Mustafa Kerem Kurban

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Machine Learning Engineer | MLOps & LLM Specialist

Innovative Machine Learning Engineer with 8+ years of experience leveraging cutting-edge AI tools to develop scalable systems, deploy advanced ML pipelines, and solve complex challenges in knowledge extraction, semantic search, and large-scale modeling. Proven ability to design AI-driven solutions across multiple domains. Passionate about leveraging generative AI to solve real-world problems and contribute to scaling innovative startups.

Work Experience

Neptune AI
Machine Learning Blogger 03/2025 - Current

- Contributing to blog portal of neptune.ai with novel techniques in LLM Research

EPFL Blue Brain Project, Geneva, Switzerland
Machine Learning Engineer 04/2024-12/2024

- Developed multi-agent LLM systems using LangChain and OpenAI Swarm for query-based scientific automation, **reducing manual analysis time by 90%**.
- Designed and deployed retrieval-augmented generation (RAG) pipelines, leveraging Neo4j for semantic search and personalized knowledge graph-based recommendations, **reducing hallucinations by >90%**.
- Designed semantic analysis pipelines to deliver **personalized insights for CRM and trend forecasting**, demonstrating cross-domain adaptability.
- Optimized AI workflows with AWS SQS and vector databases, ensuring real-time updates and scalability for production environments.
- Built user-friendly, React-based interfaces for in-house testing, improving usability of advanced AI models.

EPFL Blue Brain Project, Geneva, Switzerland
Scientific Software Developer 04/2021-04/2024

- Architected high-throughput brain analysis and simulation pipelines, **processing over 100TB of multimodal neuroscientific data** to reconstruct and validate detailed neural circuits across hippocampus, somatosensory cortex, and thalamus regions.
- Led comprehensive mapping of rat and mouse hippocampal circuits by integrating neuronal morphologies, synaptic connectivity patterns, electrophysiological recordings, and molecular profiles, resulting in multiple publications.
- Innovated new approaches for analyzing multi-scale connectivity data and single cell modeling, developing unified computational frameworks to bridge micro-to-meso scale neural architectures through integrated analysis of multi-omics datasets.

Education

BSc in Life Sciences focusing on Neuroimaging and Deep Learning (2018), Bogazici University, Turkiye
MSc in Computer Science and Neuroscience (2021), Bilkent University, Turkiye / EPFL, Switzerland

Certificates

- Neo4j Certified Professional (2024)
- LLMOps and Fine Tuning Large Language Models (DeepLearning.AI, 2024/25)
- AI Agents in LangGraph (DeepLearning.AI, 2024)
- AWS Foundations, AWS Bedrock (AWS, 2024)
- Infrastructure as Code in Google Cloud Platform (Linkedin Learning, 2024)
- Quantization Fundamentals with Hugging Face (DeepLearning.AI, 2025)

Technical Skills

- **Programming Languages**: Python, SQL, Bash, JavaScript, C++, Cuda, Go
- **AI and Data Tools:** PyTorch, TensorFlow, LangChain, Scikit-learn, Hugging Face Transformers.
- **Databases:** Neo4j, PostgreSQL, ElasticSearch, Opensearch, Redis
- **Cloud Solutions**: AWS S3, EC2, SageMaker, Lambda, CloudWatch, Neo4j AuraDB/DS
- **DevOps Tools**: Docker, Kubernetes, Git, FastAPI, Terraform
- **Graph Analytics:** NetworkX, GraphSAGE, Cypher Query Language, GraphQL
- **Front-End Development:** React.js, HTML/CSS, REST APIs

Projects

Knowledge Graph Powered Chat Agent with Neo4j and LangChain:
Designed a semantic analysis pipeline integrating Neo4j and RAG to process and personalize CRM workflows for **50k+ customer records,** reducing response time by **60%.** Leveraged AWS for scalability and ensured compliance with data privacy standards. (see https://github.com/BlueBrain/citation-graph)

Agentic Workflows for Simulation Automation:
Developed a human-in-the-loop AI system using LangChain and OpenAI APIs to automate NEURON simulation workflows. Enhanced efficiency by **70%**, achieving seamless integration with existing HPC infrastructure. (https://github.com/BlueBrain/neuroagent)

Front and Backend Development for Custom Chatbot Interfaces:

Developed a personalized website using React, Node.js, and CSS, featuring blog sections with keyword-based filtering to enhance UX, and **designed a custom Chat UI** to optimize usability for in-house chatbot applications tailored to specific use cases.

Optimizing Large Language Models for Scientific Applications:

Enhanced OpenAI's evaluation framework for processing multiple tool calls from a single user input across complex scenarios. Addressed the low coverage rate of the baseline LLM, achieving a 20% improvement through supervised fine-tuning (SFT) on open-source and industry-standard models.

For open sourced projects, publications and additional details, visit keremkurban.created.app.