Overview

Name:	Tobias Meggendorfer
Date of Birth:	20.08.1993
Citizenship:	German
Homepage:	https://tobias.meggendorfer.de
Languages:	German: Mother tongue, English: Fluent, Swedish: Basic.

Education & Research

Institute of Science and Technology Austria

since March 2021 Post-Doc (with Krishnendu Chatterjee; *ISTfellow*)

Technische Universität München

July 2016 – Feb. 2021	PhD (Landesstelle; with Jan Křetínský; Submission: Jul. 2020; *with distinction*)
WS 2015 – SS 2020	MSc. Computer Science (part time) (GPA 1.1; *with distinction*)
WS 2013 – WS 2015	MSc. Mathematics (GPA 1.2; *with distinction*)
WS 2011 – SS 2013	BSc. Mathematics, minor: Computer Science (GPA 1.6)
SS 2011 – WS 2011	TwoInOne Mathematics
WS 2008 – SS 2010	Computer Science "Vorstudium" Schüler.In.TUM

Significant Fellowships, Grants & Awards

- 2022: Selected participant of the 9th Heidelberg Laureate Forum
- 2022: Nomination for the GI dissertation award by TUM
- 2021: Fellow of the ISTfellow program – 2 year Post-Doc Fellowship/Grant

Scientific Profiles & Contributions

DBLP	Scholar	SCOPUS	WOS	ORCID
194/2764	2fzp1cAAAAAJ	57193918932	GNP-0154-2022	0000-0002-1712-2165

16 conference (6 A*, 8 A, 1 B CORE ranking) and 2 journal publications; 3 solo and 4 full first authorships; 201 citations (Google Scholar).

Teaching Experience

Developed 1 lecture, 6 times lecturer (three lectures), 7 times (head) TA; 3 MSc, 1 BSc supervisions. Several instances of voluntary teaching without teaching requirement.

Service

~65 reviews, including conferences like AAAI, ATVA, CAV, CDC, FORMATS, FoSSaCS, and TACAS; journals such as TCS and FMSD; and the Czech Science Foundation.

Scientific Profile

Currently, I focus on pushing the practical and theoretical boundaries of algorithms and decision problems related to stochastic systems, in particular Markov decision processes. I build the foundations for *risk-aware* verification of such systems, a question which is largely overlooked in verification and only sparsely investigated with mathematical rigour by the AI community as of now. For this reason, I also advocate for incorporating risk in numerous applications or try to identify well-founded contraindications for doing so. Secondly, I push the theoretical boundaries of algorithms and decision problems related to such stochastic systems through several angles. Thirdly, approaches such as partial exploration and safely incorporating machine learning methods yield significant practical improvements. Aside from these main goals, I also investigate problems in game theory (in particular bidding games, which may provide another view on risk by considering the value assigned to certain actions through bids of players), LTL to automaton translations, and probabilistic programs. I am curious about new questions and often investigate new angles towards / applications of verification, preferably across disciplines.

Scientific Contributions

Tools

Recognized scientific tools which I significantly contributed to:

- `Owl`: A library for ω-words, automata, and LTL; state-of-the-art tool for LTL to automaton translations and reactive synthesis (paired with Strix)
  Available at `https://owl.model.in.tum.de`.
- `Rabinizer 4.0`: A tool-set to produce small automata from LTL formulae.
  Part of Owl.
- `PET` (Partial Exploration Tool): A tool-set to efficiently analyse probabilistic systems using guided sampling.
  Available at `https://gitlab.lrz.de/i7/partial-exploration`.

Some further projects: `probabilistic-models` (Java library for probabilistic models), `JBDD` (pure-Java implementation of BDDs), `naturals-util` (Java library to efficiently deal with natural numbers), and `DOMtutor` (Teaching tool integrating with DOMjudge).

Peer-Reviewed Submissions

Most important submissions highlighted by **H**.

Conference

- Tobias Meggendorfer. "Correct Approximation of Stationary Distribution". In: *TACAS 2023*. Accepted, to appear. 2023

H Krishnendu Chatterjee, Tobias Meggendorfer, Raimundo Julián Saona Urmeneta, and Jakub Svoboda. "Faster Algorithm for Turn-based Stochastic Games with Bounded Treewidth". In: *SODA 2023*. Accepted, to appear. 2023

