

# Curriculum Vitae



## Person-Related Identification Information

Univ.-Prof. Dr. rer. nat. RNDr. Mgr. Bc. Jan Křetínský, Ph.D.  
Born: 26/12/1984 in Brno, Czech Republic

## Department and Corresponding Address

Chair for Foundations of Software Reliability and Theoretical Computer Science (I-7)  
Institut für Informatik, Technische Universität München (TUM)  
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## Research Employment

2015–now: Tenure-track assistant professor (W2) at TUM

2013–2015: IST Fellow (postdoctoral position funded by Marie Curie programme) at IST Austria, hosted by Prof. Thomas A. Henzinger and Prof. Krishnendu Chatterjee

2009–2014: Doctoral student (Ph. D.) at Masaryk University Brno, Czech Republic (MU), supervised by Prof. Antonín Kučera, thesis *Modal Transition Systems: Extensions and Analysis* passed with distinction

2009–2013: Doctoral student (Dr. rer. nat.) at TUM, supervised by Prof. Javier Esparza, thesis *Verification of Discrete- and Continuous-Time Non-Deterministic Markovian Systems* passed with distinction (*summa cum laude*)

## Publication Summary

38 papers with 40 collaborators resulting in ~410 citations and h-index 11 according to Google Scholar:

26 conference regular papers (3×ATVA, 4×CAV, CBSE, 6×CONCUR, FACS, 2×FSTTCS, 2×HSCC, 3×ICTAC, 2×LICS, 2×LPAR, TACAS)

5 conference tool papers (4×ATVA, CAV), 1 workshop paper (MEMICS) and 1 conference poster paper (ICPE)

4 journal papers (Acta Informatica, 2×Information and Computation, Theoretical Computer Science)

## Community Service

Program committee member: TACAS 2017, QAPL 2015

Reviewer for journals (selection): Acta Informatica, Information Processing Letters, Performance Evaluation, Theoretical Computer Science

Reviewer for conferences (selection): CAV, CONCUR, CSL, FoSSaCS, FORMATS, FSTTCS, ICALP, LATA, LICS, MFCS, POPL, QEST, STACS, TACAS

## Research Areas

Probabilistic model checking  
Applications of machine learning in verification  
Temporal logics, in particular LTL and PCTL  
Continuous-time stochastic processes and games  
Modal transition systems

## Tools

Rabinizer [26]: translation of LTL to deterministic automata  
MoTraS [20]: design and analysis of modal transition systems

## Research Stays and International Experience

Apart from working at TUM, MU, and IST Austria, as indicated above, I also stayed at

Computer Science Department and CISS, Aalborg University, Denmark (one semester in 2008, one month in 2011, two weeks in 2014) resulting in publications [2, 9, 10, 35, 36]

INRIA Rennes, France (3 weeks in 2012, 2 weeks in 2014) resulting in publications [18, 24]

Saarland University – Computer Science, Saarbrücken, Germany (1 week in 2013) resulting in publications [19, 23], previously also [14]

## Invitations to Research Seminars

Mysore seminar Trends and Challenges in Quantitative Verification, February 2016, Mysore, India

Dagstuhl seminar Non-Zero-Sum-Games and Control, February 2015, Dagstuhl, Germany

Dagstuhl seminar Quantitative Models: Expressiveness, Analysis, and New Applications, January 2014, Dagstuhl, Germany

Dagstuhl seminar Quantitative Models: Expressiveness and Analysis, January 2010, Dagstuhl, Germany

## Stipends and Grants

2013–2014: IST Fellowship (Marie Curie programme)

2009–2012: Brno Ph.D. Talent Competition, project *Formal methods for analysis and verification of complex systems*

2008–2009: Programme of Masaryk University Rector: Support of students' research activity in the fields of medicine, science and informatics, project *Probabilistic CTL and Markov chains*

## Scholarly Awards

2014: Rector's Prize for Best Doctoral Students (MU)

2009: Rector's Prize for Best Master Students (MU)

2007: Dean's Prize for Best Bachelor Students (MU)

## Previous Education

2011: Advanced Master's degree (RNDr.), Informatics - Parallel and Distributed Systems, *Probabilistic Timed Systems with Non-Determinism*, Faculty of Informatics, MU

2010: Master's degree (Mgr.), Mathematics - Algebra and Discrete Mathematics, *Modal Transition Systems*, Faculty of Science, MU  
CGPA: 1.00 (top 2%), passed with honours

