Matej Jusup

matej.jusup@gmail.com | mjusup@ethz.ch | +41764505807

matej-jusup.com | google scholar | github

EDUCATION

ETH Zurich — Zurich, Switzerland
PhD in Artificial Intelligence — Sep 2020 – Mar 2025

> THESIS TITLE: Safe Multi-Agent Reinforcement Learning with Applications in Transportation
> SUPERVISORS: Prof. Francesco Corman and Prof. Andreas Krause

University of Zagreb — Zagreb, Croatia
MSc in Mathematical Statistics; graduated with honors — Oct 2013 – Feb 2017

> MASTER THESIS: Network Optimization in Railway Transport Planning
> SUPERVISORS: Prof. Marko Vrdoljak and Prof. Andreas Dress

University of Bielefeld — Bielefeld, Germany
Erasmus student exchange — Sep 2015 – Jul 2016

University of Zagreb — Zagreb, Croatia
BSc in Mathematics — Oct 2010 – Jul 2013

RELEVANT COURSES:
Probabilistic artificial intelligence | Advanced probability | Mathematical statistics | Stochastic processes | Time-series analysis
Linear algebra | Linear optimization | Markov chains | Numerical analysis | Operations research | Data structures and algorithms

WORK EXPERIENCE

Cantab Predictive Intelligence (startup) — Zagreb, Croatia
AI Researcher - team leader — Mar 2019 - Jul 2020

Behavioral Credit Scoring:
Built a PySpark gradient-boosting model to predict consumer default risk probability, achieving a market-leading Gini metric results of up to 75%.

AI-Driven Marketing Campaign:
Devised a data-driven campaign for promoting a heart disease drug to doctors on behalf of a top pharmaceutical company, which led to a 10% sales increase during A/B testing.
Statistical analysis was conducted using Statsmodels, SciPy, and Python plotting packages.

Personalized Newsletter and E-Commerce Recommender Systems:
Constructed a hybrid recommender system combining content-based and collaborative filtering, which achieved a 1.5% click-through rate during the proof-of-concept phase.
Utilized Databricks, Python, PyTorch, and AWS in the technology stack.

Delivery Delay Estimation:
Developed a customer support system for a shopping mall during the COVID-19 pandemic, which predicted delivery delays using a time-series ARIMA model supplemented with supervised learning techniques.
The technology stack comprised Pandas, NumPy, and Sklearn.

Morgan Stanley — Budapest, Hungary
AI Researcher — Oct 2017 - Mar 2019

Systemic Risk Model Execution Efficiency:
Created a parallel version of a hill climber heuristic that made the optimization problem practically tractable. The heuristic's runtime was limited to 3 minutes and, on average, generated solutions within 5% of the optimum, with the reported worst-case being 15% for tractable test-set instances. Employed a technology stack encompassed Python, CPLEX, and OR-Tools.

Treasury Department Cash Traceability:
Constructed an uncollateralized debt tracking system by amalgamating diverse daily feeds to generate comprehensive firm-wide reports within seconds. Employed Q/kdb+, Python, PyQ kernel, and SQL for the development.

E-Trading Execution Limits Calibration:
Fine-tuned an in-house model to prevent real-time executions during high-risk scenarios, employing a statistical analysis of e-trading clients. Utilized Pandas for the calibration process.

Software Developer — Budapest, Hungary — Dec 2016 - Oct 2017

Implemented and unit-tested features for the Java-based margin calculator microservice.

Technology Analyst Program — New York & London — Aug 2016 - Dec 2016

Participated in a 15-week annual grad program among 50 globally selected interview-passing students.

University of Zagreb, Department of Mathematics — Zagreb, Croatia
Junior Teaching Assistant for Euclidean Spaces course — Oct 2013 - Mar 2014

Selected to deliver problem-solving lectures by achieving the highest course score among 70 students.

Publications

1. M. Jusup, B. Pasztor, T. Janik, K. Zhang, F. Corman, A. Krause, I. Bogunovic (2023), Safe model-based multi-agent mean-field reinforcement learning, arXiv:2306.17052

2. V. Tkachuk, S.A. Bakhtiari, J. Kirschner, M. Jusup, I. Bogunovic, C. Szepesvari (2023), Efficient planning in combinatorial action spaces with applications to cooperative multi-agent reinforcement learning, Artificial Intelligence and Statistics 2023

3. M. Jusup, J. Kirschner, T. Birchler, S. Curi, I. Bogunovic, A. Krause, F. Corman (2022), Real-time railway (re-)scheduling without human-expert knowledge, 22nd Swiss Transport Research Conference (STRC 2022)

4. M. Jusup, A. Trivella, F. Corman (2021), A review of real-time railway and metro rescheduling models using learning algorithms, In 30th International Joint Conference on Artificial Intelligence (IJCAI-21)

Talks at Conferences and Workshops

- **Workshop on Stochastic Modelling and Monte-Carlo Tree Search (invited)** — TU Munich, Germany
  Neural-MCTS applications in train routing — *Sep 2022*

- **STRC 2022 – 22st Swiss Transport Research Conference** — Monte Verità, Switzerland
  Real-time railway (re-)scheduling without human-expert knowledge — *May 2022*

- **STRC 2021 – 21st Swiss Transport Research Conference** — Monte Verità, Switzerland
  A Review of real-time railway and metro rescheduling models using learning algorithms — *Sep 2021*

- **IJCAI 2021 – RL for Intelligent Transportation Systems Workshop** — Montreal, Canada
  A Review of real-time railway and metro rescheduling models using learning algorithms — *Aug 2021*

- **DevArena – software development conference (invited)** — Zagreb, Croatia
  Machine Learning - From Idea to Production — *Oct 2019*

Personal Projects

- **Collaboration with Norbert Fogarasi – On Partial Sorting in Restricted Rounds (2017)**
  Improved a naive C++ implementation of the algorithm by reducing $\mathcal{O}(n^2\,n!)$ to $\mathcal{O}(n^2)$ space complexity

Programming Skills

Advanced: Python

Work experience: PyTorch | PySpark | Q/kdb+ | C++

Minor experience: TensorFlow | SQL | Java | JavaScript | C | R | Matlab

VCS & Other: Git | GitHub | Databricks | AWS | MS Azure

Languages

English: Professional working proficiency
Croatian: Native proficiency
German: Basic

Interests and Awards

Chess: Won silver medal at individual Croatian junior (under 20 years) championship in 2011.
The official ELO rating of 2250 places me among the top 3% of globally registered chess players.
On popular chess websites www.chess.com and www.lichess.org my percentile is 99.9%.

Academic Referees

Asst. Prof. Ilija Bogunovic at UCL | *google scholar* | i.bogunovic@ucl.ac.uk
Prof. Francesco Corman at ETH | *google scholar* | francesco.corman@ivt.baug.ethz.ch | +41446333350
Prof. Andreas Krause at ETH | *google scholar* | krausea@ethz.ch | +41446326496 (assistant)