Winthrop Gillis, PhD

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Summary

Innovative research scientist with expertise in machine learning, neural networks, and data analysis. Proven track record of designing real-time classification systems and building robust data pipelines that process 200+ TB datasets. Led cross-functional teams to develop open-source software with nationwide adoption. Published author in Nature and Cell with patent experience.

Skills

- **Languages, Libraries, Frameworks**: Python, JavaScript, Go, Bash; PyTorch, Jax, Jupyterlab, Git, Pandas, Polars, Nextflow, SLURM, Numpy, Scipy, Scikit-learn, Docker
- **Technical**: Machine learning, Deep neural networks, Data analysis and visualization, Data acquisition and organization, Statistics, Distributed computing, Project management, Experimental design

Education

Harvard University, Department of Neurobiology — Boston, MA

PhD, Neuroscience — *Sept 2016 — Sept 2023*

- Ruth L. Kirschstein Predoctoral Individual National Research Service Award (NRSA)

Boston University, College of Arts and Sciences — Boston, MA

B.A., Behavioral Biology — *Sept 2010 — May 2014*

- *Cum Laude*; Dean's List

Selected Research and Work Experience

Scientific and Technical Consultant — Jan 2024 — Present

Transpharmation — *Boston, MA*

- Pioneered sophisticated mouse behavior analysis platform for high throughput drug discovery. Enabled screening of 50+ neuropharmacological drugs. Developed quality control metrics, automating a large fraction of the analysis pipeline.

Postdoctoral Researcher — Oct 2023 — Sept 2024

Datta Laboratory, Harvard University — *Boston, MA*

- Designed neural networks to standardize mouse morphologies, enabling the study of behavioral changes by age and sex. Created statistical models to isolate the influence of age, sex, weight, and identity factors on behavior. Created robust big-data pipelines with Nextflow and Python to analyze 200+ terabytes of mouse behavior videos, significantly simplifying and automating a multi-step processing procedure.

Doctoral Researcher — Jan 2017 — Sept 2023

Datta Laboratory, Harvard University — *Boston, MA*

- Engineered a real-time ML-based behavior classification system enabling groundbreaking dopamine signaling research; developed statistical models to analyze neural activity data in freely behaving animals, resulting in multiple publications and a patent.
- Led software development team for MoSeq, an open-source Python behavioral analysis package; designed data processing pipelines, conducted nationwide training workshops, and drove user adoption.

Selected Publications

Characterizing the structure of mouse behavior using Motion Sequencing. Sherry Lin*, **Winthrop Gillis***, et al., Nature Protocols. 2024.

Spontaneous behavior is structured by reinforcement without exogenous reward. Jeffrey Markowitz*, **Winthrop Gillis***, et al., Nature. 2023.

The Striatum Organizes 3D Behavior via Moment-to-Moment Action Selection. Jeffrey Markowitz, **Winthrop Gillis**, et al., Cell. June 2018.

*Co-first author

Patents

Datta Sandeep R, et al., inventors; Harvard College, assignee. **Image processing for standardizing size and shape of organisms**. US patent US20220392017A1. 2022.

Holinski Bradley J, et al., inventors; Galvani Bioelectronics Ltd, Boston University, assignee. **Nerve cuffs, methods of fabricating the same and methods of use.** Worldwide patent WO2018022838A1. 2018.