Program

The Workshop on Generative AI for Neuroscience (Virtual)

in conjunction of Brain Informatics 2025, Bari, Italy

No registration required

Time: 9 AM to 12:30 PM (New York Time)

Date: Nov 11, 2025

Zoom link: https://stevens.zoom.us/j/93328488576?jst=1

Zoom meeting ID: 933 2848 8576

Keynote Speakers:

- Dr. Li Wang, Associate Professor, University of North Carolina at Chapel Hill
- Dr. Lifang He, Associate Professor, Lehigh University
- Dr. Xiang Li, Assistant Professor, Massachusetts General Hospital and Harvard Medical School
- Dr. Yu Zhang, Assistant Professor, Stanford University

09:00 AM - 09:45 AM	From Brain-Inspired AI to AI-Inspired Brain Science: The Rise of Generalist Models in Neuroscience (**Dr. Lifang He, Lehigh University**)
09:45 AM - 10:30 AM	From Models to Agents: Structuring Clinical AI through Reasoning, Generation, and Alignment (**Dr. Xiang Li, Havard Medical School**)
10:30 AM - 11:45 AM	Lifespan brain analysis (**Dr. Li Wang, UNC Chapel Hill**)
11:45 AM - 12:30 PM	Brain-Behavior Dimensions and Foundation Models: Advancing Precision Mental Health through Representation Learning (**Dr. Yu Zhang, Stanford University**)

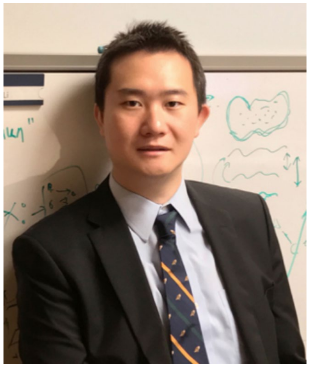
Dr. Lifang He

Lehigh University

Bio: Dr. Lifang He is an Associate Professor of Computer Science and Engineering at Lehigh University. Her research spans AI for health, multimodal neuroimaging, graph learning, and foundation models for clinical decision support. She leads several NIH- and NSF-funded projects on AI-driven biomedical systems and has authored over 200 papers in prestigious journals and conferences. She currently serves as an Associate Editor for ACM Transactions on Computing for Healthcare and the International Journal on Machine Learning and Cybernetics, and as Chair of the IEEE Computer Society at Lehigh Valley Section.

Title: From Brain-Inspired AI to AI-Inspired Brain Science: The Rise of Generalist Models in Neuroscience

Abstract: The long-standing dialogue between artificial intelligence and neuroscience is entering a new era. While early AI drew inspiration from neural principles to design learning architectures, recent advances in foundation and generative models are reshaping how we study the brain itself. This talk explores how generalist AI systems are becoming "computational microscopes" for understanding human cognition and neurodynamics. I will highlight our recent efforts—BiomedGPT, NeuroSTORM, and UniBrain—to show how generalist architectures unify diverse data modalities and multi-task objectives to support scalable clinical analysis and enable personalized modeling and decision support. Building on these examples, I will briefly discuss emerging opportunities and challenges in AI-inspired brain science, where generalist models may accelerate discovery, reveal cross-species neural correspondences, and open new frontiers in ethically grounded, interpretable, and data-efficient research.



Dr. Xiang Li

Harvard Medical School

Bio: Xiang Li is an Assistant Professor of Radiology at Harvard Medical School and Massachusetts General Hospital. He has long been dedicated to the research and application of medical artificial intelligence. He leads multiple research projects focused on medical imaging, medical text analysis, and multimodal data integration, focusing on developing artificial general intelligence solutions tailored for complex clinical scenarios. Prof. Li has made extensive contributions in areas such as medical image and text analysis, AI-assisted disease diagnosis and detection, generative AI, and computational frameworks for medical big data. He has published over 160 papers in top journals and conferences, including Nature Medicine, IEEE TPAMI, NeurIPS, ICLR, and ICML, with more than 12,000 citations and an h-index of 50. He serves on the editorial boards/area chairs of several international journals and conferences, including IEEE TMI, IEEE TAI, NeurIPS, AAAI, and MICCAI. His research has been supported by the U.S. National Institutes of Health (NIH) and focuses on topics such as large language models in medicine, multimodal data fusion, and generative AI for screening support. Professor Li has received numerous honors and awards, including the Google Scholar Program Award, the Thrall Innovation Grants Award, the NVIDIA Global Impact Award, and multiple Best Paper Awards from leading journals and conferences.

