Speech, Language, & Hearing Sciences Colloquium

Neurobiological Ground Truth for Understanding Large Language Models

Decades of research in aphasia have revealed fundamental principles about how the human brain organizes language. When stroke damages specific brain regions, the resulting patterns of impairment provide causal evidence about which neural substrates are necessary for phonological, semantic, syntactic, and fluency processes. These lesion-symptom relationships offer a valuable resource for artificial intelligence research. Large language models face a persistent validation problem in that researchers cannot determine which components are causally necessary for language operations versus merely correlated with outputs. Clinical neuroscience offers external ground truth to resolve this challenge. I present the Brain-LLM Unified Model, a framework that translates neurobiologically validated patterns from over three hundred individuals with chronic aphasia into formal mappings between human lesion data and LLM parameter spaces. This bidirectional translation provides external validation for interpretability claims, principled guidance for identifying redundant parameters, and a platform for developing clinical innovations before patient application. The work demonstrates that what we have learned from individuals with aphasia may illuminate not only how biological brains process language but also how artificial systems might be better understood and optimized.

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Please Join Us

When: Thursday, January 22, 2026

Time: 3:30- 4:30 p.m.

Where: Speech, Language, & Hearing Sciences Building Room 409

THE UNIVERSITY OF ARIZONA
COLLEGE OF SCIENCE
Speech, Language, & Hearing Sciences