

ZHEN YANG

Kuang Yaming Honors School, Nanjing University, 210023, Nanjing, China
zhen.yang@duke.edu (+86) 17751790726

EDUCATION

Nanjing University

B.S. in Physics, Kuang Yaming Honors School

September 2017 — June 2021 (expected)

GPA: 92.8/100; Ranking: 3/31

Duke University

Visiting International Student

August 2019 — December 2019

GPA: 3.925/4.0; Ranking: N/A

RESEARCH INTERESTS

Statistical Physics, Soft Matter, Complex Systems, Condensed Matter Physics (theory and simulation)

RESEARCH EXPERIENCES

Department of Mech.E & MSE, Yale University

July 2020 — Present

Student intern; Supervisor: Prof. Corey O'Hern

- Project: Connectivity and Rigidity Percolation of Sticky Deformable Particle Model
 - Detected connectivity percolation for sticky Deformable Particle Model (DPM) under periodic boundary condition based on hierarchical clustering algorithm and fitted the probability distribution of connectivity percolation threshold. The distribution gets sharper with increasing system size, indicating all configurations percolate at the same packing fraction in the thermodynamic limit;
 - Added an attractive shell to the purely repulsive frictionless disks and obtained cluster statistics at connectivity percolation threshold. Now working on the measurement of critical exponents characterizing the connectivity percolation transition for sticky disks, as part of the reproduction for [PhysRevLett.100.028001](#);

Department of Chemistry, Duke University

August 2019 — December 2019

Undergraduate Researcher; Supervisor: Prof. Patrick Charbonneau

- Project: Percolation and Dynamical Transition of modified Random Lorentz Gas
 - Introduced a potential well to the random Lorentz gas (RLG) model in three spatial dimensions (3D) and investigated consequential effects on the mean-square-displacement (MSD) of tracers traveling in the modified RLG media. The tracer's motion is ballistic at short time, diffusive or caging at long time, and at intermediate time there is a sluggish stage which can be affected by the depth and range of the potential well;
 - Carried out large scale computation tasks on Duke [Open Science Grid](#) and fitted the probability distribution of MSD to analyze the percolation transition threshold Φ_p and dynamical transition threshold Φ_d of RLG. The results suggest Φ_p is invariant under the applied potential well but Φ_d can be shifted towards Φ_p , so that the crossover of these two transitions can be shifted from higher dimensions to nearly 3D, making numerical simulation less expensive;
 - Wrote Python scripts to automatize simulation data analysis and figure plot;

PROJECT EXPERIENCES

Kuang Yaming Honors School, Nanjing University

February 2020 — June 2020

Undergraduate researcher; Supervisor: Prof. Jinglei Hu

- Project: Molecular Dynamics Simulation of bacteria swimming
 - Rederived the expression of forces exerted on bacterial flagellum using discrete model of flagellum;
 - Performed molecular dynamics (MD) and multi-particle collision (MPC) algorithm for single bacterium at equilibrium in bulk liquid;

School of Physics, Nanjing University

May 2019 — June 2019

Undergraduate Researcher; Supervisor: Prof. Jianguo Wan

- Design Project of College Physics Experiment: Data processing and theoretical analysis regarding the measurement of Thermal Conductivity of Copper and Aluminium
 - Employed fast Fourier transform (FFT) and filtering algorithm to reduce experimental errors caused by thermal waves of higher-order frequency;
 - Combined theory of heat convection and numerical simulation of heat conduction to analyze the effect of cooling water at the hotter side of metals, and found that with higher flow velocity of cooling water, the heating function would behave more like a square wave, so that the proportion of higher-frequency waves increases;

WORKING PAPER

- B. Charbonneau, P. Charbonneau, Y. Hu, and **Z. Yang**, High-dimensional void percolation criticality in random Lorentz gas and its interplay with mean-field caging, in preparation (2020).

PROFESSIONAL SKILLS

- Programming languages: C++, Python;
- High-performance computing: Slurm, HTCondor (basic);
- Simulation methods: Molecular dynamics (MD) simulation, Multi-particle collision (MPC) algorithm, Stochastic simulation algorithm (SSA & Tau-leap);

AWARDS

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| • Zheng Gang Overseas Study Fellowship | 2020 |
| • Special Prize, Elite Program Scholarship in Fundamental Sciences | 2019 |
| • First Prize, People's Scholarship | 2019 |
| • Scholarship of Dalian Institute of Chemical Physics, Chinese Academy of Sciences | 2018 |
| • First Prize, Elite Program Scholarship in Fundamental Sciences | 2018 |