2009: Master's degree (Mgr.), Informatics - Parallel and Distributed Systems, *Fundamental Properties of Probabilistic Branching-Time Logics*, Faculty of Informatics, MU  
CGPA: 1.00 (top 1%), passed with honours

2007: Bachelor's degree (Bc.), Mathematics - Mathematics, *Monadic Second Order Logic on Infinite Words and Trees*, Faculty of Science, MU  
CGPA: 1.00 (top 1%), passed with honours

2007: Bachelor's degree (Bc.), Humanities - Philosophy, General Linguistics, *Mathematical Framework for Natural Language Formal Description*, Faculty of Arts, MU  
CGPA: 1.11 (top 1%)

2007: Bachelor's degree (Bc.), Informatics - Informatics, *Use-mention Distinction in Transparent Intensional Logic*, Faculty of Informatics, MU  
CGPA: 1.01 (top 1%), passed with honours

1996–2004: High school Gymnázium Matyáše Lercha Brno, Czech Republic, passed with honours (Czech, English, Mathematics, Latin)

1991–1996: Elementary school Janouškova Brno, Czech Republic

## Summer Schools Attendance

12th International School on Formal Methods for the Design of Computer, Communication and Software Systems: Model-Driven Engineering (SFM-12:MDE), June 2012, Bertinoro, Italy

European Network of Excellence on Embedded Systems Design: Quantitative Model Checking Winter School 2012 (ARTIST), February/March 2012, Copenhagen, Denmark

International Spring School in Formal Languages and Applications (SSFLA), April 2011, Taragonna, Spain

Summer School Marktoberdorf 2010. Software and Systems Safety: Specification and Verification (ASIMOD), August 2010, Marktoberdorf, Germany

9th International Summer School on Modelling and Verifying Parallel Processes (MoVeP), June/July 2010, Aachen, Germany

Automatic Verification and Analysis of Complex Systems: 1st AVACS Spring School, March 2010, Oldenburg, Germany

## List of publications

The following lists are ordered by the date of publication.\*

### Conference Papers

- [1] Tomáš Brázdil, Vojtěch Forejt, Jan Křetínský, and Antonín Kučera. The satisfiability problem for probabilistic CTL. In Frank Pfenning, editor, *LICS*, pages 391–402. IEEE Computer Society, 2008.
- [2] Nikola Beneš, Jan Křetínský, Kim Guldstrand Larsen, and Jiri Srba. Checking thorough refinement on modal transition systems is EXPTIME-complete. In Martin Leucker and Carroll Morgan, editors, *ICTAC*, volume 5684 of *LNCS*, pages 112–126. Springer, 2009.
- [3] Tomáš Brázdil, Vojtěch Forejt, Jan Krčál, Jan Křetínský, and Antonín Kučera. Continuous-time stochastic games with time-bounded reachability. In Ravi Kannan and K. Narayan Kumar, editors, *FSTTCS*, volume 4 of *LIPICs*, pages 61–72. Schloss Dagstuhl - Leibniz-Zentrum für Informatik, 2009.
- [4] Tomáš Brázdil, Jan Krčál, Jan Křetínský, Antonín Kučera, and Vojtěch řehák. Stochastic real-time games with qualitative timed automata objectives. In Paul Gastin and François Laroussinie, editors, *CONCUR*, volume 6269 of *LNCS*, pages 207–221. Springer, 2010.
- [5] Nikola Beneš and Jan Křetínský. Process algebra for modal transition systems. In Ludek Matyska, Michal Kozubek, Tomas Vojnar, Pavel Zemcik, and David Antos, editors, *MEMICS*, volume 16 of *OASICS*, pages 9–18. Schloss Dagstuhl - Leibniz-Zentrum für Informatik, Germany, 2010.
- [6] Tomáš Brázdil, Jan Krčál, Jan Křetínský, Antonín Kučera, and Vojtěch řehák. Measuring performance of continuous-time stochastic processes using timed automata. In Marco Caccamo, Emilio Frazzoli, and Radu Grosu, editors, *HSCC*, pages 33–42. ACM, 2011.
- [7] Tomáš Brázdil, Jan Krčál, Jan Křetínský, and Vojtech Řehák. Fixed-delay events in generalized semi-Markov processes revisited. In Joost-Pieter Katoen and Barbara König, editors, *CONCUR*, volume 6901 of *LNCS*, pages 140–155. Springer, 2011.
- [8] Nikola Beneš, Ivana Černá, and Jan Křetínský. Modal transition systems: Composition and LTL model checking. In Tefvik Bultan and Pao-Ann Hsiung, editors, *ATVA*, volume 6996 of *LNCS*, pages 228–242. Springer, 2011.
- [9] Nikola Beneš, Jan Křetínský, Kim G. Larsen, Mikael H. Moller, and Jiri Srba. Parametric modal transition systems. In Tefvik Bultan and Pao-Ann Hsiung, editors, *ATVA*, volume 6996 of *LNCS*, pages 275–289. Springer, 2011.

