Yaqi Hou

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Education

University of North Carolina at Chapel Hill — Chapel Hill, NC
PhD Candidate in Physics — *Aug. 2016 - May 2022*

Duke University — Durham, NC
Exchange Student in Physics — *Aug. 2013 - Jul. 2014*

Taishan College, Shandong University — Jinan, P.R. China
B.S. in Physics — *Sep. 2011 - Jun. 2015*

Research experience

Automated-algebra method for virial coefficient calculation — **Aug 2019 - Present**

- Developed a new and scalable method in Python and Cython to calculate virial coefficient of interacting quantum system, deployed in a large cluster Open Science Grid (OSG)
- Achieved unprecedented accuracy for fourth and fifth order coefficients; Estimated even higher order coefficients for the first time

Energy of Bosonic Droplets from Quantum Noise — **Jul 2018 - May 2019**

- Extracted ground-state energy of N-body boson droplets from quantum noise using the cumulant expansion.

Thermaldynamics of Quantum Matter at Finite Temperature — **May 2017 - Dec 2018**

- Applied and improved hybrid Quantum Monte Carlo (hQMC) method implemented in Fortran.
- Extracted ground-state energy of N-body boson droplets from quantum noise using the cumulant expansion.

Numerical Simulation of Acoustic Field — **Mar 2015 - Jun 2015**

- Simulated acoustic field propagation using Finite Difference Time Domain (FDTD) method and spectrum method
- Program implemented in C and visualization is based on VTK

Flow of Granular Material in 2D Hopper — **Sep 2013 - May 2014**

- Analyzed image data in MatLab to detect, track and analysis granular particles flowing in a 2D hopper.
- Conducted small-scale Discrete Element Method (DEM) simulation, implemented in python (side project).

Project experience

COVID-19 Event Extraction from Twitter Challenge — **Jun 2020 - Sep 2020**

- W-NUT 2020 Shared task 3: extracted text spans from a given tweet for filling pre-designed slots based on pretrained language model BERT. [accepted as workshop paper]

Ebay Machine Learning Challenge — **Aug 2020 - Feb 2021**

- To match from millions of listed products according to attributes texts and product images

Quantum Matter Map — **Jun 2020 - Present**

- Extracted physics concept from unstructured literature with Natural Language Processing (NLP)
- To predict missing link and relations among literatures and concepts to build a knowledge graph
- To develop and host a public website offering user-friendly interface offering two-way user interactions

Technical Skills

Programming Languages: Python, Fortran, MatLab, C, Lua, Emacs-Lisp
Frameworks and Libraries: Numpy, pyTorch, Matplotlib, Scipy, Cython, pyQt, pandas, sqlite, OpenMP, MPI
Support Skills: Linux, Emacs, Git, LaTeX, HTcondor

Publications

8. *Fourth- and fifth-order virial expansion of harmonically trapped fermions at unitarity*
Y. Hou, K. J. Morrell, A. J. Czejdo, J. E. Drut, arXiv:2104.14440, *Phys. Rev. Research accepted*

7. *Pairing and the spin susceptibility of the polarized unitary Fermi gas in the normal phase*
L. Rammelmüller, **Y. Hou**, J. E. Drut, J. Braun, Phys. Rev. A **103**, 043330 (2021)

6. *Fourth- and Fifth-Order Virial Coefficients from Weak Coupling to Unitarity*
   Y. Hou and J. E. Drut, Phys. Rev. Lett. **125**, 050403 (2020)
   Selected as Editor's suggestion

5. *Virial expansion of attractively interacting Fermi gases in one, two, and three dimensions, up to fifth order*
   Y. Hou and J. E. Drut, Phys. Rev. A **102**, 033319 (2020)

4. *Virial coefficients of trapped and un-trapped three-component fermions with three-body forces in arbitrary spatial dimensions*
   A. J. Czejdo, J. E. Drut, **Y. Hou**, J. R. McKenney and K. J. Morrell, Phys. Rev. A **101**, 063630 (2019)

3. *Leading-and next-to-leading-order semiclassical approximation to the first seven virial coefficients of spin-1/2 fermions across spatial dimensions*
   Y. Hou, A. J. Czejdo, J. DeChant, C. R. Shill and J. E. Drut, Phys. Rev. A **100**, 063627 (2019)

2. *TEST_POSITIVE at W-NUT 2020 Shared Task-3: Joint Event Multi-task Learning for Slot Filling in Noisy Text*
   C. Chen, C. Y. Huang, **Y. Hou**, Y. Shi, E. Dai and J. Wang. In Proceedings of the Sixth Workshop on Noisy User-generated Text (W-NUT) at EMNLP (2020)

1. *Thermal conductivity and thermoelectric performance of $Sr_xBa_{1-x}Nb_2O_6$ ceramics at high temperatures.*
   Y. Li, J. Liu, **Y. Hou**, Y. Zhang, Y. Zhou, W. Su, Y. Zhu, J. Li and C. Wang, Scr. Mater. **109**, 80-83 (2015).

Teaching experience

Graduate Teaching Assistant **Jun, 2016 - Present**

- PHYS 114 General Physics for non-physics major, led workshop as *Teaching Assistant* (Fall 2016, Summer 2017)
- PHYS 118 General Physics for physics major, led workshop as *Teaching Assistant* (Spring 2017 - Spring 2018)
- PHYS 331 Introductory numerical techniques in physcis, led lab session as *Teaching Assistant* (Fall 2018)
- PhD qualification exam recitation - statistical physics, led recitation session as *Instructor* (Spring 2019)