Sanket Chirame

Department of Physics
Indian Institute of Technology, Bombay
Mumbai, India 400076

Mail: sanketchirame12@gmail.com
Web: --

Research Interest

My primary research interest lies in **Theoretical Condensed Matter Physics**. I am particularly interested in Quantum Many Body Systems, Non Equilibrium Physics of Quantum Systems and Role of Topology in Quantum systems.

Education

- Indian Institute of Technology, Bombay [2014 - Present]
  B.Tech. + M.Tech. in Engineering Physics with specialization in ***Nanoscience***
- Secured **All India Rank - 38** in Physics Graduate Aptitude Test in Engineering (GATE) [2018]
- Awarded AP grade for exceptional performance in Physics of nanostructures and nanodevices [2018]
- Recipient of prestigious National Talent Search **(NTS)** scholarship [2008]
- Secured **State Rank - 1** in Maharashtra state board secondary school examination [2012]

Research & Technical Experience

Master's Thesis - Non-equilibrium Physics of Many Body State
July '18 - Present

Guide: Prof. Soumya Bera, Department of Physics, IIT Bombay

- Understood **Matrix Product state formalism** for efficient simulation of quantum many body states
- Studied **DMRG algorithm** for quench simulation of transverse field Ising model to study dynamical quantum phase transitions characterized by non-analytic behaviour of Loschmidt echo
- Analysing time evolution of entanglement entropy in **periodically driven tight binding fermion chain** with site dependent chemical potential by computing two-point correlators

Summer Internship - Universität Konstanz, Germany
Summer 2017

Guide: Prof. Wolfgang Belzig, Dr. Akashdeep Kamra
Project: Study of qubit in squeezed boson cavity

- Investigated **excitations in squeezed boson cavity** due to its interaction with single two level system
- Analysed the time evolution of number operator expectation value in presence of squeezed mode **without** making **Rotating Wave Approximation**
- Compared the results obtained by perturbation theory and exact diagonalization to determine the contribution of non energy conserving terms in Hamiltonian

Advitiy - Student Satellite Project, IIT Bombay
Feb '17 - Present

The 2nd student satellite of IIT Bombay, technically advanced and efficient version of the 1st, Pratham

- Developed a **quality assured simulation frame-work** for attitude dynamics of satellite in python and performed extensive simulations to determine attitude deviations in an uncontrolled satellite
- Determined the **feasible specifications for magnetorquer** (actuator) considering constraints imposed by all subsystems along with ensuring the successful detumbling of 1U satellite
- Studied 'Measuring Hardness ratio of Blackhole X-ray spectrum' as a potential payload idea for Advitiy and determined the system and subsystem level requirements

Dynamics of Cellular Networks
May '16 - Sep '16

Guide: Prof. Mandar Inamdar, Department of Civil Engineering, IIT Bombay

- Studied closure dynamics of wound in epithelial monolayer due to mechanical coupling of actomyosin cable contraction tensile force and cell crawling motile force
- Performed simulations for cellular monolayer as a **vertex based model** using Chaste C++ library
- Analyzed effect of **curvature dependent motile force** on the wound closure time and trajectories of boundary cells for crescent shaped wound

Key Course Projects and Seminars

Decoherence in Quantum Dots
Autumn 2017

Guide: Prof. Kasturi Saha, Department of Electrical Engineering, IIT Bombay — *Spintronics*

- Studied the **decoherence** of an electron spin in quantum dot due to interaction with nuclear spin bath
- Performed simulations to determine decoherence in InAs quantum dot using pseudospin evolution and analysed its dependence on external magnetic field

Introduction to String Theory
Autumn 2016

Guide: Prof. Kumar Rao, Department of Physics, IIT Bombay — *Supervised Learning*

- Studied the motion of classical relativistic strings using the Nambu-Goto string action and conserved currents arising from translational and Lorentz symmetries
- Understood Gauss law and gravitational constant in extra compactified dimensions

Spin-Orbit Coupling in Graphene
Spring 2017

Guide: Prof. Anshuman Kumar, Department of Physics, IIT Bombay — *Physics of nanostructures*

- Analysed band structure of graphene considering spin-orbit coupling in the presence of electric field; studied the implications of time reversal symmetry on the degeneracy at the Dirac point

Position of Responsibility

Subsystem Head, ADC Subsystem, Advitiy
Feb' 17 - July' 18

- Headed an **interdisciplinary team of 10 members** to generate a Baseline Design of Attitude Determination and Control Subsystem (ADCS) for Advitiy
- Executed **three stage recruitment process** to test technical skills, practical approach and team work of candidates thereby selecting 8 candidates out of 30 applicants
- Developed and implemented **quality assurance guidelines** to make the design process more reliable
- Contributed to **Satellite 101 wiki**, a compilation of exhaustive knowledge of satellite project which reached 5.8k page views and **1.4k users** around the globe within a month

Teaching Assistant - Microcontroller Lab
Fall 2018

- Tutoring **40+ students** for lab on **Arduino** programming; assisting faculty in design of lab assignments, solving experimental and theory doubts, and evaluating papers

Relevant Coursework

Physics — Theoretical Condensed Matter Physics, Superconductivity and Low Temperature Physics, Physics of Nanostructures, Relativistic Quantum Mechanics, Advanced Statistical Physics, Physics of Quantum Devices, Advanced Simulation Techniques

Mathematics — Group Theory methods in Physics, Complex Analysis, Calculus, Numerical Analysis, Differential Equations (I & II)

Technical Skills

Programming Languages — Python, C++, LaTeX

Simulation Softwares — MATLAB, Mathematica, Simulink, Origin

Extra-curricular Activities

- Devised modules to work with peer learning based pedagogy and flipped classroom model of teaching as a part of summer internship program at Avanti Learning Centres
- Volunteered as a tutor for NGOs Vidya & LCCWA under **National Service Scheme** (NSS) educational outreach program
- Surveyed several physically challenged students as part of project to develop interactive learning modules
- Secured **A grade** in both Elementary and Intermediate Drawing grade examinations conducted by the Government of Maharashtra state