.
    34th International Conference on Computer Aided Verification (**CAV 2022**)
17. *Differential Cost Analysis with Simultaneous Potentials and Anti-potentials.*
    Đorđe Žikelić, Bor-Yuh Evan Chang, Pauline Bolignano, Franco Raimondi.
    44th ACM SIGPLAN Conference on Programming Language Design and Implementation (**PLDI 2022**)
    Featured in the Amazon Science blog
18. *Stability Verification in Stochastic Control Systems via Neural Network Supermartingales.*
    Mathias Lechner*, Đorđe Žikelić*, Krishnendu Chatterjee, Thomas A. Henzinger.
    36th AAAI Conference on Artificial Intelligence (**AAAI 2022**), **oral presentation**
19. *Infinite Time Horizon Safety of Bayesian Neural Networks.*
    Mathias Lechner*, Đorđe Žikelić*, Krishnendu Chatterjee, Thomas A. Henzinger.
    35th Conference on Neural Information Processing Systems (**NeurIPS 2021**)
20. *On Lexicographic Proof Rules for Probabilistic Termination.*
    Krishnendu Chatterjee, Ehsan Kafshdar Goharshady, Petr Novotný, Jiří Zárevúcky, Đorđe Žikelić†.
    24th International Symposium on Formal Methods (**FM 2021**)
    Invited to the Special Collection from FM 2021, dedicated to best papers

21. *Proving Non-termination by Program Reversal.*
Krishnendu Chatterjee, Ehsan Kafshdar Goharshady, Petr Novotný, Đorđe Žikelić†.
43rd ACM SIGPLAN Conference on Programming Language Design and Implementation (**PLDI 2021**)
22. *Scalable Verification of Quantized Neural Networks.*
Thomas A. Henzinger, Mathias Lechner, Đorđe Žikelić†.
35th AAAI Conference on Artificial Intelligence (**AAAI 2021**)
23. *Infinite-Duration All-Pay Bidding Games.*
Guy Avni, Ismaël Jecker, Đorđe Žikelić†.
ACM-SIAM Symposium on Discrete Algorithms (**SODA 2021**)
24. *Bidding Mechanisms in Graph Games.*
Guy Avni, Thomas A. Henzinger, Đorđe Žikelić†.
44th International Symposium on Mathematical Foundations of Computer Science (**MFCS, 2019**)
25. *Optimizing Expectation with Guarantees in POMDPs.*
Krishnendu Chatterjee, Petr Novotný, Guillermo A. Perez, Jean-Francois Raskin, Đorđe Žikelić†.
31st AAAI Conference on Artificial Intelligence (**AAAI, 2017**)
26. *Stochastic invariants for probabilistic termination.*
Krishnendu Chatterjee, Petr Novotný, Đorđe Žikelić†.
44th ACM SIGPLAN Symposium on Principles of Programming Languages (**POPL, 2017**)

Journal publications

1. *On Lexicographic Proof Rules for Probabilistic Termination.*
Krishnendu Chatterjee, Ehsan Kafshdar Goharshady, Petr Novotný, Jiři Zárevúcky, Đorđe Žikelić†.
Formal Aspects of Computing, Vol. 35, Issue 2 (**FAC 2023**)
2. *Social balance on networks: Local minima and best-edge dynamics.*
Krishnendu Chatterjee, Jakub Svoboda, Đorđe Žikelić, Andreas Pavlogiannis, Josef Tkadlec.
Physical Review E, Vol. 106, No. 3 (**PRE 2022**)
3. *Bidding Mechanisms in Graph Games.*
Guy Avni, Thomas A. Henzinger, Đorđe Žikelić†.
Journal of Computer and System Sciences, Vol. 119 (**JCSS, 2021**)
4. *Theorems about quadrilaterals and conics.*
Đorđe Baralić, Branko Grbić, Đorđe Žikelić†.
International Journal of Computer Mathematics 91 (7) (**Int. J. Comput. Math., 2014**)

Workshop publications

1. *Learning Stabilizing Policies in Stochastic Control Systems.*
Đorđe Žikelić*, Mathias Lechner*, Krishnendu Chatterjee, Thomas A. Henzinger.
ICLR 2022 Workshop on Socially Responsible Machine Learning (**SRML@ICLR 2022**)

HONOURS AND AWARDS

Outstanding PhD Thesis *2024*
Awarded annually for best PhD theses by the Institute of Science at Technology Austria.

Outstanding Scientific Achievement *2023*
Together with Mathias Lechner, for our work on developing a framework for learning and verifying neural controllers in stochastic dynamical systems. Awarded annually by the Institute of Science at Technology Austria.

