Geeling Chau

in: geeling | glchau.github.io

Education

California Institute of Technology - Computation and Neural Systems PhD Student (current) GPA 4.0

- NSF Graduate Research Fellowship Program Honorable Mention (2022)
- Predoctoral Training in Quantitative Neuroscience Scholar (2021-2023)
- Chen Innovator Grant (2024)

University of California, San Diego - Computer Engineering & Neuroscience (2016-2021) GPA 3.93

- *Magna Cum Laude* with *Provost Honors* all quarters. Inducted Eta Kappa Nu (2017), Tau Beta Pi (2020).
- Fellowships: Halıcıoğlu Data Science Institute Undergraduate Fellowship (2018-2019), Triton Research and Experiential Learning Scholar (2019-2020)
- Awards: Henry Memorial Booker Award (2021), Jacobs School Award of Excellence (2021)

Research

Graduate Researcher - PI: Dr. Yisong Yue. Caltech Jun 2022 - Present

- Researching machine learning techniques for interpretable and robust neural decoding for generalizing across sessions, subject, and sensors (iEEG, LFP, functional Ultrasound (fUS), EMG, and scalp EEG).
- Studied the generalizability of novel time-series encoding approaches (discrete tokenization + transformers) under sensor failure and zero-shot decoding to new sessions and subjects. *Poster presentation at COSYNE 2024*.

Rotation Student - Caltech CNS Sep 2021 - Jun 2022

- Spring Quarter - PI: Dr. Yisong Yue. Studied an adversarial network applied to brain-machine interface (BMI) data to learn session variability and improve decodability across recording sessions.
- Winter Quarter - PIs: Dr. Richard Andersen and Dr. Mikhail Shapiro. Studied functional UltraSound (fUS) as a new technology for BMI and high temporal / spatial resolution neuroscience studies. Experimented with cross-session data alignment techniques for improved data efficiency and decodability for fUS BMI. *Manuscript in preparation.*
- Fall Quarter - PIs: Dr. Ueli Rutishauser and Dr. Ralph Adolphs. Studied Single Neurons related to Error Monitoring in relation to brain structural differences in MRI scans. *Poster presentation at Human Single Neuron 2022.*

Research Assistant - PI: Dr. Vikash Gilja. UC San Diego Sep 2019 - Sep 2021

- Extracted temporal and populational neural features from sEEG data to predict low vs high valence, arousal, and dominance dimensions. Performed data driven (PCA + ICA) brain region frequency coherence analysis, Power Spectral Density (PSD) fitting and parameterization, LDA linear model feature interpretation, and unsupervised clustering analysis on auditory valence neural data. *Poster presentation at SfN 2022.*
- Designed and developed a target pursuit task with perturbations to simulate loss-of-control scenarios during game play. Assisted in EEG and eye tracking analysis synchronized with healthy subject gameplay to validate games for emotional tempering. Identified game play behavioral differences w/r to VAD scores and performed ERP analysis on EEG to identify Error Related Negativity (ERN) near onset of frustration events. *IEEE EMBC 2021 paper.*

Focus and Flow Detector - PIs: Dr. Gilja and Dr. Virginia de Sa. UC San Diego Sep 2019 - Jun 2020

- Built a real-time EEG focus decoder with *OpenBCI headset* data and *Python*, complete with calibration experiment, eye tracking, real-time EEG filtering + artifact processing, and focus model prediction. Offline classification using Shallow FBCSP CNN achieved 70% accuracy with 2 forehead electrodes. Funded by Triton Research and Experiential Learning Scholars. *Presented in a lab meeting and wrote a report.*

Research Assistant - PI: Dr. Bradley Voytek. UC San Diego Nov 2018 - Jun 2019

- Studied EEG neural correlates of visual working memory load with power spectral density parameterization. Funded by Halıcıoğlu Data Science Institute Undergraduate Fellowship. *Poster presentation at 2019 HDSI Conference.*

Posters

Chau, G., An, Y., Iqbal, A. R., Chung, S.-J., Yue, Y., & Talukder, S. (2024). Generalizability Under Sensor Failure: Tokenization + Transformers Enable More Robust Latent Spaces. *2024 Computational and Systems Neuroscience*. Lisbon, Portugal. Mar 1, 2024. Poster.

Chau, G., Fu, Z., Mamelak, A., Tyszka, M., Adolphs, R., Rutishauser, U. (2022) Paracingulate Sulcus presence affects single neuron responses to errors in human medial frontal cortex. *2022 Human Single Neuron Conference.* Los Angeles, CA. Nov 10, 2022. Poster.

Patel, A. N., Huang, J., **Chau, G.**, Ben-Haim, S., Jung, T.-P., & Gilja, V. (2022) Affect modeling of stereoencephalographic signals during naturalistic acoustic stimuli. *2022 Society for Neuroscience.* San Diego, CA. Nov 15, 2022. Poster.

Chau, G., Engen, Q. V., Voytek, B. (2019) Predicting Working Memory Capacity with Visual Memory Tasks. Halıcıoğlu Data Science Institute (HDSI) Annual Conference. San Diego, CA. June 2019. Poster.

Publications

Chau, G., An, Y., Iqbal, A. R., Chung, S.-J., Yue, Y., & Talukder, S. (2024). Generalizability Under Sensor Failure: Tokenization + Transformers Enable More Robust Latent Spaces. ArXiv.org. https://arxiv.org/abs/2402.18546

Griggs, W. S., Norman, S. L., Deffieux, T., Segura, F., Osmanski, B.-F., **Chau, G.**, Christopoulos, V., Liu, C., Mickael Tanter, Shapiro, M. G., & Andersen, R. A. (2023). Decoding motor plans using a closed-loop ultrasonic brain–machine interface. Nature Neuroscience. https://doi.org/10.1038/s41593-023-01500-7

Patel, A. N., **Chau, G.**, Chang, C., Sun, A., Huang, J., Jung, T.-P., & Gilja, V. (2021). Affective response to volitional input perturbations in obstacle avoidance and target tracking games. *2021 43rd Annual International Conference of the IEEE Engineering in Medicine & Biology Society (EMBC)*. https://doi.org/10.1109/embc46164.2021.9630523

Leadership and Other Activities

- Graduate Student Advisor @ NeuroTechX @ Caltech — Jan 2024 - Present
- Board Member @ NeuroTechers — Jun 2022 - Present
- Chapter Coach @ Eta Kappa Nu (HKN): Honor Society of IEEE — Sep 2022 - Jun 2023
- Board of Directors @ Caltech Graduate Student Council (GSC) — Jun 2022 - Jun 2023
- President, Co-Founder @ NeuroTech @ UCSD — Sep 2019 - Jun 2021
- President, Officer @ Eta Kappa Nu (HKN): Honor Society of IEEE, Kappa Psi — Jun 2017 - Jun 2020
- Computer Science Tutor @ UC San Diego CSE — Sep 2017 - Jun 2019
- Software Engineering Intern @ Microsoft — Summers 2018, 2019, 2020
- Software Engineering Intern @ Intuit — Summer 2017