Title: From Models to Agents: Structuring Clinical AI through Reasoning, Generation, and Alignment

Abstract: As clinical AI systems evolve beyond narrow prediction tasks, a central challenge lies in enabling dynamic, interpretable reasoning across heterogeneous and often incomplete data. In this talk I'll introduce our investigations into medical agentic AI and generative AI, that can reconceptualize data and model interaction as a structured, collaborative process. In this architecture, domain-specific foundation models are encapsulated as autonomous agents, each contributing specialized analyses, contextual inferences, and supporting evidence, while meta-agent(s) orchestrates action of agents and digests their feedback, based on the learnable alignment with the clinician's intent. This framework is built upon three tec, I'll introduce our investigations into medical agentic AI and generative AI, which can reconceptualize technical pillars based on our previous research. First, a reasoning meta-agent trained by mapping complex decision-making process to the ground truth via reinforcement learning, integrating each agent's outputs through structured, context-aware synthesis. Second, generative AI is embedded within the agentic system to enable richer cross-modality understanding and enhancing the agents' ability to mediate, simulate, and align heterogeneous representations. Third, the system components are supported by continuous AI-human alignment, leveraging expert-in-the-loop feedback, post-training on fine-grained clinical reasoning traces to ensure the AI remains responsive, interpretable, and grounded in real-world expert behavior.

Dr. Li Wang

University of North Carolina at Chapel Hill, USA

Bio: Dr. Li Wang is an Associate Professor with tenure at the University of North Carolina at Chapel Hill. His research interests focus on image segmentation, machine learning, and their applications to normal early brain development and disorders. He is the recipient of the NIH Career Development Award, the Distinguished Investigator Award of the Academy for Radiology & Biomedical Imaging Research, and multiple NIH R01 grants. Dr. Wang has authored over 250 peer-reviewed publications, garnering more than 16,000 citations and an h-index of 64. His brain segmentation methods have achieved Top 1 performance in multiple grand challenges. He has developed advanced volume-based analysis tools for structural brain MRIs (iBEAT V2.0), which has successfully processed 60,000+ scans acquired with diverse protocols and scanners. Widely adopted by more than 250 institutions worldwide, iBEAT V2.0 has directly contributed to over 60 publications in leading journals such as Brain, Neuron, Nature Methods, Nature Communications, and PNAS.

Title: Lifespan brain analysis

Abstract: The availability of extensive lifespan brain MRI datasets, spanning subjects from 20 gestational weeks to 100 years, presents a unique opportunity to precisely chart the trajectory of brain changes throughout the lifespan. However, a major barrier is the critical lack of lifespan computational pipelines for accurate and consistent processing and analysis of challenging lifespan brain MRIs. This talk will introduce a comprehensive set of advanced lifespan-dedicated analysis tools for lifespan brain MRIs. The topics will cover harmonization, skull stripping, tissue segmentation, motion correction, and super resolution.

Dr. Yu Zhang

Stanford University

Bio: Dr. Yu Zhang is an Assistant Professor at Stanford University. His research operates at the intersection of artificial intelligence, translational neuroscience, and precision medicine. His work leverages advanced machine learning and multimodal brain imaging (e.g., fMRI, DTI, EEG) to identify neurobiological markers underlying cognitive deficits, behavioral dysfunctions, and treatment responses in mental health disorders. He has received multiple NIH (R01, R21) and Alzheimer's Association grants and leads the Stanford Precision NeuroIntelligence (SPNI) Lab, which develops AI-driven methods to discover robust and interpretable biomarkers for personalized diagnosis and therapeutic optimization in conditions such as Alzheimer's disease, mood disorders, and neurodevelopmental disorders. Dr. Zhang published more than 170 papers in top venues including Nature Biomedical Engineering, Nature Mental Health, Nature Biotechnology, Nature Human Behavior etc.

Title: Brain-Behavior Dimensions and Foundation Models: Advancing Precision Mental Health through Representation Learning

Abstract: Mental disorders present marked clinical heterogeneity and frequent comorbidity, challenging conventional diagnostic systems and hindering the search for effective, individualized treatments. Moving beyond symptom-based categories, dimensional brain-behavior frameworks offer a principled approach to disentangling shared and disorder-specific mechanisms. In this talk, I will introduce recent advances from our lab in uncovering latent brain-behavior dimensions using contrastive machine learning, enabling the identification of neurobiologically grounded markers and transdiagnostic subtypes. These approaches leverage large-scale neuroimaging to extract brain network patterns linked to cognitive and behavioral profiles, providing more precise characterization of individual differences. I will also present BrainGFM, one of the first brain graph foundation models, established on large-scale brain graph samples aggregated across extensive datasets and brain atlases. By combining graph transformer-based pretraining with prompt-based adaptation, BrainGFM provides a unified framework that generalizes across diverse brain atlases, neurological and psychiatric disorders, and analytical tasks, demonstrating strong transferability across datasets. Together, these innovations illustrate how representation learning can bridge the gap between complex brain network data and precision mental health, enabling more accurate diagnosis and prognosis.

Organized by:

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