Rayna Dimitrova

Curriculum Vitae

✎ raynadimitrova.github.io

▬▬▬▬ Employment

10.2020-	**Tenure-track faculty member**, *CISPA Helmholtz Center for Information Security*, Saarbrücken, Germany.
01.2020-09.2020	**Lecturer(Assistant Professor)**, *The University of Sheffield*, Sheffield, UK.
01.2018-12.2019	**Lecturer(Assistant Professor)**, *University of Leicester*, Leicester, UK.
07.2017-01.2018	**Postdoc**, *The University of Texas at Austin*, Austin, USA.
06.2013-06.2017	**Postdoc**, *Max Planck Institute for Software Systems*, Kaiserslautern, Germany.
08.2006-06.2013	**Research assistant**, *Saarland University*, Saarbrücken, Germany.

▬▬▬▬ Education

08.2006-06.2014	**Ph.D. in Computer Science**, *Saarland University*, Saarbrücken, Germany. **Summa Cum Laude**
Ph.D. thesis	*Synthesis and Control of Infinite-State Systems with Partial Observability*
supervisor	Prof. Bernd Finkbeiner, Ph.D.
10.2004-05.2006	**M.Sc. in Computer Science**, *Saarland University*, Saarbrücken, Germany. **Honor's Degree**
Master thesis	*Model Checking With Abstraction Refinement for Well-Structured Systems*
supervisor	Prof. Dr. Andreas Podelski
10.2000-07.2004	**B.Sc. in Computer Science**, *Sofia University*, Sofia, Bulgaria.

▬▬▬▬ Teaching Qualifications

2019	**Associate Fellow of the Higher Education Academy**, UK.

Research Interests

My research is in the area of formal methods, focusing on the specification, verification, and synthesis of reactive systems. I investigate primarily quantitative versions of these questions, centred around the aspect of uncertainty in system and environment models. I am particularly interested in applications of formal methods to autonomous systems, where my work addresses the limitations faced by autonomous control due to imperfect sensing and stochastic disturbances.

Honors, Scholarships and Awards

2019	Invitation to Simons Institute program on "Theoretical Foundations of Computer Systems" in 2021, Berkeley, USA
2016	*Sponsorship Award by the European Association for Computer Science Logic* for the ESSLLI 2016 course "Model Counting for Logical Theories" with Dmitry Chistikov (single award out of 48 courses at ESSLLI'16)
2012	*The 2011/2012 Best Paper Award of the DFG priority programme Reliably Secure Software Systems (among 27 papers within the programme)* for "Model Checking Information Flow in Reactive Systems" with Bernd Finkbeiner, Máté Kovács, Markus N. Rabe, and Helmut Seidl, at VMCAI'12
06.2008-06.2011	*Microsoft Research European Ph.D. scholarship*
2007	*Certificate for outstanding achievements in the Master's Program* awarded by "Freunde der Saarbrücker Informatik"
08.2006-06.2008	*International Max Planck Research School Ph.D. scholarship*
10.2004-05.2006	*International Max Planck Research School scholarship for Master's studies*

Invited Keynote Talks

2018	*"Synthesis of Surveillance Strategies for Mobile Sensors"*, **South of England Regional Programming Language Seminar**, London, UK
2018	*"Synthesis of Surveillance Strategies for Mobile Sensors"*, Working Conference on Verified Software: Theories, Tools, and Experiments **VSTTE'18 part of FLoC'18**, Oxford, UK
2018	*"Causality Analysis for Concurrent Reactive Systems"*, Workshop on formal reasoning about Causation, Responsibility, and Explanations in Science and Technology **CREST'18 part of ETAPS'18**, Greece

Publications

[1] Rayna Dimitrova, Bernd Finkbeiner, and Hazem Torfah. Probabilistic hyperproperties of markov decision processes. In *Automated Technology for Verification and Analysis (ATVA)*, 2020 (to appear).

[2] Rayna Dimitrova, Maciej Gazda, Mohammad Reza Mousavi, Sebastian Biewer, and Holger Hermanns. Conformance-based doping detection for cyber-physical systems. In *Formal Techniques for Distributed Objects, Components, and Systems (FORTE)*, volume 12136 of *LNCS*, pages 59–77. Springer, 2020.

[3] Suda Bharadwaj, Abraham P. Vinod, Rayna Dimitrova, and Ufuk Topcu. Near-optimal reactive synthesis incorporating runtime information. In *International Conference on Robotics and Automation (ICRA)*, 2020.

[4] Rayna Dimitrova, Mahsa Ghasemi, and Ufuk Topcu. Reactive synthesis with maximum realizability of linear temporal logic specifications. *Acta Informatica*, 57(1):107–135, 2020.

[5] Rayna Dimitrova, Bernd Finkbeiner, and Hazem Torfah. Synthesizing approximate implementations for unrealizable specifications. In *Conference on Computer-Aided Verification (CAV)*, volume 11561 of *LNCS*, pages 241–258. Springer, 2019.