- Ali Ahmadi et al. "Algorithms and Hardness Results for Computing Cores of Markov Chains". In: *42nd IARCS Annual Conference on Foundations of Software Technology and Theoretical Computer Science, FSTTCS 2022, December 18-20, 2022, IIT Madras, Chennai, India*. Ed. by Anuj Dawar and Venkatesan Guruswami. Vol. 250. LIPIcs. Schloss Dagstuhl - Leibniz-Zentrum für Informatik, 2022, 29:1–29:20. DOI: 10.4230/LIPIcs.FSTTCS.2022.29
- Tobias Meggendorfer. "PET - A Partial Exploration Tool for Probabilistic Verification". In: *ATVA 2022*. Ed. by Ahmed Bouajjani, Lukás Holík, and Zhilin Wu. Vol. 13505. LNCS. Springer, 2022, pp. 320–326. DOI: 10.1007/978-3-031-19992-9_20

- Kush Grover, Jan Kretínský, Tobias Meggendorfer, and Maximilian Weininger. "Anytime Guarantees for Reachability in Uncountable Markov Decision Processes". In: *CONCUR 2022*. Vol. 243. LIPIcs. Schloss Dagstuhl - Leibniz-Zentrum für Informatik, 2022, 11:1–11:20. DOI: 10.4230/LIPIcs.CONCUR.2022.11
- Krishnendu Chatterjee, Amir Kafshdar Goharshady, Tobias Meggendorfer, and Dorde Zikelic. "Sound and Complete Certificates for Quantitative Termination Analysis of Probabilistic Programs". In: *CAV 2022*. Vol. 13371. LNCS. Springer, 2022, pp. 55–78. DOI: 10.1007/978-3-031-13185-1_4

H Tobias Meggendorfer. "Risk-Aware Stochastic Shortest Path". In: *AAAI 2022*. AAAI Press, 2022, pp. 9858–9867. DOI: 10.1609/aaai.v36i9.21222

- Jan Křetínský, Tobias Meggendorfer, and Maximilian Weininger. "Satisfiability Bounds for ω-Regular Properties in Bounded-Parameter Markov Decision Processes". In: *CDC 2019*. IEEE, 2019, pp. 2284–2291. DOI: 10.1109/CDC40024.2019.9029460
- Jan Křetínský, Alexander Manta, and Tobias Meggendorfer. "Semantic Labelling and Learning for Parity Game Solving in LTL Synthesis". In: *ATVA 2019*. Vol. 11781. LNCS. Springer, 2019, pp. 404–422. DOI: 10.1007/978-3-030-31784-3_24
- Jan Křetínský and Tobias Meggendorfer. "Of Cores: A Partial-Exploration Framework for Markov Decision Processes". In: *CONCUR 2019*. Vol. 140. LIPIcs. Schloss Dagstuhl - Leibniz-Zentrum für Informatik, 2019, 5:1–5:17. DOI: 10.4230/LIPIcs.CONCUR.2019.5
- Jan Křetínský, Tobias Meggendorfer, and Salomon Sickert. "Owl: A Library for ω-Words, Automata, and LTL". in: *ATVA 2018*. Vol. 11138. LNCS. Springer, 2018, pp. 543–550. DOI: 10.1007/978-3-030-01090-4_34
- Jan Křetínský, Tobias Meggendorfer, Salomon Sickert, and Christopher Ziegler. "Rabinizer 4: From LTL to Your Favourite Deterministic Automaton". In: *CAV 2018*. Vol. 10981. LNCS. Springer, 2018, pp. 567–577. DOI: 10.1007/978-3-319-96145-3_30

H Jan Křetínský and Tobias Meggendorfer. "Conditional Value-at-Risk for Reachability and Mean Payoff in Markov Decision Processes". In: *LICS 2018*. ACM, 2018, pp. 609–618. DOI: 10.1145/3209108.3209176

- Jan Křetínský and Tobias Meggendorfer. "Efficient Strategy Iteration for Mean Payoff in Markov Decision Processes". In: *ATVA 2017*. Vol. 10482. LNCS. Springer, 2017, pp. 380–399. DOI: 10.1007/978-3-319-68167-2_25
- Pranav Ashok et al. "Value Iteration for Long-Run Average Reward in Markov Decision Processes". In: *CAV 2017*. Vol. 10426. LNCS. Springer, 2017, pp. 201–221. DOI: 10.1007/978-3-319-63387-9_10
- Jan Křetínský, Tobias Meggendorfer, Clara Waldmann, and Maximilian Weininger. "Index Appearance Record for Transforming Rabin Automata into Parity Automata". In: *TACAS 2017*. Vol. 10205. LNCS. 2017, pp. 443–460. DOI: 10.1007/978-3-662-54577-5_26

Journal

- Jan Kretínský, Tobias Meggendorfer, Clara Waldmann, and Maximilian Weininger. "Index appearance record with preorders". In: *Acta Informatica* 59.5 (2022), pp. 585–618. DOI: 10.1007/s00236-021-00412-y

H Jan Kretínský and Tobias Meggendorfer. "Of Cores: A Partial-Exploration Framework for Markov Decision Processes". In: *LMCS* 16.4 (2020). DOI: https://doi.org/10.23638/LMCS-16(4:3)2020

