Xichen He

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Overview

My research interests lie in extended reality (XR), human–computer interaction (HCI), and brain–computer interfaces (BCI). I am particularly interested in developing multimodal, adaptive systems that combine eye tracking, EEG, and physiological sensing to enable more intuitive and context-aware interactions between humans and technology.

Education

- **Emory University, Laney Graduate School** — *08/ 2026 – Present*
  PHD in Computer Science & Biomedical Informatics, Advisor: Dishita G. Turakhia — Atlanta, GA, USA
  ◦ GPA: N/A
- **Columbia University, Fu Foundation School of Engineering** — *09/ 2023 – 06/ 2025*
  Master of Science in Computer Science, Advisor: Steven K. Feiner — New York, NY, USA
  ◦ GPA: 4.08/4.30
- **University of California, Santa Barbara (UCSB), College of Engineering** — *09/ 2019 – 06/ 2023*
  Bachelor of Science in Computer Science, Advisor: Kerem Çamsarı — Santa Barbara, CA, USA
  ◦ GPA: 3.92/4.00

Conference and Talk

An XR GUI for Visualizing Messages in ECS Architectures — *10/ 2024*
Demo Presentation, 2024 International Symposium on Mixed and Augmented Reality (ISMAR) — Seattle, WA, USA

Publications

Xichen He*, Ziheng Li*, Jiatuo Zou, Steven Feiner, Paul Sajda. *Mixed-Reality Co-Pilots: Reinforcement Learning from Physiological Feedback in an Implicit EEG-Pupil BCI.* To be submitted to Nature Machine Intelligence (2026)

Xichen He*, Ziheng Li*, Haowen Wei, Mengyuan Wu, Zeyi Tong, Benjamin Yang, Steven Feiner, Paul Sajda. *SwEYEpinch: Exploring Intuitive, Efficient Text Entry for Mixed Reality via Eye and Hand Tracking*. In Proceedings of the ACM Conference on Human Factors in Computing Systems (CHI'2026)

Benjamin Yang, **Xichen He**, Charlie Zou, Jen-Shuo Liu, Barbara Tversky, Steven Feiner. *Virtual Reality Task Guidance Through Relative 6DoF Pose Specification*. In Proceedings of the IEEE International Symposium on Mixed and Augmented Reality Abstracts and Workshops (ISMAR'2025)[DOI]

Benjamin Yang, Jen-Shuo Liu, **Xichen He**, Barbara Tversky, Steven Feiner. *Permanent Proxies for Bimanual Selection and Manipulation in Virtual Reality*. In Proceedings of the IEEE Conference on Virtual Reality and 3D User Interfaces Abstracts and Workshops (IEEEVR'2025) [DOI]

Benjamin Yang, **Xichen He**, Jace Li, Carmine Elvezio, Steven Feiner. *An XR GUI for Visualizing Messages in ECS Architectures*. In Proceedings of the IEEE International Symposium on Mixed and Augmented Reality Demo Session (ISMAR Adjunct'2024) [DOI]

Research Experience

- **Columbia University, Laboratory for Intelligent Imaging and Neural Computing [🌐]** — *06/ 2024 – Present*
  Research Assistant, Advisor: Paul Sajda — New York, USA
  ◦ Co-led research on multimodal BCIs integrating EEG, eye tracking, and pupillometry to infer user intent and cognitive states in XR tasks.
  ◦ Developed real-time closed-loop pipelines linking Unity, BioSemi EEG, and PhysioLabXR for adaptive XR systems.
  ◦ Co-authored *Mixed-Reality Co-Pilots* and *Brain2X*, focusing on reinforcement learning from physiological signals to enhance human-AI collaboration
- **Columbia University, Computer Graphics and User Interfaces (CGUI) Lab [🌐]** — *09/ 2023 – Present*
  Research Assistant, Advisor: Steven K. Feiner — New York, USA
  ◦ Researched on XR interaction techniques and human–AI collaboration using eye, hand, and physiological sensing.
  ◦ Engineered Unity-based XR frameworks for real-time multimodal visualization and task guidance, e.g., *SwEYEpinch*, *MercuryMessaging XR GUI*.
  ◦ Published at top venues (ACM CHI, IEEE ISMAR, IEEE VR), collaborating with HCI, vision and neuroscience team.
- **CUMC, Center For Translational & Computational Neuroimmunology (CTCN) [🌐]** — *09/ 2023 – 01/ 2024*
  Research Assistant, Advisor: Korhan Buyukturkoglu — New York, USA

◦ Trained a transformer-based regression model for brain function prediction, outperforming Pyradiomics by 5%.
◦ Adapted SynthSR for MS brain scan super-resolution and generated segmentation masks with SynthSeg.
◦ Automated preprocessing pipeline, reducing processing time by 40%.

