

# Gurbaaz Singh Nandra

SENIOR UNDERGRADUATE · COMPUTER SCIENCE AND ENGINEERING

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## Education

### Indian Institute of Technology Kanpur

B.TECH. IN COMPUTER SCIENCE AND ENGINEERING - 9.1/10.0

Kanpur, India

2019 - Present

### MGN Public School

CLASS XII CBSE BOARD - 95%

Jalandhar, India

2017 - 2019

### MGN Public School

CLASS X CBSE BOARD - 10.0/10.0

Jalandhar, India

Till 2017

## Honors & Awards

2021	<b>Silver medal in Inter IIT Tech Meet 9.0</b> , , built a 3D web visualisation tool for ISRO's Astrosat	🔗	IIT Guwahati
2020	<b>Academic Excellence Award</b> , for exceptional performance in academic year 2019-20		IIT Kanpur
2020	<b>Papertowns: An AR product</b> , approved under Pre-seed Ideation Program by DORA, IIT Kanpur	🔗	IIT Kanpur
2019	<b>All India Rank 208</b> , secured among 200k shortlisted students in JEE Advanced		India
2019	<b>All India Rank 159</b> , among 1.5 million students in JEE Mains conducted by NTA		India
2019	<b>National top 1% in NSEC</b> , and qualified for INAO and INChO olympiad conducted by IAPT		India
2019	<b>KVPY Fellowship</b> , secured <b>AIR 90</b> among 100k students conducted by IISc Bangalore		India
2017	<b>NTSE Scholarship</b> , awarded by Gov of India. Secured <b>State Rank 1</b>		India

## Work Experience

### Quadeye Securities, Gurgaon

SYSTEMS ENGINEER INTERN

2 Months

May 2022 - July 2022

- Implemented a low-latency Standard Portfolio Analysis of Risk (SPAN) margin predictor for F&O trading
- Developed a scalable XML to JSON parser and deserializer for SPAN Risk Parameter files, and adopted modern C++ practices and efficient data structures to achieve margin calculation under 6ms, tested on portfolio of 30+ instruments
- Researched and integrated the newer SPAN2 framework's API provided by Chicago Mercantile Exchange within the SPAN predictor, using Redis Cache to bring latency under 300ms
- Received Pre-Placement Offer as a Systems Engineer based on performance during the internship

### Disecto, Jammu

BACKEND INTERN

4 Months

Nov 2021 - Feb 2022

- Ideated and implemented PII data classification and anonymisation webapp pipeline using Presidio SDK
- Handled heavy data processing requests using a Celery distributed task queue behind RabbitMQ message broker
- Handled DevOps tasks and successfully built an AWS Codebuild CI/CD pipeline to automatically deploy a scalable Django React stack webapp on ECS behind Fargate and load balanced using Elastic Load Balancer
- Received Full-Time Offer based on performance during the internship

### Vaultedge Software Pvt Ltd, Bengaluru

DATA SCIENCE INTERN

2.5 Months

May 2021 - July 2021

- Assisted in building models for extracting all the relevant data from each of the documents in the loan package. Extraction of entities from OCR text of mortgage documents by fine-tuning the dataset on Question Answering models in PyTorch, pre-trained on SQuAD dataset with BERT and RoBERTa architectures
- Trained the model with custom questions on distil roberta and improved f1 score from baseline score of 0.47 to 0.67, and achieved partial match score of 0.80 for DoT documents, surpassing the existing NER approach which had score of 0.64
- Researched and explored layout forms multimodals like Layout LMv2 and LayoutXLM and used AWS textract to build in-house form recogniser and key-value relation extractor for various form documents

### Qure.ai Technologies Pvt Ltd, Mumbai

SOFTWARE DEVELOPMENT INTERN

2.5 Months

May 2021 - July 2021

- Gained exposure to various technological tools like PyDicom, Django-Swagger, Docker and wrote an introductory blog on Docker
- Tasked with testing and API documentation of Django backend of qER Image Manager for Head CT Scan DICOM images using Django and Sphinx
- Implemented a scalable and customisable dockerised React App (to serve as an in-house GUI product) to dynamically render user configuration forms for qER pathologies report using the JSON Schema based approach
- Tested the API calls to backend via ngrok tunneling before its final integration with the Django backend using Axios library. Secured the app with an authentication layer and included the helper information for better UX (user experience)

# Projects

## Adversarial Training is All You Need

IIT Kanpur

with Antreev, Anubhav and Pramodh | COURSE PROJECT, PROF. PRIYANKA BAGADE

Jan 2022 - April 2022

- Examined the defense of Adversarial Training against Poisoning attacks by implementing the defense against BadNet-type backdoor attack and Clean Label backdoor attack in Keras
- For clean label attack, the method increased the test accuracy on images with backdoor from 1.39% to 90.68% on MNIST
- For Badnet attacks, the method increased the test accuracy on images with backdoor from 1.17% to 91.71% on MNIST and from 8.64% to 54.86% on CIFAR-10

