Alice Berners-Lee, PhD

I am a data scientist with a background in neuroscience seeking to join the fight to stop climate change.
With over a decade of experience writing custom code to analyze large and complex data sets, I aim to apply my skills as a data scientist at a climate organization.

Somerville, MA | abernerslee@gmail.com | linkedin.com/in/alice-berners-lee/ | Website | GitHub

Technical Skills

PROGRAMMING LANGUAGES: Python | SQL | MATLAB | Arduino

DATA SCIENCE & MACHINE LEARNING: Linear & Logistic Regression, Classification, Clustering, Decision Trees, NLP, Feature Engineering (Numpy | Scipy | Scikit learn) | Data Processing & Visualization (Pandas | Matplotlib) | Time-series Analyses | Non-parametric Statistics | Distributed Computing (Spark, PySpark) | Neural Networks and Deep Learning (Tensor Flow, Keras) | Mapping (Geopandas, NetworkX, Shapely) | Communication (Git, Jupyter notebooks) | 3D Printing (Solidworks, Fusion 360)

CORE EXPERTISE: Data Collection & Analysis | Standard Operating Procedures | Process Implementation | Training | Proactive | Independent Contributor

Education

Data Scientist Certification - Fellowship Program | The Data Incubator | November 2022

- Capstone Project: A web app, **Car**efree, that generates and maps safer biking routes through the city of Somerville, MA using car crash data from MassDOT and Open Street Maps. Website, GitHub
- Chosen to be a speaker at the Capstone Showcase. (Four of the ten fellows were chosen.)

Ph.D. in Neuroscience | Johns Hopkins School of Medicine | 2020

- Thesis advisor: Dr. David Foster
- Thesis title: Sequences in the brain: How hippocampal replay interacts with the prefrontal cortex and changes with experience, and the discovery of theta sequences in ventral striatum. Thesis Abstract

B.S. in Neural Science | New York University | 2013

- B.S. in Neural Science, honors. Minor in Creative Writing.
- GPA: 3.66, Dean's list.
- Thesis advisor: Dr. Lila Davachi
- Thesis title: The influence of post-encoding stimulus re-exposure during awake rest on subsequent memory.

Experience

HARVARD UNIVERSITY | The Murthy Laboratory   **April 2021 – Present**
Postdoctoral Fellow

- Analyzed electrophysiological data from 1000+ neurons to understand how the odor cortex encodes scent mixtures.
- Delivered research paper to bioRxiv and submitted for publication with a recognized scientific journal.
- Discovered the odor cortex is a dynamic and robust system that can optimize for current and future demands at once.

JOHNS HOPKINS SCHOOL OF MEDICINE & UC BERKELEY | The Foster Laboratory   **2015 – 2021**
Interim Postdoctoral Scholar | October 2020 – March 2021
PhD Candidate | May 2015 – September 2020

Used MATLAB, Python, and Arduino to design and run experiments, analyzing terabytes of data with each experiment.

- Examined high-frequency events in the hippocampus to understand how memory is distributed across the brain.
  - Discovered new relationships between the discrete spikes in PFC with the oscillations in the hippocampus.
- Performed meta-analysis of data from multiple projects to explore how spatiotemporal features of replay transform.
  - Discovered that replays slow down with experience and take more time to represent the same memory, which has implications for reinforcement learning and computational models of memory

- Research Papers were published in *Neuron* and *Journal of Neuroscience* — both leading peer-reviewed journals.

JOHNS HOPKINS SCHOOL OF MEDICINE | The Knierim Laboratory   **2015**
1st year rotation student

- Trained animals on a novel task to look for behavioral correlates of lateral entorhinal cortical activity
- Wrote code to analyze neurophysiological data to investigate whether scanning behavior potentiates hippocampal place fields in the dark.

NEW YORK UNIVERSITY | The Fenton Laboratory & The Carter Laboratory   **2013-2014**
Junior Research Scientist

- Handled mouse colony breeding and maintenance, histology studies, and in-vivo virus injections and tracing experiments in rodents.

