Eashan Gupta
Computer Science & Engineering
Indian Institute of Technology Bombay

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B.Tech.
Male
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Examination	University	Institute	Year	CPI / %
Graduation	IIT Bombay	IIT Bombay	2020	8.99
Intermediate/+2	CBSE	Delhi Public School, R.K. Puram	2016	96.60
Matriculation	CBSE	Delhi Public School, R.K. Puram	2014	10.00

Pursuing **Honors** in Computer Science and Engineering

Scholastic Achievements

- Secured **All India Rank 38** in **IIT JEE Advanced** among 200 thousand candidates *(2016)*
- Secured **All India Rank 122** in **IIT JEE Mains** among 1.2 million candidates *(2016)*
- Received Gold medal for being in the **top 35** students in **INPhO**, Indian National Physics Olympiad *(2016)*
- Amongst the **top 30** students selected to attend OCSC of **INAO**, Indian National Astronomy Olympiad *(2016)*
- Recipient of **Kishore Vaigyanik Protsahan Yojna Fellowship** (KVPY) with an **All India Rank** of **121**, instituted by the Department of Science and Technology, Government of India *(2015)*
- Recipient of the **National Talent Search Examination** Scholarship awarded by the Govt. of India *(2014)*
- Amongst the **top 1%** students in **NSEC**, National Standard Examination in Chemistry *(2016)*

Internships and Research Projects

Automation of Timing Performance Checks *May '19 - July '19*
Summer Internship *Tower Research Capital, Gurgaon*
- Automated the performance **testing platform** for the software processing the order book data broadcast by market exchanges and reported the performance statistics
- Simulated environment similar to market exchanges by broadcasting old data and processing it
- Upgraded the current system running tests using new **Bash** and **Python** scripts and **Jenkins** API for automation
- Experimented over various environments using different configurations of **cache allocation technology** and running processes in parallel to observe performance statistics and any dependency patterns

Reduction in Games played on recursion schemes *May '18 - July '18*
Guide: Prof. Roland Meyer *Technische Universität Braunschweig, Germany*
- Worked on the reduction of parity games to safety games played on **higher order recursion schemes** (HORS), using similar results on reduction in the games played on **collapsible pushdown automata** (CPDA)
- Proposed a new approach to model games on recursion schemes using **computation trees** of the HORS
- Studied the equivalence between HORS to CPDA using **Krivine machines** and λ-labelled deterministic digraph
- Worked to improve the lower bound on the number of counters used in the reduction from parity to safety games

Implementation of Abstract Domains *Jan '19 - May '19*
Guide: Prof. Supratik Chakraborty *IIT Bombay*
- Studied abstract interpretation for program verification using domain specific techniques and fixed point analysis
- Implemented the **congruence** and **array** abstract domains using **C++** to be integrated in the **CAnalyzer** tool
- Engineered the array domain by mapping **segments** of an array to bound sets and sets of variable expressions
- Utilized **context-free** comparisons of variable expressions to complete operations in the array abstract domain

Course Projects

Handwriting synthesis using RNNs | *Advanced Machine Learning* *Mar '19 - May '19*
- Explored the various deep learning frameworks for handwriting synthesis and analyzed their pros and cons
- Designed an algorithm to generate cursive handwriting using attention-based **recurrent neural networks**
- Designed an **LSTM** to generate strokes for individual letters of the alphabet
- Trained the LSTM and an encoder-decoder model in an **adversarial** fashion to improve efficiency

Lightweight Probabilistic Deep Networks | *Digital Image Processing* *Oct '18 - Nov '18*
- Used probabilistic output layers and **Dirichlet** categorical classifier to account for uncertainties in deep networks
- Implemented assumed density filtering using the **Keras** API in **Python** to approximate activation uncertainties
- Modified deep network layers in the API to propagate the uncertainties within the network
- Performed experiments on MNIST and CIFAR10 database and measured cross-entropy to compare results

Automated Ticketing System for Car Parking | *Database & Information System*   Sept '18 - Nov '18
- Built an app to provide automated ticketing service for car parking using the **Flutter** API on Android
- Used **Java servlets**, **PostgerSQL** and **Tomcat** API to manage the database and its interactions with the app

Cache Timing Attacks on DSA | *Computer Architecture*   Oct '18 - Nov '18
- Explored and examined various cache timing attacks on implementations of cryptographic algorithms
- Verified the possibility of exploiting the **OpenSSL** library and recover bits of the key in a **DSA** implementation
- Studied **lattice attacks** and the hidden number problem to extract the security key using the recovered bits

Compiler for subset of C language | *Implementation of Programming Languages*   Jan '19 - May '19
- Developed a compiler and an interpreter for a subset of C language to generate its MIPS assembly code
- Used **lex** and **yacc** for parsing, creating abstract syntax trees, control flow graphs and symbol tables

Graphical Modelling and Animation | *Computer Graphics*   Aug '18 - Nov '18
- Implemented hierarchical model for 3D objects using **C++ OpenGL** and texture mapping for surfaces
- Added camera animation by moving the camera along **Bézier** curves and simulated lighting by **Phong** shading

Seat Allocation Portal | *Software Systems Lab*   Sept '17 - Nov '17
- Built a **django** based **web portal** to allocate seats based on applicant's rank and inclinations
- Implemented the **Gale-Shapley algorithm** to ensure stable matching for field allocation

Railway Signal Controller | *Digital Logic Design*   Jan '18 - May '18
- Implemented a grid railway signalling controller module on **Spartan FPGA** board using **VHDL** and **C**
- Engineered communication between FPGA and server using **UART**, and USB using the **FPGALink** library

Othello Masters | *Abstractions and Paradigms for Programming*   Mar '17 - Apr '17
- Implemented the game Othello in **Racket**, a multi-paradigm programming language in the Lisp-Scheme family
- Programmed the single player mode using the concept of **dynamic weights** and **functional programming**
- Determined the winning probability of 0.88 of our single player algorithm against the natural greedy algorithm

OTHER PROJECTS

Team Member, ADCS, Advitiy   Feb '17 - Dec '17
Advitiy is the 2nd student satellite of IITB, technically advanced and efficient version of the 1st, Pratham
- Developed a simulation for a simple Feedback Control System for a motor in **MATLAB** and **Simulink** based on the **PID controller** to understand the control law currently employed in Pratham
- Performed the **battery simulations** for the satellite in MATLAB to analyze its charging and discharging cycles to validate the control law employed in Pratham and check the overall functioning of the satellite

Wizard Chess   May '17 - June '17
Institute Technical Summer Project   IIT Bombay
- Developed an automated chess playing board which used a voice recognition system implemented using an **API**
- Engineered the single-player mode for chess using the **minimax algorithm** with **alpha-beta pruning** in C++

TECHNICAL SKILLS

Programming	C++, C, Python, Java, Bash, Racket, Haskell, Prolog, MIPS, PostgreSQL, LaTeX, VHDL
Web Development	HTML5, CSS3, JavaScript, Django, PHP, Bootstrap, jQuery
Softwares	MATLAB, Simulink, Gnuplot, Git, Android Studio, Arduino, Xilinx

POSITIONS OF RESPONSIBILITY

- TA for the online IITBombayX MOOC Soft Skills course   *Spring 2018*
- TA for the course CS - 101: Computer Programming and Utilization   *Autumn 2018*

EXTRACURRICULARS

- Successfully completed one year training in **lawn tennis** under **National Sports Organisation**, IIT Bombay
- Successfully attended **Vijyoshi Camp-2015** for the KVPY scholars held in IISER-Kolkata