Jesse Livezey

CONTACT INFORMATION

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EDUCATION

2017 Ph.D. in Physics, University of California, Berkeley
Supervisor: Prof. Michael DeWeese
Thesis: Learning and Inferring Representations of Data in Neural Networks

2013 M.A. in Physics, University of California, Berkeley

2010 B.A. in Physics and Mathematics, Cornell University

ACADEMIC POSITIONS

Postdoctoral Researcher, Supervisor: Dr. Kristofer Bouchard, Lawrence Berkeley National Lab, 2017–present.
Developing analysis tools for applying deep learning models to neural and physics datasets and interpreting learned features. Developing machine learning and information theoretic techniques for large scale data problems in science. Mentoring graduate and undergraduate students.

Graduate Research Assistant, Supervisor: Prof. Michael DeWeese, UC Berkeley, 2013–2017.
Developed deep learning analysis tools for understanding neural dynamics in sensorimotor cortex. Applying methods to brain-machine interface applications. Mentored junior graduate students and undergraduate students.

Berkeley Connect Fellow, UC Berkeley, 2013–2015.
Lead mentoring program and discussion sections for undergraduate physics majors. Organized panels on graduate school, panels on careers in industry, and visits to local companies and national labs.

Graduate Instructor, UC Berkeley, 2011–2014.
Taught undergraduate physics courses as a Graduate Student Instructor and Head Graduate Instructor for an introductory mechanics class for life science majors. Developed and co-taught a course on testing and refining scientific theories in physics as a primary instructor.

Computing Sciences Intern, Lawrence Berkeley National Lab, Summer 2015.
Developed tools for training deep networks on neural data at the National Energy Research Scientific Computing Center. Created systems for training networks using the Theano machine learning library on supercomputing clusters.

Teaching Assistant, Weill Cornell Medicine-Qatar, 2010–2011.
Taught undergraduate mechanics and electricity and magnetism courses for pre-med students. Developed lesson plans and worksheets for discussion sections and laboratory sections.

Undergrad. Research Assistant, Wilson Synchrotron, Cornell University, 2007-2010.
Created numerical simulation to understand systematic biases in new detector. Wrote data aquisition, analysis, and visualization software in a combination of Fortran 90 and MATLAB.

PROFESSIONAL EXPERIENCE

Deep Learning Researcher, Nervana, Inc., Fall 2014–Spring 2015.
Created and implemented deep learning algorithms using a new deep learning framework. Built models to factorize data using feed-forward deep networks with labeled and unlabed data.

MultiSensor Machine Learning Intern, Audience, Inc., Summer 2014.
Explored convolutional neural networks for transportation and context classification

on mobile phones. Audio and accelerometer based classification were seperately explored along with audio-accelerometer fusion networks. Training and hyperparameter search tools were developed using Amazon EC2 clusters.

Teaching Experience

Primary Instructor Positions, UC Berkeley

2013-15 *Testing and Refining Scientific Theories*, Spring semesters
Secured funding for, co-designed, and co-instructed course for freshman. Students investigated how models can inform what measurements are made and how the results of measurements dictate how scientific models are refined. The course culminated in final projects where graduate students led groups of undergraduates in authentic research projects.

2012 *Compass Summer Program*, Summer semester
Co-designed and co-taught a week-long summer program for students interested in the physical sciences. The summer program focuses on building community for an incoming cohort of students interested in the physical sciences. Curriculum focused on building and exploring scientific models using Slinkies as the model system.

Teaching Assistant UC Berkeley

Fa12-Fa13 Head Teaching Assistant, Physics 8A: Introductory Mechanics
Fa11-Sp13 Teaching Assistant, Physics 8A: Introductory Mechanics

Teaching Assistant Weill Cornell Medical School–Qatar

Sp11 Introductory Mechanics
Fa10 Introductory Electricity and Magnetism

Neuroscience and Machine Learning Workshops, UC Berkeley

2016 Teaching Assistant, *Data Science and Data Skills for Neuroscientists* at SfN
Engaged with attendees to work through tutorials on neural data analysis techniques and brainstormed applications to their own research at the Society for Neuroscience Conference.

2016 Teaching Assistant, *Theano Workshop* at the GPU Technology Conference
Helped attendees work through exercises using Theano and GPUs to build machine learning models.

2015 Teaching Assistant, *Mining and Modeling of Neuroscience Data*
Helped students with mathematical, modeling, and programming neural data analysis tutorials given by instructors. Supported students through week-long summer school at the Collaborative Research in Computational Neuroscience course at UC Berkeley.

2015 Teaching Assistant, *Theano Workshop* at the GPU Technology Conference
Helped attendees work through exercises using Theano and GPUs to build machine learning models. Helped students with mathematical, modeling, and programming neural data analysis tutorials given by instructors. Supported students through week-long summer school.

