Natalie Koh

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EDUCATION

2018-2025   Ph.D. in Interdisciplinary Neuroscience
Northwestern University, Evanston, IL
Advisor: Andrew Miri, Ph.D.
Dissertation: Characterizing the influence of primary motor cortical dynamics and inter-regional motor system interactions on movement

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2012-2016   Bachelor of Science in Psychology (with Honors), and Molecular, Cellular, & Developmental Biology
University of Washington, Seattle, WA
Advisors: Thomas Grabowski, M.D., & Tara Madhyastha, Ph.D.
Thesis: Multimodal MRI measures of cognitive impairment

RELEVANT EXPERIENCE

2017-2018   Research Assistant (added appointment)
Cognition and Cortical Dynamics Laboratory, University of Washington
PI: Andrea Stocco, Ph.D.
Primary project: Testing a common model of cognition using human connectome data

2016-2018   Research Analyst
Integrated Brain Imaging Lab, University of Washington
PI: Thomas Grabowski, M.D.
Primary projects: Development and refinement of neuroimaging processing and analysis pipelines; Analyses involving multimodal brain imaging measures alongside a comprehensive suite of behavioral, genetic testing and neuropsychological assessment tools to track adults across their lifespan and model neurodegenerative disease progression and risk

2015-2016   Student Research Assistant
Integrated Brain Imaging Lab, University of Washington
Advisors: Thomas Grabowski, M.D. and Tara Madhyastha, Ph.D.
Primary project: Multimodal MRI measures of cognitive impairment

2014-2015   Student Research Assistant
Mizumori Lab, University of Washington
PI: Sheri Mizumori, Ph.D.
Primary project: Neural basis of interval timing and intertemporal choice, and the role of the Nucleus Basalis in learning and memory

2014   Student Research Assistant
Institute for Learning & Brain Sciences, University of Washington

Primary project: Bilingual language learning in infants and toddlers

2013   Student Research Assistant
Developmental Pathways Project, University of Washington
Primary project: Longitudinal study on the development and treatment of adolescents with depression, aggression and other mental disorders

TECHNICAL & SPECIALIZED SKILLS
Programming languages: Python, MATLAB, R, Bash, SQL
Markup languages: HTML, LaTeX, Markdown
Computer-aided design: FIJI/ImageJ, Adobe Photoshop, Illustration, InDesign
Other: GNU Make, Git, XPath, Linux, Slurm, AWS

PUBLICATIONS
* = first authors

2025   (under review) **N Koh**, A Kristl, D Basrai, P Wang, & A Miri. Distributed influence on primary motor cortex preceding self-initiated movement.

2025   (under review) M Agrios*, **N Koh***, A Kristl*, S Savya*, S Hsu, P Wang, & A Miri. Broadly distributed specificity for muscle activity states in motor system neurons.

2025   (In press at Nature Neuroscience) **N Koh***, Z Ma*, A Sarup, A Kristl, M Agrios, & A Miri. Selective direct motor cortical influence during naturalistic climbing in mice.

2025   (In press at Nature Communications) A Kristl, **N Koh**, M Agrios, S Savya, Z Ma, D Basrai, Sarah H, & A Miri. Interactions between motor cortical forelimb regions and their influence on muscles reorganize across behaviors.

2021   A Stocco, C Sibert, Z Steine-Hanson, **N Koh**, J Laird, C Lebiere, & P Rosenbloom. Analysis of the human connectome data supports the notion of a "Common Model of Cognition" for human and human-like intelligence across domains. Neuroimage. 2021 Jul 15;235:118035. doi: 10.1016/j.neuroimage.2021.118035.

2020   S Rane, **N Koh**, J Oakley, C Caso, C Zabetian, B Cholerton, T Montine, & T Grabowski. Arterial spin labeling detects perfusion patterns related to motor symptoms in Parkinson's disease. Parkinsonism & Related Disorders. 2020 May 10; 76:21-28. doi:10.1016/j.parkreldis.2020.05.014

2018   S Rane, **N Koh**, P Boord, T Madhyastha, MK Askren, S Jayadev, B Cholerton, E Larson, & TJ Grabowski. Quantitative cerebrovascular pathology in a community cohort of older adults. Neurobiology of Aging. 2018 May; 65:77-85. doi: 10.1016/j.neurobiolaging.2018.01.006

2018   T Madhyastha, M Peverill, **N Koh**, C McCabe, J Flournoy, K Mills, K King, J Pfeifer, & K McLaughlin. Current methods and limitations for longitudinal fMRI analysis across development. Developmental Cognitive Neuroscience. 2018 Oct;33:118-128. doi: 10.1016/j.dcn.2017.11.006.

