Saksham Goel

cse.iitb.ac.in/~saksham.goel | github.com/kazikame
saksham.goel@cse.iitb.ac.in | LinkedIn

Education

Indian Institute of Technology Bombay - CPI: 9.42 / 10.0
- B.Tech with honors in Computer Science in Engineering *2017-2021*
- Minor in Applied Statistics and Informatics

Delhi Public School, Vasant Kunj - 97.2%
High School Intermediate/+2 *2015-2017*

Delhi Public School, Gurgaon - CGPA: 10 / 10
Matriculation, Class X *2014-2015*

Scholastic Achievements

- Secured **All India Rank 25** in **JEE Advanced** amongst more than 200,000 candidates *(2017)*
- Achieved **99.96 percentile** in **JEE Main** amongst 1.2 million candidates *(2017)*
- Awarded **AP Grade** for exceptional performance in **Linear Algebra** course (among top 4 out of 937) *(2018)*
- Secured a perfect grade point of **10.0** in the Autumn Semester of freshman year *(2017)*
- Awarded the **National Talent Search Examination** scholarship by NCERT, Government of India *(2015)*
- Recipient of the prestigious **Kishore Vaigyanik Protsahan Yojana** (KVPY) fellowship *(2016)*
- Among **top 1%** candidates selected for the **Indian National Olympiads** in Astronomy and Chemistry *(2016)*
- Received **Certificate of Merit** for outstanding academic performance and being among the **top 0.1%** of candidates in Chemistry All India Senior Secondary Examination from CBSE, Government of India *(2017)*

Research Experience

Crowdsourcing Segmentation *May - July 2019*
Guide: Prof. Thomas M. Deserno *Technische Universität Braunschweig, Germany*
- Implemented a variant of **STAPLE**, an expectation maximization algorithm with a custom **Markov Random Field** prior to delineate close to **ground-truth segmentations** of medical image scans from user data
- Deployed a complete stack consisting of a Django backend, PostgreSQL DB, **Celery+Redis** Async task management **docker** containers with an Nginx ingress, on a **kubernetes** cluster coupled with gitlab's **CI/CD**
- Built a segmentation tool with **Douglas–Peucker** simplification algorithm and **bezier curve** interpolation.
- Successfully organised a study with **50+ international users** for a submission in the **SPIE** Medical Conference

Liveness Based Garbage Collector *Jan - May 2019*
Guide: Prof. Amitabha Sanyal *IIT Bombay*
- Developed a **garbage collector** for Scheme on C++ based on static **context sensitive liveness analysis** of first-order functional programs
- Approximated liveness from a 0-CFA-like analysis to a fixed set of **DFAs** with a **partial order**
- Achieved **gains upto an order of magnitude** in garbage reclamation, significantly decreasing the memory requirement and running time over the standard mark and sweep implementation

Key Projects

Virtual Reader *Summer 2018*
Institute Technical Summer Project IIT Bombay
- Designed a **headgear** with **Raspberry Pi 3** and camera, capable of newspaper **OCR** and **image classification**
- Image preprocessing using **OpenCV** library with **Canny Edge Detection** and **Wolf-Jolion thresholding**
- Solved an image classification problem using a Convolutional Neural Network (**CNN**) with **TensorFlow**
- Built a companion **Android app** deployed with the **Tesseract OCR** engine and a text-to-speech synthesizer

Secure Personal Cloud *Autumn 2018*
Guide: Prof. Soumen Chakrabarti | Course Project *IIT Bombay*
- Constructed a 'zero-knowledge' cloud server with **end-to-end encryption** on files using **256-bit AES-GCM** block-level encryption, **RSA** & **PBKDF2** key exchange, following SSL/TLS network security standards
- Implemented multiple device synchronization with **deadlock management** and multiple user **file sharing** using key-wrapping cryptography on a Django backend and **SQL** database
- Built a Linux client with a periodic sync daemon and a responsive **web-app** with key based file rendering

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

- Developed a synthesisable version of the OSPFv2 on **VHDL** according to the **RFC 2328** industry standard
- Implemented a fast parameterisable **low-level** version of **Dijkstra**'s shortest path algorithm in VHDL with parallel comparators achieving a **speedup factor of >20** over the usual microprocessor version

Sudoku Solver *Spring 2018*
Hobby Project *IIT Bombay*

- Developed using the **OpenCV C++** library to extract, solve, and print the solution on any captured image
- Experimented with **Harris Corner detection**, probabilistic **Hough Line transformation**, and various **clustering** techniques to find the optimum algorithm for detecting the 10x10 grid and the bounding boxes
- Identified digits using the **Tesseract OCR** and solved the puzzle using the **Dancing Links algorithm**

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

- Designed an efficient spell check and correction software in **Racket** involving a **multi-paradigm** approach
- Integrated spell check using **Bloom Filter** and a variant of **MurmurHash3** written from scratch on Scheme
- Implemented the **BK Tree** data structure with **Damerau-Levenshtein** distance metric to predict corrections

Other Projects *Course Projects*

- **AudioConnect :** Android app to transmit data using **ultrasonic sound** with standard **data correction** protocols
- **Regex Matcher :** Implemented a minimalistic **egrep** in Racket by parsing regular expressions to a **trie** and building a Deterministic Finite Automaton graph for pattern matching with any given string
- **Website Portfolio :** Designed a personal homepage website using **HTML5**, Bootstrap CSS library, jQuery (**AJAX**) and PHP for user and server side scripting

Technical Skills

Programming	C++, C, Java, Python, Scheme, SWI-Prolog, Bash, Sed/Awk
System Design	Kubernetes, Docker, Django, PostgreSQL, Celery
Software	MATLAB/Octave, OpenCV, GNUplot/Matplotlib, Android Studio, LaTeX, Git, CMake, Ant/Maven/Gradle

Courses Undertaken

Computer Science	Artificial Intelligence & Machine Learning*, Automatic Speech Recognition*, Computer Architecture*, Data Structures & Algorithms, Discrete Structures, Design and Analysis of Algorithms, Computer Networks, Data Analysis and Interpretation, Logic for Computer Science, Abstractions and Paradigms in Programming, Digital Logic Design
Mathematics	Statistical Inference*, Probability Theory, Numerical Analysis*, Number Theory and Cryptography

** to be completed by Apr 2020*

Positions of Responsibility

Teaching Assistant, Calculus *Autumn 2018*
Guide: Prof. Shripad Garge

- Successfully conducted multiple lectures for **150+ freshmen** who were in the bottom 30% of the class to help them cope up with quizzes and the end-semester examination.

Extracurriculars

- Cleared **Grade 3** in **Piano** (TCL Graded Examination in Music) from the Trinity College, London *(2015)*
- Pursuing **French** Communication Course organised by the International Relations Office, IIT Bombay *(2018)*
- Completed **80 hrs of Social Service** educating underprivileged children and rural minorities about Sustainable Development under the National Service Scheme, IIT Bombay *(2018)*
- Secured **4th Position** in **Times NIE** 'Think&Learn Challenge' amongst 0.12 million participants *(2015)*
- Placed **3rd** in the **MUN** Arcade freshman event among 50 participants *(2017)*
- Represented school in RBIQ All India Inter School Quiz city finals, an **RBI** initiative *(2014)*