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State Key Laboratory of Cognitive Neuroscience and Learning
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Education & Professional Experience

Ph.D., Psychology (Cognitive Neuroscience) | 2019-2025 (expected)

Beijing Normal University

Concept Lab (<https://bilab.bnu.edu.cn/>)

Advisor: Prof. Yanchao Bi

State Key Laboratory of Cognitive Neuroscience and Learning & IDG/McGovern Institute for Brain Research

Lab relocated to School of Psychological and Cognitive Science, Peking University (2024)

Visiting Student, Psychology | 2016-2017

University of California, Berkeley

B.S., Psychology (Computer Science minor) | 2014-2019

Central China Normal University

Research Interests

- ✧ Cognitive Neural Basis of (Semantic) Knowledge Representation
- ✧ Cultural-Historical Dynamics of Collective Knowledge
- ✧ Relationships Between Language, Cultural, and Mind

Publication & Manuscript

First/Co-First Author Publications

Ze Fu, Yuxi Chu, Tangxiaoxue Zhang, Yawen Li, Xiaosha Wang, Yanchao Bi (Under Review). Semantics across the globe: A universal neurocognitive semantic structure adaptive to climate.

[\[PDF\]](#)

- ✓ *Developed comprehensive framework combining multiple approaches: 53 languages' embeddings, 253 subjects' ratings, and 86 subjects' fMRI data;*
- ✓ *Identified 13 neurocognitive dimensions as universal structures in cross-language meaning representation;*
- ✓ *Demonstrated the robust effects of climate on cross-language semantic structures' variations.*

Ze Fu*, Huimin Chen*, Zhan Liu, Maosun Song, Zhiyuan Liu, Yanchao Bi (2025). Pathogen stress heightens sensorimotor dimensions in the human collective semantic space. *Communications Psychology*, 3(2). [\[PDF\]](#)

- ✓ *Conducted large-scale historical analysis on collective semantic space across 4 countries and 100 years;*
- ✓ *Demonstrated link between pathogen stress and language evolution of semantics.*

Ze Fu, Xiaosha Wang, Xiaoying Wang, Huichao Yang, Jiahuan Wang, Tao Wei, Xuhong Liao, Zhiyuan Liu, Huimin Chen, Yanchao Bi (2023). Different computational relations in language are captured by distinct brain systems. *Cerebral Cortex*, 33(4). [\[PDF\]](#)

- ✓ *Revealed distinct neural mechanisms for different types of language-driven semantic relations;*
- ✓ *Novel application of graph-theoretical approaches to semantic relation modeling.*

Contributing Author Publications

Shuang Tian*, Lingjuan Chen*, Xiaoying Wang, Guochao Li, **Ze Fu**, Yufeng Ji, Jiahui Lu, Xiaosha Wang, Shiguang Shan, Yanchao Bi (2024). Vision matters for shape representation: Evidence from sculpturing and drawing in the blind. *Cortex*, 174, 241-255.

- ✓ *Led congenital blinds' artworks data collection; Helped with language model analysis methods*

Shuang Tian, Yuankun Chen, **Ze Fu**, Xiaoying Wang, Yanchao Bi (2023). Simple shape feature computation across modalities: convergence and divergence between the ventral and dorsal visual streams. *Cerebral Cortex*, 33(15).

- ✓ *Participated in fMRI experiment design and data collection; Helped with cross-decoding methods*

Xiaohui You, **Ze Fu**, Yue Liu, Yanchao Bi, Xi Yu (In Prep). Word learning patterns in toddlerhood reflect semantic categorical organization representation: converging evidence from 21 languages.

- ✓ *Contributed to idea formulation; Helped with data analysis methods and discussion*

Talks & Conference Presentations

2024

Representing historical cognition in language models. *Journal Club: AI for psychology*, Tsinghua University (Oral)
 Application of language models to semantic cognition research. *Lab Meeting*, Zhejiang University (Oral)
 Semantics across the globe. *Rovereto Workshop on Concepts, Actions, and Objects*, Italy (Poster)

2023

The ecological drivers of cross-cultural semantic structures. *Conceptual Brains and Cultural Evolution Workshop*, Zhuhai (Oral)
 Pathogen stress heightens sensorimotor dimensions. *Society for the Neurobiology of Language*, Marseille (Poster)

2021

Graph and vector-embedding models. *Society for the Neurobiology of Language* (Online Slam)

Research Training

Research Intern | 2018-2019

State Key Laboratory of Cognitive Neuroscience and Learning, Beijing Normal University
 Advisors: Prof. Xiaoying Wang, Prof. Yanchao Bi

- ✓ *Designed experiments for multimodal shape perception study*
- ✓ *Collected and analyzed congenital blinds' drawings and sculptures*
- ✓ *Developed protocols for cross-modal shape representation analysis*

Mentorship Experience

Thesis Supervision | 2023-2024

- ✓ *Supervised 3 undergraduate theses including one Outstanding Thesis Award recipient (Yuxi Chu, Tangxiaoxue Zhang, Yawen Li)*

Research Training Program | 2022-2024

- ✓ *Mentored undergraduates in Innovative Entrepreneurial Training Plan Program*

Professional Service

Ad Hoc Reviewer: Imaging Neuroscience

Honors & Awards

Award for Research and Innovation, Beijing Normal University (2023)

Graduate Academic Award, Beijing Normal University (2020-2023)

Technical Skills

Programming

R; Python; MATLAB

Statistical Analysis

Network analysis; Multilevel modeling; Time-series analysis

Research Method

Functional-MRI; Language text analyses; Large language models; Online behavioral experiments