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\*For brevity, in the publication list the names of the following conferences and their official abbreviations are used: Automated Technology for Verification and Analysis (ATVA), Computer Aided Verification (CAV), International ACM SIGSOFT Symposium on Component-Based Software Engineering (CBSE), Concurrency Theory (CONCUR), International Symposium on Formal Aspects of Component Software (FACS), IARCS Annual Conference on Foundations of Software Technology and Theoretical Computer Science (FSTTCS), ACM International Conference on Hybrid Systems: Computation and Control (HSCC), ACM/SPEC International Conference on Performance Engineering (ICPE), Theoretical Aspects of Computing, International Colloquium (ICTAC), IEEE Symposium on Logic in Computer Science (LICS), Logic for Programming, Artificial Intelligence, and Reasoning (LPAR), Doctoral Workshop on Mathematical and Engineering Methods in Computer Science (MEMICS).

- [10] Nikola Beneš, Jan Křetínský, Kim Guldstrand Larsen, Mikael H. Møller, and Jiri Srba. Dual-priced modal transition systems with time durations. In Nikolaj Bjørner and Andrei Voronkov, editors, *LPAR*, volume 7180 of *LNCS*, pages 122–137. Springer, 2012.
- [11] Jan Křetínský and Javier Esparza. Deterministic automata for the (F,G)-fragment of LTL. In P. Madhusudan and Sanjit A. Seshia, editors, *CAV*, volume 7358 of *LNCS*, pages 7–22. Springer, 2012.
- [12] Nikola Beneš and Jan Křetínský. Modal process rewrite systems. In Abhik Roychoudhury and Meenakshi D’Souza, editors, *ICTAC*, volume 7521 of *LNCS*, pages 120–135. Springer, 2012.
- [13] Andreas Gaiser, Jan Křetínský, and Javier Esparza. Rabinizer: Small deterministic automata for LTL(F, G). In Supratik Chakraborty and Madhavan Mukund, editors, *ATVA*, volume 7561 of *LNCS*, pages 72–76. Springer, 2012.
- [14] Tomáš Brázdil, Holger Hermanns, Jan Krčál, Jan Křetínský, and Vojtech Řehák. Verification of open interactive Markov chains. In Deepak D’Souza, Telikepalli Kavitha, and Jaikumar Radhakrishnan, editors, *FSTTCS*, volume 18 of *LIPICs*, pages 474–485. Schloss Dagstuhl - Leibniz-Zentrum fuer Informatik, 2012.
- [15] Krishnendu Chatterjee, Andreas Gaiser, and Jan Křetínský. Automata with generalized Rabin pairs for probabilistic model checking and LTL synthesis. In Natasha Sharygina and Helmut Veith, editors, *CAV*, volume 8044 of *LNCS*, pages 559–575. Springer, 2013.
- [16] Jan Křetínský and Salomon Sickert. On refinements of Boolean and parametric modal transition systems. In Zhiming Liu, Jim Woodcock, and Huibiao Zhu, editors, *ICTAC*, volume 8049 of *LNCS*, pages 213–230. Springer, 2013.
- [17] Tomáš Brázdil, Lubos Korenciak, Jan Krčál, Jan Křetínský, and Vojtech Řehák. On time-average limits in deterministic and stochastic Petri nets. In Seetharami Seelam, Petr Tuma, Giuliano Casale, Tony Field, and José Nelson Amaral, editors, *ICPE*, pages 421–422. ACM, 2013.
- [18] Nikola Beneš, Benoît Delahaye, Uli Fahrenberg, Jan Křetínský, and Axel Legay. Hennessy-Milner logic with greatest fixed points as a complete behavioural specification theory. In Pedro R. D’Argenio and Hernán C. Melgratti, editors, *CONCUR*, volume 8052 of *LNCS*, pages 76–90. Springer, 2013.
- [19] Holger Hermanns, Jan Krčál, and Jan Křetínský. Compositional verification and optimization of interactive Markov chains. In Pedro R. D’Argenio and Hernán C. Melgratti, editors, *CONCUR*, volume 8052 of *LNCS*, pages 364–379. Springer, 2013.
- [20] Jan Křetínský and Salomon Sickert. MoTraS: A tool for modal transition systems and their extensions. In Dang Van Hung and Mizuhito Ogawa, editors, *ATVA*, volume 8172 of *LNCS*, pages 487–491. Springer, 2013.
- [21] Jan Křetínský and Ruslán Ledesma-Garza. Rabinizer 2: Small deterministic automata for LTL\GU. In Dang Van Hung and Mizuhito Ogawa, editors, *ATVA*, volume 8172 of *LNCS*, pages 446–450. Springer, 2013.
- [22] Javier Esparza and Jan Křetínský. From LTL to deterministic automata: A safrless compositional approach. In Armin Biere and Roderick Bloem, editors, *CAV*, volume 8559 of *LNCS*, pages 192–208. Springer, 2014.

