

Fabian Spaeh

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Education

Ph.D. Student in Computer Science (GPA 3.9) Sep 2020 – Present
Boston University, Advised by Prof. Alina Ene Boston, MA

- Teaching Fellow Excellence Award in 2022
- Dean’s Fellowship in spring 2021

M.Sc. in Computer and Information Science (VEUK award, GPA 4.0) Apr 2018 – Apr 2020
University of Konstanz Konstanz, Germany

B.Sc. in Computer Science (VEUK award for academic excellence, GPA 3.9) Oct 2013 – Feb 2018
University of Konstanz Konstanz, Germany

Research

Learning-Augmented Algorithms

Using machine learning to improve the performance of algorithms that act under uncertainty

- Designed the first algorithms with predictions for general online assignment problems. This is relevant for ad allocation, with extensions to whole-page optimization and submodular maximization [5, 4].
- Currently working on learning-augmented algorithms for resource allocation that build upon multiplicative weights-style procedures.

Machine Learning

Designing and analyzing machine learning models; devising and testing algorithms for efficient learning

- Developed the first methods to learn mixtures of continuous-time Markov chains, with important applications to sport analytics and modeling user behavior [3].
- Generalized a method to efficiently learn mixtures of discrete-time Markov chains [6].

Work Experience

Intern, Quantitative Researcher Jun – Aug 2023
TWT, Mathematics, Computer Graphics & Sustainability Engineering Munich, Germany

- Developed an efficient approach to optimize cable harnesses in cars under a complex set of constraints, balancing harness weight and assembly complexity by extending algorithms for Steiner trees.
- Supervised a graduate student in the application development (C#).

Intern, Data Science Jun – Aug 2020
Deutsche Bundesbank, Division Monetary and Financial Statistics Frankfurt, Germany

- Aggregated data and trained a random forest to perform a missing value imputation in the Register of Institutions and Affiliates Data (Python: Pandas, Dask, Scikit-learn).
- Imputed 300 000 values with a precision of 96% and identified potential errors in manually entered rows.

Student Research Assistant Jan – Oct 2018
University of Konstanz Konstanz, Germany

- Distributed collection of live soccer-game data; currently captured 88 000 games and 270 000 000 betting odds.
- Used machine-learned rules to automate betting (JavaScript, SQL, Docker, Redis).

Publications and Manuscripts

- [1] D. Ristache, F. Spaeh, and C. Tsourakakis, “Wiser than the wisest of crowds: The asch effect and polarization revisited.” In submission.
- [2] F. Spaeh, K. Sotiropoulos, and C. Tsourakakis, “ULTRA-MC: A unified approach to learning mixtures of markov chains via hitting times.” In submission.
- [3] F. Spaeh and C. Tsourakakis, “Markovletics: Methods and a novel application for learning continuous-time markov chain mixtures.” WWW 2024.
- [4] F. Spaeh, A. Ene, and H. L. Nguyen, “Online and streaming algorithms for constrained k-submodular maximization.” In submission.
- [5] F. Spaeh and A. Ene, “Online ad allocation with predictions.” NeurIPS 2023.
- [6] F. Spaeh and C. Tsourakakis, “Learning mixtures of markov chains with quality guarantees.” WWW 2023.
- [7] F. Spaeh and S. Kosub, “Global evaluation for decision tree learning.” arXiv, 2022.
- [8] T. Hepp, F. Spaeh, A. Schönhals, P. Ehret, and B. Gipp, “Exploring potentials and challenges of blockchain-based public key infrastructures.” IEEE INFOCOM Workshops, 2019.

Teaching

Boston University

Teaching Assistant

- Randomness in Computing, Graduate Class. Fall 2021 and Fall 2022
- Advanced Optimization Algorithms, Graduate Class. Spring 2022 and Fall 2023

University of Konstanz

Lab Instructor

- Analysis and Linear Algebra, Undergraduate Class. Summer Term 2019
- Discrete Mathematics and Logic, Undergraduate Class. Winter Term 2018/2019
- Programming Course 2, Undergraduate Class. Summer Term 2015 and 2016

Technical Skills

Proficient in Python (scikit-learn, Pandas, Tensorflow), Julia, Mathematical Programming (GLPK, Gurobi), C#, C, C++, JavaScript (node.js), SQL, and Haskell.