- **UCSB, Orchestrating Physics for Unconventional Systems (OPUS) Lab [🌐]** *02/ 2022 – 06/ 2023*
  Research Assistant, Advisor: Kerem Çamsarı Santa Barbara, USA
  ◦ Developed LDPC simulators with annealing-driven decoding and adaptive soft clamping.
  ◦ Built testbed to evaluate performance across code rates, tracking parity violations and BER.

Research Code Development

- **Brain2X** *09/ 2025 – Present*
  Python, PyTorch, NumPy, Pandas, MNE, Scikit-learn
  ◦ Contributed to a cross-modal framework converting physiological signals into token representations for LLMs.
  ◦ Designed pipeline to extract and align neural rhythms, pupil dilation, and gaze dynamics as embeddings.
- **PhysioLabXR-Community** *09/ 2023 – Present*
  Python, Qt, PyQtGraph, NumPy, ZeroMQ, LSL, gRPC [GitHub]
  ◦ Contributed to PhysioLabXR, a Unity–Python toolkit integrating eye tracking, EEG, and physiological sensing.
  ◦ Built multimodal capture and sync modules for closed-loop XR experiments.
  ◦ Applied platform to *SwEYEpinch* and *Mixed-Reality Co-Pilots* for gaze-hand and EEG-driven interaction.
- **MercuryMessaging** *01/ 2024 – Present*
  C#, Unity, XRI, Photon Engine, Vuplex [GitHub]
  ◦ Contributed to MercuryMessaging, an open-source Unity ECS-based framework for communication.
  ◦ Developed XR GUI extension for debugging message flows (demoed at IEEE ISMAR 2024).
  ◦ Enhanced messaging integration for runtime inspection and immersive feedback.

Teaching Experience

- **COMS E6901—Projects in Computer Science** *01/ 2025 – 05/ 2025*
  Co-mentor, Columbia University, Supervisor: Steven K. Feiner
  ◦ Mentored students in developing XR projects using Unity, C# scripting, and related toolkits.
  ◦ Guided students in Python programming and IDE workflows for software development.
  ◦ Coached students on presentation design, creating research demonstration videos, and producing clear visual graphs for project showcases.
- **CS111—Introduction to Computational Science** *01/ 2023 – 03/ 2023*
  Teaching Assistant, UCSB, Supervisor: John R. Gilbert
  ◦ Conducted lab tutoring sessions on Python-based numerical computation and data analysis.
  ◦ Prepared lecture slides and review materials to reinforce core computational concepts.
  ◦ Graded homework and provided feedback on coding and numerical methods.

Reviews

Reviewer, ACM CHI EA'2025 *2025*

Internship Experience

- **Onki [🌐]** *03/ 2025 – 06/ 2025*
  Machine Learning Engineer Intern
- **Algorand [🌐]** *09/ 2022 – 06/ 2023*
  Student Software Engineer Intern
- **Philips Healthcare [🌐]** *06/ 2021 – 09/ 2021*
  Software Engineer Intern

Honors and Awards

- **Graduation High Honors (Top 6%)** *2023*
  UC Santa Barbara
- **Dean's Honors** *2019-2023*
  UC Santa Barbara
- **Silver Medal (rank 20/1220, top 2%)** *08/ 2022 – 11/ 2022*
  Kaggle Open Problems: Multimodal Single-Cell Integration

Skills

- **Programming Languages:** Python3, C#, C/C++, MATLAB, Java, R, Mathematica, Verilog, SQL
- **Frameworks & Libraries:** Unity (XR Interaction Toolkit, URP, Photon), PyTorch, TensorFlow, NumPy, OpenCV, Pandas, Scikit-learn, gRPC, ZeroMQ, Vuplex, Lab Streaming Layer (LSL)
- **Platforms & Systems:** Windows, Linux, Android, Docker, Meta Quest, Varjo Base, BioSemi EEG, OpenBCI