

Grace W. Lindsay

Contact: gracewlindsay@gmail.com

Education

Doctorate (PhD), Neurobiology and Behavior Program
Columbia University, New York, NY

December 2017

Bachelor of Science in Neuroscience
University of Pittsburgh, Pittsburgh, PA

May 2011

Positions Held

Postdoctoral Research Fellow
present

September 2019 -

Gatsby Computational Neuroscience Unit/Sainsbury Wellcome Center, in the labs of
Maneesh Sahani and Tom Mrsic-Flogel/Sonja Hofer, University College London.

Postdoctoral Scientist
2018-August 2019

January

Center for Theoretical Neuroscience, in the lab of Ken Miller, Columbia University.

Graduate Student

September 2013-December 2017

Neurobiology and Behavior Program, in the lab of Ken Miller, Columbia University.

Research Fellow

October 2011-July 2012

in the lab of Arvind Kumar, Bernstein Center for Computational Neuroscience in
Freiburg im Breisgau.

Undergraduate Research Fellow

August 2009-August 2011

Program in Neural Computation, in the labs of Brent Doiron (Pitt Mathematics) and
Tai Sing Lee (CMU Computer Science), Center for the Neural Basis of Cognition at
Carnegie Mellon University.

Publications

"Deep Learning Networks and Visual Perception." Grace W. Lindsay and Thomas
Serre. *Oxford Encyclopedia of Psychology* (2020, in publication).

"Attention in Psychology, Neuroscience, and Machine Learning." Grace W. Lindsay.
Frontiers in Computational Neuroscience 14 (2020): 29.

"Convolutional neural networks as a model of the visual system: past, present, and
future." Grace W. Lindsay. *Journal of Cognitive Neuroscience* (2020): 1-15.

"A unified circuit model of attention: Neural and behavioral effects." Grace W.
Lindsay, Daniel B. Rubin, and Kenneth D. Miller. *bioRxiv* (2019). Under review at
eLife.

"A deep learning framework for neuroscience." Blake A. Richards, Timothy P.
Lillicrap, Philippe Beaudoin, Yoshua Bengio, Rafal Bogacz, Amelia Christensen,
Claudia Clopath et al. *Nature neuroscience* 22, no. 11 (2019): 1761-1770.

"How biological attention mechanisms improve task performance in a large-scale visual system model" Grace W. Lindsay and Kenneth D. Miller. *eLife*. 2018 Oct 1;7. pii: e38105. doi: 10.7554/eLife.38105.

"Hebbian Learning in a Random Network Captures Selectivity Properties of the Prefrontal Cortex." Grace W. Lindsay, Mattia Rigotti, Melissa R. Warden, Earl K. Miller, and Stefano Fusi. *Journal of Neuroscience* 8 November 2017, 37 (45) 11021-11036.

"Parallel processing by cortical inhibition enables context-dependent behavior." Kishore V. Kuchibhotla, Jonathan V. Gill, Grace W. Lindsay, Eleni S. Papadoyannis, Rachel E. Field, Tom A. Hindmarsh Sten, Kenneth D. Miller, and Robert C. Froemke. *Nature Neuroscience* 20, no. 1 (2017): 62-71.

"Feature-based Attention in Convolutional Neural Networks." Grace W. Lindsay. *arXiv preprint arXiv:1511.06408* (2015).

Honors and Fellowships

Marie Skłodowska-Curie Individual Fellowship (2019-2021)

Gatsby Unit/Sainsbury Wellcome Center Research Fellowship (2019-2022)

Google PhD Fellowship in Computational Neuroscience (2016-2018)

NSF Graduate Research Fellowship Honorable Mention (2013)

DAAD (Deutscher Akademischer Austausch Dienst) Study Scholarship for study at the Bernstein Center in Freiburg, Germany (2011-2012)

CBSG (Complex Biological Systems Group) Undergraduate Fellowship (2010-2011)

uPNC (Program in Neural Computation) Undergraduate Research Fellowship (2009-2010)

University of Pittsburgh Chancellor Scholarship (2007-2011)

Conference Talks

*=invited

*"Exploring the top-down signals needed for visual attention" Cognitive Neuroscience Society conference, online. March 2021.

*"Attention in neuroscience and machine learning" International Meeting on Artificial Intelligence and its Applications (RIIAA), online. August 2020.

*"Merging neural circuit models with deep learning" Cosyne Workshops, Breckenridge USA. March 2020.

*"Understanding the feedback needed for top-down attention" Workshop on Roles and Mechanisms of Cortico-cortical Feedback at EITN, Paris France, November 2019.

*"Combining neural circuit models with deep learning" ELLIS Meeting, Berlin Germany, September 2019.

*"Attention and Modeling of Cognitive Processes." Organization for Human Brain Mapping (Educational Course), Rome Italy, June 2019.

