ANSH KHURANA
Computer Science & Engineering
Indian Institute of Technology Bombay

170050035
UG Third Year (B.Tech.)
Male
DOB: 15/07/1999

Examination	University	Institute	Year	CPI / %
Graduation	IIT Bombay	IIT Bombay	2020	9.66
Intermediate/+2	CBSE	Delhi Public School, R.K. Puram	2017	97.60
Matriculation	CBSE	Delhi Public School, R.K. Puram	2015	10.00

Pursuing **Honors** in Computer Science and Engineering and **Minor** in Applied Statistics and Informatics

Academic Achievements

- Secured **All India Rank 39** in **JEE Advanced** among 220,000 aspirants *(2017)*
- Achieved **99.99 percentile** in **JEE Main** among 1.2 million aspirants *(2017)*
- Currently ranked among the **top 10** out of 122 students in the Computer Science and Engineering Dept. *(2019)*
- Recipient of Annual Scholarship under **National Talent Search Examination** scheme (NTSE) *(2015)*
- Recipient of the prestigious **Kishore Vaigyanik Protsahan Yojana** (KVPY) Fellowship *(2016)*
- Secured **AP grade** in Physical Chemistry and Economics courses for exceptional performance *(2019)*
- Amongst the **top 1%** students across the nation in **NSEC** who were selected to appear for **INChO** *(2016)*
- Secured perfect **10.0/10.0** grade points in all courses in the autumn semester of the freshman year *(2017)*
- Scored **438/450** in **BITSAT** (Birla Institute of Technology and Science Aptitude Test) *(2017)*
- Received **Certificate of Merit** from **CBSE** for outstanding academic performance and for being among the **top 0.1 percent** candidates in the All India Senior School Certification Examination in Chemistry *(2017)*

Research and Work Experience

Multi-step Fusion for Instance Interactive Segmentation *Summer 2019*
Guide: Prof. Angela Yao | Research Internship *National University of Singapore*

- Worked on improving the Fully Convolutional Networks **(FCN)** approach towards interactive image segmentation
- Developed a generic framework using **PyTorch** to train and evaluate the model using multiple click sampling strategies to simulate human interaction and methods to encode the clicks into guidance maps
- Experimented with fusion of guidance maps into early and late stages of the **VGG-16** architecture

Moving Object Detection in Aerial Video *Winter 2018*
Winter Internship *ideaForge Technology Pvt. Ltd., Mumbai*

- Worked on the implementation of moving object detection via the **Background Motion Subtraction** approach
- Used **Liu's optical flow** method to estimate dense motion field between neighbouring two frames in the video clip
- Performed a particle advection procedure to extract dense particle trajectories and **RSVD analysis** to estimate the dominant motion component
- Separated foreground particles by utilizing an adaptive thresholding method on the length of object motion vectors

Key Projects

Virtual Reader *Summer 2018*
Institute Technical Summer Project *IIT Bombay*

- Designed a headgear with a **Raspberry Pi 3** and a camera capable of newspaper OCR and image classification
- Preprocessed images using **Canny Edge Detection** and **Wolf-Jolion Binarization** with **OpenCV** library
- Solved the image classification problem using a Convolutional Neural Network (**CNN**) with **TensorFlow**
- Built a companion **Android app** deployed with **Tesseract OCR** engine and a text-to-speech synthesizer

Secure Personal Cloud *Autumn 2018*
Guide: Prof. Soumen Chakrabarti | Course Project *IIT Bombay*

- Implemented a **Zero-Knowledge** based secure cloud using RSA, ARC4, Blowfish and AES-CBC block level file encryption at the client side to ensure secure end-to-end encrytion while uploading and sharing files
- Developed a server with **Django** web framework at the back-end integrated with an **SQL** database for managing multiple clients, deadlocks and synchronizing shared data among all the users
- Programmed a Linux client and a daemon which can observe a directory and sync user data actively
- Developed a **mobile-friendly** web-app using JavaScript for decrypting and rendering users' encrypted files

