# Ozan Baris Mulayim

PhD Candidate in Engineering at CMU | Researcher at Berkeley Lab

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## Profile

My research focuses on power systems applications of : (1) **LLM-based agentic workflows** for question answering with **knowledge graphs**, (2) physics-informed **reinforcement learning** for HVAC controls, and (3) design and utilization of **time series foundation models** for incorporating contextual information.

## Education

**Ph.D. in Engineering,** *Carnegie Mellon University* 08/2022 – 12/2025
Researcher at the INFERlab under the supervision of Prof. Mario Bergés. Pittsburgh, USA

**M.Sc. in Engineering,** *Carnegie Mellon University* 08/2022 – 05/2024
CGPA:3.94/4.00 Pittsburgh, USA

**B.Sc. in Engineering,** *Orta Dogu Teknik Universitesi* 08/2016 – 07/2021
CGPA: 3.89/4.00, Rank: 1/337 Ankara, Turkiye

## Work Experience

**Google,** *PhD Software Engineering Intern* 05/2025 – 08/2025
- Conducting research on model-based reinforcement learning for HVAC controls of real life commercial buildings. New York, NY, USA

**Lawrence Berkeley National Laboratory,** *Student Researcher/Affiliate* 05/2024 – present
- Guided research in zero-shot LLM-powered question answering systems (agentic workflows) for knowledge graphs of sensory information. Berkeley, CA, USA

**Politecnico Di Milano,** *Visiting Researcher* 04/2022 – 07/2022
- Non-Dominated Sorting Genetic Algorithm-II (NSGI-II) guided preliminary design of bridges with varying objectives. Milan, Italy

**BOLINA Ingegneria S.R.L.,** *ERASMUS Intern* 08/2021 – 11/2021
- Seismic risk analysis Venice, Italy
- Data-driven cost estimation of seismic renovation

**BridgeWIZ Engineering,** *Engineering Intern* 07/2020 – 10/2020
- A Camera and laser based CNN application to measure the diameters of the tree trunks. Ankara, Turkey
- Physics-based ML approach for formulation of a new seismic isolation bearing.
- Drone-based site inspections of bridges.
- Statistical analysis of acceleration data collected from multiple bridges for damage detection.

## Skills

**LLM Applications:** (Langchain, BIRD, Spider 2.0, Langraph, Tavily, ChromaDB, Nixtla, Lamini)

**Question Answering** (NER, NED, CL, RL, QB)

**Deep RL** (*Model-based, Physics-informed*)

**Data Science** (*Scikit-learn, Pandas, PyTorch, TensorFlow, Ray, PySpark, MrJob*)

**Computer Vision** (*CNNs, Contrastive Learning*)

**Knowledge Graphs** (*Haystack, Brick, text-to-SPARQL*)

**Signal Processing** (*Fourier Transforms, Filter Design*)

**Evolutionary Optimization** (*GA, DE, PSO, WOA*)

**System Identification** (*SciPy, SysIdentPy*)

**Hardware** (*Particle Argon,Raspberry Pi*)

## Selected Publications

**Extraction and Analysis of Time Series Data from Building Automation Systems Using Large Language Models,** *ASHRAE Summer Conference 2025*
**Ozan Baris Mulayim**, Anand Krishnan Prakash, Lazlo Paul, Marco Pritoni (2025)

**Can Time-Series Foundation Models Perform Building Energy Management Tasks?,**
*Data-centric Engineering*
**Ozan Baris Mulayim**, Pengrui Quan, Liying Han, Xiaomin Ouyang, Dezhi Hong, Mario Bergés, Mani Srivastava (2025)

**Towards Zero-shot Question Answering in CPS-IoT: Large Language Models and Knowledge Graphs,** *The 2nd International Workshop on Foundation Models for Cyber-Physical Systems & Internet of Things (FMSys'25) (Best Paper Award)*
**Ozan Baris Mulayim**, Gabe Fierro, Mario Bergés, Marco Pritoni (2025)

**Foundation Models for CPS-IoT: Opportunities and Challenges,** *arXiv:2501.16368*
**Ozan Baris**, Yizhuo Chen, Gaofeng Dong, Liying Han,
Tomoyoshi Kimura, Pengrui Quan, Ruijie Wang, Tianchen Wang, Tarek Abdelzaher, Mario Bergés, Paul Pu Liang, Mani Srivastava (2025)

