Jiachen He

1145 Appian Crossing Way, Apt 207
Lexington, KY, 40517-1069
GitHub: https://github.com/jhe274

Email : jiachen.he@outlook.com
Mobile : +1-859-300-4816
Linkedin: https://www.linkedin.com/in/jiachen-he-370558267/
Portfolio: https://jhe274.github.io/portfolio-bruce.github.io//

Skills Summary

- **Instrumentation & Electronics**: Laser Optics, Fiber Optics, Solid-State Lasers, Polarimeter, PIDs, cryogenic system, vacuum chamber, Fluxgate/Hall Effect Magnetometer, Lock-in Amplifier, Photoelastic Modulator, Electro-optic Modulator (EOM), RF Signal Generator, RF Amplifier, Spectrum Analyzer, Oscilloscope, Photo Detectors, Optical Chopper, DVMs.
- **Optical Metrology**: Polarization Modulation Ellipsometry, optical alignment, precision optical measurements, interferometry.
- **Languages**: English, Chinese(Mandarin), Python, C++, LaTeX
- **Software**: COMSOL Multiphysics, MATLAB, Mathematica, Autodesk Inventor, LabVIEW, Microsoft Office
- **Platforms**: Unix based OS (Linux, Mac OS), Microsoft Windows
- **Soft Skills**: Leadership, Effective Time Management, Event Coordination, Technical Writing, Public Speaking & Presentations, Data Analysis, Module Development, Strong Communication & Collaboration, Analytical Reasoning, Problem Solving, Project Management.

Professional Experience

- **Graduate Research Assistant** — University of Kentucky
  Research on sensitive optical magnetometer using resonant Faraday effect — *August 2019 - Present*
  - **Software Development**: Strong background in scientific programming, developed Python package for the wavelength meter, facilitating efficient communication and buffer usage without relying on low-level SCPI commands.
  - **Data Analysis**: Created and implemented multiple Python scripts for comprehensive Faraday rotation data analysis. All scripts and packages are available on GitHub to promote transparency and collaboration in scientific research.
  - **Synchronous Data Acquisition (SDAQ)**: Proficient in developing modular Python-based SDAQ systems for communication with scientific instruments such as digital I/O interfaces, wavelength meters, laser controllers, lock-in amplifiers, and Gaussmeters. The system efficiently initializes, configures, and synchronizes instruments, sending TTL-level pulse trigger signals and recording data in their buffers.
  - **Optical Metrology**: Expert in polarization modulation ellipsometry, including calibration and optimization. Performed precise optical alignment, utilizing lock-in amplifiers, Muller calculus, and waveform analysis to achieve sub-μrad accuracy in sensitive optical signal measurements.
  - **Merritt Coil Development and Implementation**: Designed and simulated (using Python) a Merritt coil system, followed by Autodesk Inventor modeling to incorporate mechanical engineering tasks for its development and construction. Collaborated closely with machine shop teams to ensure successful project delivery.
  - **Magnetic Field Design**: Independently developed a magnet box prototype, using finite element analysis (COMSOL) tools and MATLAB Simulink to create uniform magnetic fields with shielding. This early-career project deepened my experience with FEA software and involved leveraging concepts like magnetic scalar potential and image fields.
  - **Laser Frequency Stabilization**: Extensive experience in spectroscopic laser frequency stabilization using PDH and DSAS techniques with alkali metals (Rb, K).
  - **Cryogenic and Vacuum Systems**: Contributed to system calibration and maintenance of a cryogenic system, gaining hands-on experience with vacuum technologies over five years.
  - **Ongoing Projects**: Machine learning algorithms for real-time magnetic field cancellation, software development for scientific instruments and implementing side-band laser locking using EOM.
- **Summer Research** — University of Kentucky
  Research on Etch Track-Directed Growth of Carbon Nanotubes on Graphite — *May 2018 - August 2018*
  - Making graphene/boron nitride samples with attached gold particles using chemical vapor deposition, studied frictional properties on the surface of graphene using microfluidic probe.
- **Graduation Project** — Shenzhen University
  Research on the Control System of Intelligent Fish Tank Based on Single Chip Microcomputer — *September 2015 - May 2016*
- **Open Laboratory Fund Project** — Shenzhen University
  Research on the Design of Temperature-controlled Automatic Watering Device — *September 2012 - October 2013*

