Jamal Mohammed

Ph.D. in Computer Science

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Binzmühlestrasse 14, Zurich, CH-8050, Switzerland

Research Interests

Time series forecasting, predictability analysis, information theory, machine learning systems, anomaly detection, predictive modeling, and their applications to industrial automation and process optimization.

Education

Ph.D. in Computer Science 2021–2025

University of Zurich, Switzerland *Magna Cum Laude*
Advisors: Prof. M. H. Böhlen, Prof. S. Helmer
Thesis: Quantifying and Estimating Predictability Bounds in Time Series Forecasting
Focus: Machine learning systems, time series forecasting, information-theoretic approaches to predictive modeling

M.Sc. in Computer Science 2018–2020

Free University of Bolzano, Italy *110/110 with Honors*
Thesis: Deep Learning for Predictive Maintenance in Industrial Systems
Focus: Deep learning, predictive maintenance, industrial applications

B.Sc. in Computer Engineering 2014–2018

Politecnico di Torino, Italy

Academic Experience

Teaching Assistant, Database Systems 2021–2024

University of Zurich, Switzerland
- Led tutorials and laboratory sessions for 50+ undergraduate students
- Designed comprehensive assignments covering relational algebra, SQL optimization, query processing, and transaction management
- Provided one-on-one academic mentoring and research guidance
- Graded exams and provided detailed feedback to support student learning

Doctoral Researcher 2021–2025

University of Zurich, Switzerland
- Developed novel theoretical frameworks for quantifying predictability upper bounds in time series data using information-theoretic approaches
- Designed and implemented scalable ML architectures (LSTMs, Transformers, Bayesian models) for forecasting and anomaly detection

- Created open-source toolkit for reproducible predictive modeling pipelines
- Benchmarked deep learning models against theoretical performance bounds
- Published research at top-tier venues (SIGKDD 2024)

Publications

Published

J. Mohammed, M. H. Böhlen, S. Helmer. (2024). "Quantifying and Estimating the Predictability Upper Bound of Univariate Numeric Time Series." *Proceedings of the 30th ACM SIGKDD Conference on Knowledge Discovery and Data Mining (SIGKDD 2024).* DOI:10.3390/e17042367

Under Review

J. Mohammed. (2025). "Multi-Horizon Predictability Upper Bound Time Series Forecasting." Submitted to *AAAI Conference on Artificial Intelligence (AAAI 2026).*

In Preparation

J. Mohammed, M. H. Böhlen, S. Helmer. (2025). "Efficient Subsequence Matching in Time Series for Entropy Rate Estimation." In preparation for *IEEE Transactions on Knowledge and Data Engineering (TKDE).*

Research Projects

Time Series Forecasting Platform 2024

Doctoral Research
- Developed comprehensive framework for quantifying and estimating predictability limits of univariate time series data
- Implemented and benchmarked state-of-the-art deep learning models (Transformers, N-BEATS, N-HiTS)
- Established information-theoretic bounds for realistic model performance expectations
- Improved forecasting accuracy on engineering datasets by 15% through optimal model selection

Multi-Horizon Forecasting System 2025

Doctoral Research
- Designed end-to-end framework for multi-step time series forecasting combining deep learning and statistical models
- Developed novel techniques for quantifying prediction uncertainty at different forecast horizons
- Demonstrated superior performance in energy demand prediction tasks across multiple time horizons
- Contributed theoretical analysis of multi-horizon predictability bounds

Efficient Subsequence Matching 2025

Doctoral Research
- Engineered high-performance algorithms for subsequence matching in large-scale time series
- Achieved sub-linear search complexity through optimized data structures and approximation techniques

- Enabled real-time pattern detection and anomaly identification in industrial monitoring systems
- Contributed algorithmic innovations for entropy rate estimation

Industry Research Experience

Research Assistant & Data Analyst 2019–2020

Durst Phototechnik AG + Free University of Bolzano, Italy
- Developed deep learning models (LSTM-based architectures) for predictive maintenance in industrial printing systems
- Built anomaly detection pipelines for multivariate time series sensor data streams
- Reduced unplanned downtime by 23% through early failure detection
- Collaborated with domain experts to translate research into production-ready solutions

Teaching & Mentorship

Thesis Supervision 2021–2024

University of Zurich
- Supervised 3 M.Sc. theses on machine learning for sequential data analysis and optimization
- Supervised 2 B.Sc. theses on information-theoretic approaches for forecasting and anomaly detection
- Provided weekly meetings, technical guidance, and career mentorship

Technical Skills

Machine Learning: Deep Learning (Transformers, RNNs, LSTMs), Time Series Forecasting, Anomaly Detection, Bayesian Models, Optimization
Frameworks: PyTorch, TensorFlow, Keras, Scikit-learn, Statsmodels, SciPy
Programming: Python (Expert), SQL (Advanced), MATLAB, R, C, Java
Tools: Git, Docker, LaTeX, MLflow, CUDA, HPC Clusters
Theory: Information Theory, Statistical Learning, Optimization, Algorithm Design

Awards & Recognition

- Ph.D. degree awarded with distinction (Magna Cum Laude) – 2025
- M.Sc. Scholarship for semester exchange program – 2019–2020

Academic Service

Reviewing: Reviewer for conferences and journals in machine learning and data mining
Mentoring: Active mentor for undergraduate and graduate students in machine learning research

Languages

English: Fluent (Professional working proficiency)
Italian: Fluent (Native proficiency)
German: Basic (Elementary proficiency)
French: Basic (Elementary proficiency)