Yifan (Frank) Zhang

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EDUCATION

Cornell University **09/2019-Present**

Bachelor of Science in Electrical and Computer Engineering, 2022

- Cumulative GPA: 4.15/4.3; Dean's List
- Rawlings Cornell Presidential Research Scholar
- John G. Pertsch Prize (top two in department)
- Minor in Physics and Material Science

Cooper Union for the Advancement of Science and Art **09/2018-05/2019**

Bachelor of Engineering in Electrical Engineering, 2022

- Cumulative GPA: 3.9; Major GPA 4.0; Dean's List
- Sub-project lead in FSAE project team

RESEARCH EXPERIENCE

Undergraduate Researcher at Jena-Xing Group **09/2019-Present**

PI: Prof. Debdeep Jena

- ***Project 1: Tight-binding model for ultra-wide bandgap semiconductors***

  Derived the first tight-binding model of α- and β- Ga_2O_3 and Al_2O_3. The model well captures the key features of the electronic band structure with a minimum computational cost. There are two sets of models with two basis wavefunctions:
  - atomic orbitals semi-empirically fitted to density functional theory (DFT) bandstructure
  - maximally-localized Wannier functions derived directly from DFT. Constraints and simplifications based on symmetry and orbital nature are used to disentangle unnecessary features in the complicated electronic structures.

  This model enables the study of large-scale bulk materials, devices, and heterostructures with full electronic structure.

- ***Project 2: Nitride superconductivity, integration, and devices***

  Studied superconductor NbN epitaxially integrated with nitride semiconductors. Aim to fabricate devices advantageous from high crystal quality and epitaxial interfaces.
  - Participated in the process development and characterization of NbN/AlN/NbN Josephson junction. Investigated and solved etch issue related to surface organic contaminant. Currently characterizing the device and improving the contact.
  - Characterized the exotic transport features of NbN nanowire near critical temperature. Identified signatures of Kosterlitz-Thouless transition, discretized phase-slip centers, and thermal-dependent current retrapping dynamics.
  - Studied NbN/AlN/NbN Josephson junction with tunneling model and Hubbard model under Bogoliubov-de Genne formalism. Predicted the ideal/non-ideal behavior as well as microscopic features

- ***Project 3: High-field transport simulation in AlN***
  - Simulated the electron transport in AlN at high-field using monte-carlo method. Currently looking for impact ionization, its anisotropy, and anomalous temperature dependence due to the bandstructure effect. Such effect is unseen in narrow-bandgap semiconductors and hasn't been fully studied to date.
  - Will also study AlGaN alloy at different compositions.

COURSEWORK

Electrical Engineering:	Quantum Optics, Nanoscale Device Physics, Nano-Fabrication Quantum Physics of Semiconductor, RF System, Piezoelectric System, E & M, Computer Architecture, DSP, Probability
Physics:	Quantum Field Theory, Advanced Statistical Mechanics, Quantum Information Processing
Material Science:	Electronic, Magnetic, and Dielectric Materials, Thermodynamics

PROFESSIONAL EXPERIENCE

The Autonomy Lab at Cooper Union **New York, NY**

Research Assistant 06/2019 – 08/2019

- Participated in the design of an autonomous scooter that drives itself under urban environment. Lead the design and layout of the electrical and sensory system. Participated in the development of the SLAM and navigation algorithm under ROS.

Shenzhen Welldone Electronics Co., Ltd. **Shenzhen, China**

Field Application Engineer Intern 07/2018 – 08/2018

- Promoted passive components and power products from TDK, AVX, and YAGEO.
- Provided technical support for power ICs from Monolithic Power System (MPS).

PUBLICATIONS

Zhang, Y. et. al. (2021). Tight-Binding Bandstructure of α- and β- Ga_2O_3 and Al_2O_3. *J. Appl. Phys* (under review).

Zhang, Y. et. al. (2020). A Tight-Binding Model for Gallium Oxide: The Newest Ultra Wide-Bandgap Semiconductor. *Undergraduate Research Technology Conference*.

Li, Y., et. al. (2018). In Situ Investigation of the Growth of Methylammonium Lead Halide ($MAPbI_{3-x}Br_x$) Perovskite from Microdroplets. *Crystal Growth & Design, 18*(6), 3458-3464. doi:10.1021/acs.cgd.8b00181

SKILLS

Computational Physics:	Quantum Espresso (DFT), Wannier90, tight-binding model, Bogoliubov-de Genne technique, Kwant, Onscale.
Lab Skills:	Cleanroon processing, room/cryrogenic temperature transport measurement
Programming:	C, C++, Python, ROS, HTML, Verilog, PyMTL, Java, C#
Software:	MATLAB, Mathematica, Kicad EDA, AUTOCAD, SolidWorks