Ayush **Tulsyan**

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EDUCATION

May 2019	BT-MT Dual Degree (Computer Science And Engineering)	IIT Kanpur	9.0/10.0*	(PG)
			7.3/10.0*	(UG)
April 2014	Class XII (Central Board for Senior Education)	B.P.S. Burhanpur	89.60 %	
April 2012	Class X (Central Board for Senior Education)	N.M.S.S. Burhanpur	10.0/10.0	

**- at the end of 9^{th} semester*

ACADEMIC ACHIEVEMENTS

- Secured All India Rank - **17** in **GATE(CS) 2018** among 108K Candidates.
- Received a Pre Placement Offer from **Goldman Sachs, Bengaluru** at the end of summer internship, 2017.
- Secured All India Rank - **197** in **JEE-Advanced 2014** among 125K Candidates.
- Secured **99.97 percentile in JEE Mains 2014** Test among 1.5 Million Candidates.
- Qualified for **Kishore Vaigyanik Protsahan Yojana** Fellowship under stream SX, 2014 with rank 226.
- Amongst top 300 students qualified for **Indian National Astronomy Olympiad 2014** conducted by **HBCSE** .

EXPERIENCE

IIT KANPUR
Jan '19 - Ongoing

Teaching Assistant, Compiler Design, Prof. Amey Karkare

IIT KANPUR
Aug '18 - Nov '18

Tutor, Fundamentals of Programming, Prof. Purushottam Kar

GOLDMAN SACHS
May '17 - July '17

Summer Analyst, Data Architecture Team in Technology Division

- Explored the possibility of **SQL-on-Hadoop** replacing **Sybase IQ** , current data warehousing solution used by the enterprise.
- Focussed on **Presto** , which is an open source **distributed SQL query engine** primarily used for processing *Big Data*.
- Evaluated the two using guidelines provided by **TPC-DS Benchmark** , on **factors like query evaluation time, stability, scalability,** and **cost** . Automated this complete process from data generation to recording statistics, while allowing users to configure conditions including **scale of data, number of concurrent users,** and **resources available for computation** .
- Presented the analysis to 4 managing directors from their New York office, contributing to decision of deployment in Production.

PROJECTS

DFS TREES FOR DYNAMIC GRAPHS
Jan '18 - Ongoing

Thesis Project, under Prof. Surender Baswana

- Studied current state of the art algorithms for maintaining DFS trees under updates including insertion/deletion of edges/vertices.
- Aiming to replace the algorithms for Decremental and Dynamic DFS by efficient and simpler algorithms.
- **Designed a simpler and space efficient Dynamic DFS algorithm** superseding state of the art by a logarithmic factor (arXiv).

MODIFIED STACKED ATTENTION NETWORKS FOR VQA
Oct '17 - Nov '17

Course Visual Recognition, under Prof. Vinay Namboodiri — Github, Poster

- Implemented Stacked Attention Networks in Pytorch that learn to answer natural language questions based on images.
- Using the original three-part network model as baseline, experimented with several hyper-parameters, optimizers and models.
- **Improved upon the accuracy by 15 %** by incorporating **attention based LSTMs** and Batch Normalization.

CAPTCHA DECODER
Oct '17 - Nov '17

Course Machine Learning Techniques, under Prof. Purushottam Kar — Github

- Experimented with machine learning techniques to break alphanumeric CAPTCHAs by SquirrelMail used by IITK webmail services.
- Used simple methods as masking, noise filtering, sliding window matching to extract features from CAPTCHAs.
- Used these features to predict characters using a multi-class SVM. Could break CAPTCHAs with 71.0 % accuracy.
- Employed Deep learning using vanilla Resnet18 for character prediction to break captcha with 99.5% accuracy.

JAVA TO MIPS COMPILER
Jan '17 - April '17

Course Compiler Design, under Prof. Amey Karkare — Github

- Implemented a compiler in Python for a minimal subset of Java targeting MIPS, using PLY Framework.
- Processes input code in 4 stages: Lexing, Parsing & Semantic checks, Three Address Code Generation, and Machine Code translation.
- Incorporated support for recursion, dynamic memory allocation, multi-dimensional arrays, and preliminary OOP.

IDENTIFYING VULNERABILITIES AND SECURING ZOOBAR APPLICATION
Jan '17 - April '17

Course Computer Systems Security, under Prof. Sandeep Shukla

- Identified and exploited vulnerabilities in a web server including buffer overflow, Phishing, CSRF, XSS, Profile Worms, SQL Injection.
- Implemented mitigation techniques including privilege separation, stack canaries, ASLR, and server side sandboxing.

