

Akshita Panigrahi

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SUMMARY

Machine learning engineer building end-to-end AI systems for physiological and neural data, spanning data infrastructure, large-scale model training, and cloud deployment across neural interfaces, physiological sensing, sleep modeling, connectomics, and multimodal behavioral modeling. Drawn to challenging problems where advances in machine learning can reveal meaningful structure in human behavior and physiology.

EDUCATION

University of Pennsylvania, School of Engineering and Applied Science, Philadelphia, PA

2021-2025

BSE in Bioengineering | Minor in Computer Science | Concentration in Biomedical Data Science & Computational Medicine

PROFESSIONAL EXPERIENCE

Wavelet Medical, Remote

Machine Learning Consultant

May 2026-Present

- Developing deep source separation architectures to extract fetal EEG from a novel maternal abdominal sensor, designing synthetic supervision and evaluation frameworks in the absence of direct ground-truth fetal EEG.
- Building real-time ML models for detection of fetal brain distress from reconstructed EEG signals.

Johns Hopkins Applied Physics Laboratory, Intelligent Systems Center, Neuroscience Group, Laurel, MD

Associate Professional Staff I - Neural Engineer

Jul 2025-Jan 2026

- Built a self-supervised Transformer EEG foundation model for a real-time hands-free BCI, owning the end-to-end GPU stack from distributed large-corpus pretraining to streaming inference, with parallel fine-tuning sweeps on Ray benchmarked on downstream BCI decoding tasks (ERP, SSVEP, motor imagery).
- Architected a multimodal pipeline synchronizing multi-camera video, audio, and intracranial neural streams, applying vision (re-ID, 3D reconstruction, pose) and speech (diarization, sentiment) models to translate raw signals into neurally-aligned behavioral time series; deployed in a clinical deep brain stimulation (DBS) study for OCD.
- Built and deployed cloud-native ingestion pipelines for BossDB (petabyte-scale connectomics platform), processing multi-hundred-terabyte volumetric electron-microscopy datasets into queryable, visualization-ready 3D data products; led ingest for the 2025 *Nature Methods* Method of the Year dataset.
- Built a multimodal emotion representation pipeline fusing HuBERT speech and multi-view visual embeddings, with an LLM interface identifying cross-modal incongruence during DBS therapy for treatment-resistant depression.
- Developed a self-supervised contrastive encoder for fatigue estimation from wearable physiological time series, developing ingestion pipelines, database schemas, model fine-tuning, and a web-based visualization platform.

Neural Engineering Intern

Jun-Aug 2024

- Developed a Transformer transfer-learning framework for optimizing wearable sleep stage classification, by pretraining on large-scale EEG data and fine-tuning on peripheral physiological signals (PPG, respiration).
- Designed deep CNNs reconstructing cardiac and respiratory waveforms from live radar streams, deploying signal processing and on-device inference for real-time sleep staging in a contactless monitoring system.

Weber Lab, Chronobiology and Sleep Institute, Perelman School of Medicine, Philadelphia, PA

Undergraduate Research Assistant

May 2022-May 2025

- Developed a dynamical systems model of interacting REM-on/REM-off neural populations to study attractor dynamics, bifurcation structure, and neural mechanisms underlying sleep-state transitions.
- Modeled latent neural state variables from EEG time-series, using regularized statistical methods to estimate REM homeostatic pressure and predict instability in sleep-state transitions under sleep deprivation.

4Catalyzer, Gene Chaser, Southeast Asia

Software Engineering Intern

May-Aug 2023

- Collaborated with Dr. Jonathan Rothberg aboard the *Gene Chaser* research vessel to develop signal processing, instrument control, and image analysis software for a novel low-cost next-generation DNA sequencer.
- Developed computer vision pipelines for microscopy-based sequencing, fine-tuning Segment Anything to segment >40K microwells per frame and extracting fluorescence signals for dephasing and DNA base calling.