*"The stabilized supralinear network captures neural and performance correlates of attention." Gatsby Tri-Center Meeting, University College London, June 2019.

"How can we incorporate connectivity data into neural network models?" Cognitive Computational Neuroscience Meeting (Breakout Session), September 2018, Philadelphia USA.

*"Synthesizing Experimental Data with Circuit Models." Cosyne Workshops, March 2018, Breckenridge USA.

"Understanding Biological Visual Attention Using Convolutional Neural Networks." Cognitive Computational Neuroscience Meeting 2017, New York City USA

"The stabilized supralinear network replicates neural and performance correlates of attention." Cosyne 2017, Salt Lake City USA

*"Studying visual attention in convolutional neural networks". Gatsby Tri-Center Meeting, University College London, June 2016.

*"Hebbian learning in a random network replicates pattern of selectivity seen in PFC". Gatsby Tri-Center Meeting, Columbia University, June 2015

Poster Presentations

"Modeling the separate functions of feedforward and feedback pathways in the visual system", Cosyne, February 2020, Denver USA.

"Do Biologically-Realistic Recurrent Architectures Produce Biologically-Realistic Models?", Cognitive Computational Neuroscience Meeting, September 2019, Berlin Germany.

"Combining convolutional neural networks with a model of the dynamics of visual cortex", Cognitive Computational Neuroscience Meeting, September 2018, Philadelphia USA.

"Hebbian-inspired rewiring of a random network replicates pattern of selectivity seen in PFC", CNS Meeting Poster Session, August 2014.

"'Within' versus 'between' pairwise correlations and their relation to the network structure", Society for Neuroscience Conference Poster Session, October 2012.

"Membrane potential statistics reveal detailed correlation structure", Bernstein Conference on Computational Neuroscience Poster Session, September 2012.

"Tuning Curve Quality and Its Effect on Population Coding", COSYNE Poster Session, February 2011.

Teaching and Mentoring

Teaching assistant for IBRO-Simons Computational Neuroscience Imbizo summer School, January 2019 and 2020.

Teaching assistant for "Introduction to Theoretical Neuroscience" Graduate Course, Spring 2017

Teacher and course developer for "Introduction to Programming with Python" and "Artificial Intelligence" for Upward Bound Summer Academy, Summer 2016

Lecturer and curriculum developer for "Quantitative Approaches for Experimental Neuroscientists" Graduate Course, Fall 2015 and Fall 2017

Teaching assistant for "Systems & Developmental Neuroscience" undergraduate course, January-May 2014

Teacher and course developer for Columbia Splash! program, November 2013-December 2017

Teacher and course developer for BRAINYAC programming course, June-July 2013

Mentor for Masters student internship at the Bernstein Center, June 2012

Tutor for Quantitative Methods course at the Bernstein Center, May 2012

Communication and Outreach

Author of *Models of the Mind: How physics, mathematics and engineering have shaped our understanding of the brain*, publishing 2021 (Bloomsbury Sigma)

Chair of Communications and Outreach, Neuromatch Academy, April-July 2020.

Producer and co-host of *Unsupervised Thinking* (monthly podcast on neuroscience and AI), October 2015-January 2020.

Freelance science writer for the Simons Foundation and other outlets, May 2015-present.

Neuwrite (Neuroscience-Journalist Collaborative) member, February 2013-present.

Harvard BHI Essay Competition Winner, 2018.

ICVSS Essay Competition Winner, 2015.

Nerve Newsletter Staff Writer, February 2014-March 2016.

Columbia University Neuroscience Outreach, August 2012-November 2017

-Social Media Coordinator, 2013-2014 Academic Year

Academic Service

Reviewer for *eLife*, *Nature Neuroscience*, *PLoS Computational Biology*, *Computational Brain & Behavior*, *Cosyne*, and the Cognitive Computational Neuroscience conference.

Co-chair for Cognitive Neuroscience Society conference symposium on neuroscience and machine learning, 2021.

Executive board member for Neuromatch Academy, 2020.

Organizer and moderator for the Neuromatch 2.0 conference, 2020.

Panel moderator for "Biological and Artificial Reinforcement Learning" NeurIPS Workshop, 2019 and 2020.

Organizer for Breakout Session at the Cognitive Computational Neuroscience conference, 2018.

Summer Schools and Workshops Attended

Workshop on Learning in Artificial and Biological Neural Networks, Bridgetown, Barbados. February 2019

Turing Institute Data Study Group, London, UK. December 2017

DataKindUK Data Dives, London, UK. July 2017 and March 2018

Janelia Theoretical Neuroscience Workshop, Janelia Campus, September 2016.

Deep Learning Summer School, Montreal, Canada. August 2015.

International Computer Vision Summer School (ICVSS), Sicily, Italy. July 2015

Please note: While I use my maiden name (Lindsay) for professional and publishing purposes, my legal name is Grace Merel