HONGRUI ZHANG

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EDUCATION

Boston University, Boston, MA **Sep 2024 - Present**
Ph.D. Program in Materials Science and Engineering (In Progress)

Cornell University, Ithaca, NY **Aug 2022 - Jul 2024**
M.S. in Materials Science and Engineering (Minor in Computer Science). GPA: 3.8/4.3
Selected Courses: Object-Oriented Programming, Large-scale Machine Learning, Advanced Artificial Intelligence
Advisor: Prof. Michael Thompson, Prof. Bruce van Dover, Prof. Carla Gomes

Guangdong Technion - Israel Institute of Technology, Shantou, China **Aug 2018 - Jul 2022**
B.S. in Materials Science and Engineering. GPA: 91.9/100 (Top 8%)
Advisor: Prof. Zuoti Xie, Prof. Jacob Katriel

SELECTED PUBLICATIONS

Katriel, J., **Zhang, H.** (2021). First and Second Derivatives of the Chemical Potential for Noninteracting Particles. Journal of Low Temperature Physics, 202(1-2), 263-268.

RESEARCH EXPERIENCE

Boston University, Boston, MA
Research assistant to Prof. Keith Brown
Automated Mechanical Characterization of Polymeric Materials **Sept 2024 - Dec 2024**

- Developed an automated soft matter indentation system using Hertzian model and successfully mapped Youngs modulus distributions to create heatmaps of 3D-printed polymer samples with functionally graded stiffness.

Cornell University, Ithaca, NY
Research assistant to Prof. Michael Thompson, Prof. Bruce van Dover, and Prof. Carla Gomes
Enhanced Optical Characterization Using Convolutional Neural Networks **Jun 2023 - Jul 2024**

- Devised a convolutional neural network (CNN) to predict optical properties (n, k, and d) from reflectance spectra, addressing inefficiencies in traditional least-squares fitting methods.
- Generated robust training datasets using the Tauc-Lorentz model and transfer matrix methods for multilayer systems, ensuring realistic and accurate model inputs.
- Achieved high predictive accuracy ($R^2 = 0.97$) on simulated data and improved experimental predictions ($R^2 = 0.84$) by leveraging CNN predictions as initial guesses for trust region reflective (TRF) fitting.
- Integrated the CNN-TRF workflow into the Scientific Autonomous Reasoning Agent (SARA), streamlining high-throughput experimentation by enabling both rapid exploration and precise exploitation.

Guangdong Technion - Israel Institute of Technology, Shantou, China
Research assistant to Prof. Marcelo Ciappina and Prof. Jacob Katriel
Computational Analysis of High Harmonic Generation **Apr 2021 - Jun 2021**

- Led a computational study of high harmonic generation in semiconductors and graphene using Runge Kutta 4 to interpret nonlinear optical responses and extract insights into photonic materials.

Theoretical Study On the Chemical Potential for Noninteracting Particles **Mar 2020 - Jun 2020**

- Investigated the second derivative of the chemical potential for bosons and fermions as a function of temperature, uncovering its dependency on density of states, temperature, and dimensionality. Published findings in the *Journal of Low Temperature Physics*.

ABSTRACTS

M.-C. Chang, S. Ament, M. Amsler, D. Sutherland, **H. Zhang**, L. Zhou, J. M. Gregoire, C. P. Gomes, L. Smieska, A. Woll, R. B. Van Dover, and M. O. Thompson, "Accelerating High-Throughput Material Experimentation via Human-AI Collaborations," *MRS Fall Meeting & Exhibit 2024*, Materials Research Society, Boston, MA, 2024.

SKILLS

Programming: Python (3 years, proficient in PyTorch, NumPy), Java (1 year), LaTeX (proficient), Julia, Git, Fortran
Machine Learning Models: Convolutional neural networks (proficient), Bayesian optimization
Experimental: Clean-room fabrication, Ellipsometry, Probe station, Physical Vapor Deposition, AFM, SEM, XRD

TEACHING EXPERIENCE

Boston University, Boston, MA
Graduate Teaching Assistant *(20 hours/week)* **Sept 2024 - Present**

- Course: ME305 - Mechanical Properties of Materials (Advisor: Abigail Plummer)
- Developed comprehensive homework solutions to reinforce course material and support student learning.
- Led engaging discussion sections and hold office hours weekly, clarifying complex concepts and fostering interactive learning.

Cornell University, Ithaca, NY
Position: Grader *(10 hours/week)* **Aug 2023 - Present**

- Course: MSE5801 - Materials Structure and Electronic Properties.
- Designed lecture slides and developed teaching materials.
- Responsible for grading homework and exams, providing constructive feedback.

Position: Materials Research Symposium (MRS) Assistant *(8 hours/day)* **Nov 2023, Boston**

- Assisted in coordinating the MRS symposium, facilitating various sessions and supporting attendees.

Guangdong Technion - Israel Institute of Technology, Shantou, China
Position: Lab Teaching Assistant *(8 hours/week)* **Oct 2021 - Jun 2022**

- Instructed students in optical microscopy operations, fatigue experiments, and phase diagram measurements in an Engineering Materials Laboratory course.

Position: Student Assistant of News and Public Affairs *(8 hours/week)* **Sept 2018 - Jun 2019**

- Wrote and published bilingual press releases for the university's official account.
- Conducted interviews with lecturers and professors, contributing to university communications.

AWARDS and FELLOWSHIPS

Guangdong Technion - Israel Institute of Technology, Shantou, China

- Dean's List **(top 10)** **Dec 2021**
- Second Class Academic Excellence Scholarship **Dec 2021**
- Vice Chancellor's List **(top 5)** **Dec 2020**
- Second Class Academic Excellence Scholarship **Dec 2020**
- Outstanding Performance in Journalism **Dec 2020**
- Extra-curricular Scholarship **Dec 2019**
- Third Class Chancellor's Scholarship **Dec 2018**

ACTIVITIES and INTERESTS

- **Member**, American Chemistry Society. **2021**
- **Participant and champion**, English Dubbing Competition, Technion, Shantou. **Nov 2018**
- **Team member**, Astronomy Association Meteor-observing Team, Technion, Shantou. **Nov 2018**