

Spencer J. Kent

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Education

Ph.D. | Electrical Engineering and Computer Sciences Aug. 2015 - *Present*

University of California, Berkeley – Berkeley, CA

Advisor: Bruno Olshausen

B.S. | Electrical and Computer Engineering Aug. 2011 - May 2015

Rice University – Houston, TX

with Distinction in Research

Research

Interests

Theoretical Neuroscience, Computer Vision, Abstract Algebra, Information Theory

Projects

Resonator Neural Networks for factoring distributed representations

May 2017 - Present

Developed a theory of factorization in high dimensional neural circuits which is fundamental to Vector Symbolic Architectures and perception in the brain. Care has been taken to characterize the practical performance of this model as well as develop theoretical connections to Hopfield Networks and Alternating Least Squares for solving tensor factorization problems. **Manuscript currently in preparation.**

Neural coding models and lossy image compression

Nov. 2017 - Present

Exploring models of neural coding for advanced image compression, with special emphasis on nonlinear analysis transforms that produce sparse distributed codes. We believe that such transforms enable a scheme that beats state-of-the-art lossy image compression standards.

Visual scene transformation with Vector Symbolic Neural Networks

Nov. 2016 - Present

Developed a model of scene transformation that combines neural networks with Vector Symbolic Algebras in order to capture complex compositional and sequential structure within a single distributed scene representation. This is a first step toward a unified scene description language that can be consumed and modified by neural networks.

A convolutional sparse-coded point process model for exploratory neural data analysis

Jan. 2016 - Jun. 2016

Proposed a point process formulation of convolutional sparse coding that can be used as a tool for exploratory data analysis. Framework can uncover structure in a variety of multivariate point process datasets which was demonstrated on tetrode recordings from cat visual cortex.

Conference Posters

Frady, E. P.*, Kent, S. J.*, Kanerva, P., Olshausen, B. A., Sommer, F. T. (2018). Cognitive neural systems for disentangling compositions. In *Cognitive Computing 2018*.

Frady, E. P.*, Kent, S. J.*, & Olshausen, B. A. (2018). A recurrent neural network model for factoring distributed representations. In *Computational and systems neuroscience (CoSyNe '18)*.

Kent, S. J., & Olshausen, B. A. (2017). A vector symbolic approach to scene transformation. In *Cognitive computational neuroscience (CCN '17)*.

Experience

Google, Inc. | Software Engineering Intern, Google[X]

Jun. 2015 - Aug. 2015 | Mountain View, CA

Built software on the radar development team for the self-driving car project. The radar qualification software I wrote (mainly in C++) controlled diverse physical hardware, collected massive amounts of raw data, and analyzed radar performance in real-time.

Google, Inc. | Hardware Engineering Intern, Google[X]

May 2014 - Aug. 2014 | Mountain View, CA

Worked on the smart contact lenses project where I wrote software (Python, LabVIEW, and Verilog) to test and debug low-power RF devices. I also led a rapid prototyping effort which involved CAD design (Solidworks) antenna design and simulation (HFSS), fabrication, and testing in the field.

Hewlett Packard Company | Hardware Engineering Intern

May 2013 - Aug. 2013 | Houston, TX

Worked on the drive qualification team where I built test infrastructure (Python) and did verification on new 12Gbps SAS hardware using various application, link, and physical layer tools.

Sandia National Laboratories | SIP Summer Technical Intern

May 2012 - Aug. 2012 | Albuquerque, NM

Worked on two different projects, one involving nuclear weapons failsafes (software and hardware robustness) and the other involving software-defined radio (primarily 801.15.4 ZigBee).

Sandia National Laboratories | SIP Summer Technical Intern

May 2011 - Aug. 2011 | Albuquerque, NM

Worked on nuclear weapons failsafes, which included CAD design, procurement, manufacturing, and experimental test of a proposed improvement to Permissive Action Links.

SKInfrared, LLC. | Research Intern

Jan. 2011 - May 2011 | Albuquerque, NM

Worked for a skin cancer detection startup company on post-processing of clinical trial data.

Software

Programming and Markup Languages

Python • C/C++ • HTML/CSS (I designed and built <https://redwood.berkeley.edu>) • Verilog • L^AT_EX

Software/Frameworks

MATLAB • LabVIEW • Solidworks • Altium Designer • Blender • Adobe Illustrator
TensorFlow • PyTorch • OpenCV • OpenGL

Teaching

Fundamentals of Electrical and Computer Engineering | Content development TA
Rice University
Jan. 2015 - May 2015

Discrete Time Signal Processing | TA and forum moderator (edX MOOC)
Rice University
Jan. 2014 - May 2014

Service

UC Berkeley EE Graduate Student Association | Chair, student rotations committee
November 2017 - *Present*

IEEE | President, Rice University student chapter
May 2014 - May 2015

Rice University Admissions Office | Senior Undergraduate Interviewer
Aug. 2015 - May 2015

Honors & Awards

2015 | NSF Graduate Research Fellowship
2015 | UC Berkeley Chancellor's Fellowship
2015 | Rice Engineering Design Showcase First Place
2015 | Rice Engineering Alumni Association Willy Revolution Award
2015 | Rice ECE Affiliates Design Showcase First Place Undergraduate Project
2015 | Chevron Scholarship in Engineering
2014 | Eta Kappa Nu
2014 | Rice Engineering Alumni Association Merit Award in Electrical Engineering
2011 | Rice Trustee Distinguished Scholarship