

# DJORDJE ŽIKELIĆ (ĐORĐE ŽIKELIĆ)

## PERSONAL INFORMATION

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**Email:** dzikelic@smu.edu.sg

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

## EDUCATION

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**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

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**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

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\* 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 Zárevúcky, 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 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<sup>†</sup>.  
Journal of Computer and System Sciences, Vol. 119 (**JCSS, 2021**)
4. *Theorems about quadrilaterals and conics.*  
Đorđe Baralić, Branko Grbić, Đorđe Žikelić<sup>†</sup>.  
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

<b>Meta PhD Research Fellowship - finalist</b>	2022
Shortlisted as one of the 4 finalists for the programming languages category.	
<b>Gonville &amp; Caius College Scholarship and Cambridge Trust Scholarship</b>	2014-2018
Full university fees, tuition fees, and maintenance costs.	
<b>Stephen Hawking Fund Award</b>	2017
Awarded by Gonville & Caius College, Cambridge to mathematics students proceeding to Part III.	
<b>Scholar of the Gonville &amp; Caius College, Cambridge</b>	2015, 2016
High performance in the examinations of the Mathematical Tripos.	
<b>International High School Olympiads</b>	2010-2014
Participated in international high school olympiads in mathematics, physics, and astronomy. Most notable results:	
<ul style="list-style-type: none"> <li>• International Olympiad in Astronomy and Astrophysics (IOAA) 2014 (bronze medal)</li> <li>• International Mathematical Competition Arhimede 2013 (gold medal), 2012 (silver medal)</li> <li>• International Junior Science Olympiad (IJSO) 2010 (bronze medal)</li> <li>• International Astronomy Olympiad (IAO) 2010 (bronze medal)</li> <li>• International Mathematical Olympiad (IMO) 2014 (first reserve for the Serbian team)</li> </ul>	
<b>National High School Competitions</b>	2010-2014
<ul style="list-style-type: none"> <li>• Serbian Mathematical Olympiad: second prize in 2014, third prize in 2013, 2012</li> <li>• Mathematics (national): <b>first overall</b> in my year in 2014, 2012, 2010, <b>second overall</b> in 2013</li> <li>• Physics (national): first prize in 2013, second prize in 2012, 2011, third prize in 2014</li> <li>• Astronomy (national): second prize in 2014, 2012</li> </ul>	

#### TEACHING

<b>Teaching at SMU</b>	
• CS423: Heuristic Search and Optimisation	Term 2, 2024
<b>Teaching at ISTA</b>	
• 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

<b>Supervision of interns at ISTA</b>	
• Amirali Ebrahim-zadeh, Sharif University	Summer 2022
<i>Analyzing Selfish Mining in Proof of Space-based Blockchain Protocols</i> (under submission)	
• Matin Ansari-pour, Sharif University	Spring 2022
<i>Learning Control Policies for Region Stabilization in Stochastic Systems</i> (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

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- 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

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- 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

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- 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  
*Infinite-duration All-pay Bidding Games*

Aug 2019

## ORGANIZATION

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- Co-organized **Young Scientist Symposium 2019** at ISTA
- President of the **Cambridge University Serbian Society**

May, 2019  
2017-2018