Shravan Godse

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Education

Indian Institute of Technology, Bombay *July '18 - Present*
Bachelor of Technology (with honors) in Mechanical Engineering *Mumbai, India*

- CPI (after 6 semesters) : **8.97/10**
- Pursuing a minor in Management from Shailesh J. Mehta School of Management

Arihant Jr. College *June '16 - June '18*
Higher Secondary Education *Pune, India*

- Secured **90.31%** in Class XII exams (stood **second** in the institute)
- Awarded INSPIRE scholarship by Department of Science and Technology, GoI for performance in **top 1%**

Research Experience

Materials Research Lab *July '20 - Present*
Guide: Prof. Ankit Jain | Department of Mechanical Engineering *IIT Bombay*
Working as an Undergraduate Research Assistant exploring Machine Learning enabled materials discovery, Density Functional Theory (DFT) and DFT driven thermal conductivity prediction
Multichannel Thermal Transport in type-I Clathrates (Bachelors Thesis I)
Awarded Undergraduate Research Award-1 by IIT Bombay for this project

- Computed temperature dependent lattice thermal conductivity of type-I clathrates $X_8Ga_{16}Ge_{30}$ (X: Sr/Ba), using inhouse ab-inito based anharmonic lattice dynamics code on Spacetime-HPC at IIT Bombay
- Accounted for 3ph scattering, coherent transport channel and boundary+isotope scattering
- Obtained several lattice dynamical properties viz. Dispersions, DoS, Atomic Displacement Parameters, etc.
- Deployed phonon-renormalization and T-dependent PES sampling to account for strong anharmonicity
- Obtained DFT potential energy surface and force-field around Ba/Sr atoms in tetrakaidecahedral cages
- Visualized clathrate crystal structure, bonds, polyhedral cages, phonon mode-eigenvectors in VESTA

Vibrational Spectra of $FAPbBr_3$ *May '21 - Present*
Guide: Prof. David Egger | Department of Physics *TU Munich*
Research Internship at **Theory of Functional Energy Materials** Lab at TU Munich, Germany (WFH)

- Performed convergence and structure relaxation calculations on Si, GaAs, $FAPbBr_3$ using VASP
- Performed Van-der Waals corrections using Tkatchenko-Scheffler method and optB88-vdW functionals
- Obtained phonon dispersion curves of Si, GaAs and $FAPbBr_3$ using Phonopy with finite difference method
- Simulated **infrared and Raman spectra** of $FAPbBr_3$ using Phonopy-SpectroscoPy module

Materials Simulation *April '20 - July '20*
Guide: Prof. Dipanshu Bansal, Department of Mechanical Engineering *IIT Bombay*
Simulated Bandstructure, Density of states and Phonon Dispersions of materials using DFT software

- Reviewed concepts in solid state physics and completed an online course on Density Functional Theory
- Performed SCF calculations for convergences with respect to energy cutoffs and k point sampling
- Obtained bandstructure and phonon dispersion curves for **Al** and **Si** using **Quantum Espresso**
- Obtained the density of states (total and orbital projected) using dos.x and projwfc.x modules in Espresso

Industry Experience

Advance Engineering Intern | Varroc Engineering Pvt. Ltd. *December '19*
Guide: Mr. Lohit Dhamija - Manager, Advance Engineering *Pune*
Varroc is a global technology powerhouse in manufacturing and supplying automotive components

- Researched various charging strategies for Lithium-ion batteries for Electric Vehicle applications
- Studied and presented Constant Current-Constant Voltage (CC-CV), Multistage, Pulsed and Fuzzy Control based charging of lithium-ion batteries based on literature reviews
- Modelled CC-CV and Multistage charging in Simulink to compare for an optimal charging profile

Key Course Projects

Non-uniform meshed Schrodinger-Poisson | **Report** *Autumn '20*
Course : Physics of Nanoelectronic Devices
Instructor: Prof. Dipankar Saha, Department of Electrical Engineering *IIT Bombay*

- Obtained a **99.64% accuracy** with **$1/4^{th}$ computational resources** upon solving Schrodinger equation using non-uniform mesh for finite quantum well in Python
- Implemented the self-consistent Schrodinger-Poisson equation to obtain carrier densities in AlGaAs and GaAs

BiDet-binarized object detector | **Report** *Autumn '20*
Course : Deep Learning, Theory and Practice
Instructor: Prof. P. Balamurugan, Department of IEOR *IIT Bombay*

- Worked in a team of 4 and used a binarized neural network Bidet by Wang et;al for object detection
- Experimented on PASCAL-VOC and COCO datasets for training and testing the object detector

Benzene Molecule Simulation | **Report** *Autumn '20*
Course : Introduction to Ab-initio methods
Instructor: Prof. Sumit Saxena, Department of MEMS *IIT Bombay*