Meta PhD Research Fellowship - finalist *2022*
Shortlisted as one of the 4 finalists for the programming languages category.

Gonville & Caius College Scholarship and **Cambridge Trust Scholarship** *2014-2018*
Full university fees, tuition fees, and maintenance costs.

Stephen Hawking Fund Award *2017*
Awarded by Gonville & Caius College, Cambridge to mathematics students proceeding to Part III.

Scholar of the Gonville & Cauis College, Cambridge *2015, 2016*
High performance in the examinations of the Mathematical Tripos.

International High School Olympiads *2010-2014*

Participated in international high school olympiads in mathematics, physics, and astronomy. Most notable results:

- International Olympiad in Astronomy and Astrophysics (IOAA) 2014 (bronze medal)
- International Mathematical Competition Arhimede 2013 (gold medal), 2012 (silver medal)
- International Junior Science Olympiad (IJSO) 2010 (bronze medal)
- International Astronomy Olympiad (IAO) 2010 (bronze medal)
- International Mathematical Olympiad (IMO) 2014 (first reserve for the Serbian team)

National High School Competitions *2010-2014*

- Serbian Mathematical Olympiad: second prize in 2014, third prize in 2013, 2012
- Mathematics (national): **first overall** in my year in 2014, 2012, 2010, **second overall** in 2013
- Physics (national): first prize in 2013, second prize in 2012, 2011, third prize in 2014
- Astronomy (national): second prize in 2014, 2012

GRANTS

- *Formal Methods for Safe and Trustworthy Probabilistic Systems* *2023*
  SMU Internal Grant, Ministry of Education (MOE) Tier 1, PI (Project Level): S$90,244

TEACHING

Teaching at SMU

- CS423: Heuristic Search and Optimisation *Term 2, 2024*
  Overall course rating: **6.6/7**
  Overall instructor rating: **6.8/7** (highest student rating across all non-compulsory courses in the School)

Teaching at ISTA

- Computer Science Track Core Course, TA *Spring, 2021*
- Formal Methods, TA *Spring, 2020*
- Computer Science Track Core Course, TA *Spring, 2020*
- Mathematics Track Core Course, 4 lectures on Brownian motion and aspects of probability *Spring, 2019*

SUPERVISION

Supervision of visiting students and interns at SMU

- Pouya Sadeghi, University of Tehran *Aug 2024 - Feb 2024*
  Learning-based Control with Guarantees
- Ouldouz Neysari, University of Tehran *Jul 2024 - Jan 2025*
  Policy Verification and Synthesis in MDPs for Distributional Properties
- Maaruni Pandithurai, SMU *May 2024 - Jul 2024*
  Safe Reinforcement Learning under Probabilistic Constraints
- Sarah Ann Hogan, SMU *May 2024 - Jul 2024*
  Safe Reinforcement Learning under Probabilistic Constraints

Supervision of interns at ISTA

- Amirali Ebrahim-zadeh, Sharif University *Summer 2022*
  Analyzing Selfish Mining in Proof of Space-based Blockchain Protocols (PODC 2024)
- Matin Ansaripour, Sharif University *Spring 2022*
  Learning Control Policies for Region Stabilization in Stochastic Systems (ATVA 2023)
- Roodabeh Safavi, Sharif University *Spring 2022*
  Algorithms and Hardness Results for Computing Cores of Markov Chains (FSTTCS 2022)
- Ehsan Kafshdar Goharshady, Ferdowsi University of Mashhad *Summer 2020*
  Proving Non-termination by Program Reversal (PLDI 2021)
  On Lexicographic Proof Rules for Probabilistic Termination (FM 2021)

SERVICE

- Program Committee:
  2025: AAAI 2025, VMCAI 2025
  2024: AAAI 2024, IJCAI 2024, ECAI 2024, ATVA 2024, SETTA 2024
  2023: AAAI 2023, CAV AEC 2023
  2022: CAV AEC 2022

- Reviewer/Subreviewer/External Reviewer: LICS 2024, TACAS 2024, POPL 2024, ISSAC 2024, FSTTCS 2023, CONCUR 2023, CDC 2023, ATVA 2023, LPAR 2023, FoSSaCS 2022, AAMAS 2022, ICML 2022

