Nicholas M. Blauch

Computational neuroscience · Vision Science · Machine Learning

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Education

Carnegie Mellon University — *Pittsburgh, PA, USA*

Ph.D. Program in Neural Computation | Neuroscience Institute | Center for the Neural Basis of Cognition — *Sep 2018 - Aug 2023 (exp.)*

Quantitative Concentration: Computer Vision and Deep Learning

University of Massachusetts, Amherst — *Amherst, MA, USA*

B.S. in Individual Concentration: Cognitive Computational Neuroscience | Minor in Physics | Cum Laude — *2013-2017*

Commonwealth Honors College

Experience

Carnegie Mellon University — *Pittsburgh, PA, USA*

Graduate Researcher — *Sep 2018 - Aug 2023 (exp.)*

Computational modeling, neuroimaging, and psychophysics of high-level vision and its hemispheric and topographic organization

SPARK Neuro, Inc. — *Remote*

Computational Neuroscience Intern — *May - August 2022*

Deep learning analyses of spectral EEG data for cognitive impairment diagnostics

University of Massachusetts, Amherst — *Amherst, MA, USA*

Pre-doctoral Research Associate and Lab Manager — *2017-2018*

fMRI and behavioral studies of face perception and mental navigation in isoluminant color spaces

Skills

Programming	Proficient: Python, MATLAB. Working knowledge: BASH, LaTeX, R, Java
Cluster computing	Remote development with VScode, SLURM, LFS, AWS Sagemaker, S3, EC2
Neuroscience	Psychophysical experiments, fMRI, DWI, computational modeling, studies of visual cortex
Machine Learning	PyTorch, CNNs, RNNs, GNNs, transformers, transfer learning, self-supervised and unsupervised learning, bio-inspiration
Data Science	Git, WandB, Jupyter Notebooks, Pandas, Matplotlib, Plotly, Seaborn, Statsmodels, Scikit-learn

Publications

- Ayzenberg, V., **Blauch, N.M.**, Behrmann, M. Using deep neural networks to address the how of object recognition (2023). *PsyArxiv*. Rebuttal to TiCS commentary.
- **Blauch, N.M.** Behrmann, M., Plaut, D.C. A connectivity-constrained computational account of topographic organization in primate high-level visual cortex (2022). *Proceedings of the National Academy of Sciences*, 119 (3).
- **Blauch, N.M.**, Behrmann, M., Plaut, D.C. Computational insights into human perceptual expertise for unfamiliar and familiar face recognition (2021). *Cognition*, 208, 104341.
- **Blauch, N.M.**, Behrmann, M. Plaut, D.C. (2021). Deep learning of shared perceptual representations for familiar and unfamiliar faces: Reply to commentaries. *Cognition*, 208, 104341.
- Granovetter, M., Burlingham, C., **Blauch, N.M.**, Minshaw, C., Heeger, D., Behrmann, M. (2020) Uncharacteristic task-evoked pupillary responses implicate atypical locus coeruleus activity in autism. *Journal of Neuroscience*.
- **Blauch, N.M.**, Behrmann, M. (2019). Representing faces in 3D. Nature Human Behavior. Commentary.
- **Blauch, N.M.**, Aminoff, E., Tarr, M.J. (2017). Functionally localized representations contain distributed information: insight from simulations of deep convolutional neural networks. Proceedings of the 39th Annual Meeting of the Cognitive Science Society.

Manuscripts in preparation

- **Blauch, N.M.**, Behrmann, M., Plaut, D.C. A computational model of the hemispheric and topographic organization of human ventral temporal cortex.
- Vin, R., **Blauch, N.M.**, Plaut, D.C., Behrmann, M. Beyond the VWFA: a bihemispheric large-scale network underlies visual word recognition
- **Blauch, N.M.**, Maallo, M., Plaut D.C., Behrmann, M. Structural and functional correlates of individual differences in lateralization of high level visual functions in ventral temporal cortex.

