Petr Novotný

Contact Information

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Employment

2018–now   Assistant professor at the Faculty of Informatics, Masaryk University.

2015–2018   Postdoc in the group of Krishnendu Chatterjee at the Institute of Science and Technology (IST) Austria.

Education

2010–2015   Ph.D. in Computer Science, Faculty of Informatics, Masaryk University.

- Supervisor: Professor Antonín Kučera.
- Ph.D. thesis: *Controller Synthesis for Resource-Aware Systems*
- Thesis readers:
  - Prof. Rajeev Alur, University of Pennsylvania
  - Assoc. Prof. Michal Koucký, Charles University
  - Prof. Jean-François Raskin, Université Libre de Bruxelles
- Dean's prize for an outstanding Ph.D. thesis.

2008–2010   Master's degree in Mathematics, Faculty of Science, Masaryk University.

- Specialization: Algebra and Discrete Mathematics.
- Master's thesis: *Algebraic Methods for CSP*.
- Graduated with distinction.

2005–2009   Bachelor's degree in Computer Science, Faculty of Informatics, Masaryk University.

- Bachelor's thesis: *TeX Macros for Typesetting LR(0) Syntactic Analysers*.
- Graduated with distinction.

2005–2008   Bachelor's degree in Mathematics, Faculty of Science, Masaryk University.

- Bachelor's thesis: *Universal Algebra and CSP*.

Research Interests

Foundations of probabilistic verification, analysis of probabilistic programs, probabilistic planning, reinforcement learning, graph games.

Publications

The default ordering of authors in the publications that I co-authored is the alphabetic ordering, with three exceptions agreed by all co-authors.

Peer-Reviewed Conference Papers

[1]   K. Chatterjee, E.K. Goharshady, P. Novotný, D. Žikelić: **Proving Non-termination by Program Reversal.** Accepted at PLDI 2021, to appear.

[2]   T. Brázdil., F. Blahoudek, P. Novotný, M. Ornik, U. Topcu, and P. Thangeda: **Qualitative Controller Synthesis for Consumption Markov Decision Processes.** In *Computer Aided Verification (CAV 2020),* pp. 421-447. Springer (2020).

[3]   K. Chatterjee, M. Chmelík, D. Karkhanis, P. Novotný, and A. Royer: **Multiple-Environment Markov Decision Processes: Efficient Analysis and Applications.** *In International Conference on Automated Planning and Scheduling (ICAPS 2020),* pp. 48-56. AAAI Press (2020).

[4]   T. Brázdil, K. Chatterjee, P. Novotný, and J. Vahala: **Reinforcement Learning of Risk-Constrained Policies in Markov Decision Processes.** In *AAAI Conference on Artificial Intelligence (AAAI 2020),* pp. 9794-9801. AAAI Press (2020).

[5]   T. Brázdil, K. Chatterjee, A. Kučera, P. Novotný, and D. Velan: **Deciding Fast Termination for Probabilistic VASS with Nondeterminism.** In *Automated Technology for Verification and Analysis (ATVA 2019),* pp. 462-478. Springer (2019).

[6]   G. Avni, T.A. Henzinger, R. Ibsen-Jensen, and P. Novotný: **Bidding Games on Markov Decision Processes**. In *Reachability Problems (RP 2019),* pp. 1-12. Springer (2019).

[7]   N. Balaji, S. Kiefer, P. Novotný, G. A. Pérez, and M. Shirmohammadi: **On the Complexity of Value Iteration.** In *Automata, Languages, and Programming (ICALP 2019),* pp. 102:1-102:15. Schloss Dagstuhl - Leibniz-Zentrum für Informatik (2019).

[8]   K. Chatterjee, A. Elgyütt, P. Novotný, and O. Rouillé: **Expectation Optimization with Probabilistic Guarantees in POMDPs with Discounted-sum Objectives.** In *International Joint Conference on Artificial Intelligence (IJCAI 2018),* pp. 4692-4699. ijcai.org (2018).