- [23] Holger Hermanns, Jan Krčál, and Jan Křetínský. Probabilistic bisimulation: Naturally on distributions. In Paolo Baldan and Daniele Gorla, editors, *CONCUR*, volume 8704 of *LNCS*, pages 249–265. Springer, 2014.
- [24] Ulrich Fahrenberg, Jan Křetínský, Axel Legay, and Louis-Marie Traonouez. Compositionality for quantitative specifications. In Ivan Lanese and Eric Madelaine, editors, *FACS*, volume 8997 of *LNCS*, pages 306–324. Springer, 2014.
- [25] Tomáš Brázdil, Krishnendu Chatterjee, Martin Chmelík, Vojtěch Forejt, Jan Křetínský, Marta Z. Kwiatkowska, David Parker, and Mateusz Ujma. Verification of markov decision processes using learning algorithms. In Franck Cassez and Jean-Francois Raskin, editors, *ATVA*, volume 8837 of *LNCS*, pages 98–114. Springer, 2014.
- [26] Zuzana Komárková and Jan Křetínský. Rabinizer 3: Safrless translation of LTL to small deterministic automata. In Franck Cassez and Jean-Francois Raskin, editors, *ATVA*, volume 8837 of *LNCS*, pages 235–241. Springer, 2014.
- [27] Maria Svoreňová, Jan Křetínský, Martin Chmelík, Krishnendu Chatterjee, Ivana Černá, and Calin Belta. Temporal logic control for stochastic linear systems using abstraction refinement of probabilistic games. In Antoine Girard and Sriram Sankaranarayanan, editors, *HSCC*, pages 259–268. ACM, 2015.
- [28] Nikola Beneš, Przemyslaw Daca, Thomas A. Henzinger, Jan Křetínský, and Dejan Nickovic. Complete composition operators for ioco-testing theory. In Philippe Kruchten, Steffen Becker, and Jean-Guy Schneider, editors, *CBSE*, pages 101–110. ACM, 2015.
- [29] Krishnendu Chatterjee, Zuzana Komárková, and Jan Křetínský. Unifying two views on multiple mean-payoff objectives in Markov decision processes. In *LICS*, pages 244–256. IEEE, 2015.
- [30] Tomáš Brázdil, Krishnendu Chatterjee, Martin Chmelík, Andreas Fellner, and Jan Křetínský. Counterexample explanation by learning small strategies in Markov decision processes. In Daniel Kroening and Corina S. Pasareanu, editors, *CAV*, volume 9206 of *LNCS*, pages 158–177. Springer, 2015.
- [31] Tomáš Babiak, František Blahoudek, Alexandre Duret-Lutz, Joachim Klein, Jan Křetínský, David Müller, David Parker, and Jan Strejček. The hanoi omega-automata format. In Daniel Kroening and Corina S. Pasareanu, editors, *CAV*, volume 9206 of *LNCS*, pages 479–486. Springer, 2015.
- [32] Jan Křetínský, Kim Guldstrand Larsen, Simon Laursen, and Jiří Srba. Polynomial time decidability of weighted synchronization under partial observability. In Luca Aceto and David de Frutos-Escrig, editors, *CONCUR*, volume 42 of *LIPICs*, pages 142–154. Schloss Dagstuhl - Leibniz-Zentrum fuer Informatik, 2015.
- [33] Vojtěch Forejt, Jan Krčál, and Jan Křetínský. Controller synthesis for MDPs and frequency LTL\GU. In Martin Davis, Ansgar Fehnker, Annabelle McIver, and Andrei Voronkov, editors, *LPAR*, volume 9450 of *LNCS*, pages 162–177. Springer, 2015.
- [34] Przemyslaw Daca, Thomas A. Henzinger, Jan Křetínský, and Tatjana Petrov. Faster statistical model checking for unbounded temporal properties. In *TACAS*. Springer, 2016. To appear.