Teaching Experience

- **University of Kentucky** — Lexington, US
  Graduate Teaching Assistant — *August 2017 - May 2019*
  - Instructed undergraduate students in Newtonian mechanics, electromagnetism, and physical optics through hands-on lab sessions and interactive recitations, fostering a deeper understanding of core physics concepts.
- **Beijing Dasheng Online Science and Technology Co., Ltd.** — Shenzhen, China
  Oral English Teacher (Online) — *February 2016 - July 2016*
  - As an online English instructor, I taught fundamental communication skills to adult learners, enhancing their oral proficiency.

Education

- **University of Kentucky** — United States
  Ph.D. in Physics — *(Expected Graduation Date: May 2025) August 2019 - Present*
  ***Courses**: Advanced Mechanics, Quantum Mechanics, Electromagnetic Theory, Statistical Mechanics, Methods of Theoretical Physics, Solid State Physics, Fundamental Particle Physics, Computational Physics.*

  ***Focus**: Magnetic field design and modeling, electric and magnetic polarizability, light interaction with materials in magnetic field, laser & fiber optics, optical metrology, polarization modulation ellipsometry, optical homodyne detection, atomic spectroscopy, balanced polarimetry, laser frequency stabilization.*
- **University of Kentucky** — United States
  M.S. in Physics — *August 2017 - May 2019*
- **Shenzhen University** — China
  B.E. in Measurement Control Technology and Instruments — *September 2010 - July 2017*
  ***Thesis**: Research on the Control System of Intelligent Fish Tank Based on Single Chip Microcomputer.*

Publications

- **Korsch, W., Broering, M., Timsina, A., Leung, K.K., Abney, J., Budker, D., Filippone, B.W., He, J., Kandu, S., McCrea, M. and Roy, M., 2024. Electric charging effects on insulating surfaces in cryogenic liquids.** Review of Scientific Instruments, 95(4).

Presentations

In Person

- **J. He, W. Korsch, "Resonant Faraday rotation measurements in a potassium vapor cell."**: American Physical Society April meeting, Sacramento, April 2024

Poster Presentations

- **J. He, W. Korsch,"Resonant Faraday rotation measurements in a potassium vapor cell."**: Department of Physics & Astronomy, University of Kentucky, August 2024
  Awarded Second Overall Best Poster
- **J. He, W. Korsch, "A compact magnet design to create low-gradient magnetic field in the presence of magnetic shielding."**: National Nuclear Physics Summer School, Massachusetts Institute of Technology, Cambridge, July 2022
- **J. He, W. Korsch,"A compact magnet design to create low-gradient magnetic field in the presence of magnetic shielding."**: Department of Physics & Astronomy, University of Kentucky, August 2021

Leadership & Awards

- Graduate Student Congress (GSC) representative of Physics, University of Kentucky — *August 2023 - August 2024*
- Graduate Student Congress (GSC) Conference Award — *April 2024*
- Huffaker Travel Scholarship, Department of Physics & Astronomy, University of Kentucky — *July 2022, April 2024*
- Departmental fellowship for graduate students with an outstanding curriculum — *August 2017 - May 2019*
- Max Steckler Fellowship, Graduate School Fellowship, University of Kentucky — *August 2018*

Volunteering

- **Raleigh International** — Gorkha, Nepal
  Venturer — *July 2016 - August 2016*
  - Created a simple webpage using online tools and successfully raised £2000 within two days to support a charity program aiding the earthquake-affected village of Chuwatar, Nepal.
  - Contributed to the construction of sanitary installations, water purification systems, and the laying of water pipelines, including excavating the foundation for a water reservoir to improve local living conditions and ensure a reliable clean water supply.
- **Beijing Youngs Group Public Relation Planning Co., Ltd.** — Shenzhen, China
  Volunteer Docent, Intel Developer Forum 2015 — *August 15, 2015 - August 21, 2015*
  - Selected as one of the top 10 out of 500 volunteers and recognized as an "Exceptional Volunteer".