# The Neurocognitive Mechanism, Computational Model, and Theoretical Framework for Naturalistic Language Communication

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The Chinese University of Hong Kong

## Abstract

Interpersonal communication is one of the crucial factors driving the co-evolution of human brain and language. However, most of previous studies on the neural mechanism of language have focused on language processing at the individual level, resulting in a difficulty revealing the interpersonal attributes of language due to the lack of interpersonal communication context. To address this gap, our team have developed and validated a naturalistic social interaction paradigm. Based on this paradigm, we are able to combine functional near-infrared spectroscopy, transcranial direct current stimulation technology, and computational model techniques, etc. Through a series of studies, we have revealed a unique neural response pattern, i.e., interpersonal neural synchronization (INS), during naturalistic language communication. This response pattern differs from the single-brain activation pattern in both cognitive and neural mechanisms. Moreover, we have constructed a neural computational model based on dual-brain hemodynamic signals to understand the implicit cognitive mechanism of interpersonal communication. By analyzing the INS pattern in the communication process, we have revealed the mechanism of selective attention in a naturalistic interpersonal communication context, a cortical architecture supporting shared representation of semantics, and the construction of social relationships due to high-quality interpersonal communication. Finally, a theoretical model for interpersonal language communication has been proposed, which successfully extended the neurocognitive theory for language from the single-brain to the dual-brain framework.

## Speaker

Chunming Lu is a Professor and a Principal investigator of the State Key Laboratory of Cognitive Neuroscience and Learning, Vice President of IDG/McGovern Institute for Brain Research, Beijing Normal University. His research interests include language communication and interpersonal interaction, as well as educational neuroscience. His study has been funded by the National Natural Science Foundation of China, etc.. He has published more than 70 papers in journals such as Nature Communications, PNAS, Psychological Science, Brain stimulation etc., and won the second prize of Natural Science Award of Beijing Science and Technology Award (ranked first). At present, he is a member of communication committee, Society of fNIRS, the vice chairman of the Cognitive Neurobiology Branch of the Chinese Neuroscience Society.