[9]   T. Brázdil, K. Chatterjee, A. Kučera, P. Novotný, D. Velan, and F. Zuleger: **Efficient Algorithms for Asymptotic Bounds on Termination Time in VASS.** In *Logic in Computer Science (LICS 2018),* pp. 185-194. ACM (2018).

[10]   S. Agrawal, K. Chatterjee, and P. Novotný: **Lexicographic Ranking Supermartingales: An Efficient Approach to Termination of Probabilistic Programs.** In *Principles of Programming Languages (POPL 2018),* Article No. 34. ACM (2018).

[11]   K. Chatterjee, P. Novotný, G. A. Pérez, J.-F. Raskin, and Đ. Žikelić: **Optimizing Expectation with Guarantees in POMDPs.** In *AAAI Conference on Artificial Intelligence (AAAI 2017),* pp. 3725-3732. AAAI (2017).

[12]   K. Chatterjee, P. Novotný, and Đ. Žikelić: **Stochastic Invariants for Probabilistic Termination.** In *Principles of Programming Languages (POPL 2017),* pp. 145-160. ACM (2017).

[13] K. Chatterjee, H. Fu, P. Novotný, and R. Hasheminezhad: **Algorithmic Analysis of Qualitative and Quantitative Termination Problems for Affine Probabilistic Programs.** In *Principles of Programming Languages (POPL 2016),* pp. 327-342. ACM (2016).

[14] T. Brázdil, K. Chatterjee, M. Chmelík, A. Gupta, and P. Novotný: **Stochastic Shortest Path with Energy Constraints in POMDPs: (Extended Abstract).** In *Autonomous Agents & Multiagent Systems (AAMAS 2016),* pp. 1465-1466. ACM (2016).

[15] T. Brázdil, A. Kučera, and P. Novotný: **Optimizing the Expected Mean Payoff in Energy Markov Decision Processes.** In *Automated Technology for Verification and Analysis (ATVA 2016),* pp. 32-49. Springer International Publishing (2016).

[16] T. Brázdil, V. Forejt, A. Kučera, and P. Novotný: **Stability in Graphs and Games.** In *Concurrency Theory (CONCUR 2016).* Schloss Dagstuhl – Leibniz-Zentrum für Informatik (2016).

[17] T. Brázdil, S. Kiefer, A. Kučera, and P. Novotný: **Long-Run Average Behaviour of Probabilistic Vector Addition Systems.** In *Logic in Computer Science (LICS 2015),* pp. 44-55. IEEE (2015).

[18] T. Brázdil, L. Korenčiak, J. Krčál, P. Novotný, and V. Řehák: **Optimizing Performance of Continuous-Time Stochastic Systems Using Timeout Synthesis.** In *Quantitative Evaluation of Systems (QEST 2015),* pp. 141-159. Springer International Publishing (2015).

[19] T. Brázdil, D. Klaška, A. Kučera, and P. Novotný: **Minimizing Running Costs in Consumption Systems.** In *Computer Aided Verification (CAV 2014),* pp. 457-472. Springer International Publishing (2014).

[20] T. Brázdil, S. Kiefer, A. Kučera, P. Novotný, and J.-P. Katoen: **Zero-Reachability in Probabilistic Multi-Counter Automata.** In *Computer Science Logic/Logic in Computer Science (CSL-LICS 2014).* ACM (2014).

[21] T. Brázdil, T. Chen, V. Forejt, P. Novotný, and A. Simaitis: **Solvency Markov Decision Processes with Interest**. In *Foundations of Software Technology and Theoretical Computer Science (FSTTCS 2013),* pp. 487-499. Schloss Dagstuhl – Leibniz-Zentrum für Informatik (2013).

