Lila (Shuchen) Liu

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Education

- **Beijing Normal University (BNU)** — Beijing, P.R.China
  BS in Psychology, GPA: 90.65/100 — *Sep 2019 - Jun 2023*
  Core Courses: *Experimental Psychology, Physiological Psychology, Cognitive Psychology, Developmental Psychology, Linear Algebra, Statistics for Psychology, Data Analysis and Modeling in Neurobiology, Neuroscience*
  Thesis: *Serial dependence in the perception of looming stimuli*

- **University of California(UC), Berkeley** — Berkeley, CA, USA
  Visiting Student, GPA: 3.93/4.00 — *Jan 2022 - May 2022*
  Core Courses: *Data Analysis, Perception, Basic Issues in Cognition, The Evolution of Human Behavior*

- **University of Minnesota (UMN), Twin Cities** — Minneapolis, MN, USA
  Graduate Research Assistant, GPA: 3.88/4.00 — *Sep 2023 - Apr 2024*
  Core Courses: *Stat Analysis, Proseminar in Perception, Advanced Machine Learning, Introduction to Functional MRI, Computer Vision*

Research Experience

- **Contextual Cueing Effect in Different Viewing Conditions Using "Mouse-Eye" Paradigm [pipeline]**
  Beijing Normal University. Advisor: Dr.Ke Zhou — *Sep 2023 - Present*
  - A comprehensive study with gaze-contingent displays aimed to investigate whether central vision loss may prevent the incidental learning of contextual cues or expression of learning as a result of the loss of peripheral vision.
  - Designed and implemented a series of PsychoPy based wrapper programs to fully automate the end-to-end studies from online behavioral experiments to output analysis results.
  - Employed "Mouse-Eye" method, an alternative to traditional gaze-contingent eye tracking, which simulated peripheral scotoma and is effective for online scaling up.
  - Peripheral vision loss impaired the learning of spatial contexts under tunnel view search, but facilitation became manifest when the display was made fully visible.
  - The difference in reaction time between identified and unidentified repeated configurations in the testing phase depended on the explicit awareness of the configuration repetition.

- **Visual Mode Switching: Repeated Adaptation to Spatial Distortions by Meridional-Size Lens [code]**
  University of Minnesota. Advisor: Dr.Stephen Engel — *Sep 2023 - Apr 2024*
  - Investigated the long-term adaptation to correct optical distortions caused by astigmatism lenses, and whether observers can learn to switch to a "skew mode" when such configuration is repeatedly encountered.
  - Designed and implemented a Matlab based rectangle adjustment task using cancellation method to quantify individual spatial distortions as the perceptual consequence of wearing astigmatism spectacles.
  - Guided observers to wear cylindrical lenses that magnify images along a 45-degree axis for two 2-hour sessions on each of five consecutive days.
  - Revealed that despite idiosyncratic visual space distortion, there was faster and stronger re-calibration towards the direction of the adapting skew across days upon wearing the glasses, revealing visual mode switching.

- **Inferential Emotion Tracking in Context-Based Emotion Perception**
  University of California, Berkeley, Research Assistant. Supervisor: Dr.David Whitney — *Feb 2022 - Sep 2022*
  - This project aimed to deep dive how the nature of contextual information and emotional cues were combined in order to perceive emotion accurately in the brain, like from facial expressions to body movements, by recruiting dynamic inferential affect tracking(IAT) technique
  - Designed and implemented the experiment program with PsychoPy in Python and preprocessed the obtained data for further analysis
  - Incredible accuracy of context in perceiving emotion was shown when analyzing the correlation between the leave-one-out consensus of the fully informed condition and context-only condition via bootstrap and permutation across stimuli and subjects
  - Exercised Bayesian model, linear regression model and some other state-of-the-art analysis models respectively to quantify the roles of context and characters in emotion recognition. Results illustrated that Bayesian model outperformed other analysis model in this analysis
  - Explored the relationship between IAT and various psychological tests scores for disorders such as autism

- **Exploring Serial Dependence in Radiologist Perception of Mammograms Using Naturalistic Stimuli [code]**
  University of California, Berkeley, Research Assistant. Supervisor: Dr.David Whitney *Jan 2022 - Dec 2022*
  - Serial dependence refers to the biased visual mechanism contributing to stabilize out visual perception across time with various kinds of features and modalities. This research was especially applicable in the diagnostic error in radiologists toward medical image. The study of underlying mechanism of object stabilization was supervised and supported by the Visual Perception Lab at UC Berkeley
  - Preprocessed and analyzed subject records obtained from a medical student training application database using Python to explore and verify our guess on the existence and effect size of serial dependence
  - Iterative input variable adjustment and parameters refinement on the experimental design were conducted to probe how the differences of the tumor morph generated by generative adversarial network between continuous trials affect serial dependence
  - Designed and implemented a PsychoPy based wrapper program to fully automate the end to end experiment from online record queries to output analysis results.

