Siddharth Krishnan
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ACADEMIC DETAILS

Degree/ Board	Institute	Year	CPI/%
B.Tech*	IIT Gandhinagar	2016-Present	9.17
Maharashtra Board(HSC)	Pace Junior Science College	2016	90.62
ICSE	Bombay Scottish School, Mahim	2014	93

*B.Tech with Minors in **Physics** - expected in July 2020

FIELDS OF INTEREST

- Atomistic Materials Simulation
- High-throughput Computation for materials
- Quantum Materials and devices for energy storage, energy harvesting, and electronic and optical devices
- Computational Nanoscale device modeling

INTERNSHIPS

- **Cascaded Tunneling Field Effect Transistor(CasTFET)**
  (Guide:Dr. Tillmann Kubis, Network for Computational Nanotechnology, Purdue University, May'19 - August'19)
  - Performed calculations for Si-Ge heterostructures using a Tight-Binding Hamiltonian based Non-Equilibrium Green's Formalism on the NEMO5
  - Studied the effect of Electrical field on the electron and hole distributions in the nanostructure
  - Analysed the results to assess their performance as CastFETs
  - Optimised the geometry of the nanostructures to improve the carrier distributions for high ON current
  - Explored novel material systems(such as InAs-GaSb nanostructures) for their application in CasTFET
  - Attempted to generate tight-binding parameters for calculating electronic properties of InAs-GaSb nanostructures
  - Wrote PBS scripts to execute calculations of computing clusters
- **Modeling Thermal Capacitances in Hetero-junction Bipolar Transistors**
  (Guide: Dr.Anjan Chakravorthy, Professor, Indian Institute of Technology Madras, May'18 - August'18)
  - Conducted a numerical study of heat flow in various transistor geometries using TCAD and circuit modeling tools
  - Proposed a *compact model* for transient self-heating in *Si-Ge HBTs*
  - Implemented the compact model in *Verilog A*
  - Obtained an accurate model which matched with *TCAD* thermal simulations of the transistor
- **Non-Equilibrium Green's Function**
  (Guide:Dr. Tillmann Kubis, Network for Computational Nanotechnology, Purdue University, (May'19 - August'19)
  - Implemented Non-Equilibrium Green's under the Effective Mass approximation for AlGaAs-GaAs Heterostructures
  - Applied the reduced eigenspace approximation for calculating transmission through these nanostructures
  - Conducted a literature survey to understand the basic theory behind Non-Equilibrium Greens Function Formalism

RESEARCH PROJECTS

- **Electron Transport in Graphene Nanostructures**
  (Guide:Dr. Ravi Hegde, Assisstant Professor, Indian Institute of Technology Gandhinagar, December'18 - present)
  - Understanding the fundamentals of transport physics in nanoscale low dimensional systems
  - Calculating the Conductance of various Graphene dots of different geometries in Kwant(python library)
  - Calculated the I-V curve for these structures using Landauer Formalism
  - Calculating the conductance curves for Graphene-Hexagonal Boron Nitride Ring-Dot Heterostructures and observing the effect of changes in the geometry of the structure on its transport
  - Attempting to gain a deep understanding of transport in these structures and to discover new physics which can be exploited in various novel devices

- **Cost-Effective Integration of Bipolar Transistors in 180nm CMOS Technology**
  (Guide:Dr.Nihar Mohapatra, Associate Professor, Indian Institute of Technology Gandhinagar, Jan'18 - Apr'18)
  - Studied the various aspects of the process which strongly affect the bipolar transistors performance
  - Optimized the doping concentration of the base region and the collector region of the BJT as well as the emitter and base thickness
  - Studied the effect of Shallow Trench Isolation edges on the breakdown voltage of the transistor
  - Experimented with various lateral device geometries and studied the variation in the device performance
  - Attained a gain β of 120 and an Early Voltage of 23 V for a bipolar NPN transistor

COURSE PROJECTS

- **Materials Science of Quantum Computers**
  (April'18 - May'18)
  - Conducted a literature survey, studying the various methods of realizing qubits and the materials involved
  - Analyzed the properties of the materials which are required for this application
  - Identified the advantages and disadvantages for different methods of realizing quantum bits
  - Compiled the findings from the research and analysis into a comprehensive report

- **Computational Model for Vector Mediated Epidemics**
  (October'19 - December'19)
  - Implement a stochastic model based on Markov Process for Vector Mediated Epidemic spread
  - Modelled stationary hosts as lattice points, sharing the lattice sites with mobile vectors
  - Used Monte-Carlo methods to observe phase transition in the process
  - Optimized and parallelized the code for efficient use fo available hardware
  - Studied the effect of variation in active parameters like the host(human) recovery rate and the number of lattice points were varied on the epidemic spread

- **Numerical Methods for Quantum and Classical Physics**
  (February'19 - April'19)
  - Implemented Euler-Cromer and Velocity Verlet method for calculating phase space plots for mechanical oscillators and astronomical bodies.
  - Numerically solved the Schrodinger Equation for various potentials using matching and shooting method

CONFERENCES/PRESENTATIONS

- **Asymmetric Current-Voltage Characteristics in Graphene-hBN Dot-Ring Nanostructures -a numerical study** IEEE NMDC 2019- *Stockholm, Sweden*

TECHNICAL SKILLS

- **Script:** Python, C, C++, VerilogA, PBS
- **Tools:** MATLAB, NEMO5, SILVACO(TCAD), Sentaurus (TCAD), Cadence Virtuoso, LaTeX

TEACHING EXPERIENCE

- **Teaching Assistant for Electronic Devices**, IIT Gandhinagar
  (August'19 - November'19)
  - Designed question papers and problem sets, conducted MATLAB introduction session, corrected answer scripts and organised learning sessions for the introductory course on solid state device physics for undergraduates

ACADEMIC ACHIEVEMENTS

- Dean's List holder for the 2^{nd}, 3^{rd}, 4^{th} and 5^{th} semester. Dean's List is awarded to a student for excelling in academics by obtaining a CPI of 8.5 or higher in that particular semester

RELEVANT COURSES

- *Undergraduate Level Courses*:
  - Electronic Devices
  - Introduction to Materials Science
  - Probability and Random Processes
- *Graduate Level Courses*:
  - Computational Physics (Fall Semester 2019)
  - Quantum Mechanics I (Fall Semester 2019)
  - Statistical Mechanics(Spring Semester 2020)
  - Physics of Transistors
  - Nanoscale Device Engineering
  - Lasers
  - Physics of 2D materials

CO-CURRICULAR ACTIVITIES

- **EWYL Program**(Earn While You Learn)
  - Prepared Question Banks for Undergraduate Mathematics Courses, September 2017-March 2018 at IIT Gandhinagar
- **Member of Team LaTeX**(Student Organisation)
  - Organised and co-instructed a workshop in January 2018 and January 2019 on **Introduction to LaTeX** for the entire student community of IIT Gandhinagar

EXTRA-CURRICULAR ACTIVITIES

- Represented IIT Gandhinagar in various sports tournaments as a member of the college basketball team
- Prepared Question Banks for Undergraduate Mathematics Courses, September 2017-March 2018 at IIT Gandhinagar