[22] T. Brázdil, A. Kučera, and P. Novotný: **Determinacy in Stochastic Games with Unbounded Payoff Functions.** In *Mathematical and Engineering Methods in Computer Science (MEMICS 2012),* pp. 94-105. Springer Berlin/Heidelberg (2013). **Best paper award.**

[23] T. Brázdil, K. Chatterjee, A. Kučera, and P. Novotný: **Efficient Controller Synthesis for Consumption Games with Multiple Resource Types.** In *Computer Aided Verification (CAV 2012),* pp. 23-38. Springer Berlin/Heidelberg (2012).

[24] T. Brázdil, A. Kučera, P. Novotný, and D. Wojtczak: **Minimizing Expected Termination Time in One-Counter Markov Decision Processes.** In *Automata, Languages and Programming (ICALP 2012),* pp. 141-152. Springer Berlin/Heidelberg (2012).

Peer-Reviewed Journal Papers

[25] K. Chatterjee, H. Fu, P. Novotný, and R. Hasheminezhad: **Algorithmic Analysis of Qualitative and Quantitative Termination Problems for Affine Probabilistic Programs.** In *ACM Transactions on Programming Languages and Systems (TOPLAS),* Volume 40, Issue 2, Article No. 7. ACM (2018).

Projects & Funding

2018–2021 PI of a 3-year Junior Grant of the Czech Science Foundation *"Verification and Analysis of Probabilistic Programs."*

2015–2017 Recipient of ISTFELLOW, a 2-year postdoctoral research fellowship at IST Austria co-funded by the EU Marie Curie Actions program. (A 2-year postdoc salary and an additional budget for travel and other research costs.)

Invited Talks

2019 **Martingales for Probabilistic Termination and Safety.** University of Oxford, UK, September 2019.

Martingales for Probabilistic Termination and Safety. University of Mons, Belgium, June 2019.

2018 **Risk-Aware Planning in Partially Observable Markov Decision Processes.** GAMENET Conference (a meeting of the COST Action European Network for Game Theory). Krakow, Poland, September 2018.

Martingales for Probabilistic Termination and Safety. University of Texas at Austin, USA, January 2018.

2017 **Checking and Classifying Fast Termination in VASS.** University of Warsaw, Poland, November 2017.

2014 **'Til the Well Runs Dry: Modelling and Synthesis of Resource-Dependent Systems.** University of Oxford, UK, October 2014.

Teaching & Other Pedagogical Experience

Supervision of Ph.D. students:

- Co-supervising Jiří Vahala (Masaryk University, 2019-now, co-supervisor Tomáš Brázdil)
- Co-supervising Jiří Zárevúcky (Masaryk University, 2020-now, co-supervisor Jan Strejček)
- Co-supervising Đorđe Žikelić (IST Austria, 2019-now, co-supervisor Krishnendu Chatterjee)

Supervision of Bachelor's and Master's students: total of 10 projects supervised as of May 2020.

Supervision of interns at IST Austria:

- Deep Karkhanis (IIT Bombay), spring/summer 2018.
- Sheshansh Agrawal (IIT Bombay), spring/summer 2017.
- Owen Rouillé (ENS Rennes), fall 2016.
- Đorđe Žikelić (University of Cambridge), summer 2016.

- Anchit Gupta (IIT Bombay), summer 2015.

Lecturing and tutoring at the Faculty of Informatics, Masaryk University:

- Lecturer of the course *Introduction to Informatics* (2020–now).
- Lecturer of the course *Introduction to Ph.D. Study* (2018–now).
- Tutorials for the following courses: *Algorithms and Data Structures* (2019–2020), *Mathematical Foundations of Computer Science* (2018–2020), *Computability and Complexity* (2018–2020), *Mathematical Logic* (2011–2013), *Math Foundations* (2010), *Graph Algorithms* (2009), *Mathematics II* (2009), *Automata and Grammars* (2008–2011), *Mathematics I* (2008–2009).
- Student project supervisor for the course *Real-Time Systems* (2014).
- Guest lecture on introduction to mathematical logic (part of the course *Mathematical Logic*, 2013).
- Series of lectures on games of imperfect information (part of the course *Seminar on Stochastic Methods*, 2013).