Workshop Leader Positions, UC Berkeley

2013 *Compass Teacher Training Workshop*, Summer semester
Ran a series of weekly workshops to introduce instructors to the Compass Project's teaching philosophy and methods and to help them design the curricula for the courses they were teaching.

2013 *Introduction to Scientific Programming*, Summer semester
Developed and ran a summer-long programming workshop aimed at undergraduate and graduate students with little-to-no programming experience who are interested in research.

Invited Talks

2019 "Unsupervised Discovery of Temporal Structure in Noisy Data with Dynamical Components Analysis." Columbia University, Center for Theoretical Neuroscience.
2019 "What can machine learning tell us about the brain?" Fordham University.
2019 "Everything R&D Teams Need to Know About Deep Learning." Medical Design & Manufacturing West.
2018 "Deep Learning Demystified." Xavier University AI Summit.
2018 "What are the building blocks of scientific data?" Los Medanos Community College, Math-Engineering-Science Achievement Program.
2014 "Brain Physics.", Lake Tahoe Community College Foundation's Speaker Spotlight Series.

Awards

2017 Physics Departmental Service Award, University of California, Berkeley
2013-15 Berkeley Connect Fellowship, UC Berkeley Physics
2013 Outstanding Graduate Student Instructor (GSI) Award, UC Berkeley GSI Teaching and Resource Center
2013 7th place, Kaggle: Belkin Energy Disaggregation Competition
2010 Physics Departmental Service Award, Cornell University

Service

Reviewer for Conference on Neural Information Processing Systems (NeurIPS) 2015-2017

The Compass Project at UC Berkeley, 2011–2016
Coordinator, teacher, and mentor. Compass is a student-run program that supports diversity and community in the physical sciences. Responsibilities include: hiring and training 2013 summer program teachers, organizing leadership retreats, and evaluating Compass programs.

Respect is Part of Research Facilitator, UC Berkeley Physics Department, 2015–2016
Facilitator for the incoming graduate student workshop. Respect is Part of Research is a program created and run by graduate students at UC Berkeley whose goal is to create a respectful, positive working environment in science departments free from sexual harassment.

Grad-To-Grad Mentoring (G2G) Program, UC Berkeley Physics Department, 2013
Graduate Mentor. Active mentor of first year graduate students as part of new graduate mentoring initiative in the physics department.

Software and Computational Resources

- Lead Developer Team for PyUoI. Source code.

- Contributed Python to *The Open Course in Data Science for Neuroscience*
- Contributed Hopfield Network Lab to VS 265: Neural Computation
- Open Source Contributions: SciPy, Theano, Pylearn2.
- Scientific Python: NumPy, SciPy, Cython, Pandas, Matplotlib.
- Machine/Deep Learning: PyTorch, TensorFlow, scikit-learn, Theano.
- HPC: mpi4py, SLURM.
- Familiarity with C/C++ and Fortran.
- Github: github.com/JesseLivezey

Professional Training

2018 Recognizing and Addressing Power Dynamics in Science and Academia, Society for Neuroscience short course
2013 Berkeley Science Network Mentoring Deep Dive Retreat
2013 Encouraging Student Participation, Berkeley Graduate Student Instructor Teaching and Resources Center
2011 Professional Preparation: Supervised Teaching of Physics
2011 Teaching Conference for First-Time GSIs

Professional Membership

- Society for Neuroscience

Publications

Journal Publications

- **J.A. Livezey**, K.E. Bouchard, E.F. Chang. Deep learning as a tool for neural data analysis: speech classification and cross-frequency coupling in human sensorimotor cortex, PLoS Computational Biology. 2019.
- **J.A. Livezey**, A.F. Bujan, F.T. Sommer. Learning low coherence, overcomplete representation with linear inference. In press, Journal of Machine Learning Research. Preprint. 2019.
- C. Berggren, P. Gandhi, **J.A. Livezey (equal authorship)**, R. Olf. A Tale of Two Slinkies: Learning about Model Building in a Student-Driven Classroom. The Physics Teacher, 2018.
- P.R. Gandhi, **J.A. Livezey**, A.M. Zaniewski, D.L. Reinholz, D.R. Dounas-Frazer. Attending to experimental physics practices and lifelong learning skills in an introductory laboratory course. American Journal of Physics, 2016.
- J.R. Calvey, W. Hartung, Y. Li, **J.A. Livezey**, J. Makita, M.A. Palmer, and D. Rubin. Measurements of electron cloud growth and mitigation in dipole, quadrupole, and wiggler magnets. Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment. 2015.
- J.R. Calvey, G. Dugan, W. Hartung, **J.A. Livezey**, J. Makita, and M.A. Palmer. Measurement and modeling of electron cloud in a field free environment using retarding field analyzers. Physical Review Special Topics - Accelerators and Beams. 2014.
- J.R. Calvey, W. Hartung, Y. Li, **J.A. Livezey**, J. Makita, M.A. Palmer, and D. Rubin. Comparison of electron cloud mitigating coatings using retarding field analyzers. Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment. 2014.

