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

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 Braunshweig, 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 2^{nd} student satellite of IITB, technically advanced and efficient version of the 1^{st}, 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++

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)*

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