NEW YORK UNIVERSITY | The Carew Laboratory   **2013**
Research Technician

- Isolated single bifurcated sensory neurons using cell culture in Alpysia and allowed them to make synapses with two distinct motor neurons in order to study changes seen in a two-trial form of long-term memory.
- Developed RNA probes of cysteine-rich neurotrophic factor (CRNF) to look at molecular changes at the synapse.

NEW YORK UNIVERSITY | The Davachi Learning and Memory Laboratory   **2010-2013**
Undergraduate Research Assistant to Dr. Arielle Tambini | 2011-2013

- Designed and coded human behavioral tasks, collected data, and analyzed it.
- Using behavioral tasks in humans, we found that re-activating representations during awake post-encoding rest enhances memory of those specific representations.

Undergraduate Research Assistant to Dr. Katherine Duncan | 2010-2011

- Ran and analyzed an experiment to investigate differences in encoding and retrieval states on memory generalization in humans.

Projects and Papers

Carefree – Be carefree, leave your car at home   [Website](#), [GitHub](#)

- Processed public car crash data from MassDOT and Open Street Map data to build a model that predicts the danger of biking on each street of Somerville, MA and built a website that provides safer routes for users.

Learning-Dependent Evolution Of Odor Mixture Representations In Piriform Cortex   [Article Link](#)

> **Berners-Lee, A.*,** Shtrahman, L.*, Grimaud, J., Murthy, V.N. Neural representation of odor mixtures in the piriform cortex evolves to balance identity coding and learned categorization. *bioRxiv* (2022). *Equal contribution.

- Utilized time-series analysis, circular statistics, and data visualizations to test hypotheses, explore the novel dataset.
- Examined simultaneous data from 1000+ neurons and performed data analysis to understand physical processes.

Hippocampal replays appear after a single experience and add greater detail with more experience   [Article Link](#)

> **Berners-Lee, A**., Feng, T., Silva, D., Wu, X., Ambrose, E., Pfeiffer, B., Foster, D. Hippocampal replays appear after a single experience and slow down with subsequent experience as greater detail is incorporated. *Neuron* (2022).

- Performed signal processing of the local field potential to identify candidate events of high oscillatory activity.
- Used Bayesian decoding on the spike data from hundreds of simultaneously recorded neurons to reveal the information being represented during these events.
- Wrangled data from several past experiments into a consolidated dataset to explore how spatiotemporal features of replay change with repeated experience.
- Found that replays tend to slow down with experience, taking more time to represent the same memory. This work has implications for reinforcement learning and computational models of memory.

Prefrontal cortex response to hippocampal replays   [Article Link](#)

> **Berners-Lee, A**., Wu, X., Foster, D. Prefrontal cortical neurons are selective for non-local hippocampal representations during replay and behavior. *Journal of Neuroscience* (2021).

- Used a variety of techniques in time-series analysis, circular statistics, and visualizations to both test hypotheses and explore this large novel data set.
- Discovered new relationships between the discrete series of spikes in prefrontal cortex with the phasic theta oscillations in the hippocampus. This work sheds light on the underpinnings of memory and planning.

Targeting memory reactivation during rest in humans   Article Link

> Tambini, A., **Berners-Lee, A**. & Davachi, L. Brief targeted memory reactivation during the awake state enhances memory stability and benefits the weakest memories. *Scientific Reports* 7, 15325 (2017).

- Designed, coded, and ran experiments in humans to test whether brief sub-conscious re-exposure of cues from previously learned associations changed the memory for those associations.
- Found that reactivation of cues during only sub-conscious rest improved memory stability.

Invited Talks

World Wide Neuroscience, Welcome Centre for Integrative Neuroimaging, Oxford   **2020**

> Title: Hippocampal replays appear after a single experience and slow down with subsequent experience as greater detail is incorporated. Recording Link

Junior Scientist Workshop on Neural Circuits and Behavior, Janelia Research Campus   **2019**

> Title: Replay slows down with experience

Conference Presentations

50th Annual Meeting of the Society of Neuroscience   **2021**

> **Berners-Lee, A.,** Shtrahman, E., Grimaud, J., & Murthy, V. N. (2021). Neural representation of odor mixtures in the piriform cortex evolves to balance identity coding and learned categorization.