## Go to MIPS Compiler

IIT Kanpur

with Antreev, Anshumann and Dipanshu | COURSE PROJECT, PROF. AMEY KARKARE AND PROF. SUBHAJIT ROY

Jan 2022 - April 2022

- Implemented a Golang compiler from scratch with assembly language generated for MIPS 64 bit architecture
- The syntactic and semantic correctness of a program was verified using a lexer and parser written in Python using the PLY library alongside suitable error and warning generation for erroneous programs
- Implemented basic features like conditionals, loops, functions along with advanced features such as automatic type inference, short-circuit evaluation, compile-time constant expressions evaluation, pointers and multi-level break

## Parallel Programming

IIT Kanpur

with Dipanshu Garg | COURSE PROJECT, PROF. MAINAK CHAUDHURI

Jan 2022 - April 2022

- Implemented and compared locks such as spin lock, ticket lock etc. and barriers such as tree barrier etc. with semaphores and condition variables.
- Optimized algorithm for distributed systems for TSP, matrix inversion, matrix product and Gauss-Seidel iterative solver using OpenMP and CUDA

## GemOS

IIT Kanpur

COURSE PROJECT, PROF. DEBADATTA MISHRA

Sept 2021 - Nov 2021

- Implemented pipe and persistent pipe related system calls to support interprocess communication
- Implemented a basic debugger that allows to set/remove breakpoints at beginning or end of function calls, provide information about the register values and backtrace the function call stack
- Implemented a simplified threading library with interface similar to POSIX thread, where each thread can optionally have an augmented address space with controlled read/write access to its sibling threads

## IITK Coin

IIT Kanpur

Mentor: Bhuvan Singla (Y18) | SUMMER PROJECT, PROGRAMMING CLUB

May 2021 - July 2021

- Developed a centralised pseudo-coin system in golang for use in IITK Campus
- Involved Database Management, Password Authentication with Hashing & Salting and Session Validation with JWTs
- Implemented techniques such as concurrency and deadlock prevention to keep transactions ACID compliant

## AI Lawyer

IIT Kanpur

with Parth Srivastava, Shubh Agrawal and Suhas | COURSE PROJECT, PROF. SWAPRAVA NATH

Sept. 2020 - Nov. 2020

- Implemented game theory and argumentation framework via graphical database Neo4j and textual entailment NLP to build an AI debating chat-bot
- Conducted a data-driven study, and successfully used BERT for argumentation mining to generate 2,26,335 arguments from web-scraped 31,125 raw US Supreme Court Cases
- Encapsulated the constructed weighted directed graph of arguments/ arguments network in a debater chat app using websockets with Node.js, Express and Socket.io with Vanilla JS on the frontend with a custom UI

## Speech Ledger

D2C Hackathon

with Antreev S Brar and Som V Tambe | FLIPKARTGRID 2.0

July 2020 - Aug. 2020

- Developed a custom pipeline for a Realtime Background Noise Suppression to solve problems of Voice Interactions in Indian Houses & Neighborhoods
- Fine tuned the denoiser Dual-Signal Transformation LSTM network, Speaker recognition module based on VGG-Speaker-recognition and Speaker diarization based on UIS-RNN to work synchronously with Flipkart's Speech-to-Text API
- Qualified for penultimate round, among Top 36 teams in the problem statement category

## Model Zoo

IIT Kanpur

Mentors: Nirmal Suthar, Deepankur Kansal (Y18) | SUMMER PROJECT, PROGRAMMING CLUB

May 2020 - Jul. 2020

- Studied Deep Learning research papers and implemented them from scratch using PyTorch, in domains of Computer Vision, NLP, GANs and MultiModals
- Worked with InfoGAN, GloVe, ResNet-34 and Image Captioning multimodal with CNN encoder and LSTM decoder and CIFAR-10, MNIST and Flickr8k datasets and summarised the results in blogs

## RAD: Reading, Analysis, Discussion

IIT Kanpur

Mentors: Simran Singh, Yawar Altaf (Y18) | SUMMER PROJECT, ASTRONOMY CLUB

May 2020 - Jul. 2020

- Reading, analysis and discussion of various astronomical concepts and phenomenon from celebrated book Introduction to Astronomy : Frank H. Shu
- Grasped an intermediate level knowledge of Tensors and documented the summary of topics discussed in  $\text{\LaTeX}$
- Won award in the category "The Best Documentation" by SnT Council, IITK for the project

