# Marcel Moosbrugger

Academic Curriculum Vitae

marcel.moosbrugger@tuwien.ac.at
marcelmoos.com

## Personal Data

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| Date of Birth: | 14th January 1994 |
| Languages: | German (native), English (fluent), French & Italian (basics) |
| Nationality: | Austria |
| Personal Interests: | Sports of all kinds, Non-fiction books |

## Research Interest

- Formal Methods
- Probabilistic Programming
- Computer-Aided Verification
- Machine Learning

## Education

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|---|---|
| Since 2020 | Ph.D. in Computer Science – TU Wien<br>Supervision: Prof. Laura Kovács |
| June 2020 | Master of Science – TU Wien<br>GPA 1.0 (grades range from 1 (best) to 5) |
| February 2018 | Bachelor with Honors – TU Wien<br>Special 1 year program - GPA 1.0 (grades range from 1 (best) to 5)<br>Among best 5 % of students - Mentor: Prof. Thomas Eiter |
| February 2017 | Bachelor of Science – TU Wien<br>GPA 1.0 (grades range from 1 (best) to 5) |

## Career History

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| Since 2020 | Ph.D. Researcher – TU Wien |
| Sep. 2023 | Visiting Researcher – Max Planck Institute for Software Systems and Saarland University |
| Jan. - Mar. 2022 | Research Scholar (3 months) – RWTH Aachen University – with Prof. Joost-Pieter Katoen |
| 2019 | Teaching Assistant – TU Wien |
| Aug. - Sep. 2019 | Research Scholar (2 months) – Purdue University – with Prof. Roopsha Samanta |
| July 2018 | Research Scholar (1 month) – ENS Paris-Saclay – with Prof. Laurent Doyen |
| 2014 - 2018 | Software Engineer Massive Art / Sulu |

## Teaching

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|---|---|
| 2022 | Teaching Assistant & Lecturer – “Formal Methods in Computer Science - Lab”<br>Master course, 89 enrolled students |
| 2022 | “Abenteuer Informatik” – Recurring computer science workshop for primary schools (age 7 to 8) |
| 2021 | Teaching Assistant & Lecturer – “Formal Methods in Computer Science - Lab”<br>Master course, 91 enrolled students |
| 2020 | Teaching Assistant & Lecturer – “Formal Methods in Computer Science”<br>Master course, 414 enrolled students |
| 2019 | Teaching Assistant & Lecturer – “Complexity Theory”<br>Master course, 16 enrolled students |
| 2019 | Teaching Assistant – “Algorithms & Data Structures”<br>Bachelor course, 791 enrolled students |
| 2017 | Lecturer – “Introduction to Java”<br>Free course for refugees – 30 enrolled students |

## Prizes & Distinctions

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|---|---|
| 2022 | SAS 2022 -- Radhia Cousot Young Researcher Best Paper Award |
| 2022 | QEST 2022 -- Best Paper Award |
| 2022 | Recipient of the CONFEST 2022 Participation Grant |
| 2022 | Member of the “TU Wien 30 under 30” (list of 30 people below 30 years with exceptional achievements) |
| 2022 | Awardee of the “Chrstina Hörbiger Prize” of the TU Wien to promote the international mobility of young scientists. |
| 2021 | Winner of the “Diploma Thesis Award” of the City of Vienna for my master’s thesis. |
| 2020 | Winner of the “Distinguished Young Alumn Award” for the best master’s thesis of the semester. |
| 2020 | Nominee for the “Würdigungspreis” (Prize of the Austrian state for the best master graduates) |
| 2018 | Bachelor with Honors – Certifies being among the top 5 % of students |
| 2015 & 2016 | Recipient of the Performance Scholarship given to students who “achieved excellent academic performance” |

## Community Work

**PC Member:** CAV 2021 (Artifact Evaluation), CAV 2022 (Artifact Evaluation)

**Session Chair:** CONCUR 2020

**(Sub-)Reviewer:** JSCO 2023, LICS 2023**,** POPL 2022, POPL 2021, FAC 2022, CAV 2021, FMCAD 2021, FOAC 2022, TACAS 2022

**Committees:** Habilitation committee Dr. Dejan Nickovic

## Software

- Polar – Analyze probabilistic loops with algebraic recurrences (https://github.com/probing-lab/polar)
- Amber – Analyze termination behavior of probabilistic programs (https://github.com/probing-lab/amber)
- Mora – Generating moment-based invariants for probabilistic loops (https://github.com/probing-lab/mora)

## Supervised Students

- Julian Müllner, Master thesis; Topic: Exact Inference for Probabilistic Loops, 2022 -- 2023
- Julian Müllner, Student researcher; Topic: Sensitivity analysis for probabilistic loops, 2021 – 2022
- Caroline Jabs, Master thesis,; Topic: Novelty-detection based split-selection-heuristics for neural network verification, 2022

- Daneshvar Amrollahi, Student researcher; Topic: Solving Invariant Generation for Unsolvable Loops, 2021

## Talks

2023 Talk at ROCKS 2023 on “Algebraic Analysis of Probabilistic Loops”

2023 Talk at the Austrian Computer Science Day on “Automated Analysis of Probabilistic Loops”

2023 Lecture at Bellairs 2023 on “Algebraic Analysis of Probabilistic Loops”

2022 Talk at OOPSLA 2022 on “This is the Moment for Probabilistic Loops”

2022 Talk at SAS 2022 on “Solving Invariant Generation for Unsolvable Loops”

**2022 TEDx Talk on the Societal Impacts of AI (at TEDx Salzburg in German)**

2021 Talk at FM 2021 on “The Probabilistic Termination Tool Amber”

2021 Talk at ESOP 2021 on “Automating Termination Analysis of Polynomial Probabilistic Programs”

2020 Talk at the Epilog of the faculty of informatics @ TU Wien.

## Publications

[1] Strong Invariants Are Hard: On the Hardness of Strongest Polynomial Invariants for (Probabilistic) Programs, POPL 2024

[2] Automated Sensitivity Analysis for Probabilistic Programs, iFM 2023

[3] The Probabilistic Termination Tool Amber, Invited for FMSD Journal

[4] This is the Moment for Probabilistic Loops, OOPSLA 2022

**[5] Solving Invariant Generation for Unsolvable Loops, SAS 2022, Radhia Cousot Young Researcher Best Paper Award**

[6] Distribution Estimation for Probabilistic Loops, QEST 2022

**[7] Moment-based Invariants for Probabilistic Loops with Non-polynomial Assignments, QEST 2022, Best Paper Award**

[8] The Probabilistic Termination Tool Amber, FM 2021

[9] Automating Termination Analysis of Polynomial Probabilistic Programs, ESOP 2021

<u>Currently under Review</u>

[A] Exact and Approximate Moment Derivation for Probabilistic Loops With Non-Polynomial Assignments, Invited to TOMACS Special Issue for QEST 2022

[B] (Un)Solvable Loop Analysis, Invited to FMSD Special Issue for SAS 2022