2017   **N Koh**, A Lee, K McLaughlin, T Grabowski, & T Madhyastha. A tutorial on modeling fMRI data using a General Linear Model. BioRxiv: https://doi.org/10.31234/osf.io/crx4m.

2017   T Madhyastha, **N Koh**, TK McAllister-Day, M Fernandez, A Kelley, DJ Peterson, S Rajan, K Woelfer, J Wolf, & TJ Grabowski. Running Neuroimaging Applications on Amazon Web Services: How, When, and at What Cost? Frontiers in

Neuroinformatics. 2017 Nov 3;11:63. doi: 10.3389/fninf.2017.00063.

2017   T Madhyastha, MK Askren, & **N Koh**. A Reproducible Neuroimaging Workflow using the Automated Build Tool "make". The Practice of Reproducible Research. Oakland, California: University of California Press.

2016   MK Askren, TK McAllister-Day, **N Koh**, Z Mestre, JN Dines, BA Korman, SJ Melhorn, DJ Peterson, M Perevill, X Qin, SD Rane, MA Reilly, MA Reiter, KA Sambrook, KA Woelfer, TJ Grabowski, & T Madhyastha. Using Make for Reproducible and Parallel Neuroimaging Workflow and Quality Assurance. Frontiers in Neuroinformatics, 2016 Feb 2;10:2. doi: 10.3389/fninf.2016.00002.

ABSTRACTS

2025   A Ulmer, D Yu, A Zimnik, A Russo, A Kristl, M Agrios, **N Koh**, S Savya, A Miri, M Churchland, A Kennedy, & J Glaser. Identifying interpretable latent factors within and across brain regions. Computation and Systems Neuroscience (COSYNE) 2025, Montreal, Canada.

2019   S Rane, **N Koh**, JP Owen, D Hippe, & TJ Grabowski. Vascular pathology in distinct degenerative diseases, Alzheimer's & Dementia: The Journal of the Alzheimer's Association, 15(14):730-730.

2018   S Rane, **N Koh**, JP Owen, & TJ Grabowski. High frontal white matter hyperintensity burden in individuals with mild cognitive impairment. Alzheimer's & Dementia: The Journal of the Alzheimer's Association, 14(8):457-458.

2016   S Rane, **N Koh**, P Boord, MK Askren, JC Gatenby, T Madhyastha, Z Mestre, & TJ Grabowski. Cerebrovascular Reserve as a Marker for Vascular Pathology and Cognitive Status in Older Adults, Alzheimer's & Dementia: The Journal of the Alzheimer's Association, 12(7):502-503.

POSTERS

2024   **N Koh**, A Kristl, M Agrios, S Savya, D Basrai, & A Miri. Preparatory activity is distributed across multiple motor system regions during self-initiated movement. Society for Neuroscience 2024, Chicago, IL.

2024   S Savya, M Agrios, **N Koh**, A Kristl, S Hsu, & A Miri. Testing hierarchical models of self-driven action decisions. Society for Neuroscience 2024, Chicago, IL.

2024   M Agrios, A Kristl, S Savya, **N Koh**, S Hsu, SA Solla, & A Miri. Using interpretable generative models to probe the multiregional interactions underlying movement initiation. Society for Neuroscience 2024, Chicago IL.

2023   M Agrios, S Hsu, **N Koh**, S Savya, A Kristl, S Solla, & A Miri. Using interpretable, generative models to probe interactions across cortical and subcortical motor system regions. Society for Neuroscience 2023, Washington D.C.

2023   A Kristl, **N Koh**, Z Ma, D Basrai, S Hsu, M Agrios, S Savya, A Saiki, & A Miri. Reorganization of premotor and primary motor cortex dynamics across behaviors. Society for Neuroscience 2023, Washington D.C.