TECHNICAL SKILLS

Languages: Python, Java, C/C++, TypeScript, JavaScript, SQL, MATLAB, R, Rust, OCaml

AI/ML: PyTorch, JAX, TensorFlow, Keras, PyTorch Lightning, Hugging Face, scikit-learn, NumPy, SciPy, pandas, OpenCV, MLflow, Weights & Biases, Ray, Dask, CUDA/cuDNN, LangChain, RAG, LoRA

Cloud, Backend & DevOps: AWS (S3, EC2, EKS/Kubernetes, Lambda, DataSync), GCP (Compute Engine, GKE, BigQuery), Git, Docker, CI/CD, FastAPI, REST APIs, Neo4j, Dask, SLURM, Linux

SELECTED PROJECTS

ROBIN: Real-Time Oxygenation & Bloodflow Insight for Neonates (Capstone), UPenn Jun 2024-May 2025

- Engineered a low-cost wrist-worn neonatal monitor integrating custom near-infrared spectroscopy (NIRS) hardware with real-time signal processing to continuously measure cerebral oxygenation and blood flow.
- Developed LSTM-Transformer models for real-time prediction of hypoxia and ischemia from NIRS time-series.
- Validated against research-grade Doppler ultrasound with clinicians at the Children's Hospital of Philadelphia, with alerting designed to fit existing NICU intervention protocols.

StrEEG: Real-Time EEG Decoding Platform (BCI Course Project), UPenn Jan-May 2025

- Built a real-time EEG decoding platform using PyTorch, FastAPI, and Docker, with streaming signal preprocessing, low-latency inference, experiment tracking, and interactive visualization.
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PROFESSIONAL ACTIVITIES

NIH BRAIN CONNECTS Consortium, Laurel, MD — Member Jul 2025-Jan 2026

- Contribute to community efforts around scalable connectomics infrastructure, staying current on best practices in data standardization, metadata schemas, and access to large-scale neural datasets.

4Catalyzer LLMs for Bio Hackathon, Singapore — Organizer & Instructor Jul 2023

- Organized the *Large Language Models (LLMs) for Biology Hackathon* and *Touch the Future* showcase, collaborating with leading AI and healthcare innovators across Southeast Asia.

Synapse Magazine, Philadelphia, PA — Staff Writer Sep 2022-May 2025

- Wrote monthly articles on topics such as organoids and BCIs for Penn's undergraduate healthcare magazine.

Weber-Chung Lab Python Boot Camp, Philadelphia, PA — Instructor Jun-Aug 2022

- Designed and led a Python data analysis bootcamp for 50+ trainees (undergraduate to postdoctoral), covering data wrangling, visualization, and machine learning workflows.
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PUBLICATIONS

Coon, W. G., Luna, D., **Panigrahi, A.**, Reid, M., & Ogg, M. (2025). Getting More from Less: Transfer Learning Improves Sleep Stage Decoding Accuracy in Peripheral Wearable Devices. arXiv. doi: <http://arxiv.org/abs/2506.00730>

Matelsky, J. K., Martinez, H., Xenos, D., Robinette, M., **Panigrahi, A.**, & Wester, B. (2025). Analyzing large connectome graphs with BossDB network tools. Current Protocols, 5, e70273. doi: 10.1002/cpz1.70273

AWARDS & HONORS

- JHU/APL REDD Bravo Award (2025)
 - Member of JHU/APL team recognized in 2025 Nature Method Method of the Year (2025)
 - Finalist, Design of Medical Devices Competition at the University of Minnesota (2025)
 - Winner, 4Catalyzer Programming Challenge (2023)
 - UPenn CURF Summer Research Award (2022)
 - Yale Science and Engineering Award (2021)
 - American Institute of Aeronautics and Astronautics Award (2021)
 - Willowcroft Science Award (2021)
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RELEVANT COURSEWORK

Deep Learning

Signals & Systems

Tiny Machine Learning

Big Data Analytics

Linear Algebra & Optimization

Brain-Computer Interfaces

Artificial Intelligence

Data Structures & Algorithms

Computer Vision