

# Hongbin Ren

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## Education

### UCAS (University of Chinese Academy of Sciences)

PH.D. CANDIDATE, THEORETICAL PHYSICS

Beijing, China

Sept. 2015 - June. 2021

### NTU (National Taiwan University)

TRANSFER STUDENT, PHYSICS DEPARTMENT

Taipei, China

Sept. 2013 - Jan. 2014

### SCU (Sichuan University)

B.S. IN PHYSICS

Chengdu, China

Sept. 2011 - June. 2015

add GPA and rank

## Academic Experience

### Institute of Physics

RESEARCH ASSISTANT

Beijing, China

Sept. 2015 - Present

I worked with Prof. *Lei Wang* and Prof. *Xi Dai* on applying machine learning method to first principle calculation:

- Approximate kinetic energy (KE) functional with Gaussian process (GP) model
  - Accurately predict KE and it's functional derivative by training GP and gradient of GP.
  - Enable automatic gradient calculation with respect to GP's hyperparameter and inputs by implementing *GPFlux.jl*.
  - Save **80%** training time by using gradient based optimization method.
- Scientific machine learning in quantum chemistry
  - Improve the convergence rate of Hartree Fock (HF) algorithm to superlinear by designing a density matrix based HF algorithm.
  - Enable automatic gradient calculation of energy with respect to all variational parameters by implementing *QuantumLang.jl*.
  - Gain **100×** speedup in all benchmarks compare to previous published research.

## Social Experience

### Gaosi Education Corp.

HIGH SCHOOL PHYSICS TEACHER

Beijing, China

Apr. 2016 - June. 2018

- Achieve a 80% autumn-winter class transfer rate and is among the top 5% of all the high school physics teachers.
- Improve the physics exam score of students in my class by regularly assessing their learning condition and actively communicating with their parents.
- Designe a systematic high school physics lecture notes.

## Programming and Open Source

- **Language:** Python, Julia.
- **Open Source:** Owner of *GPFlux.jl*, *QuantumLang.jl*; contribute to *Stheno.jl* (2 merged PRs), *NiLang.jl* (1 merged PR).

## Honors & Awards

2017 **Head of Institute of Physics' Award,**  
2015 **Merit Graduate of Sichuan Province,**  
2013 **First Class Scholarship of Sichuan University,**

*Institute of Physics*  
*Sichuan University*  
*Sichuan University*