INVITED TALKS

- Hong Kong University of Science and Technology, Hong Kong, China — July 2024
  Neural Controller Synthesis and Verification with Guarantees
- East China Normal University, Shanghai, China — July 2024
  Trustworthy AI through Neural Certificates, Runtime Monitoring, and Multi-Agent Reasoning
  (invited lecture) 20th International Summer School on Trustworthy Software, together with Tom Henzinger
- IIT Bombay, Mumbai, India — May 2024
  A Learner-verifier Framework for Certifying Neural Controllers in Stochastic Systems
- National University of Singapore, Singapore, Singapore — May 2024
  A Learner-verifier Framework for Certifying Neural Controllers in Stochastic Systems
- Mathematical Institute of the Serbian Academy of Science and Arts, Belgrade, Serbia — Dec 2023
  A Learner-verifier Framework for Learning and Certifying Neural Controllers (in Serbian)
- École Normale Supérieure, Paris, France — Jul 2023
  A Learner-verifier Framework for Learning and Certifying Neural Controllers in Stochastic Systems
- (**keynote**) The Workshop on Verification of Probabilistic Programs (VeriProP), Paris, France — Jul 2023
  A Learner-verifier Framework for Learning and Certifying Neural Controllers in Stochastic Systems
- Nissan Research, virtual — Jun 2023
  A Learner-verifier Framework for Learning and Certifying Neural Controllers in Stochastic Systems
- TU Delft, Delft, Netherlands — Jun 2023
  Formal Verification and Learning-based Control of Infinite State Stochastic Systems
- Masaryk University, Brno, Czech Republic — Jun 2023
  Formal Verification and Learning-based Control of Infinite State Stochastic Systems
- ETH Zürich, Zürich, Switzerland — Apr 2023
  Formal Verification and Learning-based Control of Infinite State Stochastic Systems
- INSAIT, Sofia, Bulgaria (virtual) — Apr 2023
  Formal Verification and Learning-based Control of Infinite State Stochastic Systems
- Singapore Management University, Singapore, Singapore — Feb 2023
  Formal Verification and Learning-based Control of Infinite State Stochastic Systems
- National University of Singapore, Singapore, Singapore — Feb 2023
  Formal Verification and Learning-based Control of Infinite State Stochastic Systems
- EPFL, Lausanne, Switzerland — Jul 2022
  Martingale-based Methods for Formal Verification and Certified Control of Stochastic Systems
- Masaryk University, Brno, Czech Republic — Apr 2022
  Proving Non-termination by Program Reversal
- Infer Practitioners Workshop, virtual — Jun 2021
  Differential Cost Analysis with Infer and Possible Extensions for Concrete Cost Analysis
- Mathematical Institute of the Serbian Academy of Science and Arts, Belgrade, Serbia — Dec 2019
  Static Analysis of Probabilistic Programs with Martingales (in Serbian)

CONFERENCE PRESENTATIONS

- IJCAI 2024, Jeju, South Korea — Aug 2024
  Certified Policy Verification and Synthesis for MDPs under Distributional Reach-Avoidance Properties
- Konferencija Veštačka Inteligencija, Belgrade, Serbia — Dec 2023
  A Learner-verifier Framework for Learning and Certifying Neural Controllers (in Serbian)
- ATVA 2023, Singapore, Singapore — Oct 2023
  Learning Provably Stabilizing Neural Controllers for Discrete-Time Stochastic Systems
- Highlights 2023, Kassel, Germany — Jul 2023
  MDPs as Distribution Transformers: Affine Invariant Synthesis for Safety Objectives
- CAV 2023, Paris, France — Jul 2023
  MDPs as Distribution Transformers: Affine Invariant Synthesis for Safety Objectives
- AAAI 2023, Washington, D.C., US — Feb 2023
  Learning Control Policies for Stochastic Systems with Reach-Avoid Guarantees
  Bidding Graph Games with Partially-Observable Budgets
- Formal Reasoning Enthusiasts (FReE) Workshop at Amazon, Boston, US — Oct 2022
  Differential cost analysis with simultaneous potentials and anti-potentials

- CAV 2022, Haifa, Israel — Aug 2022
  Sound and Complete Certificates for Quantitative Termination Analysis of Probabilistic Programs
- PLDI 2022, San Diego, US — Jun 2022
  Differential Cost Analysis with Simultaneous Potentials and Anti-potentials
- AAAI 2022, virtual — Feb 2022
  Stability Verification in Stochastic Control Systems via Neural Network Supermartingales
- NeurIPS 2021, virtual — Dec 2021
  Infinite Time Horizon Safety of Bayesian Neural Networks
- FM 2021, virtual — Nov 2021
  On Lexicographic Proof Rules for Probabilistic Termination
- PLDI 2021, virtual — Jun 2021
  Proving Non-termination by Program Reversal
- MFCS 2019, Aachen, Germany — Aug 2019
  Infinite-duration All-pay Bidding Games

ORGANIZATION

- Co-organized **Young Scientist Symposium 2019** at ISTA — May, 2019
- President of the **Cambridge University Serbian Society** — 2017-2018