

YingKai Liu

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Education

2015 - present: Boling School of Physics, Nankai University, Tianjin, China.
(Currently a senior undergraduate).
GPA: 3.45 (Top 20%)

Research Interest

I am interested in the topological properties of materials and the phenomenon of integer discreteness arising from continuous symmetry. In particular, I am interested in learning advanced Mathematics tools, bridge it with actual Physics systems, by describing and discovering topological quantum systems. I am also interested in how particles subject to relatively simple laws can exhibit collective novel properties as a whole.

Research Experience

Dec. 2017 - present: **Undergraduate research fellow**, Chern Institute of Mathematics (CIM), Nankai University, China (Advisor: Prof. Molin Ge).

- ❑ Learning Berry phase of spin-1 particle in anomalous Zeeman effect.

July. 2018 - Sept. 2018: **Visiting undergraduate**, Yeshiva University, USA (Advisor: Prof. Emil Prodan).

- ❑ Studied index theorem and K-theory. Calculated the Chern number of a 2-D bulk model and winding number of edge model under fluctuation.
- ❑ Studied the Non-Abelian braiding of Majorana excitations.

July 2017 - Oct. 2017: **Visiting undergraduate**, University of Nevada, Las Vegas, USA (Advisor: A. Prof. Qiang Zhu).

- ❑ Built a database prototype for processing, storing and querying VASP calculation results using Python.
- ❑ Built an Evolutionary Algorithm package using Python.

Apr. 2016 - Oct. 2017: **Undergraduate research fellow**, Nankai University, China (Advisor: Prof. Xiangfeng Zhou).

- ❑ Studied calculation methods of Berry phase in 2D materials
- ❑ Investigated the band structure of multiple 2D materials using tight-binding model.

Awards and Scholarships

MCM Successful Modeling prize (2016);
MCM Honorable Mentioning prize (2017);
Second scholarship of Nankai University (2016);
Boling scholarship of Nankai University (2015, 2016, 2017);

Courses Taken

Theoretical Mechanics
Quantum Mechanics
Electrodynamics
Thermodynamics
Optics
Introduction to Group theory
Computational Physics
Solid Physics (till June, 2019)
Quantum Field Theory
Advanced Quantum Mechanics (till Jan., 2019)

Extracurricular Activities

- ☐ Director of Academic Department, Student Union of School of Physics
Responsible for holding college-wide and school-wide English and Physics activities and organize lectures of Physics.
- ☐ Participated in Physicists' Tournament of Nankai University and won the 4th place as group leader.