Thea Ng

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EDUCATION

Mount Holyoke College, South Hadley, MA — Expected May 2026
Expected B.A. in Neuroscience and Mathematics
GPA: 3.96/4.00 Full Financial Aid (4 years)

PUBLICATIONS

1. **Ng, T.,** Noh, E., & Spencer, R. M. C. (2024). Does slow oscillation-spindle coupling contribute to sleep-dependent memory consolidation? A Bayesian meta-analysis. ***eLife, 13,*** RP101992. https://doi.org/10.7554/eLife.101992.1

2. **Ng, T.,** Barnes, M., Delvey, C., Gaudette, L., Jones, B., Mooney, L., Orlovsky, I., Rodheim, K., Rusin, K., & Spencer, R. M. C. (Submit by March 2025). Hierarchical organizations of clustered traveling waves dominate the long-range transmission of memory during sleep. University of Massachusetts Amherst, Amherst, MA.

3. **Ng, T.,** Abedeen, A., Sanchez, R., Mooney, L., & Spencer, R. M. C. (Submit by April 2025). Sleepy, an automated open-source framework for Polysomnography data analysis in Python. University of Massachusetts Amherst, Amherst, MA.

4. **Ng, T.*,** Orlovsky, I.*, & Spencer, R. M. C. (In preparation). The directionality of emotional information flow in network interactions during encoding modulates memory performance. University of Massachusetts Amherst, Amherst, MA. (*contributed equally to this study)

5. **Ng, T.,** & Li, Y. (2022). The impact of introducing biased information on people's market expectations and risk preferences. *Unpublished manuscript,* Nanyang Technological University, Singapore.

CONFERENCE PRESENTATIONS

Oral & Poster presentations

1. **Ng, T.,** Mooney, L., Orlovsky, I., Barnes, M., Delvey, C., Gaudette, L., Rusin, K., Rodheim, K., Jones, B., & Spencer, R. M. C. (June 2025). Decoding spatiotemporal dynamics of sleep spindles and their age-related effects on emotional memory consolidation. Expected to present at *SLEEP 2025, The 39th Annual Meeting of the Associated Professional Sleep Societies*, Seattle, WA.

RESEARCH EXPERIENCES

Research Assistant — June 2023 – Ongoing
Department of Psychological & Brain Sciences, University of Massachusetts Amherst

March 2024 - Ongoing
• Studying the grouping of interactions of inter-area traveling waves as trains by designing multi-level behavioral-PSG-fMRI analysis using both traditional and computational methods, under the supervision of Dr. Rebecca Spencer (PI) in the SomNeuro lab.
• Designed multi-Gaussian curve fitting and unsupervised classifiers to detect sleep spindle and slow oscillation characteristics flexibly to account for individual differences in frequencies of neural oscillations.

• Pioneering neural network models to predict the occurrences and interactions of traveling waves during sleep.
• Developing machine learning methods to detect inter-regional phase-amplitude coupling of sleep waves based on rhythmic networks and spatiotemporal compositions.
• Improved and generalized computational behavioral methods, including the drift-diffusion model (DDM) and unequal-variance signal detection theory (UVSDT), to measure time drifted changes in memory consolidation.
• Developed automated pipelines and interfaces for high-density Polysomnography data preprocessing, cleaning, spectral analysis, event detection, and spatiotemporal analysis.
• Advising other labmates in advanced time-series analysis, spectral analysis, data cleaning, and visualization.
• Facilitating the lab's transition to Python for the electrophysiology and neuroimaging analysis.

June 2023 - March 2024
• Applied the Bayesian hierarchical model in R to conduct a meta-analysis of 297 effect sizes, examining the relationship between memory consolidation and phase-amplitude coupling of neural oscillations during sleep.
• Applied advanced statistical analysis approaches including non-linear hypothesis testing, leave-one-out cross-validation, distribution approximation & transformation, and simulation to include multi-level moderators in meta-analysis and solve complex statistical problems beyond the scope of existing functions.
• Re-evaluated the statistical power, robustness, and properties of the circular-linear regression in the phase-amplitude coupling, and developed novel standardization methods to approximate a normal distribution.
• Revealed that precise and strong SO-fast SP coupling in the frontal lobe predicts memory consolidation, with the strength of this association mediated by memory type, aging, and dynamic spatiotemporal features.

