Kanan Mahammadli

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Education

Middle East Technical University — Ankara, Turkey

Bachelor of Science in Mathematics (Minor in Statistics), CGPA: 3.64 — *Sep. 2020 - July 2025*

- **Ranking:** 4/141
- **Honors:** High Honor Student (4 semesters), Honor Student (3 semesters)
- **Awards**: Full Tuition Scholarship for Academic Excellence (6 semesters)
- **Undergraduate Coursework:** Optimization, Mathematical Statistics, Operations Research, Real Analysis, Complex Analysis, Probability and Statistics, Calculus, Linear Algebra, Differential Equations, Abstract Algebra
- **Graduate Coursework:** Machine Learning, Deep Learning, Sequence Models in MultiMedia

Publications

- **Mahammadli, K.**, & Ertekin, S. (2024). "Sequential Large Language Model-Based Hyper-parameter Optimization." arXiv preprint arXiv:2410.20302 (2024).*(being finalized for submission to Journal of Machine Learning Research).*
  - **Overview**
    - Developed the SLLMBO framework to enhance LLM-based hyperparameter optimization (HPO), reducing API costs, mitigating overexploitation, and automating the tuning process.
  - **Key Contributions**
    - Introduced the first framework to benchmark multiple LLMs for HPO, identifying performance dependency on the choice of the LLM and the tendency of fully LLM-based methods to overexploit the search space.
    - Designed a hybrid LLM-TPE sampler, combining LLMs for initialization and exploitation with Tree-structured Parzen Estimator (TPE) for exploration, achieving a balanced exploration-exploitation trade-off.
  - **Results and Impact**
    - Demonstrated that the LLM-TPE sampler achieves competitive results compared to Bayesian Optimization and surpasses fully LLM-based strategies in 9 of 14 classification and regression tasks.
    - Elevated Gemini from one of the least effective fully LLM-based models to a top 3 performer with the hybrid approach, enabling cost-effective optimization over longer runs (up to 50 iterations).

Research Experience

Undergraduate Student Researcher — July 2024 – Present

AI Lab, METU BILTIR Center, Supervised by Prof. Seyda Ertekin — *Ankara, Turkey (Onsite)*

- Conducted research on automated and efficient hyperparameter optimization using large language models which led to the development of the SLLMBO framework (see Publications)

Undergraduate Deep Learning Research Intern — Oct. 2022 – Dec. 2022

University College London, Supervised by Prof. Yukun Hu — *London, UK (Remote)*

- Worked on Physics-Informed Deep Learning project.
- Helped to develop a Physics-Informed loss function-based neural network to approximate solutions of Partial Differential Equations (Heat Equations for industrial heat furnaces), replacing the numerical Newton's method and significantly speeding up the solution process.

Undergraduate Computer Vision Research Intern — July 2022 – Oct. 2022

University of Houston, Supervised by Prof. Ioannis Kakadiaris — *Houston, TX (Onsite)*

- Contributed to human detection project from UAV datasets with varying angles, distances, and weather conditions, using Feature Pyramid Networks (FPN) to improve detection accuracy.
- Performed face similarity analysis, applying FaceNet embeddings to generate vector representations of faces and utilizing FAISS for efficient clustering in high-dimensional vector spaces.

Research Projects

Common Carotid Artery Segmentation Sep. 2023 – Present

- *Independent Research*
- Benchmarked segmentation models (U-Net, FPN) on the Mendeley dataset, achieving a 91.86% Jaccard index.
- Explored semi-supervised learning to leverage unlabeled data and improve performance.
- Researching few-shot segmentation performance of SAM model in medical imaging.

Early Sepsis Detection Jan. 2024 – July 2024

- *Graduate Sequential Modeling in Multimedia course project supervised by Prof. Erdem Akagunduz*
- Pioneered a multistep forecasting approach for early sepsis detection, predicting onset from 12 hours before with a 7-step-ahead horizon, achieving performance comparable to single-step models.
- Designed a custom, weighted loss function to address severe class imbalance, penalizing later prediction errors more heavily, which improved recall in critical pre-sepsis hours.

Class-Specific Data Augmentation for Breast Cancer Classification Jan. 2022 – July 2022

- *Graduate Machine Learning course project supervised by Prof. Seyda Ertekin*
- Introduced class-specific data augmentation, significantly improving the detection rates for minority classes within a Vision Transformer-based classification framework.
- Achieved on average 11% increase in f1-score for minority classes, thereby reducing critical misclassifications associated with higher mortality.

Industry Experience

Undergraduate Student Researcher July 2023 – July 2024

AI Lab, METU BILTIR Center, Supervised by Prof. Seyda Ertekin *Ankara, Turkey (Onsite)*

- Contributed to projects on computer vision models for the computer-aided manufacturing process, mainly focusing on object detection, segmentation, and tracking tasks.

Senior Data and Optimization Scientist Nov. 2023 – Present

SmartKiwi AI *London, UK (Remote)*

- Investigated limitations of the foundational time series model's adaptation to new domains and building an automated fine-tuning framework.
- Developed an end-to-end forecasting platform with integrated LLM-Agent chat for interactive data analysis and decision support, enabling users to gain insights on historical patterns and future forecasts.
- Built high-frequency forecasting and queue optimization models for Istanbul Grand Airport, achieving 92% accuracy in passenger flow predictions, reducing passenger waiting time.

Mid-level Data Scientist May 2023 – Nov. 2023

SmartKiwi AI *London, UK (Remote)*

- Explored generalization of the foundation model for multiple granularities for daily, weekly, and monthly forecasts.
- Designed mathematical models for automated scheduling and route assignments, replacing manual processes with data-driven decisions to enhance overall network performance.

Junior Data Scientist Jan. 2023 – May 2023

SmartKiwi AI *London, UK (Remote)*

- Built a scalable ML solution with continual learning for dynamic surge pricing serving 80+ locations.
- Initiated foundational model building for multiple time series forecasting with self-supervised learning, leveraging transformer architecture and patch tokenization.

Data Scientist Intern Nov. 2021 – Apr. 2022

Affable AI *Singapore, Singapore (Remote)*

- Investigated latency optimization in NLP systems, designing a sentiment analysis pipeline to demonstrate advancements in efficient model deployment for large-scale applications.
- Explored Transformers-based approaches for text classification, analyzing their effectiveness in capturing contextual embeddings for robust brand categorization tasks.

Data Science and Machine Learning Mentor Nov. 2021 – March 2022

ABB Tech Academy *Baku, Azerbaijan (Remote)*

- Mentored 50 students, preparing and evaluating engaging assignments and hands-on projects with real-world applications.