

# DJORDJE ZIKELIC (ĐORĐE ŽIKELIĆ)

## PERSONAL INFORMATION

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

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## CURRENT POSITION

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

*Jan 2024 - Present*

## EDUCATION

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**Institute of Science and Technology Austria (ISTA)**  
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

*2018 - 2023*

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

*2014 - 2018*

**Mathematical Grammar School, Belgrade, Serbia**

*2010 - 2014*

## PRIOR EMPLOYMENT

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

*Aug 2022 - Oct 2022*

**Amazon, UK (virtual)**  
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.

*Oct 2020 - Jan 2021*

## PUBLICATIONS

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\* equal contribution, † authors ordered alphabetically

### Conference proceedings

1. *Sound and Complete Witnesses for Template-based Verification of LTL Properties on Polynomial Programs.*  
Krishnendu Chatterjee, Amir Kafshdar Goharshady, Ehsan Kafshdar Goharshady, Mehrdad Karrabi, Đorđe Žikelić†.  
27th International Symposium on Formal Methods (**FM 2024**)  
**Distinguished Paper Award**
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<sup>†</sup>.  
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<sup>†</sup>.  
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 Ansari Pour, Krishnendu Chatterjee, Thomas A. Henzinger, Mathias Lechner, Đorđe Žikelić<sup>†</sup>.  
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<sup>†</sup>.  
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<sup>†</sup>.  
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<sup>†</sup>.  
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<sup>†</sup>.  
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<sup>†</sup>.  
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<sup>†</sup>.  
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 Závřický, Đorđe Žikelić<sup>†</sup>.  
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<sup>†</sup>.  
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<sup>†</sup>.  
35th AAAI Conference on Artificial Intelligence (**AAAI 2021**)
23. *Infinite-Duration All-Pay Bidding Games*.  
Guy Avni, Ismaël Jecker, Đorđe Žikelić<sup>†</sup>.  
ACM-SIAM Symposium on Discrete Algorithms (**SODA 2021**)
24. *Bidding Mechanisms in Graph Games*.  
Guy Avni, Thomas A. Henzinger, Đorđe Žikelić<sup>†</sup>.  
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<sup>†</sup>.  
31st AAAI Conference on Artificial Intelligence (**AAAI, 2017**)
26. *Stochastic invariants for probabilistic termination*.  
Krishnendu Chatterjee, Petr Novotný, Đorđe Žikelić<sup>†</sup>.  
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<sup>†</sup>.  
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 Pavliogiannis, 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>FM 2024 Distinguished Paper Award</b>	2024
For "Sound and Complete Witnesses for Template-based Verification of LTL Properties on Polynomial Programs".	
<b>Outstanding PhD Thesis</b>	2024
Awarded annually for best PhD theses by the Institute of Science at Technology Austria.	
<b>Outstanding Scientific Achievement</b>	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.	
<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.	

Scholar of the Gonville & Caius College, Cambridge  
High performance in the examinations of the Mathematical Tripos.

2015, 2016

### 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

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

2023

## TEACHING

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### Teaching at SMU

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

Term 2, 2024

### Teaching at ISTA

- 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

Spring, 2021

Spring, 2020

Spring, 2020

Spring, 2019

## SUPERVISION

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### Supervision of visiting students and interns at SMU

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

Aug 2024 - Feb 2025

Jul 2024 - Jan 2025

May 2024 - Jul 2024

May 2024 - Jul 2024

### Supervision of interns at ISTA

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

Summer 2022

Spring 2022

Spring 2022

Summer 2020

## SERVICE

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

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

## ORGANIZATION

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| • Co-organized <b>Young Scientist Symposium 2019</b> at ISTA   | May, 2019 |
| • President of the <b>Cambridge University Serbian Society</b> | 2017-2018 |