

Chenxi Liao

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Research interest: Visual perception and cognition, Visual psychophysics, Computational models of perception, Human-machine alignment, Learning and neural plasticity

Education

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| Ph.D Neuroscience , American University, Washington, DC | Expected Dec 2025 |
| • Advisor: Prof. Bei Xiao, Department of Computer Science | |
| M.S. Neuroscience , American University, Washington, DC | 2020 – 2023 |
| M.S. Industrial Engineering , Columbia University, New York, NY | 2018 – 2020 |
| B.S. Mechanical Engineering , George Washington University, Washington, DC | 2014 – 2018 |

Selected Research Experience

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| Visual adaptation of material appearances , Bei Xiao Lab | 2024 – Present |
| • Designed psychophysical experiments to investigate the adaptation aftereffect of complex stimuli. | |
| • Applied Bayesian multilevel modeling to analyze adaptation effect. | |
| Material Categorization , Bei Xiao Lab | 2023 – Present |
| • Investigated the interplay between material categorization, property estimation, and visual discrimination. | |
| • Developed self-supervised deep learning models to quantify and compare category representations between humans and artificial systems. | |
| Probing the vision-language connection in material perception , Bei Xiao Lab | 2023 – 2024 |
| • Developed a deep-learning-based image morphing pipeline for generating controlled visual stimuli. | |
| • Implemented Representational Similarity Analysis and unsupervised alignment to characterize individual differences in how visual and semantic representations align. | |
| Unsupervised learning of translucency perception , Bei Xiao Lab | 2021 – 2023 |
| • Curated and processed image datasets tailored for training machine learning models of translucency perception. | |
| • Developed an unsupervised deep generative model that predicts human translucency judgments, revealing latent visual features aligned with perceptual dimensions. | |
| Probing the effect of color on translucency perception , Bei Xiao Lab | 2020 – 2021 |
| • Designed and deployed online experiments for crowdsourcing human behavioral data over Pavlovian. | |
| • Used image statistics to quantify visual features underlying perceptual judgments. | |

Fellowships & Awards

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| Center for Neuroscience and Behavior Summer Research Award , American University | 2024 |
| Center for Neuroscience and Behavior Travel Award , American University | 2022 |
| College of Arts and Sciences Graduate Student Research Award , American University | 2021 |

Summer School

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| Visual Neuroscience From Spikes to Awareness , Hesse, Germany | 2024 |
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Publications

Xiao, B & **Liao, C.** (2025). Understanding vision in the physical world through material perception. Nature Reviews Psychology (Conditionally Accepted).

Liao, C., Sawayama, M., & Xiao, B. (2024). Probing the link between vision and language in material perception using psychophysics and unsupervised learning. PLOS Computational Biology, 20(10), e1012481.

Reinisch, M., He, J., **Liao, C.**, Siddiqui, S., & Xiao, B. (2024). CTP-LLM: Clinical trial phase transition prediction using large language models. In 2024 IEEE International Conference on Bioinformatics and Biomedicine (BIBM) (pp. 3667-3672). IEEE.

Liao, C., Sawayama, M., & Xiao, B. (2023). Unsupervised learning reveals interpretable latent representations for

translucency perception. PLOS Computational Biology, 19(2), e1010878. (Issue cover story)

Liao, C., Sawayama, M., & Xiao, B. (2022). Crystal or jelly? Effect of color on the perception of translucent materials with photographs of real-world objects. Journal of Vision, 22(2), 6-6.

Conference Proceedings

Liao, C., Sawayama, M., & Xiao, B. (2024). Probing the link between vision and language in material perception. Cognitive Computational Neuroscience Conference. Boston, MA.

Liao, C., Sawayama, M., & Xiao, B. (2022). Translucency perception emerges in deep generative representations for natural image synthesis. Cognitive Computational Neuroscience Conference. San Francisco, CA.

Abstracts

Liao, C., Cheeseman, J., Schmidt, F., Fleming, R. W., & Xiao, B. (2025). Visual adaptation of complex material appearances. Vision Sciences Society. **Poster**. St. Pete’s Beach, FL.

Liao, C., Sawayama, M., Cheeseman, J., Schmidt, F., Fleming, R. W., & Xiao, B. (2024). Probing the relationship between material categorization and material property estimation using ambiguous visual stimuli. Vision Sciences Society. **Poster**. St. Pete’s Beach, FL.

Liao, C., Sawayama, M., & Xiao, B. (2023). Probing the link between vision and language in material perception using machine learning and psychophysics. **Poster**. Society for Neuroscience Annual Meeting, Washington, DC.

Liao, C., Sawayama, M., & Xiao, B. (2023). Shared representation of different material categories: transfer learning from crystals to soaps. Vision Sciences Society. **Talk**. St. Pete’s Beach, FL.

Liao, C., Sawayama, M., & Xiao, B. (2022). A perceptual evaluation of the StyleGAN2-ADA generated translucent objects. Vision Sciences Society. **Talk**. St. Pete’s Beach, FL.

Sawayama, M., Liao, C., Nishida, S. Y., & Xiao, B. (2022). Replaceability of two deep generative models trained with a pair of translucent objects with different geometries. **Poster**. St. Pete’s Beach, FL.

Liao, C., Sawayama, M., & Xiao, B. (2021). Individual differences in the classification of translucent materials using photos of real-world objects. **Poster**. Virtual Meeting.

Teaching

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| Teaching Assistant, Computer Vision | 2024 |
| Teaching Assistant, Cognition and Perception | 2023-2024 |
| Teaching Assistant, Introduction to Deep Learning, Applied Natural Language Processing, Introduction to Programming. | 2021-2023 |

Technical Skills

Languages: Python, TensorFlow, PyTorch, Git, R, Matlab, SQL, JavaScript, P5.JS

Deep learning Convolutional Neural Network, Recurrent Neural Network, Generative Adversarial Network, Self-supervised Learning Models, Transfer Learning, Large Language Models, Vision-language Models, Stable Diffusion

Statistical modeling: Generalized Linear Model, Bayesian Multilevel Models