Gurbaaz Singh Nandra

SENIOR UNDERGRADUATE · COMPUTER SCIENCE AND ENGINEERING

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Education

Indian Institute of Technology Kanpur　　　　　　　　　　　　　　　　*Kanpur, India*
B.TECH. IN COMPUTER SCIENCE AND ENGINEERING - 9.1/10.0　　　　　　　　　*2019 - Present*

MGN Public School　　　　　　　　　　　　　　　　　　　　　　　*Jalandhar, India*
CLASS XII CBSE BOARD - 95%　　　　　　　　　　　　　　　　　　　　　*2017 - 2019*

MGN Public School　　　　　　　　　　　　　　　　　　　　　　　*Jalandhar, India*
CLASS X CBSE BOARD - 10.0/10.0　　　　　　　　　　　　　　　　　　　　*Till 2017*

Honors & Awards

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

Work Experience

Quadeye Securities, Gurgaon ⧉　　　　　　　　　　　　　　　　　　*2 Months*
SYSTEMS ENGINEER INTERN　　　　　　　　　　　　　　　　　　　*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 ⧉　　　　　　　　　　　　　　　　　　　　　　　*4 Months*
BACKEND INTERN　　　　　　　　　　　　　　　　　　　　　　　*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 ⧉　　　　　　　　　　　　　*2.5 Months*
DATA SCIENCE INTERN　　　　　　　　　　　　　　　　　　　　　*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 ⧉　　　　　　　　　　　　　*2.5 Months*
SOFTWARE DEVELOPMENT INTERN　　　　　　　　　　　　　　　　　*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 MIPS64 bit architecture
- Designed a lexer, parser and semantic analyzer that supports Go features including Multidimensional Arrays, Short Variable Declaration, Multilevel Pointers, Structs, Floats , Strings and Switch statements.
- Implemented Advanced features such as automatic type inference, short- circuit evaluation, compile-time constant expressions evaluation, pointers, multi-level break , recursion, string manipulation functions and basic features like conditionals, loops, functions and warning generation for erroneous programs.
- Awarded with the best score for the project among all groups in the course

Parallel Programming ⭘ *IIT Kanpur*

with Dipanshu Garg | Course Project, Prof. Mainak Chaudhuri *Jan 2022 - April 2022*

- Implemented efficient programs for solving Travelling Salesman Problem and Lower Triangular System using OpenMP
- Implemented and compared the performance of various software locks like Lamport's Bakery, Spin Lock, Test-and- Test-and-Set, Array locks and barriers like Sense reversal barrier and Tree barrier
- Implemented efficient GPU programs for Gauss Siedal Solver and Matrix Vector Product using CUDA API

GemOS *IIT Kanpur*

Course Project, Prof. Debadatta Mishra *Sept 2021 - Nov 2021*

- Created file archiving utility and enabled IPC using system calls like pipe(), fork() and exec()
- Implemented system calls for pipe and persistent pipe structures sharing order preserved data concurrently
- Developed a series of threading APIs with private memory areas by extending clone() system call
- Built a debugger for functions using INT3 featuring stack backtrace of functions

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 the IITK Campus with net/http library for client/server implementation
- Involved Database Management, User Authentication with Hashing & Salting and User Validation with JSON Web Tokens(JWTs) using bcrypt and jwt-go packages
- Explored and implemented various techniques such as concurrency and deadlock prevention to keep transactions safe in SQLite engine and maintain ACID properties in the SQL database

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) | Sᴜᴍᴍᴇʀ Pʀᴏᴊᴇᴄᴛ, Aꜱᴛʀᴏɴᴏᴍʏ Cʟᴜʙ
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 LaTeX
- Won award in the category "The Best Documentation" by SnT Council, IITK for the project

Basic CP
IIT Kanpur

Sᴜᴍᴍᴇʀ Pʀᴏᴊᴇᴄᴛ Pʀᴏɢʀᴀᴍᴍɪɴɢ Cʟᴜʙ
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) | Sᴇᴍᴇꜱᴛᴇʀ Pʀᴏᴊᴇᴄᴛ, Aꜱꜱᴏᴄɪᴀᴛɪᴏɴ ꜰᴏʀ Cᴏᴍᴘᴜᴛɪɴɢ Aᴄᴛɪᴠɪᴛɪᴇꜱ
Jan. 2020 - May 2020

- Thoroughly read and studied the blog on same project by Philipp Oppermann 🔗 to an 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 Aᴅᴠᴀɴᴄᴇᴅ Tʀᴀᴄᴋ Cᴏᴜʀꜱᴇ Pʀᴏᴊᴇᴄᴛ, Pʀᴏꜰ. Pɪʏᴜꜱʜ Rᴀɪ
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

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

Relevant Coursework

Quantum Computing [†]	Principles of Programming Language [†]	Computational Genomics [†]
Compiler Design	Deep Learning for Computer Vision*	Parallel Programming
Computer Network	Image Processing*[†]	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 Responsibilty

Coordinator
IIT Kanpur

Aꜱᴛʀᴏɴᴏᴍʏ Cʟᴜʙ
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**

Senator
IIT Kanpur

Sᴛᴜᴅᴇɴᴛꜱ' Gʏᴍᴋʜᴀɴᴀ
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

Cᴏᴜɴꜱᴇʟʟɪɴɢ Sᴇʀᴠɪᴄᴇ
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

Cᴏᴜɴꜱᴇʟʟɪɴɢ Sᴇʀᴠɪᴄᴇ
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

Qᴜɪᴢ Cʟᴜʙ
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