Alexander Belsten

Redwood Center for Theoretical Neuroscience
University of California, Berkeley
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belsten.github.io

EDUCATION

Ph.D.   **University of California, Berkeley**, Berkeley, California
Vision Science (2021-25)
Advisor: Bruno A. Olshausen
Dissertation: *Efficient Coding of Color in Natural Images*

B.S.   **Rensselaer Polytechnic Institute**, Troy, New York
Computer and Systems Engineering (2016-20)
GPA: 3.78

RESEARCH INTERESTS

Theoretical neuroscience

Vision science

Machine learning

APPOINTMENTS

2026–   **University of California, Berkeley**, Berkeley, California
Postdoc, Redwood Center for Theoretical Neuroscience
Advisor: Bruno A. Olshausen

2021–25   **University of California, Berkeley**, Berkeley, California
Graduate Student Researcher, Redwood Center for Theoretical Neuroscience
Advisor: Bruno A. Olshausen

2021   **Washington University in St. Louis**, Saint Louis, Missouri
Research Assistant & Systems Engineer, Department of Neurosurgery
Advisor: Peter Brunner
Improved and maintained BCI2000. List of contributions:
(belsten.github.io/research/#contributions-to-bci2000)

2020–21   **Rensselaer Polytechnic Institute**, Troy, New York
Research Assistant, Intelligent Structural Systems Laboratory
Advisor: Fotis Kopsaftopoulos

2018–21   **National Center for Adaptive Neurotechnologies**, Albany, New York
Research Assistant
Advisors: Peter Brunner, Gerwin Schalk

TECHNICAL SKILLS

Programming: C/C++, Python, MATLAB

Machine Learning: PyTorch, TensorFlow

Scientific Computing: NumPy, SciPy, OpenCV

Tools: Git, LaTeX

PUBLICATIONS

Citation data available at **Google Scholar**

2025   A. Belsten and B. A. Olshausen. "Unifying Information Maximization in Linear and Linear–Nonlinear Neural Networks." In preparation.

2025   A. Belsten, E. P. Frady, and B. A. Olshausen. "Emergence of Unique Hues from Sparse Coding of Color in Natural Scenes." In submission.

2025   A. Belsten and B. A. Olshausen. "Emergence of Strategic Cone Weighting from Efficient Coding of Spatiochromatic Natural Images." Journal of the Optical Society of America A 42 (5), B495-B502.

2024   P. Demarest, N. Rustamov, J. Swift, T. Xie, M. Adamek, H. Cho, E. Wilson, Z. Han, A. Belsten, N. Luczak, P. Brunner, S. Haroutounian, E. C. Leuthardt. "A Novel Theta-Controlled Vibrotactile Brain–Computer Interface to Treat Chronic Pain: A Pilot Study." Scientific Reports 14 (1), 3433.

2022   C. Bybee, A. Belsten, and F. T. Sommer. "Cross-Frequency Coupling Increases Memory Capacity in Oscillatory Neural Networks." arXiv:2204.07163 [q-bio.NC].

2022   G. Schalk, S. Worrell, F. Mivalt, A. Belsten, I. Kim, J. M. Morris, D. Hermes, B. T. Klassen, N. Staff, S. Messina, T. Kaufmann, J. Rickert, P. Brunner, G. Worrell and K. J. Miller. "Towards a Fully Implantable Ecosystem for Adaptive Neuromodulation in Humans." Frontiers in Neuroscience 16, 932782.

2021   A. Belsten and F. Kopsaftopoulos. "Data-Driven Flight State Identification via Time-Series-Informed Features and Convolutional Neural Network." AIAA Aviation Forum, 3182.

2020   A. Belsten, M. Adamek, and P. Brunner. "Hardware Abstraction to Facilitate the Dissemination and Validation of Electrophysiological Experiments." IEEE EMBS.

INVITED TALKS

2025   **Vision Brunch**, Stanford University, Stanford, California

2025   **Optica Webinar: Color Data Blast for Early-Career Researchers**, Virtual

2025   **Vision Sciences Society meeting (VSS)**, St. Pete Beach, Florida

CONFERENCE POSTERS

2025   **Society for Neuroscience (SfN)**, San Diego, California
Presenting author on one poster; co-author on two others

2025   **Computational and Systems Neuroscience (COSYNE)**, Montreal, Canada

2024   **International Color Vision Society Meeting (ICVS)**, Ljubljana, Slovenia

2023   **Society for Neuroscience (SfN)**, Washington D.C
Presenting author on one poster; co-author on one other

2022 **Bay Area Vision Research Day (BAVRD)**, University of California, Berkeley, Berkeley, California

2022 **Computational and Systems Neuroscience (COSYNE)**, Lisbon, Portugal

2021 **Society for Neuroscience (SfN)**, Virtual
Presenting author on one poster; co-author on two others

2021 **NIH BRAIN Initiative**, Virtual

2020 **Society for Neuroscience (SfN)**, Virtual
Presenting author on one poster; co-author on one other

GRANTS AND AWARDS

2025 **National Eye Institute Early Career Scientist Travel Grant**

2016 **Rensselaer Leadership Award**

TEACHING EXPERIENCE

2022 **Neural Computation** (VS265), University of California, Berkeley
Graduate Student Instructor

2020 **Digital Signal Processing** (ECSE4530), Rensselaer Polytechnic Institute
Undergraduate Teaching Assistant

2018 **Data Structures** (CSCI1200), Rensselaer Polytechnic Institute
Undergraduate Mentor

2018 **Foundations of Computer Science** (CSCI2200), Rensselaer Polytechnic Institute
Undergraduate Mentor

SERVICE AND LEADERSHIP

2022– **Active contributor**, Sparse Coding Repository
(github.com/rctn/sparsecoding)

2022–23 **Social chair**, Berkeley Vision Science Student Government

2022 **Speaker committee**, Bay Area Vision Research Day

2019–20 **President (2019); Webmaster (2020)**, IEEE-HKN honor society, Beta Nu Chapter

ACADEMIC HONORS

2016–20 **Rensselaer Dean's Honor List** (8 semesters)