- **The Dynamic Formation of Interpersonal Trust: Evidence from the Trust Game [code]**
  Chinese Academy of Sciences, Research Assistant. Advisor: Dr.Yuan Zhou *Sep 2020 - Sep 2021*
  - An interactive investigation on how real personal experience and prior reputation influenced the investment decisions in the trust game across different ages. This project also targeted to explore a possible trajectory between personalities like Machiavellianism with the accelerated investment rates and strategies
  - Proposed and designed an enhanced experiment based on additional Repeated Trust Game paradigm by introducing more adjustable environmental variables. The experiment intended to reflect more practical result distributions with more complex parameters
  - Independently implemented the entire experiment using E-Prime and launched it online for data collection. Successfully gathered data from over 100 participants, aged 8 to 60, across various regions within a 4-month period.
  - Collected behavioral data was fed to a Hierarchical Bayesian Model analyzer, uncovering significant differences in implicit variables like learning rate and reward prediction error across different age groups.

Projects

- **BrainCognit: A Region-Aware Contrastive Learning Framework for Functional MRI Analysis [code]**
  AWS Academy Project. Supervisor: Dr.Suyuan Chen *Apr 2024 - Present*
  - Applied a region-aware graph attention mechanism that leverages the functional specificity, connectivity, and consistency of brain regions across individuals (ROIs)
  - Introduced a transformer-based encoder-decoder architecture with contrastive learning to capture temporal dynamics from fMRI signals.
  - Employed Static-Graph and Adaptive-Graph transient state encoders to encode brain regions, and contrastive loss to enhance the model's ability to differentiate between similar and dissimilar brain activity segments.

- **3DPerceptFusion: Exploring Depth Perception and Realism via Visual Cues Manipulation in XR [code]**
  XR Bootcamp Scholarship *Feb 2024 - Present*
  - Depth perception is what brings the illusion of presence to life, we questioned how digital stereoscopic images convey a sense of spatial depth and dimension within virtual worlds in XR.
  - Manipulated various visual cues within a scene in Unity, including binocular disparity, focus and texture gradients to investigate how these perceptual cues are utilized to enhance realism.

Publications

[1] **Liu, S.**, Zhou, K. (Submitted). Tunnel Vision and Beyond: Unveiling Implicit Spatial Learning with the 'Mouse-Eye' Approach.

Posters & Presentations

[2] **S. Liu**, S. Engel. (2024, May). *Observers can learn to immediately correct spatial distortions produced by prescription lenses.* Poster presented at Vision Sciences Society 2024.

[1] Y. Jin, **S. Liu**, L. Yan, Q. Gao, Y. Zhou. (2022, November). *Altered Social Learning from Losses in Major Depressive Disorder: Insights from a Reinforcement Learning Model in the Trust Game.* Talk given at The 4th Annual Academic Conference of the Decision Psychology Division, Chinese Psychological Society.

Honors & Awards

- Cognitive Neuroscience student travel award *Jul 2021*
- Dean's Honour Roll (Top 10% by semester GPA) *2019 - 2023*
- Department of Psychology Graduate Fellowship *2023 - 2024*
- Elsevier Vision Research Travel Award *2024*

Skills Summary

- **Programming**: R, Python (scikit-learn, Pandas, NumPy, SciPy, TensorFlow), Matlab, JavaScript, C#
- **Tools**: PsychoPy, SPSS, Mplus, JASP, E-Prime, Qualtrics, Photoshop, Git
- **Languages**: Mandarin(native), English (fluent)

Teaching & Leadership

- **Instructor at Tencent Education** Online
  Differential Geometry (note) *May 2023 - Present*
- **Teaching Assistant at BNU** Beijing, P.R.China
  Matlab Technology in Psychology (code) *Spring, 2021*
- **Chairman of BNU Go Chess Club** Beijing, P.R.China
  Organized Colloquiums on Informatical Analysis of Go *Oct 2020 - May 2022*