- Brookshire, G., Kasper, J., **Blauch, N.M.**, Wu, Y.C., Glatt, Ryan, Merrill, D., Gerrol, S., Yoder, K.J., Quirk, C., Lucero, C.. Data leakage in deep learning studies of translational EEG. In submission.

Conference Presentations

- **Blauch, N.M**, Behrmann, M., Plaut, D.C. A computational model of the cortical topography of human ventral temporal cortex. Nanosymposium. Talk at *Society for Neuroscience*, San Diego, CA. 2022.
- **Blauch, N.M**, Behrmann, M., Plaut, D.C. Connectivity constraints, viewing biases, and task demands within a bi-hemispheric interactive topographic network account for the layout of human ventral temporal cortex. Talk at *Vision Sciences Society Annual Meeting*, St. Pete Beach, Fl. 2022.
- **Blauch, N.M**, Behrmann, M., Plaut, D.C. Developing topographic organization in a recurrent neural network with biological constraints. Talk at *Vision Sciences Society Annual Meeting*, 2021. Virtual.
- Vin, R., Behrmann, M., **Blauch, N.M.**. Investigating distributed functional connectivity during word and nonword visual recognition. Poster at *Vision Sciences Society Annual Meeting*, 2021. Virtual.
- **Blauch, N.M.**, Behrmann M., Plaut, D.C. Cortical organization as optimization. Poster at *Vision Sciences Society Annual Meeting*, 2020. Virtual.
- **Blauch, N.M.**, Maallo, A.M., Plaut, D.C., Behrmann M. Evidence for an interactive account of hemispheric specialization in visual perception of words and faces. Poster at *Conference of the Cognitive Neuroscience Society*, 2020. Virtual.
- **Blauch, N.M.**, Behrmann M., Plaut, D.C. Computational insights into human expertise for familiar and unfamiliar face recognition. Poster at *Conference of the Cognitive Neuroscience Society*, 2020. Virtual.
- De La Rosa-Rivera, N.M., Leger, K., **Blauch, N.M.**, Cowell, R.A. Neural correlates of recognition memory in the human ventral visual stream. Poster at *Conference of the Society for Neuroscience*, 2019. Chicago, IL.
- **Blauch, N.M.**, Behrmann M., Plaut, D.C. Visual Expertise and the Familiar Face Advantage. Poster at *3rd Annual Cognitive Computational Neuroscience Conference*, 2019. Berlin, Germany.
- **Blauch, N.M.**, De Avila Belbute Peres, F., Faroqui, J., Chaman Zar, A., Plaut, D., Behrmann, M. Assessing the Similarity of Cortical Object and Scene Perception with Cross-Validated Voxel-Encoding Models. Poster at *Vision Sciences Society Annual Meeting*, 2019. St. Pete Beach, FL.
- **Blauch, N.M.**, Cowell, R.A. Task Demands and Stimulus Normalization in Face Perception: an fMRI Study. Poster at *2nd Annual Cognitive Computational Neuroscience Conference*, 2018. Philadelphia, PA.
- **Blauch, N.M.**, Aminoff E., Tarr, M.J. Understanding Cortical Face Selectivity. Poster at *1st Annual Cognitive Computational Neuroscience Conference*, 2017. New York, NY.
- **Blauch, N.M**, Aminoff, E., Tarr, M.J. Functionally Localized Representations Contain Distributed Information: Insight from Simulations of Deep Convolutional Neural Networks. Talk at *39th Annual Meeting of the Cognitive Science Society*, 2017. London, U.K.

Invited Talks

- Wang Lab, Washington University. 2023.
- Kanwisher Lab, MIT. 2022.
- Konkle & Alvarez Vision Lab, Harvard University. 2022.
- Kietzmann Lab, Donders Institute (remote). 2021.
- McClelland Prize award talk. Center for the Neural Basis of Cognition, Carnegie Mellon University. 2021.
- Presidential Fellowship data-blitz, Neuroscience Institute, Carnegie Mellon University. 2019.

