Gaurav P
Computer Science & Engineering
Indian Institute of Technology Bombay

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B.Tech.
Gender: Male
DOB: 08-11-2001

Examination	University	Institute	Year	CPI / %
Graduation	IIT Bombay	IIT Bombay	2023	

Pursuing **Minors** in **Data Science and Machine Learning** and **Honors** in Computer Science

Scholastic Achievements and Olympiads

- Secured **All India Rank 278** in **IIT JEE-Advanced** out of 245,000 candidates *(2019)*
- Secured **99.994 percentile** in **JEE-Main** out of 1.2 million candidates *(2019)*
- Qualified **Indian National Physics Olympiad**(INPHO) among **top 46** students nationally *(2019)*
- Attended selection camp for **IPHO** by **Tata Institute of Fundamental Research**(TIFR) *(2019)*
- Awarded the prestigious **KVPY Fellowship** by DST, Govt. of India with **All India Rank 38** *(2018-19)*
- Secured **Top 35** in **National Standard Exam Physics**(NSEP) in the country *(2019)*
- Awarded National Talent Search Examination (**NTSE**) scholarship by NCERT, Govt. of India *(2017)*
- Awarded **Advanced Performer Grade** in **Quantum Mechanics** course for top 1% *(2019)*
- Secured **High Distinction** for Maths and Science in **ICAS** conducted by **UNSW**(Australia) *(2018)*
- Secured rank1 in **NSO**,rank2 in **IMO**, nationally conducted by **Science Olympiad Foundation**(SOF) *(2019)*
- Qualified for **Indian National Chemistry Olympiad** (INCHO),**Indian National Astronomy Olypiad**(INAO), **Indian National Physics Olympiad** (INPHO) among top 300 students nationally *(2019)*

Research Projects

Retinal Fundus Segmentation *Ongoing*
Guide: Prof Suyash Awate | Research Project *IIT Bombay*

- Developed a baseline **U-Net** model for the joint **Segmentation** of the optic **disc** and optic **cup**
- Simulated **imaging artifacts** and common **retinal abnormalities** to make the model robust while training
- Achieved **Dice** Coefficients of **0.81** for the optic cup and **0.92** for the optic disc using the baseline model

Smart Car Monitoring *Summer 2021*
Guide: Prof T.Deserno | Research Internship *TU Braunschweig*

- Performed **Literature search** over various sources like **Scopus,IEEE Xplore** to understand algorithms used
- Incorporated **Xception-v3** network as part of transfer learning in the model to achieve **93% validation accuracy**
- Implemented a **CNN-LSTM** model to incorporate **temporal features** for better hand activity monitoring

IPL Data Analysis *Summer 2021*
Guide: Prof Amuthan | Summer Undergraduate Research Project *IIT Bombay*

- Analysed various parameters to infer the abilities of different batsmen and bowlers and plotted them
- Developed **linear** model using **VarSVM** package to device **weightage** to parameters of measure and rate players
- Teams were analysed and given ratings similar to **Elo-Rating** by fitting a **Gumbell** distribution with **IPL Data**

Key Projects

Bayesian Super Resolution *Summer 2021*
Guide: Prof Suyash | Course Project *IIT Bombay*

- Devised a two-stage model for estimating single **high-resolution** image from several **unaligned LR** images
- Computed **marginal likelihood** using **Gaussian** prior over HR image to estimate **image registration** parameters
- Computed the **Maximum A-Posteriori** (MAP) estimate of the HR image by using **edge-preserving** priors like the **Markov Random Field** (MRF) prior and the **Total Variation** (TV) prior
- Achieved a **44** % improvement in **PSNR** values compared to traditional approaches like **Bicubic interpolation**

Poisson Denoising-Deblurring *Summer 2021*
Guide: Prof Ajit Rajwade | Course Project *IIT Bombay*

- Implemented **Plug and Play** scheme to solve **Poisson Inverse** problems of **Denoising** & **Deblurring**
- **Alternating Direction of Multipliers Method**(ADMM) was used to solve the **Bayesian** formulation
- **BM3D** and **L-BFGS** were used as **Gaussian Denoiser** for denoising and deblurring respectively
- High **PSNR** values were obtained after solving the inverse problem on poor images with the help of **Binning**

Intelligent Chess Agent *Summer of Science* *Summer 2021*

- Implemented Reinforcement Learning based agent that **self-plays** and uses **TD(0) learning** to find optimal policy.
- Used **depth-limited mini-max** search to find the optimal move. Implemented **Treestrap** to improve the policy from the mini-max search results. Used α, β **pruning** to fasten the mini-max technique to search.

