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 evolutional 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* (under review)
- 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