Jai Bhagat

Curriculum Vitae

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Summary

I enjoy figuring out how things work.
My research focuses on developing theories and tools to create and explain intelligent behavior.
I've contributed to many renowned projects across AI, ML, and Neuroscience.
I enjoy working on solo projects, but my best work comes in collaborations.

Education

Ph. D. Systems & Computational Neuroscience | University College London | London, UK | 2025

A.S.P. Neuroscience | Massachusetts Institute of Technology | Cambridge, MA, USA | 2018

B.A. Neuroscience | Boston University | Boston, MA, USA | 2015

Professional Experience

`Machine Learning Research Scientist`, Enigma — 2025/09 – Present
Palo Alto, CA, USA

`Bogue Fellow Research Scientist`, UCL - Anthropic — 2025/01 – 2025/03
San Francisco, CA, USA

`Data Scientist`, Sainsbury Wellcome Centre — 2020/11 – 2021/08
University College London, London, UK

`Software Developer`, CortexLab & International Brain Lab — 2018/10 – 2020/08
University College London, London, UK

`Technical Associate I/II`, Wilson Lab — 2016/06 – 2018/06
Massachusetts Institute of Technology, Cambridge, MA, USA

`Research Assistant`, Perceptual Neuroimaging Lab — 2013/06 – 2014/06
Boston University, Boston, MA, USA

`Research Assistant`, Calakos Lab — 2012/05 – 2012/08
Duke University, Durham, NC, USA

Publications

Journal Articles

Bhagat J.*, Molas-Medina S.*, Giglemiani G., Heimersheim S. Compressed computation is not computation in superposition. *NeurIPS 2025 Mechanistic Interpretability Workshop*.

Bhagat J., Pouget A. G., Molas-Medina S. A pipeline for interpretable neural latent discovery. *NeurIPS 2025 Data on the Brain & Mind Workshop*.

Campagner D.* ***Bhagat J.****, Lopes G.* et al. Aeon: An open-source platform to study the neural basis of ethological behaviors over naturalistic timescales. *Biorxiv & In Press*.

Bhagat J.*, Molas-Medina S.*, Giglemiani G., Heimersheim S. Compressed computation is not computation in superposition. *Arxiv*.

International Brain Laboratory, Banga K., Benson J., ***Bhagat J.***, et al. Reproducibility of in-vivo electrophysiological measurements in mice. *eLife* 2025.

Steinmetz N. A., Aydin C., Lebedeva A., Okun M., Pachitariu M., ***Bhagat J.***, et al. Neuropixels 2.0: A miniaturized high-density probe for stable, long-term brain recordings. *Science* 2021.

Bhagat J.*, Wells M. J.*, Harris K. D., Carandini M., Burgess C. P. Rigbox: An open-source toolbox for probing neurons and behavior. *eNeuro* 2020.

Conference Abstracts

Campagner D.*, ***Bhagat J.****, Lopes G.*, et al. Aeon: an open -source platform for testing normative models of natural behaviours and their neural implementations. *Cosyne 2025*.

Bhagat J.*, Wells, M. J.*, Harris, K. D., Carandini, M., Burgess, C. P. Rigbox: An open-source toolbox for probing neurons and behavior. *SFN 2019*.

Bhagat J., Penagos, H., Wilson, M. LSTM Neural Networks for LFP Event Detection and Classification in the Rodent Hippocampal-Cortical Network. *MIT Brain and Cognitive Sciences Retreat 2018*.

Bhagat J., Varela, C., Flores, F., Zhang, J., Wilson, M. Machine Learning Techniques to Improve Analyses of Neural Spike Data. *MIT Intelligence Quest 2018*. [*Press Release*]

Open-source Projects

nanoGPT: A minimal (nanomal?) repository containing code for building, training, and running nanoGPT. (Sole creator, developer, and maintainer)

Wall-E-GPT: Python and Arduino code for a GPT-controlled, semi-autonomous rover robot running on a Raspberry Pi. (Sole creator, developer, and maintainer)

aeon_mecha: Project Aeon's main library for interfacing with acquired experiment data. (Creator, developer, maintainer: active)

aeon_experiments: Project Aeon's main Bonsai and C# library for running behavioral neuroscience experiment workflows. *(Developer, maintainer: active)*

ibllib: The International Brain Laboratory's core shared Python libraries for data management and neural electrophysiology acquisition ↪ analysis pipeline. (Developer, maintainer)