## Journal Papers

- [35] Nikola Beneš, Jan Křetínský, Kim Guldstrand Larsen, and Jiri Srba. On determinism in modal transition systems. *Theoretical Computer Science*, 410(41):4026–4043, 2009.
- [36] Nikola Beneš, Jan Křetínský, Kim G. Larsen, and Jiri Srba. EXPTIME-completeness of thorough refinement on modal transition systems. *Information and Computation*, 218:54–68, 2012.
- [37] Tomáš Brázdil, Vojtěch Forejt, Jan Krčál, Jan Křetínský, and Antonín Kučera. Continuous-time stochastic games with time-bounded reachability. *Information and Computation*, 224:46–70, 2013.
- [38] Nikola Beneš, Jan Křetínský, Kim G. Larsen, Mikael H. Møller, Salomon Sickert, and Jiří Srba. Refinement checking on parametric modal transition systems. *Acta Informatica*, 52(2-3):269–297, 2015.

## Theses

- [39] Jan Křetínský. *Fundamental properties of probabilistic branching-time logics*. Master’s thesis, Masaryk University, Brno, Dept. of Computer Science, 2009.
- [40] Jan Křetínský. *Modal transition systems*. Master’s thesis, Masaryk University, Brno, Dept. of Mathematics, 2010.
- [41] Jan Křetínský. *Verification of Discrete- and Continuous-Time Non-Deterministic Markovian Systems*. PhD thesis, Institut für Informatik, Technische Universität München, 2013.
- [42] Jan Křetínský. *Modal Transition Systems: Extensions and Analysis*. PhD thesis, Masaryk University, Brno, Dept. of Computer Science, 2014.

## List of courses taught

### Lecturer

IN2050 Model Checking (TUM, Summer 2016)

IN2007 Complexity (TUM, Summer 2016)

IN2041 Automata and Formal Languages (TUM, Winter 2015/16)

### Teaching assistant

IN2041 Automata and Formal Languages (TUM, Winter 2009/10, 2010/11, 2011/12, 2012/13) in English

IN0018 Discrete Probability Theory (TUM, Summer 2012) in English and in German

IN2007 Complexity (TUM, Summer 2010, 2011) in English

IA008 Computational Logic (MU, Spring 2009) in English

MB003 Linear Algebra I (MU, Spring 2008) in Czech

M1110 Linear Algebra and Geometry I (MU, Autumn 2007) in Czech

IB102 Automata and Grammars (MU, Autumn 2007) in Czech

MB005 Foundations of Mathematics (MU, Autumn 2007) in Czech

## List of students and Bachelor theses supervised

Carlos Camino: Probabilistic Cellular Automata

Martin Stoll: MoTraS: A Tool for Modal Transition Systems

Salomon Sickert: Refinement Algorithms for Parametric Modal Transition Systems

Imre Vadsz: Discretization of Time-Bounded Reachability in Generalized Semi-Markov Games

Dennis Kraft: Almost Sure Winning Strategies in Stochastic Real Time Games with Timed Automata Objectives

Markus Dausch: Tool for Continuous Time Stochastic Games (GUI and Simulations)

Tuan Duc Nguyen: An Extension of a Tool for Modal Transition Systems

Philip Meyer: Algorithms for Refinement of Modal Process Rewrite Systems

Alexander Manta: Implementation of Algorithms for Modal Transition Systems with Durations

Michael Opitz: Algorithms for the Verification of Open Interactive Markov Chains

Additionally, in papers [16, 20, 26] the only co-authors were supervised undergraduate students.