Lecturing at IST Austria:

- Guest lecture on infinite-state probabilistic systems (part of the course *Formal Methods*, 2017)

Lecturing at the Theiresias Support Centre for Students with Special Needs of Masaryk University:

- Individual teaching of a hearing-impaired student (course name: *Selected Topics in Automata Theory*, 2012).

Conference Presentations

Presentations at CAV'20, ICALP'19, IJCAI'18, POPL'18, AAAI'17, POPL'17, ATVA'16, AA-MAS'16, CAV'14, CSL-LICS'14, FSTTCS'13, CAV'12 + several workshop presentations.

Research Stays and Summer Schools

2019
- One-week stay at the Department of Computer Science, University of Oxford, United Kingdom.

2018
- One-week stay at the Department of Aerospace Engineering and Engineering Mechanics, University of Texas at Austin, USA.

2017
- One-week stay at the Department of Computer Science, University of Oxford, United Kingdom.

2016
- One-week stay at the Department of Computer Science, University of Oxford, United Kingdom.

2014
- One-week stay at the Department of Computer Science, University of Oxford, United Kingdom.
- 1st EATCS Young Researcher's School on Automata, Logic and Games, Telč, Czech Republic.
- One-week stay at IST Austria, Klosterneuburg, Austria.

2013
- Summer School Marktoberdorf 2013 on Software Systems Safety, Marktoberdorf, Germany.
- One-week stay at the Department of Computer Science, University of Oxford, United Kingdom.
- GAMES Winter School 2013, Champéry, Switzerland.

2012	• One-week stay at the Department of Computer Science, University of Oxford, United Kingdom.
	• One-week stay at IST Austria, Klosterneuburg, Austria.
	• 13th Max Planck Advanced Course on Foundations of Computer Science (AD-FOCS 2012), Max Planck Institute for Informatics, Saarbrücken, Germany.
	• ARiSE/VCLA Winter School on Verification, Technische Universität Wien, Vienna, Austria.
2011	• One-week stay at IST Austria, Klosterneuburg, Austria.

Academic Awards

2020	Rector's Award for Outstanding Research Results Achieved by Young Scientists under 35, Masaryk University.
2015	Dean's prize for an outstanding Ph.D. thesis, Faculty of Informatics, Masaryk University.
2012	MEMICS 2012 Best Paper Award.
2010	Dean's prize, Faculty of Science, Masaryk University.
2009	Dean's prize, Faculty of Informatics, Masaryk University.

Academic Service

Program committees:

2020	20th International Conference on Autonomous Agents and Multiagent Systems (AAMAS 2021).
2019	Highlights of Logic, Games and Automata (Highlights 2019).
2017	2nd Workshop on Design and Analysis of Robust Systems (DARS 2017), collocated with CAV 2017.
2016	22nd European Conference on Artificial Intelligence (ECAI 2016).

Events:

2021	21st Czech-Slovak Undergraduate Student Research Competition (evaluation committee membership).
2019	20th Czech-Slovak Undergraduate Student Research Competition (organization and evaluation committee membership).
2014	Member of the organizing committee of the 1st EATCS Young Researcher's School on Automata, Logic and Games.

Departmental Service, Outreach

2020   Python tutor at the Data Science course organized by *Czechitas*, a non-profit organization aimed at increasing digital proficiency among women and children.

2017   Organizer of RiSE seminar at IST Austria. The seminar, organized under auspices of the Austrian Society for Rigorous Systems Engineering, consisted of invited talks of reputable researchers in the area of formal methods.

2012–2014   Member of a team designing admission tests for Master's studies at the Faculty of Informatics, Masaryk University.

Further Qualifications

2013   Two-week advanced soft skills course. Contents: psychology of communication, leadership, basics of coaching.

2012   Two-week soft skills course. Contents: project management, effective communication, time management, teamwork.

References

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