Malarial Parasite Detection *Winter 2018*
Guide: Prof. Suyash P. Awate | Winter Project *IIT Bombay*

- Programmed a python script for detecting Plasmodium malariae in digital images of thin blood films
- Trained a **random forest** classifier to perform pixel-wise classification through a moving patch
- Utilizing StainTools for normalizing brightness and stain colours of images to improve model accuracy

CorRacketify *Spring 2018*
Guide: Prof. Amitabha Sanyal | Course Project *IIT Bombay*

- Built an efficient spell check and correction software in **Racket** involving a **multi-paradigm** approach
- Integrated spell check using **Bloom filter**, a probabilistic data structure backed with 13 instances of **MurmurHash3** hash function to minimize false positives and optimize space requirements
- Implemented the **Burkhard-Keller Tree** data structure to support a dynamic dictionary based on the **Damerau-Levenshtein** edit distance metric to predict suitable alternatives for incorrectly spelled words

Open Shortest Path First v2 *Spring 2019*
Guide: Prof. Ashwin Gumaste | Course Project *IIT Bombay*

- Developed a synthesizable version of OSPF v2 in **VHDL** according to the **RFC 2328** industry standard
- Implemented multiple **Finite State Machines** for work conserving operation of link state update procedures

Other Projects *Course Projects*

- **SAT Solver :** Programmed a SAT solver in Racket using the Davis-Putnam-Logemann-Loveland **(DPLL)** procedure to check the satisfiability of a boolean proposition in its conjunctive normal form
- **Bayesian Image Inpainting :** Solved the **Euler-Lagrange** equation to minimize the **Mumford Shah** functional for obtaining the reconstructed image
- **Regex Matcher :** Implemented a minimalistic version of egrep in Racket by parsing the regular expression into a **trie** and building a **DFA** graph to check whether a string matches the regular expression
- **Socket Programming :** Implemented terminal based client/server file transfer protocol which handled all the file types, catered to multiple concurrent requests, supported error handling and bi-directional traffic

Technical Skills

Programming	C++, C, Python, Bash, Java, Racket(PLT Scheme), SWI-Prolog, VHDL, MySQL
Web Development	HTML5, CSS, Bootstrap, JavaScript, jQuery, AJAX, PHP, Django
Data Science	TensorFlow, PyTorch, OpenCV, MATLAB/GNU Octave, Scikit-learn
Software	Android Studio, Git, LaTeX, SOLIDWORKS, AutoCAD, Inkscape, Arduino

Key Courses Undertaken

Computer Science	Artificial Intelligence and Machine Learning*, Digital Image Processing*, Medical Image Computing, Data Structures and Algorithms, Data Analysis and Interpretation, Computer Networks, Software Systems Lab, Logic for Computer Science
Mathematics	Linear Algebra, Probability Theory, Statistical Inference*, Differential Equations, Derivative Pricing, Calculus

** to be completed by Nov 2019*

Positions of Responsibility

Teaching Assistant *Jul 2018 - Nov 2018*
MA 105, Calculus

- Conducted multiple help sessions attended by **150+ freshmen** under the guidance of Professor Shripad Garge
- Covered and explained the concepts of Calculus, solved their doubts and helped them to prepare for examinations

Volunteer *Apr 2018 - Mar 2019*
Web and Coding Club, IIT Bombay

- Speaker for Scratch Day and Introduction to Git session conducted for students of the institute
- Responsible for managing the club's website and organizing events to develop the coding culture among freshmen

Extracurriculars

- Successfully completed a year long course under **NSO** in **Weightlifting** in the freshman year *(2018)*
- Engineered an app-controlled bot as a part of XLR8 competition organized by ERC (STAB, IIT Bombay) *(2017)*
- Worked as an organizer for Mood Indigo and handled artists for multiple concerts (Pronites) *(2017)*
- Completed 3 years of formal education (CBSE) in the **French** language *(2013)*