2022   **N Koh**, Z Ma, A Sarup, A Kristl, M Agrios, & A Miri. Motor Cortical Activity in a Control Space Predicts Muscle State-Dependent Cortical Influence During Naturalistic Behavior. Neural Control of Movement Society Meeting 2022, Dublin, Ireland.

2022   Z Ma, **N Koh**, A Kristl, A Sarup, & A Miri. A Control Space for Muscle State

Dependent Cortical Influence During Naturalistic Motor Behavior. Computational and Systems Neuroscience (COSYNE) 2022, Lisbon, Portugal.

2019   A Sarup, A Kristl, **N Koh**, M Agrios, M Young, S Bandyopadhyay, & A Miri. A Paradigm for Physiological Examination of Naturalistic Climbing Behavior in Mice. Society for Neuroscience 2019, Chicago, IL.

2017   **N Koh**, TK McAllister-Day, M Fernandez, A Kelley, DJ Peterson, S Rajan, K Woelfer, J Wolf, TJ Grabowski, & T Madhyastha. Running Neuroimaging Applications on Amazon Web Services: How, When, and at What Cost? Organization for Human Brain Mapping 2017, Vancouver, BC.

2017   DJ Peterson, **N Koh**, MK Askren, JC Gatenby, T Madhyastha, & TJ Grabowski. Profiles of White Matter Microstructure in a Population-Based Cohort of Elderly Patients. Organization for Human Brain Mapping 2017, Vancouver, BC.

2017   T Madhyastha, M Perevill, **N Koh**, C McCabe, J Flournoy, K King, K McLaughlin, & TJ Grabowski. Neuropointillist: Bringing the Flexibility of R to Voxelwise Modeling of fMRI Data. Organization for Human Brain Mapping 2017, Vancouver, BC.

2015   **N Koh**, MK Askren, DJ Peterson, M Jutras, EA Buffalo, & TJ Grabowski. Can Decreased Novelty Preference Identify Cognitive Impairment in Older Adults? Mary Gates Undergraduate Research Symposium 2016, University of Washington, Seattle, WA.

TALKS
2022   **N Koh**. Characterizing the Influence of Motor Cortical Dynamics On Functional Elements of Movement. Northwestern Department of Neurobiology Data Talks Seminar Series, Northwestern University, Evanston, IL.

2016   **N Koh.** Multimodal MRI Measures of Cognitive Impairment. Mary Gates Undergraduate Research Symposium 2017, University of Washington, Seattle, WA.

RELEVANT COURSES TAKEN
Biophysical Signal Processing; Quantitative Methods in Neuroscience; Instrumentation for Neuroscience; Machine Learning: Foundations, Applications, and Algorithms; Deep Learning Foundations from Scratch; Applied Multivariate Statistical Analysis; Circuits & Systems of Motor Control; Topics in Applied Mathematics: Network Science; Data Driven Methods for Dynamical Systems; Data Management and Information Processing

COURSES TAUGHT
2020   Teaching Assistant, undergraduate course in Systems and Behavioral Neuroscience
2019   Teaching Assistant, undergraduate course in Physiology

FELLOWSHIPS, HONORS AND AWARDS
2023   INTERSECT Research Software Engineering Training Bootcamp, NSF Funding Recipient
2018-   Northwestern Institute on Complex Systems Data Science Initiative Fellow
2018   AMP Lab Fellow – Mini Project: Evaluation of VR Stair Descent for Rehabilitative Applications

2017 Washington Research Foundation Innovation Post-baccalaureate Fellowship in Neuroengineering
2016 University of Washington Summer Institute in Statistics for Big Data Scholarship
2016 Guthrie Prize in Psychology for Best Empirical Paper
2015 Mary Gates Research Scholarship
2014 Psi Chi Honor Society
2014 TriBeta Biological Sciences Honor Society

PROFESSIONAL AFFLIATIONS / LEADERSHIP
2019-2023 Communications Director – Northwestern University Brain Awareness Outreach
2019- 2024 Member, Society for Neuroscience (SfN)
2022-2023 Member, Neural Control of Movement Society (NCM)

OTHER
2017-2018 Volunteer – Neuroscience Outreach at the University of Washington
2015 Junior Editor – Grey Matters Journal, University of Washington