

# Deniz Kocanaogullari

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Machine Learning Scientist with a PhD and patented innovations in creating computationally efficient AI for healthcare. Seeking an AI/ML Engineering role to deploy robust, real-time solutions for real-life problems.

## EDUCATION

<b>University of Pittsburgh</b> – PhD in Electrical and Computer Engineering	Aug 2024
<b>University of Pittsburgh</b> – MS in Electrical and Computer Engineering	Apr 2021
<b>Istanbul Technical University</b> – BS in Electronics and Communication Engineering	Jun 2019

## SKILLS

**Languages:** Python, C++, MATLAB, R, SQL

**ML Tools:** JAX, TensorFlow, PyTorch, scikit-learn, OpenCV, pandas, NumPy, SciPy, Matplotlib, seaborn

**Tools:** Git, Docker, GNU/Linux, Bash, Slurm, AWS EC2/S3

## EXPERIENCE

**Boston Children's Hospital CRL - QUIN Group, Machine Learning Scientist** – Boston, MA      Sep 2024 – Present

- Engineered physics-informed deep learning models that reduced inference time by 80%, enabling real-time processing for clinical applications and significantly cutting computational costs
- Developed a flexible super-resolution framework for MRIs, allowing clinicians to generate high-resolution images from low-resolution scans at any desired scale, improving diagnostic clarity from existing data
- Partnered with clinical stakeholders at BCH to ensure AI solutions met usability and diagnostic needs

**University of Pittsburgh SPSL Lab, Research Assistant** – Pittsburgh, PA      Aug 2019 – Aug 2024

*Hearing Aid EEG Project - Project Co-lead*      Jan 2022 – Aug 2024

- Designed and patented a novel, brain-inspired neural network that outperformed state-of-the-art models by 15% in accuracy while requiring 50% fewer operations for next-generation hearing aids
- Enabled a shift to wearable devices by developing an algorithm that maintained 95% of the original system accuracy using only 12.5% of the EEG sensors, drastically reducing hardware cost and improving user comfort
- Successfully optimized the neural network for deployment on resource-constrained microcontrollers by using 8-bit quantization, reducing the model footprint while retaining 97% of its original accuracy

*Augmented Reality EEG Project - Project Lead*      Aug 2019 – Aug 2024

- Led a cross-functional team of 10+ engineers and occupational therapists to design, build, and deploy a novel, AR-based stroke rehabilitation system from concept to patient trials
- Managed the end-to-end data lifecycle, including designing protocols and collecting proprietary EEG data from stroke patients in clinical settings to build and validate our machine learning models
- Built a robust data preprocessing pipeline that improved the signal-to-noise ratio, directly boosting the accuracy of downstream ML models by 15% and ensuring reliable system performance
- Engineered generalized lightweight neural networks that achieved real-time performance on the BCI device by reducing model parameters by 30%, a key requirement for providing immediate patient feedback

**Istanbul Technical University, Undergraduate Research Assistant** – Istanbul, Turkey      Jan 2018 – Jun 2019

- Initiated and developed a graduation project to create a computationally efficient MRI reconstruction model, investigating novel deep learning techniques to reduce processing time
- Engineered a CNN in TensorFlow that measurably improved MRI image clarity (0.34 dB PSNR gain) without increasing model complexity or training cost, demonstrating a direct path to better diagnostic images
- Led research and implementation of competing algorithms for benchmarking, while also training junior students on deep learning (CNNs, GANs) techniques

- Developed and field tested a cross-platform heart-rate sensor and GPS tracker application using Python in a military-industrial corporation that focuses on research, development and manufacturing
- Cut project overhead and eliminated outsourcing fees by architecting and developing a single, cross-platform Python application to replace three separate, native apps (iOS, Android, PC)

- Developed a new automation scheme for bottling machines using C++ and PLCs, contributing to a project aimed at increasing production throughput and reducing mechanical errors by 20%
- Presented the machines and automation pipeline to auditors and buyers, assisted with installation procedures

## PATENTS

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- \* **Kocanaogullari, D.**, Akcakaya, M., Grattan, E., Wittenberg, G. F., Mak, J., Ostadabbas, S. & Huang, X. PCT International Application No. PCT/US2023/016885, 2023
- \* Gall, R., **Kocanaogullari, D.**, Akcakaya, M. & Kubendran, M. PCT International Application No. PCT/US2023/079463, 2023

## PUBLICATIONS

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- **Kocanaogullari, D.**, Gall, R., Mak, J., Huang, X., Mullen, K., Ostadabbas, S., Wittenberg, G. F., Grattan, E. S. & Akcakaya, M. "Patient-Specific Visual Neglect Severity Estimation for Stroke Patients with Neglect using EEG", *Journal of Neural Engineering*, 2024
- **Kocanaogullari, D.**, Gall, R., Akcakaya, M., Erdogmus, D. & Kubendran, R. "Corticomorphic Hybrid CNN-SNN Architecture for EEG-based Low-footprint Low-latency Auditory Attention Detection", *IEEE Transactions on Pattern Analysis and Machine Intelligence (PAMI)* (Submitted)
- Mak, J., **Kocanaogullari, D.**, Huang, X., Mullen, K., Grattan, E. S., Ostadabbas, S., Wittenberg, G. F., Akcakaya, M. "A Scalable EEG-Based Spatial Neglect Detection System in Augmented Reality for Stroke Patients", *Neurorehabilitation & Neural Repair* (Submitted)
- **Kocanaogullari, D.**, Soehner, A., Akcakaya, M., Bendixen, R., Hartman, A. G. "What goes on when the lights go off? Using machine learning techniques to characterize a child's settling down period", *Frontiers in Network Physiology*, 2025
- **Kocanaogullari, D.**, Mak, J., Huang, X., Kersey, J., Shih, M., Grattan, E., Skidmore, E., Wittenberg, G. F., Ostadabbas, S., Akcakaya, M. "Detection of Stroke-Induced Visual Neglect and Target Response Prediction Using Augmented Reality and Electroencephalography," In *IEEE Transactions of Neural Systems and Rehabilitation Engineering*, 2022
- **Kocanaogullari, D.**, Huang, X., Mak, J. Shih, M. Skidmore, E. Wittenberg, G. F., Ostadabbas, S., Akcakaya, M., "Fine-tuning and Personalization of EEG-based Neglect Detection in Stroke Patients," 2021 43rd Annual International Conference of the IEEE Engineering in Medicine & Biology Society (EMBC), 2021, pp. 1096-1099
- **Kocanaogullari, D.**, Mak, J., Kersey, J., Khalaf, A., Ostadabbas, S., Wittenberg, G., Skidmore, E., Akcakaya, M., "EEG-based Neglect Detection for Stroke Patients," 2020 IEEE 42nd Annual International Conferences of the IEEE Engineering in Medicine and Biology Society (EMBC 2020), Online, 2020
- **Kocanaogullari, D.**, Eksioğlu, E. M., "Deep Learning For MRI Reconstruction Using A Novel Projection Based Cascaded Network," 2019 IEEE 29th International Workshop on Machine Learning for Signal Processing (MLSP), Pittsburgh, PA, USA, 2019, (pp. 1-6)