[6] Rayna Dimitrova, Bernd Finkbeiner, and Hazem Torfah. Approximate automata for omega-regular languages. In *Automated Technology for Verification and Analysis (ATVA)*, volume 11781 of *LNCS*, pages 334–349. Springer, 2019.

[7] Suda Bharadwaj, Roderik Bloem, Rayna Dimitrova, Bettina Könighofer, and Ufuk Topcu. Synthesis of minimum-cost shields for multi-agent systems. In *2019 American Control Conference, ACC 2019, Philadelphia, PA, USA, July 10-12, 2019*, pages 1048–1055, 2019.

[8] Rayna Dimitrova, Mahsa Ghasemi, and Ufuk Topcu. Maximum realizability for linear temporal logic specifications. In *Automated Technology for Verification and Analysis (ATVA)*, volume 11138 of *LNCS*, pages 458–475. Springer, 2018.

[9] Suda Bharadwaj, Rayna Dimitrova, and Ufuk Topcu. Distributed synthesis of surveillance strategies for mobile sensors. In *IEEE Conference on Decision and Control (CDC)*, pages 3335–3342. IEEE, 2018.

[10] Suda Bharadwaj, Rayna Dimitrova, and Ufuk Topcu. Synthesis of surveillance strategies via belief abstraction. In *IEEE Conference on Decision and Control (CDC)*, pages 4159–4166. IEEE, 2018.

[11] Rayna Dimitrova, Ivan Gavran, Rupak Majumdar, Vinayak S. Prabhu, and Sadegh Esmaeil Zadeh Soudjani. The robot routing problem for collecting aggregate stochastic rewards. In *Conference on Concurrency Theory (CONCUR)*, volume 85 of *LIPIcs*, pages 13:1–13:17, 2017.

[12] Dmitry Chistikov, Rayna Dimitrova, and Rupak Majumdar. Approximate counting in SMT and value estimation for probabilistic programs. *Acta Informatica*, pages 1–36, 2017.

[13] Rayna Dimitrova and Rupak Majumdar. Reachability analysis of reversal-bounded automata on series–parallel graphs. *Acta Informatica*, pages 1–37, 2016.

[14] R. Dimitrova, J. Fu, and U. Topcu. Robust optimal policies for markov decision processes with safety-threshold constraints. In *IEEE Conference on Decision and Control (CDC)*, pages 7081–7086, 2016.

[15] David Deininger, Rayna Dimitrova, and Rupak Majumdar. Symbolic model checking for factored probabilistic models. In *Automated Technology for Verification and Analysis (ATVA)*, volume 9938 of *LNCS*, pages 444–460. Springer, 2016.

[16] Rayna Dimitrova, Luis María Ferrer Fioriti, Holger Hermanns, and Rupak Majumdar. Probabilistic CTL*: The deductive way. In *Tools and Algorithms for the Construction and Analysis of Systems (TACAS)*, volume 9636 of *LNCS*, pages 280–296. Springer, 2016.

[17] Dmitry Chistikov, Rayna Dimitrova, and Rupak Majumdar. Approximate counting in SMT and value estimation for probabilistic programs. In *Tools and Algorithms for the Construction and Analysis of Systems (TACAS)*, volume 9035 of *LNCS*, pages 320–334. Springer, 2015.

[18] Rayna Dimitrova and Rupak Majumdar. Reachability analysis of reversal-bounded automata on series-parallel graphs. In *Sixth International Symposium on Games, Automata, Logics and Formal Verification (GandALF)*, volume 193 of *EPTCS*, pages 100–114, 2015.

[19] Rayna Dimitrova and Rupak Majumdar. Deductive control synthesis for alternating-time logics. In *International Conference on Embedded Software (EMSOFT)*, pages 14:1–14:10. ACM, 2014.

[20] Jie Fu, Rayna Dimitrova, and Ufuk Topcu. Abstractions and sensor design in partial-information, reactive controller synthesis. In *American Control Conference (ACC)*, pages 2297–2304. IEEE, 2014.

[21] Rayna Dimitrova and Bernd Finkbeiner. Lossy channel games under incomplete information. In *1st International Workshop on Strategic Reasoning (SR)*, volume 112 of *EPTCS*, pages 43–51, 2013.

[22] Rayna Dimitrova and Bernd Finkbeiner. Counterexample-guided synthesis of observation predicates. In Marcin Jurdzinski and Dejan Nickovic, editors, *10th International Conference on Formal Modeling and Analysis of Timed Systems (FORMATS)*, volume 7595 of *LNCS*, pages 107–122. Springer, 2012.

[23] Rayna Dimitrova, Bernd Finkbeiner, and Markus N. Rabe. Monitoring temporal information flow. In Tiziana Margaria, Bernhard Steffen, and Maik Merten, editors, *5th International Symposium On Leveraging Applications of Formal Methods, Verification and Validation (ISoLA)*, volume 7609 of *LNCS*, pages 342–357. Springer, 2012.