Refereed Conference Publications

- D. G. Clark, **J.A. Livezey (co-first author)**, K. E. Bouchard. Unsupervised Dis-

covery of Temporal Structure in Noisy Data with Dynamical Components Analysis. In press, Advances in Neural Information Processing Systems. Preprint. 2019.

Journal Publications Under Review

- P.S. Sachdeva, **J.A. Livezey**, M.R. DeWeese. Heterogeneous synaptic weighting improves neural coding in the presence of common noise. Under review, Neural Computation. Preprint. 2019.
- P.S. Sachdeva, **J.A. Livezey**, A.J. Tritt, K.E. Bouchard. PyUoI: The Union of Intersections Framework in Python. Under review, Journal of Open Source Software. 2019.

Preprints and Technical Reports

- **J.A. Livezey**, A. Hwang, K.E. Bouchard. Hangul Fonts Dataset: a Hierarchical and Compositional Dataset for Interrogating Learned Representations. Preprint.. 2019.
- E.M. Dodds, **J.A. Livezey**, M.R. DeWeese. Spatial whitening in the retina may be necessary for V1 to learn a sparse representation of natural scenes. Preprint. 2019.
- D.G. Clark, **J.A. Livezey**, E.F. Chang, K.E. Bouchard. Spiking Linear Dynamical Systems on Neuromorphic Hardware for Low-Power Brain-Machine Interfaces. Preprint. 2018.
- Theano Development Team (including **J.A. Livezey**). Theano: A Python framework for fast computation of mathematical expressions. Technical Report. 2016.

Conference Proceedings and Workshops

- **J.A. Livezey**, M. Dougherty, P.S. Sachdeva, S. Madhow, K.E. Bouchard. Optimal or random?: how correlated variability impacts population neural coding. Society for Neuroscience Conference. 2019.
- D. G. Clark, **J.A. Livezey (co-first author)**, K. E. Bouchard. Unsupervised Discovery of Temporal Structure in Noisy Data with Dynamical Components Analysis. Society for Neuroscience Conference. 2019.
- **J.A. Livezey**, M. Dougherty, P.S. Sachdeva, S. Madhow, K.E. Bouchard. A theory of structured noise correlations in peripheral and higher order brain areas and their significance. Computational and Systems Neuroscience Conference. 2019.
- **J.A. Livezey**, M. Dougherty, P.S. Sachdeva, S. Madhow, K.E. Bouchard. A theory of structured noise correlations in peripheral and higher order brain areas and their significance. Computational and Systems Neuroscience Conference. 2019.
- D.G. Clark, **J.A. Livezey**, D. Donofrio, P. Calafiura, J. Carmena, E. Chang, K.E. Bouchard. Neuromorphic Computing Algorithms and Hardware for Low-power Neural Decoding and Brain-Machine Interfaces. Computational and Systems Neuroscience Conference. 2018.
- R. Carney, **J.A. Livezey**, D. Clark, P. Calafiura, D. Donofrio, K. Bouchard, M. Garcia-Sciveres. Neuromorphic Kalman filter implementation in IBMs TrueNorth. Journal of Physics: Conference Series. 2017.
- **J.A. Livezey**, G. Anumanchipalli, B. Cheung, Prabhat, M.R. DeWeese, E.F. Chang, K.E. Bouchard. Deep networks reveal the structure of motor control in sensorimotor cortex during speech production. Computational and Systems Neuroscience Conference. 2016.
- G. Telian, M. Mudigonda, **J.A.** Livezey, R. Zarcone, M.R. DeWeese, H. Adesnik. Active sensation disrupts correlations in S1 and M1 networks in the mouse neocortex– a sensorimotor account. Computational and Systems Neuroscience Conference. 2016.
- B. Jimenez, **J.A. Livezey**, M.R. DeWeese. Learning sparse representations of visual stimuli from natural movies. Computational and Systems Neuroscience

Conference. 2016.

- **J.A. Livezey**, G.K. Anumanchipalli, B. Cheung, Prabhat, F.T. Sommer, M. R. DeWeese, K.E. Bouchard, E.F. Chang. Classifying spoken syllables from human sensorimotor cortex with deep networks. NeurIPS Workshop on Statistical Methods for Understanding Neural Systems. 2015.
- B. Cheung, **J.A. Livezey**, A.K. Bansal, B.A. Olshausen. Discovering Hidden Factors of Variation in Deep Networks. International Conference on Learning Representations Workshop, 2015. Preprint.