Samuel Mestern, MSc. PhD Candidate

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EXPERIENCE

Research Scientist
2019 – Present

Robarts Research Institute, Western University | *London, Ontario*

- Designed and built a high-throughput dynamic clamp system enabling biohybrid networks of up to 1000 neurons, connecting living neurons with computational models via C/C++/Python with Brian2 and PyTorch integration.
- Developed neural ODE and machine-learning models of hypothalamic neuron dynamics, combining *in vitro* patch-clamp recordings with *in silico* simulation to study recurrent inhibition in the neuroendocrine stress circuit.
- Co-first author on a publication in *eLife* dynamics of stress circuits.
- Built pyNetSim, a Python interface to the lab's C-based neural network simulator (NetSim), adopted by multiple researchers; optimized Poisson sampling algorithm, reducing simulation time by 10x.
- Mentored graduate and undergraduate students on computational neuroscience methods and experimental design.

EDUCATION

Ph.D. Neuroscience
2021 – present

University of Western Ontario

- Thesis: *In Silico and In Vitro understanding of local network control of hypothalamic signalling.*

M.Sc. Neuroscience
2019 – 2021

University of Western Ontario

- Thesis: *The role of inflammation in stress signalling & hypothalamic plasticity.*

B.Sc. Hons. Science
2014 – 2019

Carleton University

- Neuroscience with Minor in Psychology.
- Thesis: *Effects of various early life psychological stressors on plasticity in the rat hippocampus.*

SELECTED PROJECTS

SciAgent
2026

- A generic framework for building AI-powered scientific data analysis agents with built-in scientific rigor guardrails. Features a 5-layer guardrail system (code scanning, data validation, domain-specific bounds checking), a self-assembly wizard for generating domain-specific agents, and plugin architecture. Built with Python, supports CLI, web UI, and IDE integration (Copilot/Claude Code). Public MVP at sciagent.app. Open source under MIT licence.
- *github.com/smestern/sciagent*

treepilot
2026

- An agentic AI framework + frontend for Genealogy Research. Built with Python and LLMs, it automates family tree construction and data extraction from genealogical records.
- **Winner of Github Copilots' "Weekend Hackathon Challenge"**

High-Throughput Dynamic Clamp System
2025

- Real-time C/C++ engine with Python API and Brian2/PyTorch integration; scales to 1000-neuron biohybrid networks.
- *Publication under revision.*

patchOTDA
2024

- I developed a software package and GUI that corrects for batch effects and experimental variability in electrophysiological data. The tool uses AI-based optimal transport methods to enable cross-dataset comparisons and improve reproducibility in neural recordings.
- **Winner of Allen Institutes' "MapMySpikes challenge"**

pyNetSim 2023

- I developed a Python interface for the Muller Lab's C-based neural network simulator (NetSim), now used by multiple researchers in the lab to accelerate their workflow. I also optimized the Poisson sampling algorithm, reducing simulation time by 10x.
- *This is currently closed source. I am happy to provide documentation upon request.*

pyAPisolation 2019

- I developed a Python tool for automated extraction and analysis of intracellular electrophysiological time-series data, now used by colleagues across multiple labs. I maintained and expanded the software with features including a GUI, curve fitting, post-hoc analysis, and export to proprietary formats.

AWARDS

2023–2024 Ontario Graduate Scholarship, University of Western Ontario. **Proposal:** Probing Recurrent Inhibition of the Neuroendocrine Stress Circuit Using *In Vitro, in Silico, In Vivo* Techniques. **Amount:** $15,000

2022–2023 Ontario Graduate Scholarship, University of Western Ontario. **Proposal:** Understanding Recurrent Inhibition of the Neuroendocrine Stress Circuit. **Amount:** $15,000

2020–2022 CONP Scholars Award for Open Science, University of Western Ontario. **Proposal:** I-MT Primate Cell Type Database. **Amount:** $15,000 / yr

2018–2020 Dean's Honour List, Carleton University.

2016 George Fierheller Scholarship, Carleton University. **Amount:** $3,000

SKILLS

Coding Java, C, C++, PHP, Python, R, SQL, XML/XSL, PyTorch, Brian2, LaTeX, …

Databases MySQL, PostgreSQL, HSQL, SQLite, …

Web Dev HTML, CSS, JavaScript, Flask, FastAPI, …

Misc. Academic research, teaching, training, consultation, LLMs / Agentic AI, LaTeX typesetting and publishing.

RESEARCH PUBLICATIONS

Thesis

1. **S. Mestern**, "Examining the role of chloride homeostasis and PGE2 signaling in the neuroendocrine stress response to inflammation," Masters Thesis, The University of Western Ontario (Canada), Aug. 31, 2021.

Journal Articles

1. A. Ichiyama, **S. Mestern**, G. B. Benigno, K. E. Scott, B. L. Allman, L. Muller, and W. Inoue, "State-dependent activity dynamics of hypothalamic stress effector neurons," *eLife*, vol. 11, J. A. Kauer, J. R. Huguenard, A. Yamanaka, and J. S. Bains, Eds., e76832, Jun. 30, 2022, ∗A. Ichiyama and S. Mestern contributed equally to this work, ISSN: 2050-084X. [link] DOI: 10.7554/eLife.76832 Accessed: May 28, 2023.

REFERENCES

Available on Request