[24] Rayna Dimitrova, Bernd Finkbeiner, Máté Kovács, Markus N. Rabe, and Helmut Seidl. Model checking information flow in reactive systems. In *13th International Conference on Verification, Model Checking, and Abstract Interpretation (VMCAI)*, volume 7148 of *LNCS*, pages 169–185. Springer, 2012.

[25] Rayna Dimitrova and Bernd Finkbeiner. Synthesis of fault-tolerant distributed systems. In Zhiming Liu and Anders P. Ravn, editors, *Automated Technology for Verification and Analysis, 7th International Symposium (ATVA)*, volume 5799 of *LNCS*, pages 321–336. Springer, 2009.

[26] Rayna Dimitrova and Bernd Finkbeiner. Abstraction refinement for games with incomplete information. In Ramesh Hariharan, Madhavan Mukund, and V Vinay, editors, *IARCS Annual Conference on Foundations of Software Technology and Theoretical Computer Science (FSTTCS)*, volume 2 of *LIPIcs*, pages 175–186. Schloss Dagstuhl – Leibniz-Zentrum fuer Informatik, 2008.

[27] Rayna Dimitrova and Andreas Podelski. Is lazy abstraction a decision procedure for broadcast protocols? In *Verification, Model Checking, and Abstract Interpretation, 9th International Conference (VMCAI)*, volume 4905 of *LNCS*, pages 98–111. Springer, 2008.

Professional Service

- **Co-organizer and Program Committee co-chair**

  - Workshop (Collaborative Incubator) on Automata and Cyber-Physical Systems 2020
  - Verification Mentoring Workshop (VMW'20) at CAV'20
  - Verification Mentoring Workshop (VMW'19) at CAV'19
  - 16th International Workshop on Satisfiability Modulo Theories (SMT'18), part of FLoC'18
  - 5th Workshop on Synthesis (SYNT'16) affiliated with CAV'16

- **PC member** for conferences and workshops: HVC'15, VMCAI'16, SMT'16, HVC'16, SYNT'17, VSTTE'17, SMT'17, HVC'17, APLAS'17, MeTRiD'18, CyPhy'18, FORTE'19, APLAS'19, FMCAD'19, SRC at PLDI'19, SYNT'19, CyPhy'19, VMCAI'20, FORMATS'20, FMCAD'20, VMCAI'21

- **External reviewer** for conferences: HVC'08, RV'11, FM'11, FM'12, CAV'13, CSL'13, LICS'14, VMCAI'14, FMCAD'14, HVC'14, CADE-25, TACAS'15, CDC'15, GandALF'15, POPL'16, TACAS'16, HSCC'16, CDC'16, CDC'17, LICS'18, CDC'18

- **External reviewer** for journals: Acta Informatica, Journal of Computer Security, Science of Computer Programming, IEEE Control Systems Letters, Automatica, Algorithmica, Formal Methods in System Design, Logical Methods in Computer Science

Teaching Experience

At Summer Schools

2019	Lecturer for the course **Synthesis of Reactive Systems** at the Midlands Graduate School in the Foundations of Computing Science (MGS'19)
2016	Co-lecturer for the course **Model Counting for Logical Theories** at the European Summer School in Logic, Language and Information (ESSLLI'16)

At the University of Sheffield

SS 19/20	Team supervisor for the course **Introduction to Software Engineering**

At the University of Leicester

SS 18/19	Co-lecturer for the course **Cryptography and Internet Security**
SS 18/19	Project supervisor for the course **Software Engineering Group Project**
WS 18/19	Co-lecturer for the course **Automata, Languages and Computation**
WS 18/19	Co-lecturer for the course **C++ Programming**
SS 17/18	Co-lecturer for the course **Analysis and Design of Algorithms**
SS 17/18	Project supervisor for the course **Software Engineering Group Project**

At TU Kaiserslautern and MPI-SWS

WS 16/17	Lecturer for the course **Program Analysis**
WS 15/16	Co-instructor for the seminar **Verification Meets Machine Learning**

At Saarland University

SS 07/08	Co-instructor for the seminar **Games in Verification and Synthesis**
WS 07/08	Head teaching assistant for the course **Verification**

Student Supervision

At the University of Sheffield

2019/20	Supervised 6 MSc students

At the University of Leicester

2019/20	Supervised 4 MSc students
2018/19	Supervised 6 BSc students and 4 MSc students
2017/18	Supervised 4 MSc students

At MPI-SWS

2015	Supervised Master thesis: *"Model Checking of Probabilistic Graphical Models"*, student: David Deininger, Max Planck Institute for Software Systems

At Saarland University

2013	Supervised Bachelor thesis: *"Slicing Abstractions for Safety Games"*, student: Robin Wagner, Saarland University, (co-supervised with Andrey Kupriyanov)
2009	Supervised Master thesis: *"Symbolic Encodings of Timed Games with Incomplete Information"*, student: Daniel Dahrendorf, Saarland University