Compressive Sensing and Recovery *Spring 2021*

Guide: Prof Ajit Rajwade | Course Project *IIT Bombay*

- Coupled CS-based **tomographic** reconstruction was performed for brain images with **l1-ls**(optimization package)
- **Iterative Shrinkage-Thresholding Algorithm**(ISTA) was applied for denoising which was applied patch-wise
- Set of video frames were recovered from a **Single exposure Coded Snapshot** using compressing sensing methods with **Orthogonal Matching Pursuit** for the optimization problem and high **PSNR** values were achieved

Computer Vision Intern *Summer 2020*

Languify, Startup IITB *Mumbai, India*

- **Developed Face Emotion Recognition** module in python by processing real time video feed
- Incorporated **ResNet Architecture** in the model to reduce **model size** and get better performance
- Used **Gluon CV** to study the **Body Pose** and developed a method for measuring the extent of **body language**

Other Projects

Notify Me *Prof. Amitabha Sanyal | Course Project* *Autumn 2020*

- Developed **Centralized Notification System** for students with both **Django** Framework and **Android** application using **Android studio** with priority feature and a dashboard for professors to manage groups

Season of Code *Web and Coding Club* *Summer 2020*

- Implemented **Lossless Compression algorithm** with **Fourier Transform** to order the data and store it.
- Implemented **Seq2Seq** model in **Tensorflow2.0** with **custom loss function** for increased performance

Emotify | Emotion Recognition Model *ITSP* *Summer 2020*

- Developed a **Face Emotion Recognition Model** in python using **Keras** and **OpenCv** to analyse video feed
- Constructed a **dataset** by using **FER2013** dataset and crawled images from **shutterstock API** using **beautifulsoup** to remove data imbalance and built **Web Application** and **Android App** for integration

Technical Skills

Programming	C++, Python,Bash, Sqlite, HTML5,Bootstrap JavaScript,Angular
Software	MATLAB, MS-EXCEL, Git, LaTeX, AutoCAD
ML Packages	TensorFlow,Pytorch,OpenCV, SciPy,Sklearn,Var-SVM

Positions of Responsibility

Department Academic Mentor *Computer Science and Engineering Department* *(2021-2022)*

- Appointed mentor for 8 **sophomores** to help with **Academic** issues and Co-Mentoring another set of students
- Among the 26 candidates selected after extensive **peer reviews** and **interviews** out of a total of 74 applicants

Teaching Assistant *MA106, Linear Algebra* *(Spring 2021)*

- Conducted regular **tutorial sessions** for a batch of **46** students and evaluated their examination papers

Institute Summer Technical Project Mentor *Garbage Classification Project* *Summer 2021*

- Mentored a team of 4 students who worked on **Garbage Classification** using Deep Learning Architectures

Department Sports Secretary *Computer Science and Engineering Department* *(2020-2021)*

- Responsible for conducting **Sports Events** and **fun activities** for 750+ CSE students
- Keeping people engaged in **Co-curricular Activities** during the **Pandemic** amidst the academic load

Key Courses Undertaken

Computer Science	Data Structures and Algorithms,Data Analysis and Interpretation, Software Systems Lab*, Design and Analysis of Algorithms, Computer Networks and Lab,Advanced Image Processing, Medical Image Computing,Machine Learning and AI*,Reinforcement Learning*,Computer Architecture*,Operating Systems*,Automata Theory**,Advanced Machine Learning**,Advanced RL**,Database management**,Implementation of Programming Languages**
Mathematics	Calculus, Linear Algebra,Introduction to Probability Theory,Numerical Analysis**
Others	Economics,Quantum Mechanics, Philosophy*,

**to be completed by Autumn 2021*
***to be completed by Spring 2022*

Extracurriculars

- NSO Cricket : Selected Amongst **300+** students who applied *(2019)*
- Part of **Samvaad** a **Spirituality** group at IITB guided by **ISKCON** *(2019-Present)*
- Secured **First Certificate in English** by **Cambridge University** *(2015)*
- **District Chess** player,participated in various tournaments and won them *(2012-2014)*
- Completed **Junior Student** examination by **Indian Red Cross Society** *(2016)*
- Participated in **Young Indians** Seed Drive of planting **1lakh** trees *(2012)*