RAILQUERY
Jan '17 - April '17

Course Principles of Database Systems, under Prof. Medha Atre — Github

- Implemented a miniature railway inquiry platform, built over a graph based DB, with data scraped using Railway API.
- Designed an ANNE-stack(Angular, NodeJS, Neo4J, Express) based website, and suitable schema and indices for Neo4j to handle standard queries including trains between stations, connecting trains, fetch train route, all reachable stations.

NOT ANOTHER COMPLETELY HEURISTIC OS
July '16 - Nov '16

Course Operating Systems, under Prof. Mainak Chaudhuri — Github

- Extended NachOS by implementing parts of the standard sys-calls including Fork, Join, Sleep, Exec and Exit.
- Implemented and evaluated performance of scheduling algorithms including FCFS, SJF, Pre-emptive RR and UNIX Scheduling.
- Implemented Demand Paging, Shared Memory Allocation, and Page Replacement Algorithms including FIFO, LRU and LRU-Clock and analysed their performance under different workload settings.

BAJA SAE, IITK MOTORSPORTS
Jan '15 - Jan '16

Faculty Advisor Prof. Avinash Kumar Agarwal, Dept of Mechanical Engineering — Report

- Amongst 24 members of the team who worked on a yearlong project which involved designing and manufacturing an All-Terrain Vehicle and competed in Baja Student India '16, held in Noida in Jan '16.
- Lead the Chassis subsystem during designing phase of 3 months. Optimized the strength and weight of roll cage by virtual designing and simulation. Intensively simulated the CAD Model for ensuring reliability of structure and safety of driver.
- The Team stood 13^{th} in Overall ranking, 6^{th} in Design event, 4^{th} in both Acceleration and Maneuverability event.

OTHER MINOR PROJECTS

- **Convergence to Equilibria in Plurality Voting** Studied the conditions for convergence to equilibria in plurality voting (eg: online voting, where voters can keep changing their votes) as a project under course Algorithmic Game Theory. Report
- **Modern Cryptology** Studied classical and modern cryptographic methods and their weaknesses. Designed Chosen plain text attacks for weaker models of DES, AES, and RSA and extracted the keys used to encrypt data. Github
- **Video Broadcasting Service** A resource efficient python implementation of a concurrent video broadcasting server. Github
- **Computer Networks** Made an html and a proxy server for GET requests in C++ as a project.

ACHIEVEMENTS IN PROGRAMMING

- Secured Rank **67^{th}** (among 2670) in Kickstart Round H 2018 organized by Google.
- Secured Rank **13^{th}** (among 98) and **12^{th}** (among 160) in **ACM-ICPC Regionals** at Gwalior and Kanpur respectively, 2018.
- Secured Rank **30^{th}** (among 3290) in ICPC Regionals Online, 2018 and qualified for Kanpur and Gwalior Regionals.
- Secured Rank **221^{th}** (mong 3400) in **Snackdown 2017 Online Elimination**.
- Secured Rank **25^{th}** (among 120) and **50^{th}** (among 291) in **ACM-ICPC Regionals** at Chennai and Amritapuri respectively, 2017.
- Secured Rank **46^{th}** (among 2925) in ACM-ICPC Regionals, Online, 2017.
- Secured Rank **304^{th}** (among 3600) in **Snackdown 2016 Online Elimination**.

POSITIONS OF RESPONSIBILITY

Feb '16 - July '16 | **Subsystem Head, Chassis, IITK Motorsports**
Jun '15 - Apr '16 | **Student Guide, Counselling Service**
Apr '15 - Apr '16 | **Academic Mentor** *(Fundamentals of Computing)*, **Counselling Service**

TECHNICAL SKILLS

Programming Languages — C, C++, Python, Javascript, Bash, Oz, OCaml, PHP, SQL, HTML, CSS
Tools and Frameworks — Git, Vim, Emacs, LaTeX, GDB, Pytorch, Django, Wireshark, Octave, Matlab

RELEVANT COURSEWORK

Design and Analysis of Algorithms	Computer Networks	Compiler Design	Machine Learning Techniques
Randomized Algorithms	Operating Systems	Principles of Programming Lang.	Probability and Statistics
Algorithmic Game Theory	Computer Architecture	Modern Cryptology	Abstract Algebra
DS & Algorithms(A*)	Computer Systems Security	Computational Complexity Theory	Linear Algebra and ODE

A: Grade for Exceptional Performance*

EXTRA-CURRICULAR ACTIVITIES

Enjoy riding motorbikes, cycling, playing table tennis, and hiking
Competed in **Code.Fun.Do 2015** and made an application which intends to smoothen out **document handling**
Designed a Website for Institute's SAE team
Member of the team which received Best Sectional Project Award in course project of Manufacturing Processes(TA201A)