# Daichi Suwa

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## Education

**University of Texas at Austin** | *GPA: 3.62; Upper Division GPA: 3.65* *May 2026*
**Honors Program** | *Dean's Scholar* *Austin, TX*
**Bachelor of Science** | *Physics*
**Focus** | *Theoretical Physics, Condensed Matter Theory*

**Mountain View High School** *May 2022*
*Mountain View, CA*

## Research Interests

Theory of correlated electronic phases and the emergent phenomena in thin-films. Application of computational methods and theoretical tools (e.g. QFT) in condensed matter physics.

## Research Experience

**Condensed Matter Theory** | *Allan H. MacDonald's Group* *July 2024 - present*
*Theory of Thin-Film materials (Graphene) and Computational Approach* *Austin, TX*

- Individual study on theoretical/computational physics; constructions of physical models of materials and computational solvers.
- Implemented the Hartree-Fock self-consistent field solvers from scratch in Julia-lang, and applied on:
  - Tight-binding model of monolayer Graphene
  - Continuum model of Rhombohedral Multilayer Graphene
- Studied converged states for each isospin-polarization (spin and valley); mapped energetically stable phases under different parameters (carrier density, interlayer bias, etc.)

**Magnetic Matter Experiment** | *Freshman Research Initiative* *Jan 2023 - Nov 2023*
*Perovskite sample synthesis, e-beam deposition* *Austin, TX*

- Synthesizing perovskite material (RNiO3) for finding doping rate that will make the sample superconductive.
- E-beam deposition, a technique used to create thin film crystals on substrates by beaming into a target material in a vacuum chamber where pressure and temperature is controlled.

## Works in Progress

**Microscopic Theory of Vortex Cores in Graphene Superconductors** *Expected submission*
Univeristy of Texas at Austin | *Advisor: Prof. Allan H. MacDonald* *Spring 2026*

- Investigating the competition between fully gapped chiral ($p + ip$) and nodal ($p_x$, $p_y$) pairing states in p-wave graphene superconductors.
- Analyzing how the lack of simple time-reversal invariance in the band structure lifts the degeneracy between $p + ip$ and $p - ip$ channels, potentially favoring a chiral state despite experimental suggestions of nodes.
- Developing a continuum model to calculate the energetic stability of vortex core structures under effective attractive interactions.

## Skills

**Languages:** English | Japanese

**Programming Languages:** Rust-lang | Julia-lang | Python | LEAN4 | Typescript/Javascript | C/C++

**Technologies:** GPGPU | CUDA.jl | WGPU | OS-dev | WASM | Binary Parser | Tauri | Linux

**Computational Methods:**

| | |
|---|---|
| Markov Chain Monte Carlo method | FFT Convolution |
| Hartree-Fock self-consistent field method | DIIS (Direct Inversion in Iterative Subspace) method |

## Awards and Honors

**Walter E. Millet Endowed Scholarship in Physics** | University of Texas at Austin *Sept 2025*

**Melvin J. Rieger Scholarship Fund in Physics** | University of Texas at Austin *Sept 2024*
*Sept 2023*

**Qiskit Fall Fest 2022 3rd Prize** | UT Quantum Collective *Oct 2022*

**Dean's Scholars Honors Program** | University of Texas at Austin *June 2022*

## Employment

**Intern (Incoming), Quantum Computing Applications Research** *Jan 2026 - Mar 2026*
*QunaSys Inc. Tokyo, Japan (Remote)*

- Selected for a competitive internship program focused on exploring industrial applications of quantum computing.
- Research on corporate use cases, applying academic knowledge to real-world industry challenges.
- Scheduled to collaborate with client companies to design discussion frameworks and identify areas where quantum algorithms can provide advantage.

## Community Engagement

**Austin Parkour Community, Member** | Austin, TX *Oct 2023 - Present*

**Society of Physics Student, Member** | *University of Texas at Austin* *Aug 2022 - Present*

## Personal Projects

**Fundamental Particle Field Simulation** | *GPU simulation, Lattice-QED* *May 2025 - present*

- Simulating the particle fields by using the time-evolution equations extracted from Euler-Lagrange equations of fields.
- An attempt to extend and apply my understanding from the Intro to Standard Model undergraduate course.

**Digital Guitar Effector w/ FFT** | *Embedded system, Rust-lang* *Jan 2025 - present*
*Expanding the boundaries of real-time sound modification for guitar*

- Developing a highly customizable digital guitar signal effector, while most electric guitar effectors utilize analog circuits to modify the guitar signals.
- Aims to expand the boundaries of real-time sound modification e.g. allowing a guitar to output violin sounds.
- Utilized embedded system technologies: RP2040, Raspberry Pi Pico, Rust-lang, Embassy-rs, ADC, FFT, I2S, etc.

**Rust-lang Hot Module Replacement PoC** | *Low-layer hack* *Jun 2023 - Mar 2025*

*Proving the possibility of Hot Module Replacement development in Rust-lang*

- Implemented the fundamental framework that offers Hot Module Replacement (HMR) functionality in compilation-time-expensive language (Rust-lang).
  - Implementation of HMR in compiling language involves high number of low-layer hacks.
- Implementation of HMR result in drastic decrease of resource/time consumption in modern tech development routine.