Awards and Honors

- Travel Award, Vision Sciences Society Annual Meeting. 2022.
- Best poster, Neuroscience Institute mini-retreat, Carnegie Mellon University. 2022.
- McClelland Prize for Outstanding Graduate Student Paper (Cognition, 2021), Center for the Neural Basis of Cognition. Carnegie Mellon University. 2021.
- Carnegie Mellon Neuroscience Institute Presidential Fellowship. 2019.
- Cum Laude and Multidisciplinary Honors with Great Distinction, Commonwealth Honors College, University of Massachusetts Amherst. 2017.
- Excellence in Presentation, Chapter Meeting, Western Massachusetts Society for Neuroscience (2017)
- Dean's Scholar, University of Massachusetts, Amherst. 2013-2017.
- John and Abigail Adams Scholar, University of Massachusetts, Amherst. 2013-2017.
- Dean's List (6x), University of Massachusetts, Amherst. 2013-2017.

Teaching

- Project TA, Neuromatch Academy. 2021.
- Head TA for undergraduate Program in Neural Computation (uPNC), Center for the Neural Basis of Cognition, Carnegie Mellon University. 2020.
- TA for Parallel Distributed Processing, Department of Psychology, Carnegie Mellon University (2x). 2020-2021.

- TA for undergraduate Program in Neural Computation (uPNC), Center for the Neural Basis of Cognition, Carnegie Mellon University. 2019.
- Organized Coding and Computation in Psychology and Neuroscience workshop, UMass Neuroscience Club. 2016.
- Tutor in Math, Physics, and Computer Science, UMass Amherst Learning Resource Center. 2014.

Mentorship

- (2023-) Taha Binhuraib, machine learning engineer at Novus Technologies and former Neuromatch student. Topic: topographic recurrent and transformer language models of semantic cortical organization.
- (2022) Ricky Huang, mathematics undergraduate student at Carnegie Mellon. Topic: divisive normalization in interactive topographic networks.
- (2020-2022) Raina Vin, computational neuroscience undergraduate student at Carnegie Mellon. Topic: network analyses of word recognition using fMRI. Now: Ph.D. Student in Neuroscience, Yale University.
- (2018-2019) Sandrine Jabbour, biochemistry & molecular biology undergraduate student at University of Massachusetts, Amherst. Topic: behavioral studies of color space navigation. Now: Clinical deep brain stimulation specialist at Medtronic.

Service and Leadership

- Ad-hoc reviewer for Current Biology, NeurIPS Shared Visual Representations in Humans and Machines workshop, Cognitive Computational Neuroscience conference, NeuroImage, Trends in Cognitive Sciences, Nature Human Behavior, Journal of Cognitive Neuroscience, Neuropsychologia, Cognition, Cerebral Cortex, Developmental Cognitive Neuroscience, Nature Computational Science.
- Graduate Representative, Pitt-CMU Brain Imaging and Data Generation and Education (BRIDGE) Center. 2021-2022.
- Graduate Representative, Pittsburgh Vision Community Group. 2020.
- Co-chair, Colloquium Committee, Center for the Neural Basis of Cognition. 2020-2021.
- Undergraduate Representative, Organizing Committee for the Western Massachusetts Society for Neuroscience . 2016-2017.
- Senior Advisor, UMass Neuroscience Club. 2017.
- President, UMass Neuroscience Club. 2015-2016.

References

- Dr. David C. Plaut (CMU; plaut@cmu.edu)
- Dr. Marlene Behrmann (CMU & University of Pittsburgh; behrmann@pitt.edu)
- Dr. Michael Tarr (CMU; michaeltarr@cmu.edu)
- Dr. Leila Wehbe (CMU; wehbe@cmu.edu)