MatchMentor: Football video analysis AI to democratise player training. (Creator, developer, and maintainer: active)

Rigbox: A MATLAB and C based toolbox for running behavioral neuroscience experiments and managing data. (Developer, maintainer)

Burgess Steering Wheel Setup. Hardware designs and assembly instructions for a rig used to run the Burgess Steering Wheel Task. (Contributor)

J_Clust. A MATLAB complete spike sorting package. (Sole creator, developer, and maintainer)

Talks & Tutorials

Neuroverse Panel Discussion: "Can Computational Models & Machine Learning Capture the Full Complexity of the Brain?" Sainsbury Wellcome Centre, University College London. London, UK. 2024-10-22.

Video-based Analysis of Animal Behavior. Sainsbury Wellcome Centre, University College London. London, UK. 2023-11-29.

Collaborative Coding and Software Development Best Practices. Sainsbury Wellcome Centre, University College London. London, UK. 2023-10-25.

Introduction to Software Development in Python. Sainsbury Wellcome Centre, University College London. London, UK. 2023-09-21.

Neuroverse Podcast: Challenges with Collaborative Neuroscience & the Impact of Generative AI. London, UK. 2023-06-29.

Introduction to High-performance Computing with Linux. Sainsbury Wellcome Centre, University College London. London, UK. 2023-04-25.

International Brain Laboratory Data Organization and Architecture. Jerome L. Green Science Center, Columbia University. New York, NY. 2019-09-02.

Optimizing Tetrode Spike Sorting and Using LSTMs for LFP Event Detection. Cruciform Building, UCL. London, UK. 2018-04-06.

Git and Github for Code Versioning and Collaboration in Neuroscience. Picower Institute for Learning and Memory, MIT. Cambridge, MA. 2018-03-28.

An Introduction to Spike Sorting. Center for Brains, Minds and Machines, MIT. Cambridge, MA. 2017-03-22.

TEACHING

Neuronauts Summer Camp – 2023. Instructor. Sainsbury Wellcome Centre, University College London. London, UK. 2023-07-31 – 2023-08-04.

Neuronauts School Club – 2022-2023. Instructor. Sainsbury Wellcome Centre, University College London. London, UK. 2022 - 2023.

SWC Bonsai Workshop – 2022. Teaching Assistant. Sainsbury Wellcome Centre, University College London. London, UK. 2022-11-08 – 2022-11-11.

SWC Ph. D. Bootcamp – 2022. Teaching Assistant. Sainsbury Wellcome Centre, University College London. London, UK. 2022-09-13 – 2022-09-30.

Neuronauts Summer Camp - 2022. Head Instructor. Sainsbury Wellcome Centre, University College London. London, UK. 2022-07-25 – 2022-08-05.

International Brain Lab Code Camp – 2019. Workshop Organizer and Instructor. Jerome L. Green Science Center, Columbia University. New York, NY. 2019-09-02 – 2019-09-06.

Neuropixels Course at UCL – 2019. Workshop Teaching Assistant. Sainsbury Wellcome Centre, UCL. London, UK. 2019-04-29 – 2019-05-01.

Neuroinformatics – Spring 2019. Course Teaching Assistant. Sainsbury Wellcome Centre, UCL. London, UK. 2019.

9.123: Neurotechnology in Action – Spring 2018. Guest Lecturer. Department of Brain and Cognitive Sciences, MIT. Cambridge, MA. 2018.

9.17: Systems Neuroscience – Fall 2017. Guest Lecturer. Department of Brain and Cognitive Sciences, MIT. Cambridge, MA. 2017.

AWARDS

Bogue Fellowship 2024: £4000

Fondation JFMLCT Education Outreach Fund 2023: £5000

UCL AWPO Bespoke Project Fund 2022: £15000

SWC Public Engagement Fund 2022: £1000

SWC Ph. D. Scholarship 2021: £150000

Professional Groups & Activities

UCL NeuroAI. Organizing committee member. 2023-Present.

