

# Aobo LYU

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## Education

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### Sichuan University (SCU)

*BS in Information Management and Information System, School of Public Administration (SPA)*

**Sichuan, China**

09/2017 – 06/2021

### University of California, Berkeley

*Exchange Student, Information School*

**California, United States**

01/2020 – 05/2020

### Washington University in St. Louis (Wustl)

*MS in Systems Science and Mathematics, McKelvey School of Engineering (MSE)*

**Missouri, United States**

09/2022 – 05/2024

### Washington University in St. Louis (Wustl)

*Ph.D. in Systems Science and Mathematics, McKelvey School of Engineering*

**Missouri, United States**

01/2024 – Now

### Honors, Scholarship and Awards:

- Outstanding Master's Research Award 05/2024.
- Honors Master Student 01/2023.
- Honors Graduates of Sichuan Province. 05/2021.
- Yongzhuang Top-10 Undergraduate Scholarships. 11/2019.

## Research Papers

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### Structural Impossibility of Antichain-Lattice Partial Information Decomposition

*First Author; Instructor: Prof. Andrew Clark, Department of Electrical & Systems Engineering, Wustl; Prof. Netanel Raviv, Department of Computer Science and Engineering, Wustl; Publishing on ISIT 2026: IEEE International Symposium on Information Theory.*

- This paper shows that the main obstruction in multivariate PID is not merely axiomatic but structural: antichain-lattice representations are fundamentally unable to universally recover mutual information from decomposed atoms. It also introduces System Information Decomposition (SID) as a self-consistent framework for three-variable systems.

### Multivariate Partial Information Decomposition: Constructions, Inconsistencies, and Alternative Measures

*First Author; Instructor: Prof. Andrew Clark, Department of Electrical & Systems Engineering, Wustl; Prof. Netanel Raviv, Department of Computer Science and Engineering, Wustl; Published on Journal of Physical Review E.*

- This paper provides the first explicit closed-form solution for two-source partial information decomposition (PID) that satisfies the standard axioms and properties. It further proves fundamental inconsistencies of lattice-based PID for multi-sources, and introduces alternative multivariate unique and synergistic information measures validated through Ising-model.

### Explicit Formula for Partial Information Decomposition

*First Author; Instructor: Prof. Andrew Clark, Department of Electrical & Systems Engineering, Wustl; Prof. Netanel Raviv, Department of Computer Science and Engineering, Wustl; Published on ISIT 2024: IEEE International Symposium on Information Theory.*

- By introducing the do-operation, an operation over the variable system which sets a certain marginal to a desired value, the paper provides the first explicit formula for calculating the information atoms so that Williams and Beer's Partial Information Decomposition axioms are satisfied, as well as additional properties from subsequent studies in the field.

### Emergence and Causality in Complex Systems: a survey of causal emergence and related quantitative studies

*Third Author; Instructor: Prof. Jiang Zhang, School of Systems Science, Beijing Normal University; Published on Journal of Entropy.*

- This survey reviewed the current popular framework for Emergence and causality, where I mainly working on sorting out the causal emergence framework based on the information decomposition method.

### System Information Decomposition

*First Author; Instructor: Prof. Jiang Zhang, School of Systems Science, Beijing Normal University.*

- Based on the Partial Information Decomposition method, the research proposes a System Information Decomposition that can equally decompose the information of all variables of a system according to their higher-order interaction relationships.

### Research on the Impact of Dynamic Issuing Mechanism of Digital Currency on Macroeconomic Operation

*First Author; Instructor: Dr. Liang Zhou, SPA, SCU; Published on Journal of Intelligent & Fuzzy Systems.*

- The paper proposed a Dynamic Issuance Mechanism (DIM) of Central Bank Digital Currency, which can eliminate currency leakage rate and improve economic operation efficiency.

### Research on the Demands of Elderly in the Community Home-Based Care Model

*First Author; Instructor: Prof. Ying ZHAO, SCU. Published on DHA2020: International Conference on Digital Health and Medical Analytics.*

- Collected elderly's demographic information and established a service demand model based on decision tree.

### Research on Credit Mechanism of Electronic Honor Certificate System based on Blockchain

*Fourth Author; Instructor: Prof. Ying ZHAO, SPA, SCU. Published on IECB2020: Electronic Business under COVID-19 Pandemic.*

- Proposed a solution of trusted electronic honor certificate system based on blockchain, and verified the effectiveness.

## Extracurricular Activities

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**Ph.D. Advisory Board of Department of Electrical and Systems Engineering**

09/2024 – Now

**Washington University Symphony Orchestra & Wind Ensemble (French Horn)**

02/2023 – Now