

# 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%**

## 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

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

### Vibrational Spectra of $FAPbBr_3$

May '21 - August '21

Guide: Prof. David Egger | Department of Physics

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

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 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

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### 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 **1/10<sup>th</sup> 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 IEOB

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 Theory calculations on **Benzene molecule**
- Performed self consistent calculations using pw.x module and visualized the **molecular orbitals** of Benzene

## TECHNICAL ACTIVITIES

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### 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

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**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<sup>A</sup>T<sub>E</sub>X, Adobe-Photoshop\*, Inkscape\*, MS Office, Blender\*

\*basic proficiency

## SCHOLASTIC ACHIEVEMENTS

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- 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

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

<sup>†</sup> Coursera MOOCs    <sup>‡</sup> to be completed by Dec 2021

## MENTORSHIP ROLES

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<b>Institute Student Mentor</b> <i>Institute Student Mentorship Program</i>	<i>June '21 - Present</i> <i>IIT Bombay</i>
<ul style="list-style-type: none"><li>• 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</li><li>• Responsible for mentoring a group of incoming freshmen aiding them adjust to life at IIT Bombay</li></ul>	
<b>Department Academic Mentor</b> <i>Department Academic Mentorship Program</i>	<i>July '20 - May '21</i> <i>IIT Bombay</i>
<ul style="list-style-type: none"><li>• Part of a 39-member team selected out of 100+ applicants after extensive interviews and peer reviews</li><li>• Mentoring 6 sophomores in the department to provide academic guidance and general counsel</li><li>• Functioning as the First Point of Contact, aiding communication between students and faculty</li></ul>	
<b>Summer of Science Mentor</b> <i>Maths and Physics Club</i>	<i>Apr '20 - June '20</i> <i>IIT Bombay</i>
<ul style="list-style-type: none"><li>• Mentored students for a study in Controls Theory as a part of Summer of Science by MnP club</li><li>• Provided them with textbooks and online references to topics pertaining their interests</li></ul>	

## VOLUNTEERING

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<b>Convener - Krittika, The Astronomy Club</b> <i>Institute Technical Council</i>	<i>Apr '19 - Apr '20</i> <i>IIT Bombay</i>
<ul style="list-style-type: none"><li>• As a part of a team of 8, responsible for organizing 20+ technical events like lectures and workshops</li><li>• Entrusted with responsibility and maintenance of Dobsonian and Alt-azimuth mount telescopes</li><li>• Conducted over-night sky observation sessions and theoretical astronomy competitions in the campus</li><li>• Familiarized beginners in astronomy with basic concepts in star-gazing and telescope handling</li><li>• Designed posters, stickers and other merchandise for the club and increased public outreach</li></ul>	

## EXTRACURRICULAR ACTIVITIES

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- 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

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Prof. Ankit Jain  
Materials Research Lab  
Department of Mechanical Engineering  
Indian Institute of Technology, Bombay  
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