

SHRAVAN GODSE

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EDUCATION

Indian Institute of Technology, Bombay

Bachelor of Technology (with honors) in Mechanical Engineering

July '18 - Present
Mumbai, India

- CPI (after 6 semesters) : **8.97/10**

- Pursuing a minor in Management from Shailesh J. Mehta School of Management

Arihant Jr. College

Higher Secondary Education

June '16 - June '18
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%**

PUBLICATION

Shravan Godse, Yagyank Srivastava, Ankit Jain *Anharmonic Lattice Dynamics in Type-I Clathrates*
(under review, 2021)

RESEARCH EXPERIENCE

Materials Research Lab

Guide: Prof. Ankit Jain | Department of Mechanical Engineering

July '20 - Present
IIT Bombay

Working as an Undergraduate Research Assistant exploring Machine Learning enabled materials discovery, Density Functional Theory (DFT) and DFT driven thermal conductivity prediction

Awarded **Undergraduate Research Award-1** by IIT Bombay for contributions to research in lattice dynamics

Multichannel Thermal Transport in type-I Clathrates (Bachelors Thesis I)

- Computed temperature dependent lattice thermal conductivity of type-I clathrates $X_8Ga_{16}Ge_{30}$ (X: Sr/Ba), using inhouse ab-initio 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

Lattice Dynamical Properties using Machine Learning (Bachelors Thesis II, ongoing)

- Obtained material fingerprints using **Voronoi Tessellation** and **Local Property difference** technique
- Employing techniques like **neural networks**, regression, **random forests**, KNN, to predict lattice dynamical properties like heat capacity, sound velocity and mean square displacements

Vibrational Spectra of $FAPbBr_3$

Guide: Prof. David Egger | Department of Physics

May '21 - August '21
TU Munich

Research Internship at **Theory of Functional Energy Materials** Lab at TU Munich, Germany (WFH)

- Investigated potential energy surface of FA^+ in $PbBr_3$ environment and optimized hybrid perovskite structure
- Reviewed and performed Van-der Waals corrections using Tkatchenko-Scheffler method in VASP
- 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 VASP and PhonoPy-Spectroscopy modules

Materials Simulation

Guide: Prof. Dipanshu Bansal | Department of Mechanical Engineering

April '20 - July '20
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 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

Archimedes Screw for Manhole Cleaning | [Website](#)

Autumn '21

Course : Machine Design

Instructor: Prof. Shantanu Tripathi, Department of Mechanical Engineering

IIT Bombay

- Working in a team of 7, designing engineering solutions to alleviate the issue of manual scavenging in India
- Modeled an archimedes screw in **Fusion 360** and estimated efficiency, torque and power requirements

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 **1/10th 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 Materials Science

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

Institute Technical Council

IIT Bombay

- Worked in a **33 member** tech-team in the institute with a vision of developing a **Personal Air Taxi**
- Completed MATLAB Onramp and modeled thermostat and Falcon's flight as a part of Simulink Onramp
- Modeled 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, L^AT_EX, Fusion 360, Inkscape, MS Office,

*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]
- Secured **325/340(4.5/6 AWA)** in **GRE** and **111/120** in **TOEFL** ['21]
- Awarded the **Scholarship for Higher Education (SHE)** under INSPIRE scheme by **DST**, Government of India for outstanding performance scoring in top 1% in class XII examination ['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 Engineering Curriculum*	Fluid Mechanics, Solid Mechanics, Thermodynamics, Heat Transfer Mechanical Measurements, Manufacturing Processes
Machine Learning, Math	Deep Learning-Theory and Practice, Statistical Machine Learning and Data Mining, Linear Algebra, Multivariable Calculus
Physics, Materials Science	Quantum Physics, Physics of Nanoelectronic Devices, Introduction to Ab-initio Methods, Lattice Dynamics and Thermal Transport

*associated Lab Course

MENTORSHIP ROLES

Institute Student Mentor <i>Institute Student Mentorship Program</i>	<i>June '21 - Present</i> <i>IIT Bombay</i>
<ul style="list-style-type: none">• Part of a 133-member team selected out of 300+ applicants on the basis of overall performance in the institute via a rigorous procedure of SoPs, interviews and peer reviews• Responsible for mentoring a group of incoming freshmen aiding them adjust to life at IIT Bombay	
Department Academic Mentor <i>Department Academic Mentorship Program</i>	<i>July '20 - May '21</i> <i>IIT Bombay</i>
<ul style="list-style-type: none">• Mentored 6 sophomores in the department to provide academic guidance and general counsel• Functioned as the First Point of Contact, aiding communication between students and faculty	
Summer of Science Mentor <i>Math and Physics Club</i>	<i>May '20 - July '20</i> <i>IIT Bombay</i>
<ul style="list-style-type: none">• Mentored students over the summer of 2020 in a detailed study on Controls Theory and its applications• Provided them with textbooks and online resources on Controls Theory pertaining to topics of their interest	

EXTRACURRICULAR ACTIVITIES

- Volunteered at Krittika, the astronomy club of IIT Bombay, conducting star gazing activities and lectures
- An active member of Materials Science student interest group
- 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 Fit in Deutsch 1 (A1 level proficiency in German) conducted by Goethe Institut

REFERENCES

Prof. Ankit Jain Materials Research Lab Department of ME IIT Bombay a_jain@iitb.ac.in	Prof. David Egger TheoFEM Lab Department of Physics TU Munich, Germany david.egger@tum.de	Prof. Dipanshu Bansal Vibrational Spectroscopy Lab Department of ME IIT Bombay dipanshu@iitb.ac.in
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