

Roza Gunes Bayrak, PhD

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SUMMARY

Applied ML Researcher with expertise in multimodal time-series modeling, and large-scale neuroimaging data analysis. 7+ years building deep learning pipelines and scalable data workflows for high-dimensional biomedical data. Authored of 30+ peer-reviewed publications (including NeurIPS, ICML). Experienced in project management, leading multidisciplinary research collaborations, and mentoring junior researchers.

WORK EXPERIENCE

Neuroimaging and Brain Dynamics (NEURDY) Lab

Nashville, TN

Senior Research Engineer

(Aug. 2024 – Present)

- **NEUROADAPTER**

Architected prompt-driven protocols to automatically create dataset adapters for state-of-the-art learning models. **Built** reusable data ingestion and preprocessing pipelines. **Processed and harmonized** large multimodal time-series datasets containing millions of signal measurements. **Created** a reproducible workflow for experiment configuration, training, and tracking. **Benchmarked** the performance of 20+ general-purpose time series and domain-specific pretrained foundation models across 15+ independent datasets.

Together these protocols and built-in workflow **reduced engineering overhead** for integrating new ML approaches into research pipelines.

- **PHYSAI**

Platform: Built a centralized, user-facing research platform to improve accessibility and reuse of internal research outputs including analytical tools, published papers and quality assessed datasets.

Quality Assessment Software: Designed a software workflow to automate assessment and provide model-based suggestions for correcting common artifacts. Working with a team of undergraduate and graduate students to develop a full-stack application for visualizing physiological signals, reviewing data quality, detecting and correcting artifacts using state-of-the-art technology.

Vanderbilt University

Nashville, TN

Assistant Research Professor

(Aug. 2023 – Present)

- **Grant Writing** | Principal investigator for an NIH U24 grant submission (in revision) and co-investigator on an RO1 (resubmitted).
- **PHYSIOQA** | Organized and leading a global collaborative effort with 7 labs 24+ contributors to standardize physiological signal quality assessment.
- **Reproducibility** | Leading the BIDS-ification of two in-house datasets to organize the data collected in a standardized, reproducible format that makes sharing, analysis, and use with automated tools much easier.
- **Mentorship** | Supervised students to design and evaluate SOTA model pipelines for cross-modal translation between EEG and fMRI signals. Published and presented at NeurIPS.; on development of DL pipelines for classifying vigilance states from neuroimaging data using pretrained models. Published and presented as second senior author at SPIE.
- **NEUROGRAPH** | Contributed to design and evaluation of benchmarking experiments for graph neural network models applied to brain graph data. Created the preprocessing pipeline, curated dataset and guided evaluation metric selection. Published and presented at NeurIPS.

Graduate Researcher, Computer Science PhD

(Jan. 2018 – Jul. 2023)

Advisor: *Catie Chang*

- **DeepPhysioRecon** | Built deep learning pipelines to reconstruct physiological signals from temporal brain imaging data.
- **Struct2Func** | Developed ML models for individualized brain mapping using graph neural networks and spherical convolutional networks.

- **PRAGMA** | Co-developed a d3-based interactive visualization platform for functional brain parcellations.
- **PhysioPatterns** | Conducted large-scale data analyses experiments linking brain signals, physiological measurements, and cognitive and behavioral measures.
- **TRACTEM** | Designed and evaluated reproducible workflow protocols for manual tractography.
- Contributed to open-source scientific software tools used in neuroimaging research pipelines.

EDUCATION

Ph.D., Computer Science, Vanderbilt University — 2023

Dissertation: *Computational Methods to Advance Individual Precision in Brain Mapping*

M.S., Electrical Engineering, Tufts University — 2016

B.S., Electrical & Communication Engineering, Çankaya University — 2010

COMMUNITY & LEADERSHIP

Open-Source Contributor, Physiopy, Nilearn, Datalad

Founder, Chair, BrainHack Vanderbilt

Co-Chair, CVPR Workshop on Medical Computer Vision (2025)

Reviewer, NeurIPS, ICML, ICLR, MICCAI, MiDL

SELECT PUBLICATIONS (out of 30+)

(Full list: <https://scholar.google.com/citations?user=QHN1CZsAAAAJ&hl=en>)

- **Bayrak RG**, Hansen CB, Salas JA, Ahmed N, Lyu I, Mather M, Huo Y, Chang C. DeepPhysioRecon: Tracing peripheral physiology in low frequency fMRI dynamics. *Imaging Neuroscience*. 2025 Sep 25;3:IMAG-a.
- Li Y, Lou A, Xu Z, Zhang S, Wang S, Englot DJ, Kolouri S, Moyer D, **Bayrak RG**, Chang C. NeuroBOLT: Resting-state eeg-to-fmri synthesis with multi-dimensional feature mapping. *Advances in NEURIPS*. 2024 Dec 16;37:23378-405.
- Said A, **Bayrak RG**, Derr T, Shabbir M, Moyer D, Chang C, Koutsoukos X. Neurograph: Benchmarks for graph machine learning in brain connectomics. *Advances in NEURIPS*. 2023 Dec 15;36:6509-31.
- **Bayrak RG**, Hoang N, Hansen CB, Chang C, Berger M. PRAGMA: Interactively constructing functional brain parcellations. In *2020 IEEE Visualization Conference (VIS) 2020 Oct 25 (pp. 46-50)*. IEEE.
- **Bayrak RG**, Li Y, Yu R, Li C, Chang C. neuroadapter: Any-to-brain model transfer via agentic adaptation (in prep).
- **Bayrak RG**, and community. Toward Standardized Physiological Data Quality Assessment in Neuroimaging: Current Practices, Challenges, and a Path Forward (in prep).

SKILLS

Data: Large-scale heterogenous time-series data quality assessment, preprocessing, feature extraction

Infrastructure / Experimentation: Docker, SLURM, Hydra, Weights & Biases

Programming: Python, MATLAB, D3.js, SQL (PostgreSQL)

Libraries / Frameworks: PyTorch, PyTorch Lightning, HuggingFace Transformers, Pandas, NumPy, Scikit-learn, SciPy, Nilearn, MNE, Matplotlib, Seaborn, Plotly