**On the Impact of Simulated Occupancy Behavior Assumptions on Reinforcement Learning for HVAC Controls,** *e-Energy'25: ACM International Conference on Future and Sustainable Energy Systems*
**Ozan Baris Mulayim**, Mario Bergés (2025)

**Reimagining Time Series Foundation Models: Metadata and State-Space Model Perspectives,**
*NeurIPS on Time Series in the Age of Large Models*
Pengrui Quan, **Ozan Baris Mulayim**, Liying Han, Dezhi Hong, Mario Berges, Mani Srivastava (2024)

**Large Language Models for the Creation and Use of Semantic Ontologies in Buildings: Requirements and Challenges,** *BuildSys'24: ACM International Conference on Systems for Energy-Efficient Buildings DOI:10.1145/3671127.3698792*
**Ozan Baris Mulayim,** Lazlo Paul, Marco Pritoni, Anand Krishnan Prakash, Malavikha Sudarshan, and Gabe Fierro (2024)

**Are Time Series Foundation Models Ready to Revolutionize Predictive Building Analytics?,** *BuildSys'24: ACM International Conference on Systems for Energy-Efficient Buildings DOI: 10.1145/3671127.3698177*
**Ozan Baris Mulayim**, Pengrui Quan, Liying Han, Xiaomin Ouyang, Dezhi Hong, Mario Bergés, and Mani Srivastava (2024)

**Semantic Technologies in Practical Demand Response: An Informational Requirement-based Roadmap,**
*Energy and Buildings (Under Review)*
**Ozan Baris Mulayim**, Yuvraj Agarwal, Mario Bergés, Steve Schaefer, Derek Supple (2024)

**Leveraging Grey Box Models for Enhanced Energy Flexibility in Centralized and Decentralized Single-Zone Multi-Node Systems,**
*IEEE International Conference on Communications, Control, and Computing Technologies for Smart Grids*
**Ozan Baris Mulayim**, Mario Bergés (2024)

**Beyond Average: Evaluating Indoor Average Temperature in Grey Box Modeling,**
*International High Performance Buildings Conference (Finalist for the best-paper award)*
**Ozan Baris Mulayim**, Mario Bergés (2024).

**Unmasking the Role of Remote Sensors in Comfort, Energy and Demand Response,**
*Data-Centric Engineering.*
**Ozan Baris Mulayim**, Edson Severnini, Mario Bergés (2024)

## Related Coursework

**10601: Introduction to Machine Learning,** *CMU Machine Learning*

**10703: Deep Reinforcement Learning and Control,** *CMU Machine Learning*

**15688: Practical Data Science,** *CMU Information Systems*

**12770: Autonomous Sustainable Buildings,** *CMU Civil and Environmental Engineering*

**17722: User Focused Sensing Systems,** *CMU Software Engineering*

**18290: Signals & Systems,** *CMU Electrical and Computer Engineering*

## Awards

**Fulbright,** *Principal Nominee, 2022-2023, ($100K)*
Awarded, not used.

**CMU Dean's Fellowship,** *2022-2023 ($90K)*

**METU Educational Support Scholarship,** *2016-2021 ($2100/yr)*

**Borusan Foundation Scholarship,** *2016-2021 ($2100/yr)*

**Best Paper in ACM FMSys'25 (Foundation Models for CPS-IoT),** *2025*

**Best Paper Runner-up in High Performance Buildings Conference,** *2025*

## Voluntary Experience

**ODTU LODOS Foundation,** *Active Member* 02/2017 – 07/2021
An organization dedicated to supporting individuals with leukemia, autism, Down syndrome, and cerebral palsy through advocacy, awareness, and specialized care initiatives.

**ODTU Izci Grubu,** *Active Member* 09/2018 – 07/2021
A nonprofit camping organization dedicated to supporting disadvantaged communities by constructing libraries and raising funds to improve educational resources.

**SERCEV Foundation,** *Active Member* 02/2017 – 07/2017
An organization dedicated to improving the lives of children with cerebral palsy through educational and emotional support.

## Professional Memberships and Service

**IEEE, ACM,** *Student Member* 2024

**ACM Computing Surveys,** *Reviewer* 2023

## Leadership Experience

**Board Member in ODTU LODOS Foundation** 2019 – 2020
I led the division focused on supporting individuals with Down syndrome, contributing to the organization's mission of providing advocacy, raising awareness, and integrating them into society.

**Team leader of ODTU IACES**
My team won the smart city competition organized by IACES in Turkiye. Our design was the availability detection for the campus facilities using surveillance cameras and sensing technologies.