Theses

- Tobias Meggendorfer. "Verification of Discrete-Time Markov Decision Processes". PhD thesis. Technical University of Munich, Germany, 2021. URL: https://nbn-resolving.org/urn:nbn:de:bvb:91-diss-20210226-1550256-1-5
- Tobias Meggendorfer. "Solving the quantitative Reachability Problem on Markov Decision Processes using Learning Algorithms". Masters's Thesis. Technical University of Munich, Germany, 2020
- Tobias Meggendorfer. "On Fairness in Social Decision Schemes". Masters's Thesis. Technical University of Munich, Germany, 2015
- Tobias Meggendorfer. "The Laplace equation involving measure data". Bachelor's Thesis. Technical University of Munich, Germany, 2013

Community Service & Reviewing

I served as a PC member for

> AAAI (2023), ATVAART (2019), CAV AEC (2022), TACAS AE (2018, 2019, 2020), HSCC RE (2021, 2022, 2023), PLDI AEC (2023)

(sub-)reviewed for the following conferences:

> ACC, ACSD, ALT, ATVA x3, CDC, FORMATS, FoSSaCS x2, GandALF, ICTAC x5, IJEECS, MEMICS, Petri Nets, PEVA, QAPL, QEST x4, TACAS x8, VMCAI x3,

the following journals:

> CAOR, FMSD x2, IEEE TSE, JALC, KiMfest, LATA, STTT, TCS x2, YINCO,

and the following grant agencies:

> Czech Science Foundation (CZF).

Scientific Events

- Co-organizer of the Young Scientists Symposium 2022 (ISTA)

Teaching

Teaching Tool DOMtutor

I developed the tool DOMtutor, which aids automation of DOMjudge, an online platform for evaluating code submissions. This tool is a centrepiece of my algorithms lecture, drastically improving the quality of teaching and reducing the overhead for setup etc. Designed to be agnostic of the lecture structure, it is already being explored by other institutions for use with their teaching.

Teaching Experience

IST Austria, since 2021

Lecturer:

- Introduction to Programming with Python (Block Course, PhD Students, English): WS2021
- Applied Algorithms and Data Structures (Full lecture, PhD Students, English): WS2021, WS2022
  Fully designed, organized, and taught by myself.

Technical University of Munich, 2016-2021

Lecturer:

- Algorithms for Programming Contests (Practical Course, MSc, English): WS2018, WS2019, SS2020, WS2020

Head TA:

- Quantitative Verification (Full lecture, MSc, English): WS2018
- Fundamental Algorithms (Full lecture, MSc, English): WS2017

TA:

- Einführung in die theoretische Informatik (Full lecture, BSc, German): SS2017, SS2018
- Diskrete Strukturen (Full lecture, BSc, German): WS2017
- Model Checking (Full lecture, MSc, English): SS2017
- Einführung in die Informatik 2 (Full lecture, BSc, German): WS2016

Students & Thesis Supervision

- Maximilian Prokop: Advanced Machine Learning Guidance for Reactive LTL Synthesis (2022, MSc Thesis, passed with distinction)
- Alexander Manta: Machine Learning Guidance in Automata-Theoretic Approach for Reactive LTL Synthesis (2019, MSc Thesis, passed with distinction, resulting in a joint publication at ATVA'19)
- Calvin Chau: Computing a Distribution-based Probabilistic Bisimulation (2019, BSc Thesis, passed with distinction)
- Sebastian Fiss: Learning Methods for Parity Games and Their Application to LTL Synthesis (2018, MSc Thesis, passed with distinction)

Other Relevant Experience

Events & Activities

- 2022: Organizer of a local branch of the Wintercontest 2022 (friendly programming contest of German Universities) at IST
- 2020: Co-Organizer of the GCPC 2020 (German Collegiate Programming Contest) at TUM
- 2020: Co-Organizer of a local branch of the FAU Wintercontest 2020 (friendly programming contest of German Universities) at TUM
- 2019: Coach at ICPC NWERC 2019 (ICPC Northwestern Europe Regional Contest) in Eindhoven
- 2019: Co-Organizer of the GCPC 2019 (German Collegiate Programming Contest) at TUM

Certification & Training

- 2022: FIT4FUNDING course on EU grant writing

Practical Experience

- Since 2012: CTO of German KMU "CMR GmbH" (< 10 employees, mostly 8h/week part time) Activities include requirement analysis, software design, full-stack development using Java, embedded systems development, leading a team of 1-3 developers.
- 2012: Internship followed by student employee position at Siemens AG
- Significant contributions to several open-source projects (e.g. RoaringBitmap and fastutil).