Egemen Erbayat

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PROFESSIONAL SUMMARY

PhD student in Electrical and Computer Engineering with a strong foundation in mathematics, machine learning, and communication theory. Experienced in finding, analyzing, and discovering insights, as well as formulating and implementing solutions for research problems. Throughout my career, I have gained diverse experience as both a software and machine learning engineer, working across a range of industries, from healthcare to market operations. Currently, my research focuses on AI applications and optimizations in communication systems, where I apply advanced machine learning techniques, computer vision, and optimization algorithms. My work has consistently demonstrated improvements in system accuracy and efficiency.

WORK EXPERIENCE

Machine Learning Software Engineer Intern May 2025 — August 2025
Meta Platforms, Inc. *Sunnyvale, CA*
Ads Ranking and Foundational AI Team

- Developed a scalable feature importance algorithm that runs efficiently on local CPU environments without requiring GPU-based training.
- Achieved similar ranking performance to existing methods at under 1% of the computational cost with drastically lower runtime and memory usage. Enabled significant performance and cost gains at scale.

Machine Learning and Computer Vision Research Intern June 2024 — August 2024
Siemens Healthineers *Princeton, NJ*

- Developed an automated co-registration method for paired CTA and OCT/IVUS images using Python and advanced machine learning techniques, resulting in improved AI training accuracy with higher-quality ground truth data for coronary artery analysis.
- Applied advanced computational methods, including optimization algorithms and image processing techniques, to enhance medical image co-registration accuracy, achieving optimized alignment between different imaging modalities for more precise diagnostic analysis.

Vision and Perception Developer February 2022 — May 2022
Delivers.ai *Istanbul, Turkey*

- Refined algorithm parameters and integrated advanced deep learning models, achieving an 87% improvement in landmark localization accuracy using Python and CNN frameworks.
- Enhanced the positional accuracy of delivery robots by 63 centimeters through the implementation of NetVLAD and ROS, utilizing OpenCV and PyTorch, resulting in more reliable navigation and a significant reduction in delivery errors.

Image Processing Engineer Intern September 2021 — October 2021
Vispera *Istanbul, Turkey*

- Developed and implemented image stitching algorithms using Python and OpenCV, improving the accuracy of product shelf monitoring by 20% and reducing manual stock tracking time by 45%, leading to more efficient supermarket operations.

Software Engineer July 2020 — January 2021
Baykar Technologies *Istanbul, Turkey*

- Developed formation flight algorithms for emerging technologies such as UAV swarms and designed simulation interfaces using C++ and C#, optimizing collaborative flight strategies and improving swarm coordination.
- Facilitated knowledge-sharing and problem-solving across interdisciplinary teams, enhancing collaboration and efficiency in UAV swarm projects through effective communication and teamwork.

EDUCATION

Doctor of Philosophy in Electrical and Computer Engineering, George Washington University Aug. 2022 — May 2026

- **GPA: 4.00/4.00**; Advisor: Prof. Dr. Suresh Subramaniam

- **Relevant Coursework:** Design & Analysis of Algorithms, Machine Learning, Reinforcement Learning, Computer Vision, Applied Optimization Modeling, Machine Intelligence, Linear Optimization

Bachelor of Science in Electrical and Electronics Engineering, Bogazici University September 2017 — June 2022

- **GPA: 3.72/4.00**; Graduated with High Honors
- **Relevant Coursework:** Image Processing, Computer Vision, Probability, Linear Algebra, Computer Networks

SELECTED PUBLICATIONS

INFOCOM DeepWireless Workshop 2025, E. Erbayat, Y. Mei, G. Adam, S. Subramaniam, S. Coffey, N.D. Bastian, T. Lan, LAMPS: Learning-based mobility planning via posterior state inference using Gaussian Cox process models.

ACM MobiHoc 2024, E. Erbayat, A. Maatouk, P. Zou, S. Subramaniam, Age of Information Optimization and State Error Analysis for Correlated Multi-Process Multi-Sensor Systems, October 2024

Journal of Optical Communications and Networking, E. Erbayat, G. Figueiredo, S. Petale, S.-C. Lin, M. Matsuura, H. Hasegawa, S. Subramaniam, "Towards Scalable Passive Optically-Powered Fronthaul Networks," June 2025. DOI: 10.1364/JOCN.559900

IEEE Cloud Summit 2024, E. Erbayat, R. Zou, X. Wei, G. Venkataramani, S. Subramaniam, A Trade-off Analysis of Latency, Accuracy, and Energy in Task Offloading Strategies for UAVs, June 2024

IEEE ICC 2024, E. Erbayat, S. Petale, S. Lin, M. Matsuura, H. Hasegawa, S. Subramaniam, Fronthaul Network Architecture and Design For Optically Powered Passive Optical Networks, June 2024

SELECTED PROJECTS

Machine Learning Design for UAV Edge-Server IoT Systems (Python, Tkinter, YOLO, SSD, UDP, RTP)

- Designed a novel UAV Edge-server system for analyzing the tradeoff between accuracy, latency, and power consumption by utilizing machine learning models to control object detection and video transmission.
- Implemented preprocessing techniques on the edge server using Python and OpenCV, reducing data transmission requirements while maintaining object detection accuracy.
- Implemented a simulator featuring a user-friendly GUI that allows dynamic selection of deep learning models for object detection and real-time decision-making regarding data transmission between edge devices and servers.

Fronthaul Network For Optically Powered Passive Optical Networks (Python, Gurobi, Graph Algorithms)

- Conducted extensive research on fronthaul network architecture and design, with a particular emphasis on integrating power-over-fiber technology to enhance network resilience during power outages, especially in disaster-prone areas.
- Developed and implemented various algorithms, including integer linear programming and fast algorithms for splitter localization problems, to optimize network topology while considering both fiber and power costs.
- Engineered a network design algorithm 100x faster than ILP solutions, with only 3-5% cost increase for medium networks and greater efficiency for larger networks, demonstrating superior scalability and cost-effectiveness.

Optimizing Flow Scheduling in Data Center Networks (Algorithm Design, Mathematical Modeling)

- Designed a scheduling algorithm that leverages reconfigurable circuit switch capabilities with multiple transceivers to optimize flow times and throughput in data center networks.

Age of Information (Information Theory, Decision Making)

- Investigated multi-source, multi-channel IoT systems within the Age of Information framework, analyzing correlations between diverse information sources and their impact on decision-making processes, resulting in a comprehensive understanding of complex information dynamics in time-sensitive scenarios.

AWARDS

- **Scholarships during Ph.D:** Helgert Family Endowed Fund, Pickholtz, Sprawcew, Zhamg & Wang and Cagatay Ozdogru
- **Scholarships during Bachelor's:** Turkish Governmental Outstanding Success and Boğaziçi University Outstanding Success
- **National University Admission Exam:** Ranked 10^{th} in Mathematics and Science among 2.3 million candidates. (July 2017)

SKILLS

Technical Skills: C/C++, C#, Python, MATLAB, Unix/Linux, VHDL, ROS, Gurobi LLM, PyTorch, NumPy, TCP/IP
Analytical Skills: Problem formulation, Optimization, Machine Learning Algorithm design, ILP design, AI, GenAI