# DJORDJE ZIKELIC (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

## 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 Ansaripour, 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 Bolignano, 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, Jiři 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, 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

**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

## TEACHING

**Teaching at SMU**
- CS423: Heuristic Search and Optimisation *Term 2, 2024*

**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 interns at ISTA**
- Amirali Ebrahim-zadeh, Sharif University *Summer 2022*
  *Analyzing Selfish Mining in Proof of Space-based Blockchain Protocols* (under submission)
- 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: AAAI 2024, ECAI, 2023, AAAI 2023
- Artifact Evaluation Committee: CAV 2023, CAV 2022
- Reviewer: TACAS 2024, POPL 2024, FSTTCS 2023, CONCUR 2023, CDC 2023, ATVA 2023, LPAR 2023, FoSSaCS 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*
- 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