

DJORDJE ŽIKELIĆ (ĐORĐE ŽIKELIĆ)

PERSONAL INFORMATION

Email: dzikelic@smu.edu.sg

Website: <https://djordjezikelic.github.io/>

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*

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

EMPLOYMENT

Singapore Management University

Jan 2024 - Present

School of Computing and Information Systems (SCIS)

Assistant Professor of Computer Science

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

1. *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**)
2. *Learning Provably Stabilizing Neural Controllers for Discrete-Time Stochastic Systems.*
Matin Ansari pour, Krishnendu Chatterjee, Thomas A. Henzinger, Mathias Lechner, Đorđe Žikelić†.
21st International Symposium on Automated Technology for Verification and Analysis (**ATVA 2023**)
3. *Reachability Poorman Discrete-Bidding Games.*
Guy Avni, Tobias Meggendorfer, Suman Sadhukhan, Josef Tkadlec, Đorđe Žikelić†.
26th European Conference on Artificial Intelligence (**ECAI 2023**)
4. *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**)
5. *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**)

6. *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**
7. *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**
8. *Bidding Graph Games with Partially-Observable Budgets.*
 Guy Avni, Ismaël Jecker, Đorđe Žikelić†.
 37th AAAI Conference on Artificial Intelligence (**AAAI 2023**), **oral presentation**
9. *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**)
10. *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**)
11. *Differential Cost Analysis with Simultaneous Potentials and Anti-potentials.*
 Đorđe Žikelić, Bor-Yuh Evan Chang, Pauline Bolognani, Franco Raimondi.
 44th ACM SIGPLAN Conference on Programming Language Design and Implementation (**PLDI 2022**)
Featured in the Amazon Science blog
12. *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**
13. *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**)
14. *On Lexicographic Proof Rules for Probabilistic Termination.*
 Krishnendu Chatterjee, Ehsan Kafshdar Goharshady, Petr Novotný, Jiří Závěručky, Đorđe Žikelić†.
 24th International Symposium on Formal Methods (**FM 2021**)
Invited to the Special Collection from FM 2021, dedicated to best papers
15. *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**)
16. *Scalable Verification of Quantized Neural Networks.*
 Thomas A. Henzinger, Mathias Lechner, Đorđe Žikelić†.
 35th AAAI Conference on Artificial Intelligence (**AAAI 2021**)
17. *Infinite-Duration All-Pay Bidding Games.*
 Guy Avni, Ismaël Jecker, Đorđe Žikelić†.
 ACM-SIAM Symposium on Discrete Algorithms (**SODA 2021**)
18. *Bidding Mechanisms in Graph Games.*
 Guy Avni, Thomas A. Henzinger, Đorđe Žikelić†.
 44th International Symposium on Mathematical Foundations of Computer Science (**MFCS, 2019**)
19. *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**)
20. *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, Jiří Závěručky, 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 Scientific Achievement | <i>2023</i> |
| 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 | <i>2022</i> |
| Shortlisted as one of the 4 finalists for the programming languages category. | |
| Gonville & Caius College Scholarship and Cambridge Trust Scholarship | <i>2014-2018</i> |
| Full university fees, tuition fees, and maintenance costs. | |
| Stephen Hawking Fund Award | <i>2017</i> |
| Awarded by Gonville & Caius College, Cambridge to mathematics students proceeding to Part III. | |
| Scholar of the Gonville & Caius College, Cambridge | <i>2015, 2016</i> |
| High performance in the examinations of the Mathematical Tripos. | |
| International High School Olympiads | <i>2010-2014</i> |
| Participated in international high school olympiads in mathematics, physics, and astronomy. Most notable results: | |
| <ul style="list-style-type: none"> • 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 | <i>2010-2014</i> |
| <ul style="list-style-type: none"> • 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 | |

TEACHING

- | | |
|---|--|
| Teaching at SMU | |
| <ul style="list-style-type: none"> • CS423: Heuristic Search and Optimisation | <i>Term 2, 2024</i> |
| Teaching at ISTA | |
| <ul style="list-style-type: none"> • Computer Science Track Core Course, TA • Formal Methods, TA • Computer Science Track Core Course, TA • Mathematics Track Core Course, 4 lectures on Brownian motion and aspects of probability | <i>Spring, 2021</i>
<i>Spring, 2020</i>
<i>Spring, 2020</i>
<i>Spring, 2019</i> |

SUPERVISION

- | | |
|--|--------------------|
| Supervision of interns at ISTA | |
| <ul style="list-style-type: none"> • Amirali Ebrahim-zadeh, Sharif University
<i>Analyzing Selfish Mining in Proof of Space-based Blockchain Protocols</i> (under submission) | <i>Summer 2022</i> |

- Matin Ansari pour, 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: AAI 2024, ECAI, 2023, AAI 2023
- Artifact Evaluation Committee: CAV 2023, CAV 2022
- Reviewer: TACAS 2024, POPL 2024, FSTTCS 2023, CONCUR 2023, CDC 2023, ATVA 2023, LPAR 2023, FoS-SaCS 2022, AAMAS 2022, ICML 2022

INVITED TALKS

- 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
- 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

- 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
- AAI 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
- AAI 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