Neuronauts. Founder, President. 2021-Present.

Project Aeon. Head of Data Architecture. 2021-Present.

International Brain Lab. Member. 2019-Present.

Society for Neuroscience. Member. 2019-Present.

Cognitive Rhythms Collaborative. Member. 2017-2018.

MIT Ephys Analysis and Spike Sorting Discussion Group. Founder, President. 2016-2018.

The Nerve Magazine. Writer and Editor. 2013-2014.

Additional Training

2025 | MARS Scholar - AI Alignment | Cambridge AI Safety Hub | Cambridge, UK

2024 | ARENA Scholar - AI Alignment | ARENA Education

2023 | Extracellular Ephys Acquisition | Cajal Advanced Neuroscience Training | Lisbon, Portugal

2023 | Machine Learning Summer School | Stellenbosch University | Gordon's Bay, South Africa

2016 | Programming Languages Specialization | Coursera

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Technical Skills & Knowledge

(items in each subsection in descending, rightward rank by proficiency)

Computer Science & Programming

General Programming Languages (Active Projects)

`Python` (including Jax, PyTorch, TensorFlow, Keras, Polars, Pandas and Scikit-learn packages)

`Bonsai` `Rust` `CUDA` `Mojo`

General Programming Languages (Past Projects)

`MATLAB` (including NI-DAQ mx, Data Acquisition, Signal Processing, Wavelet, Statistics and Machine Learning, and Neural Network toolboxes)

`C` `Racket` `Lisp` `ML` `Ruby` `Javascript` `Java` `R` `Wolfram` `Julia`

Database & Command Languages

`SQL / MySQL` `Git` `Zsh` `Bash` `PS`

Markup Languages

`Markdown` LaTeX 2$_\varepsilon$ `HTML` `CSS`

Data Serialization Languages

`YAML` `JSON` `XML`

Programming Paradigms

Procedural Object-Oriented Functional Reactive

Development Practices and Processes

Versioning (DVCS) Test-driven development (TDD) Continuous integration (CI) Continuous delivery (CD) Software Development Lifecycle (SDLC) Models: Waterfall, V, Agile (Kanban, Scrum)

Statistics & Mathematics

Basic Data Visualization & Analysis

Dimensionality Reduction Procedures: PCA, Wavelet Analysis, t-SNE

Clustering Techniques: k-means, FCM, MoG, HDBSCAN, OPTICS

Inferential Statistics: Frequentist & Bayesian hypothesis testing

Regression Methods: Logistic, Multilinear (incl. L1 / L2 norm), GLMs, Random Forests

Deep & Reinforcement Learning

ANN Architectures: Transformer, VAE, GAN, LSTM, RNN, CNN

Training Optimizers: Adam and variants, RMSprop, SGD, BFGS

Regularization Techniques: K-Fold and Cross-validation, Layer and Gradient Normalization, Dropout

RL Models: Policy Gradient Methods (e.g. PPO), DQN, Distributional, TD, Bandit

Distributed Training, Apps, & Services: DDP, FSDP, RAG, Wandb, AWS (S3, EC2, ECS), GCP, HF 🤗

Signal Processing

Basic Digital Filter Design: IIR and FIR filters.

Mechatronics

Creating basic mechatronic circuits

Designing simple PID and Kalman Filter Control Systems

Assembling experiment rigs, via 3d printing and laser-cutting

Designing and building hobbyist robots, controlled via microcomputers (including Raspberry Pis (using ROS / RosPy), LattePandas, Jetson Nanos) and microcontrollers (including Arduinos, FPGAs)

Assembling computer acquisition systems from components

Wiring tetrodes and building tetrode drives

Wet Lab

Behavioral assessments on humans and rodents

Genotyping (via PCR and gel electrophoresis) on rodents

Electrophysiology and fiberphotometry neural recordings on rodents

Optogenetic and pharmacologic neural manipulations on rodents

Stereotaxic surgeries on rodents

Perfusions, histology, and post-mortem fluorescence micrscopy on rodents