

Batuhan Koyuncu

Machine Learning Researcher | Time-Series Foundation Models • Forecasting & Health Sensing
Saarbrücken, Germany • batukoyuncu@gmail.com • batukoyuncu.com • [GitHub](#) • [LinkedIn](#) • [Google Scholar](#)

Profile

Time-Series Foundation Models • Deep Generative Modeling • Probabilistic Modeling • Agentic Workflows • LLM & RAG Applications • Interpretability

Machine learning researcher and builder specialising in **foundation models for time-series and sequential data**. I model the same underlying problem — forecasting and reasoning under uncertainty — across domains: from central-bank-grade macroeconomic forecasting at the BIS to personalised health forecasting from wearable physiological signals. ELLIS PhD candidate with publications at top machine learning conferences and journals, hands-on experience shipping LLM and RAG applications, and a track record of turning probabilistic modelling into robust, real-world tools.

Experience

Visiting AI Researcher, Bank for International Settlements (BIS) Spring 2025
Basel, Switzerland | Hosted by Fernando Perez-Cruz

- Designed and trained **BISTRO**, a transformer-based foundation model for macroeconomic time-series forecasting across multiple economies, supporting both unconditional and conditional (scenario & counterfactual) forecasts.
- Delivered a single pretrained model spanning many countries and indicators, replacing bespoke per-series pipelines and enabling central-bank-grade policy simulation; results published as **BIS Working Paper No. 1337**.

AI Scientist, Intor AI 2025 – Present
Remote

- Build and ship production **Retrieval-Augmented Generation (RAG)** systems for law firms — document-grounded chatbots and full-stack web applications.
- Own the stack end-to-end: retrieval, LLM orchestration (LangChain / LangGraph, MCP, OpenAI & Anthropic APIs), and deployment — delivering research-grade methods as reliable products in a fully remote team.

PhD Researcher (ELLIS), Saarland University 2021 – Present
Saarbrücken, Germany | Advisors: Prof. Isabel Valera & Prof. Ole Winther

- **Time-series foundation models**: probabilistic transformer architectures for interpretable, robust multivariate forecasting, transferable to finance, energy, and demand planning.
- **Hypernetwork-based neural parameterisation**: used deep generative models to parameterise neural networks — removing gradient dependency and enabling amortised inference with up to **10× speed-ups** over standard fine-tuning.
- **Health sensing & physiological ML**: personalised imputation and forecasting pipelines for irregular clinical time series; hierarchical models for real-time **stress prediction from wearable-sensor data** (HRV, EDA, PPG).

Visiting Researcher, Technical University of Denmark (DTU) Summer 2025
Copenhagen, Denmark | Hosted by Prof. Ole Winther

- Developed time-continuous generator functions for scalable generative modelling of sequential data.

Earlier research., MSc Researcher (Boğaziçi Univ., generative second-order ODEs) | Graduate Research Assistant (Medical & Biological Physics — CNN models for chemotherapy-response prediction) 2019 – 2021

Technical Skills

Programming & Tools: Python, SQL, C++, MATLAB, Git, Docker, Slurm, AWS

ML & Deep Learning: PyTorch, JAX, Hugging Face, Lightning, Transformers, distributed training

LLMs & GenAI: RAG, LoRA & PEFT fine-tuning, agentic workflows (LangChain / LangGraph), MCP, embeddings & vector search, prompt engineering, LLM evaluation, OpenAI & Anthropic APIs

Focus areas: Time-Series Foundation Models, Forecasting, Generative & Probabilistic Modelling, Physiological / Wearable Signal Modelling, Healthcare ML

Languages: Turkish (native), English (fluent), German (B1)

Selected Publications

Full list on [Google Scholar](#).

- Koyuncu, B., Kwon, B., Lombardi, M.J., Perez-Cruz, F., Shin, H.S. (2026). **BISTRO: A Foundational Model for Unconditional and Conditional Forecasting of Macroeconomic Time Series**. *BIS Working Papers*, No. 1337.
- Koyuncu, B., DeVries, R., Winther, O., Valera, I. (2026). **Temporal Variational Implicit Neural Representations**. *Transactions on Machine Learning Research (TMLR)*.
- Peis, I., Koyuncu, B., Valera, I., Frellsen, J. (2025). **Hyper-Transforming Latent Diffusion Models**. *International Conference on Machine Learning (ICML)*.
- Koyuncu, B., Bauerschmidt, T.N., Valera, I. (2024). **E-ProTran: Efficient Probabilistic Transformers for Forecasting**. *Workshop on Structured Probabilistic Inference & Generative Modeling, ICML*.
- Koyuncu, B., Sanchez-Martin, P., Peis, I., Olmos, P.M., Valera, I. (2023). **Variational Mixture of Hyper Generators for Learning Distributions Over Functions**. *International Conference on Machine Learning (ICML)*.
- Koyuncu, B., Melek, A., Yilmaz, D., Tuzer, M., Unlu, M.B. (2022). **Chemotherapy Response Prediction with Diffuser Elapser Network**. *Scientific Reports*, 12(1).

Education

- Ph.D., Computer Science**, Saarland University (ELLIS PhD Program) 2021 – Present
Advisor: Prof. Isabel Valera
- M.Sc., Computer Engineering**, Boğaziçi University 2018 – 2021
GPA 3.8/4.0
- B.Sc., Physics**, Boğaziçi University 2013 – 2018
Ranked 3rd, Class of 2018
- Fulbright Ph.D. Grant (2018); Turkish Research Council Undergraduate Scholarship, \$20k (2014–2018).

Invited Talks

- “Introducing BISTRO” Jun 2026
Working Group on Econometric Modelling (WGEM), Eurosystem
- “Forecasting Macroeconomics with BISTRO” May 2026
7th Workshop on High-Dimensional Time Series in Macroeconomics & Finance, Vienna
- “Using Hypernetworks for Parameterizing Neural Networks” Aug 2025
Technical University of Denmark, Copenhagen
- “VaMoH: Inferring Distributions over Functions” Apr 2023
ELLIS Alicante Unit, Alicante
- “Using CNNs to Learn Dynamics of Coupled PDEs” Mar 2020
Boğaziçi University, Istanbul
- “Utilizing Deep Learning to Predict Chemotherapy Response” Feb 2020
Kodluyoruz Research, Istanbul
- “Solving Combinatorial Optimization Problems with RL” Nov 2019
Inzva, Istanbul

Teaching & Supervision

- Assistant Instructor**, *Advanced Time Series Analysis*, Saarland University (2025) — EM, HMM, variational inference, transformers & foundation models.
- Teaching Assistant**, *ProbAI Summer School*, Copenhagen (2024) — variational inference & deep generative models.
- Assistant Instructor**, *Machine Learning*, Saarland University (2023-2025).
- Student supervision**: co-supervised three BSc theses (2025-2026) and BSc/MSc term projects on conformal prediction (2023).