Research Assistant June 2024 – September 2024
Chemers Neustein Summer Undergraduate Research Fellowship (SURF) Program, The Rockefeller University
• Researched inter-area interactions of neural representations under the mentorship of Dr. Lucas Tian and Dr. Winrich Freiwald (PI) in the Laboratory of Neural Systems, supported by the Rockefeller SURF Fellowship.
• Developed moment-to-moment logistic regression decoders to extract shape and location representations of visual-motor integration from multi-neuron activity recorded across multiple brain regions in macaque monkeys.
• Discovered dynamic shifts in inter-area communication of neural representation across various phases of multi-step action planning and execution sequences using cross-correlations and custom permutation tests.
• Adopted the model of communication subspace to explore brain connections at the sub-population level, and revealed the hierarchical directionality of communications during actions.
• Collaborated on a program-wide group project examining the neurobiological impacts of aging, focusing on impaired neurogenesis, cellular-immune interactions, and their roles in cognitive decline.

Research Assistant June 2023 – August 2023
Polymath Jr.: A Collaborative Mathematical Research Program for Undergraduates
• Worked on a remote project on generative models in machine learning under the supervision of Dr. Baptista from the California Institute of Technology.
• Researched the optimal transportation, Bayesian inferences, and data assimilation. Improved lab Python codes.

Research Assistant August 2021 – July 2022
Nanyang Technological University (remote) & Hong Kong
• Studied the impact of unconscious cognitive gender bias in information processing and decision-making process. Studied probability modeling and inference. Assisted in process tracing and computer simulation under the supervision of Dr. Li.
• Collected data and conducted data analysis, built and assessed multiple logistic regression models.

Research Assistant March 2021 – July 2021
Department of Economics, University of Cambridge (remote)

• Under the guidance of Prof. Gallo from the University of Cambridge, studied the impacts of confirmation bias on investment decisions and effective strategies to reduce the extent of impacts by the intersection of psychology, probability, and economics.
• Worked on the design and collection of questionnaires, modeling, and data analysis in SPSS.

Volunteer Director of Student Research Program February 2021 – December 2023
AEC Foundation, CA (remote)
• Advised high school research assistants in a non-profit organization to collect information from 100+ questionnaires about children with autism and data analysis. Facilitated further experiment design and implementation by computer-based experiments for attention checking. Mentored EEG analysis, cognition tasks, and remote meetings with special education families.

RESEARCH OBJECTIVES

Cognitive neuroscience; Computational neuroscience; Advanced mathematical and statistical modeling; Advanced neuroscience technique, theory, & framework developments; Topics in sleep, memory, learning, emotion, & decision-making; The effects of development, aging, gender, disability, & patient factors.

RELEVANT SKILLS AND CERTIFICATIONS

• Expert in Python, R, MATLAB, SPSS, interfaces including MNE-Python, Nipy, SPM, FSL, Stan, Fieldtrip, EEGLAB, and pipeline & package developments.
• Highly proficient with EEG, PSG, fMRI, DTI, *in vivo* electrophysiology, behavioral analysis, computational modeling, advanced statistical analysis, data handling and visualization, machine learning & deep learning, multi-level modeling of neural data, novel statistical method development, and simulation.
• Proficiently skilled in mathematical and physical modeling of dynamic spatiotemporal composition, neural networks and circuits, functional and structural connectivity, and nonlinear systems.
• Extensive experience with basic software and languages including LaTeX, Microsoft Word, Excel, PowerPoint, Photoshop, Illustrator, etc. for manuscript writing and visualization.
• Familiar with working with people including children and elderly from diverse backgrounds.
• Have strong research, leadership, communication, innovation, mentorship, problem-solving, and critical thinking skills, as well as unwavering enthusiasm and curiosity for advanced research topics.
• Completed both CITI human and animal subjects research training, and ethic training.
• Highly proficient in English, Cantonese, Japanese, Mandarin, & Taiwanese, strong public-speaking skills.