17th Annual Cosyne Meeting   **2020**

> **Berners-Lee, A**., Feng, T., Silva, D., Wu, X., Ambrose, E., Pfeiffer, B., Foster, D., "Hippocampal replay slows down with experience, as greater detail is incorporated,"

49th Annual Meeting of the Society for Neuroscience   **2019**

> **Berners-Lee, A**., Wu, X., Foster, D. "Prefrontal neurons are tuned to the spatial trajectory information content of hippocampal neurons during non-local hippocampal representation of future and past places, but not during local hippocampal representation of current place."

39th Annual NYU Undergraduate Research Conference   **2013**

> **Berners-Lee, A.**, Tambini, A., Davachi, L."The Influence of Post-encoding Stimulus Re-exposure on Subsequent Memory".

42nd Annual Meeting of the Society for Neuroscience   **2012**

> Inhoff M.C., Heusser A.C., Tambini A., **Berners-Lee A**., Martin C.B., O'Neil E.B., Koehler S., Vazquez B., Devinsky O., & Davachi, L. "Material-specific associative memory and perceptual deficits in a patient with a right perirhinal cyst."

Awards

Best in Poster Presentation   **2013**

> 39th Annual NYU Undergraduate Research Conference, "The Influence of Post-encoding Stimulus Re-exposure on Subsequent Memory".

Departmental Certificate of Excellence for Honors Thesis   **2013**

> Presented to a senior who has shown exceptional research ability in undergraduate Neural Science

Teaching, Mentoring, Outreach and Volunteer Work

Assessor, Time for the Planet   **2023-Present**

Volunteer to assess ideas and organizations in the pre-selection of innovations with the highest impact potential to help Time for the Planet to fund work that will contribute to the tackle climate change on a large scale.

Mentor, Harvard Graduate Women in Science and Engineering, Harvard   **2021-2023**

Mentored two women, one masters student in Neuroscience and one PhD student in Physics.

Volunteer, Somerville Homeless Coalition / Project SOUP **2021-2022**

Brought groceries to 4-7 households around Somerville every week or every other week.

Volunteer, Elizabeth Warren **2019-2020**

Organized and trained other volunteers to knock doors for Elizabeth Warren in the 2020 Democratic presidential primary. We went door-to-door to talk to voters in urban and rural areas of California and Nevada.

Facilitator, Thriving in Science **2018- 2019**

Organized and facilitated monthly discussions with a group of graduate students and post-docs to support each other through the challenges of scientific research.

Tutor, Reading Partners **2015-2019**

Tutored a student twice a week who was below grade level in reading. Tutored two students for over two years in an elementary school in West Baltimore, MD and another student in an elementary school in Oakland, CA.

Brain Fest Coordinator, Project Bridge **2016-2017**

Planned and executed a day-long "Brain Fest" for the Baltimore public including booths, talks, and art. Designed an "Escape-the-Brain" room which has been replicated yearly since.

Teaching Assistant, Neuroscience and Cognition I **2015**

Assisted in teaching the core class for all neuroscience graduate students by organizing and holding review sessions, and facilitating a deeper discussion on the material.

Coordinator, NYU CNS Visiting Scientist Program **2014**

Coordinated a series of visits to introduce neuroscience research to six high schools in the NY Metro region in communities under-represented in science.

Mentor, Davachi Lab **2012-2013**

Trained and supervised two undergraduate students in data collection and behavioral analysis in MATLAB.

Group Leader, Alternative Breaks **2010-2012**

Alternative Breaks (AB) is a national community service program sponsored by Break Away. I led groups of 8-10 fellow undergraduates to do trail work in national parks in North Carolina (2011) and Tennessee (2012).

In 2011 I was voted Best Leader by the NYU AB community.

Vice President, Heart-to-Heart **2009-2012**

Organized and supervised free blood pressure screenings in low-income areas in all five boroughs of NYC to raise awareness and provide free information about high blood pressure.