## Basic CP

IIT Kanpur

SUMMER PROJECT PROGRAMMING CLUB

May 2020 - July 2020

- Learnt about different Data Structures and advanced algorithms covering Number Theory, DP, Greedy algorithms, Trees, Graphs and practised on competitive programming platforms
- Explored the domain of optimising time and space complexity and studied fast computation techniques

## Writing OS in Rust

IIT Kanpur

Mentors: Saurav Prakash, Satyam Ralhan (Y17) | SEMESTER PROJECT, ASSOCIATION FOR COMPUTING ACTIVITIES

Jan. 2020 - May 2020

- Thoroughly read and studied the blog on same project by Philipp Oppermann [↗](#) to create operating system using minimal Rust kernel that runs on bare metal
- Created a Rust executable that does not link the standard library
- Understood working of a kernel and the communication via system calls

## Examination Portal

IIT Kanpur

with Anubhav Kalyani | ESC101 ADVANCED TRACK COURSE PROJECT, PROF. PIYUSH RAI

Sept. 2019 - Nov. 2019

- Developed a web application enabling user to create or appear for a timed bound MCQ exam. Post submission one can view utilities like score, rank, average class marks and the correct solutions.
- Implemented user authentication using Firebase Auth and handled user queries via Firebase Realtime Database

## Technical Skills

<b>Programming</b>	C/C++, Python, Golang, Bash, Javascript, Verilog, Julia, Rust
<b>Machine Learning</b>	PyTorch, Keras, Tensorflow, Spacy, NLTK, OpenCV, Scikit-learn
<b>Web Development</b>	Django, Flask, FastAPI, Jekyll, Hugo, React, Sphinx, JQuery, HTML5, CSS
<b>Utilities</b>	AWS, Docker, Kubernetes, Git, PostgreSQL, SQLite, Neo4j, Firebase, Selenium, Vim, $\LaTeX$
<b>OS</b>	Linux (Ubuntu, Manjaro), Windows, WSL
<b>Languages</b>	English, Hindi, Punjabi

## Relevant Coursework

Quantum Computing <sup>†</sup>	Principles of Programming Language <sup>†</sup>	Computational Genomics <sup>†</sup>
Compiler Design	Deep Learning for Computer Vision*	Parallel Programming
Computer Network	Image Processing <sup>†</sup>	Linear Algebra and ODE
Data Structures and Algorithms	Software Development and Operations	Computer Organisation
Discrete Mathematics	Fundamentals of Programming	Logic in Computer Science
Probability in Computer Science	Introduction to Game Theory and Design Mechanism*	Multivariate Calculus
		* - PG Course   † - Ongoing

## Positions of Responsibility

### Coordinator

IIT Kanpur

ASTRONOMY CLUB

April 2021 - Present

- Responsible for handling club activities and events, organising workshops, watch streams and webinars for the campus
- Revamped and built the clubs website to host blogs and resources for astronomy enthusiasts, live at [astro.sntiitk.in](https://astro.sntiitk.in)

### Senator

IIT Kanpur

STUDENTS' GYMKHANA

March 2021 - Present

- Represented 900+ students of my batch and helped in carrying out initiatives in the governing body of Students' Gymkhana

### Student Guide

IIT Kanpur

COUNSELLING SERVICE

November 2020 - July 2021

- Assisted in organising workshops and sessions for the incoming batch of **1000+** students during Orientation Week
- Responsible for getting **5** juniors acclimatized to campus life throughout their first year and helping beyond it

### Academic Mentor, Electrodynamics

IIT Kanpur

COUNSELLING SERVICE

November 2020 - July 2021

- Held virtual classes and doubt clearing sessions for **30+** students to cope with the academic session in freshmen year

### Secretary

IIT Kanpur

QUIZ CLUB

July 2020 - May 2021

- Tasked with conducting quiz events for freshers and managing the design sector for social media posters for the club events

## Miscellaneous

- Prof. Piyush Rai, based on the performance in screening test, offered to switch to Advanced Track of the course ESC101 - Fundamentals of Computing attended by over 450 freshmen
- Co-mentored "Computational Astrophysics", an SnT summer project under Astronomy Club IITK for 20+ mentees in the domain of computational techniques used in simulations, data processing and experimental analysis [↗](#)
- Built a python package for scraping linkedin comments and extracting relevant information from them. Repository on #1 result for Google search query of "Linkedin Comment Scraper" [↗](#)

- Mentored JEE students on Chemistry during pandemic for a startup, Edvizo in 2020 [↗](#).
- One-on-one mentored a JEE student (now in IIT Roorkee), as part of the CovEd India initiative in 2020 [↗](#).
- Performed street play(*nukkad natak*) and mime act in inter-hall competition Galaxy '20 in front of 100+ live audience
- Qualified among the 30 slots for cricket in Compulsory Physical Activity (CPA) 2019 among trials conducted for 100+ students