Yaqi Hou

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Education

University of North Carolina at Chapel Hill, Chapel Hill, NC   Aug 2016 - May 2022
Ph.D. candidate in Physics

Duke University, Durham, NC   Aug 2013 - Jul 2014
Visiting student in Physics

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

Project experience

Quantum Matter Map   Aug 2020 - Mar 2021
- Extracted and classified physics terms from unstructured documents with weak supervision
- Prepared training datasets and applied transformer-based Natural Language Processing (NLP) models

Ebay Machine Learning Challenge   Aug 2020 - Feb 2021
- Performed entity matching for millions of products with noisy attributes texts and images
- Applied fine-tuned models to normalize and predict missing data

COVID-19 event extraction from noisy tweets   Jun 2020 - Sep 2020
- Identified text spans in tweets for given target slots
- Applied a global learning model based on pretrained language models, such as BERT and XLNet
- Shared task 3 of W-NUT 2020; accepted as a workshop paper

Economics data fetch and cleaning   Jul 2019 - Aug 2019
- Built a crawler using *selenium* to fetch public data
- Preprocessed and cleaned multimodal data; organized using a *sqlite* database

Image crawler: CLI and GUI   Jun 2019 - Jan 2020
- Developed a Command-Line Interface (CLI) crawler to collect public, non-copyrighted images, with concurrency downloads using the producer-consumer design
- Developed a Graphical User Interface (GUI), with PyQt5 and the MVC pattern, to interact with the CLI crawler driver and display fetched contents
- Implemented a *sqlite*-based tagging system to organize images and the metadata

General programming projects   Jun 2017 - Present
- Developed and contributed to packages for Awesome WM (in *Lua*), Emacs (in *E-lisp*), and general *Bash/Zsh* scripts
- Developed a CLI labeling tool based on *curses* for classifying given candidates in an efficient and mouse-free fashion
- Managed personal and research group's *Linux* server; Worked on large-scale computational cluster and cloud server

Technical skills

Programming Languages: Python, Fortran, MatLab, C, Lua, Emacs-Lisp, Julia
Frameworks and Libraries: Numpy, PyTorch, Matplotlib, Scipy, Cython, PyQt 5, pandas, sqlite, OpenMP, MPI
Supporting Skills: Linux, Emacs, Git, LaTeX, Jupyter, HTcondor, Excel, PowerPoint, HTML and CSS

Fellowships and awards

UNC Dissertation Completion Fellowship   Aug 2021 - May 2022
Support tuition, fees and stipends during the final PhD year for completing the dissertation

UNC Dean's Graduate Fellowship in the College of Arts & Sciences   May 2021
Support summer fees, stipends and travel funds

Publications

8. Fourth- and fifth-order virial expansion of harmonically trapped fermions at unitarity
   Y. Hou, K. J. Morrell, A. J. Czejdo and J. E. Drut, Phys. Rev. Research **3**, 033099 (2021)

7. Pairing and the spin susceptibility of the polarized unitary Fermi gas in the normal phase
   L. Rammelmüller, **Y. Hou**, J. E. Drut and 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).

PRESENTATIONS

3. From few to many: thermodynamics with up to seventh-order virial coefficients
   Y. Hou and J. E. Drut, APS April Meeting 2021 S13.00007

2. Fourth- and Fifth-Order Virial Coefficients from Weak Coupling to Unitarity
   Y. Hou and J. E. Drut, APS March Meeting 2021 M21.00006

1. Fourth- and Fifth-Order Virial Coefficients from Weak Coupling to Unitarity
   Y. Hou and J. E. Drut, Southeastern Section of the APS (SESAPS) 2020 F05.00002

RESEARCH EXPERIENCE

Quantum virial expansion of unitary quantum matter   Aug 2019 - Present
- Developed a novel, analytic method in *Python* to evaluate quantum virial expansion by automating algebraic operations; the first work to push the calculation up to the fifth order with high accuracy
- Optimized performance with *Cython* and *multiprocessing* for large-scale parallel deployment on computing cluster

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*

Stochastic methods for thermaldynamics of quantum matter at finite temperature   May 2017 - Feb 2021
- Applied stochastic methods [hybrid Quantum Monte Carlo (hQMC) and Complex Langevin (CL)] in *Fortran*
- Improved sampling efficiencies using stochastic trace estimator and Physics-Informed Neural Network [in progress]
- Analyzed simulation results to determine observables such as energy

Numerical simulation of acoustic field propagation   Mar 2015 - Jun 2015
- Developed in *C* and *C++* to simulate the acoustic field propagation using Finite Difference Time Domain (FDTD) method
- Built the object model and visualized the propagation results with the *VTK* toolkit

Flow of granular material in 2D hopper   Sep 2013 - May 2014
- Performed image registration, boundary detection in *MatLab* to identify and analysis granular particle flow
- Reconstructed stress information from image intensity to study the jamming-flowing phase transition

TEACHING EXPERIENCE

Graduate Teaching Assistant   Jun 2016 - May 2020
- Taught mini-course and led workshops for introductory and middle level undergraduate courses
- Instructor of recitation for Ph.D. qualification exam; grader for various graduate-level courses

ACADEMIC SERVICES

Assistant organizing Quantum Many-Body Days 2021   Sep 2021
- Co-hosted and managed the zoom webinars and live stream on YouTube

COMAP MCM/ICM Contest Judge   Feb 2021 - Apr 2021
- Evaluate and comment submissions for a inter-disciplinary problem on mathematical modeling and policy making

Co-mentor for Graduate Research   Dec 2019 - Aug 2021
- Helped graduate students from the group with research projects
- Assisted in managing group's computational resources and coordinated its usage

Co-mentor for Undergraduate Research   May 2020 - Aug 2020
- Co-mentored undergraduates for Undergraduate Summer Research program
- Coordinated team's research plan; helped the student to participate in research work