

Yanbo Zhang

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Education

School of Physics, University of Science and Technology of China (USTC)	Hefei, Anhui, China
Bachelor of Science in Physics	Sept. 2013 – Jul. 2018
• Major: Condensed Matter Physics	
Karolinska Institute (KI)	Stockholm, Sweden
• Visiting Student	Mar. 2017 – Jun. 2017
Arizona State University	Tempe, Arizona, USA
• PhD Student	Aug. 2018 – today

Research Experiences

Research Project Conducted at Karolinska Institute

Project: Infer Cellular Automata Rule of Systems with Different Complexity Level

Advisor: Professor Hector Zenil

Research Assistant Mar. 2017 – Jun. 2017

- Involved in programming and building specific methods;
- Used an estimation of Kolmogorov complexity to quantify a system's complexity, and mathematically considered the relation between the complexity and the difficulty (the time cost of reconstructing a system's dynamic) of studying a system;
- Found that there is a positive power-law correlation between dynamic reconstruction difficulty and system complexity;
- Built a method based on balance calculation and observation to speed up the dynamic reconstruction process; this method is also a mathematical version of "Hypothetico-deductive-method".

Research Project Conducted at Karolinska Institute

Project: Classify Boolean Networks by Comparing to Cellular Automata

Advisor: Professor Hector Zenil and Professor Narsis Kiani

Research Assistant Mar. 2017 – Jun. 2017

- Aimed to use Cellular Automata to scale dynamics of Boolean Networks and then classify them;
- Worked on programming and proposed Boolean Networks dynamic scale method based on Cellular Automata.
- Learned and studied the model of Boolean network.

Independent Project Conducted at University of Science and Technology of China

Project: Identify Universal Turing Machine in Cellular Automata

Independent Researcher May 2016 – Sept. 2016

- Extracted particle from discrete system and studied the interactions between them to find a method of measuring the computational power of system and further identify potential universal cellular automata;
- Analyzed the two features of cellular automata: storage information and processing information ability;
- Built a set of complete methods which can identify potential universal cellular automata;
- Gained a result that using abilities of storing and processing information to characterize complex systems is effective and succinct.

Research Project Conducted at University of Science and Technology of China

Project: Percolation on High Dimension Systems Advisor: Professor Youjin Deng

Research Assistant Mar. 2016 – Jun. 2016

- Took in charge of programming by teaming up with an upper classman;

- Initiated a lot of discussions and theory proofs on how to measure the topology and geometric property of percolation structure;
- Computed percolation threshold of high dimension percolation model.

Research Project Conducted at University of Science and Technology of China

Project: Statistical Mechanics of Computation Systems

Independent Researcher Mar. 2016 – Present

- Researched literature and learned that there are deep correlations between path entropy and intelligence;
- Aimed to get the statistical properties of Universal Turing Machines and distinguish them with other systems.

Research Project Conducted at University of Science and Technology of China

Project: Statistical Mechanics of Human Knowledge Advisor: Dr. Lingfei Wu

Research Assistant Jan. 2016 – Mar. 2016

- Aimed to observe evolutionary dynamics of human knowledge system via dimensionality reduction;
- Used principal component analysis (PCA) to illustrate the citing network from APS to find a trend of the network structure with time.
- Collaborated with the post-doctor of University of Chicago, Lingfei Wu, and worked on programming and data processing.

Project Conducted at Shanghai Institute of Microsystem and Information Technology (SIMIT)

Project: A Study on SQUID Superconducting Coil Advisor: Dr. Shulin Zhang

Exchange Student Aug. 2015

- Measured magnetocardiogram by using superconducting coil instrument;
- Designed a tool which can automatically enwind superconducting coil.

Publications

- Wu Yiming, Yukun Wu, Chao Ma, **Yanbo Zhang**, Huaiyi Ding, Nan Pan, and Xiaoping Wang, The role of few-layer TiO_x surfactant: remarkably-enhanced succeeding radial growth and properties of ZnO nanowires, *Journal of Materials Chemistry C*
- **Yanbo Zhang**, Definition and Identification of Information Storage and Processing Capabilities as Possible Markers for Turing-universality in Cellular Automata, *Complex Systems*
- Hector Zenil, **Yanbo Zhang** (co-first author), Narsis A. Kiani, “Observability and Sensitivity in the Reconstruction of Generative Models of Dynamical Systems,” submitted

Academic Activities

Conference on Network, Geometry and Machine Learning, Beijing, China **Oct. 2016**

- Learned the relations between Ads/CFT and graph theory;
- Learned the idea of connecting statistical mechanics with machine learning;
- Found the strong connection between hyperbolic geometry and complex networks.

Swarm Agents Club Annual Meeting, Nanjing University, Nanjing, China **Jul. 2015**

- The club is established for explorers who are interested in the cutting-edge academic research of complex systems;
- Exchanged with excellent individuals about frontier research in various fields.

Honors & Awards

- Honorable Mention in Mathematical Contest in Modeling (MCM) 2017
- The Best Technology Award in RoboGame, USTC 2014

Skills & Interests

- Proficient in C, C++, Wolfram Mathematica, Python, R, Julia

- Skilled at data structure and optimization algorithm (greedy algorithm, dynamic programming algorithm, genetic algorithm)
- Interested in designing, 3D modeling, classical poems, Chinese Guqin