- Utilised **Quantum Espresso** to carry out Density Functional Thoery calculations on **Benzene molecule**
- Performed self consistent calculations using pw.x module and visualized the **molecular orbitals** of Benzene

Technical Activities

Nonlinear Dynamics and Chaos | **Report** *Summer '20*
Summer of Science, Maths and Physics Club *IIT Bombay*

- Applied concepts of Nonlinear Dynamics and Chaos to Economic Supply-Demand models
- Performed extensive study of Nonlinear Dynamics through books by Strogatz, Shone and online resources
- Simulated the Cobweb Model with Adaptive Expectations for nonlinear supply by Cars Homes, 1994 (Journal of Economic Behavior and Organization) using MATLAB and demonstrated Chaotic Behavior

Junior Controls Engineer | **Exofly IIT Bombay** *Summer '20*
Summer of Science, Maths and Physics Club *IIT Bombay*

- Part of **33 member** tech-team in the institute with a vision of developing a **Personal Air Taxi**
- Completed MATLAB Onramp and modelled thermostat and Falcon's flight as a part of Simulink Onramp
- Modelled a **Deca-copter** (UAV with ten rotors) in **Simulink** using custom made blocks

Technical Skills

Languages	: Python, MATLAB, C++, HTML*, CSS*
Softwares and Packages	: Simulink, NumPy, Matplotlib, Pandas, Keras, Scikit-Learn
Materials Simulation/Querying	: Quantum Espresso, VASP, Phonopy ASE, Matminer, Pymatgen
Others	: Autocad, LaTeX, Adobe-Photoshop*, Inkscape*, MS Office, Blender*

*basic proficiency

Scholastic Achievements

- Awarded a merit-based **branch change** based on exemplary academic performance in the first year ['19]
- Secured **All India Rank 1242** among **2 lakh** candidates in **JEE Advanced** for admission to IITs ['18]
- Secured **All India Rank 3433** among **1.1 million** in **JEE Main** entrance exam ['18]
- Amongst **top 1 %** students in **National Standard Examination in Physics** and **National Standard Examination in Astronomy** conducted by Indian Association of Physics Teachers ['18]
- Recipient of the prestigious **Kishore Vaigyanik Protsahan Yojana (KVPY) scholarship**, a national fellowship awarded by Dept. of Science & Technology, Government of India ['18]

Key Courses

Mechanical Core Courses	Strength of Materials, Fluid Mechanics, Thermodynamics, Structural Mechanics, Manufacturing Processes, Mechanical Measurements Heat Transfer,Mechanical Design‡ Thermal Design of Electronic Equipment‡
Programming & Math Courses	Computer Programming and Utilization, Neural Networks and Deep Learning†, Applied Machine Learning in Python†, Deep Learning-Theory and Practice, Statistical Machine Learning and Data Mining‡, Multivariable Calculus
Physics/others	Quantum Physics and Applications, Density Functional Theory†, Physics of Nanoelectronic Devices, Introduction to Ab-initio methods, Lattice Dynamics and Thermal Transport, Neuromorphic Engineering‡

† Coursera MOOCs ‡ to be completed by Dec 2021

Mentorship Roles

Department Academic Mentor *July '20 - May '21*
Department Academic Mentorship Program *IIT Bombay*

- Part of a 39-member team selected out of 100+ applicants after extensive interviews and peer reviews
- Mentoring 6 sophomores in the department to provide academic guidance and general counsel
- Functioning as the First Point of Contact, aiding communication between students and faculty

Summer of Science Mentor *Apr '20 - June '20*
Maths and Physics Club *IIT Bombay*

- Mentored students for a study in Controls Theory as a part of Summer of Science by MnP club
- Provided them with textbooks and online references to topics pertaining their interests

Volunteering

Convener - Krittika, The Astronomy Club *Apr '19 - Apr '20*
Institute Technical Council *IIT Bombay*

- As a part of a team of 8, responsible for organizing 20+ technical events like lectures and workshops
- Entrusted with responsibility and maintenance of Dobsonian and Alt-azimuth mount telescopes
- Conducted over-night sky observation sessions and theoretical astronomy competitions in the campus
- Familiarized beginners in astronomy with basic concepts in star-gazing and telescope handling
- Designed posters, stickers and other merchandise for the club and increased public outreach

Extracurricular Activities

- Finished year long training in Swimming under National Sports Organization (NSO)
- Completed 3 levels of Indian Classical Music (Vocals) and 1 level of Harmonium (Indian Classical)
- Completed School Students Summer Programme by IUCAA, Pune
- Completed Fit in Deutsch 1 (A1 level proficiency in German) conducted by Goethe Institut

References

Prof. Ankit Jain
Materials Research Lab
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Indian Institute of Technology, Bombay
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Prof. David Egger
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Technical University of Munich, Germany
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