Pulkit Kumar

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Education

Manipal Institute of Technology — Manipal, IN
Bachelor of Technology in Electrical & Electronics Engineering — *Aug. 2023 – May 2027*

St. Francis De Sales Public School — Bengaluru, IN
High School Diploma, Indian School Certificate (ISC) — *June 2017 – May 2023*

Technical Skills

Languages: Java, C/C++, JavaScript, Python, SQL, TypeScript, GoLang, Rust, Bash, Verilog, MATLAB, JS, TS
Frameworks/Libs: Next, React, Angular, Node.js, Spring Boot, Tailwind, WordPress, Flutter, Django, Vue, KMP
Others: REST, GraphQL, yocto, buildroot, gdb, cmake, Maven, CUDA, OpenGL, gcc, gnu toolchain, AArch64 ISA
CI/CD: Git, Perforce, GitHub Actions, TravisCI, Jenkins, Vercel, GitLab, Netlify, JUnit, Mockito, Docker, Kubernetes
Databases: MongoDB, PostgreSQL, Cassandra, InfluxDB, Neo4j, MySQL, DynamoDB, Oracle DBMS, Terraform
Cloud: AWS ELB, CDK, Lambda; Azure OpenAI, Bicep, Synapse; GCP Maps, Earth Engine, Dataproc, Firebase
AI: PyTorch, JAX, TensorFlow, Keras, OpenCV, LangChain, HuggingFace, Claude, OpenAI, Gemini APIs
Data: Redis, Elasticsearch, Logstash, Scala, Kafka, Spark, Kibana, Prometheus, Grafana, Hadoop, memcached
Comms: CAN, Ethernet, IsoSPI, I2C, SPI, UART, RS232, USB3, BT, SMBus, VGA, AUX/I2S, TCP/IP, DHCP

Experience

Machine Learning Engineer — October 2024 – Present
Internship - Teachafy Labs — *Bengaluru, IN*

- Built a data ingestion pipeline for existing models using the Flowise API and automated data preparation tasks using the Adobe Services & Extract APIs, nltk, pandas, and cloudconvert, which reduced TTM by a whopping 88% and increased accuracy of ingested data by 39%+, significantly increasing user adoption and directly contributing towards the 45%+ MoM growth.
- Currently working on building RAG-based optimized LLM applications using LangChain, OpenAPI, Cohere & FastAPI

System Engineer — January 2024 – Present
Student Racing - Team SolarMobil — *Manipal, IN*

- Engineered the automotive electronics system for a solar racing EV, developing firmware for a custom ECU on an STM32H750B-DK (ARM Cortex M7), contributing 80k+ lines of low level & bare-metal C/C++ drivers to interface with dozens of automotive sensors and actuators. Configured CAN bus communication using a CANalyzer with critical tractive components like the custom BMS, race MPPT, and motor controller.
- Implemented safety-critical real-time task scheduling and synchronization using FreeRTOS, reducing thread latency by 108ms- a 55% decrease. Immensely improved driver awareness by reducing response times by 40%+ & interaction with a touch HMI display built using TouchGFX and established data logging via SDMMC interfaces. Integrated a telemetry system using XBee 900 HP modules and the WebSockets.
- Developed and deployed a cloud-based telemetry and data visualization system, enabling live data analysis for the race engineering team. Implemented data storage solutions using Prometheus and InfluxDB Cloud and created interactive dashboards with Grafana and Angular. Integrated APIs such as ArcGIS, Solcast, Google Maps, and Earth Engine to fuse vehicle state data with environmental irradiation & traffic data, providing comprehensive situational awareness. Automated predictive Simulink modelling, empowering the strategy team to make data-driven decisions and optimize race strategy, all of which resulted in 2+ filed patent applications.
- Led the adoption of an industry-standard embedded development toolchain using test-driven HIL CI/CD pipelines, ensuring high reliability and maintainability of the systems. Collaborated with multidisciplinary engineering teams and conducted stringent code reviews under tight deadlines, introducing Agile methodologies & Atlassian Jira for project management- leading to a 60% decrease in estimated timelines amidst increased collaboration & code quality.

Web Developer — Sept 2024 – Present
Internship - MTTN — *Manipal, IN*

- Built and deployed a beautiful, intuitive website for Manipal's largest student organisation- witnessing traffic of 80k+ MAU, to handle which, we utilised an AWS ELB service to package a NextJS, ThreeJS, GSAP frontend into an S3 bucket serving a Spring Boot REST API packaged into a Docker container with a Kubernetes cluster & ELK stack for cloud monitoring, performing intense code reviews and setting up a test-driven CI/CD pipeline for the same.
- Also worked on the mobile app for Android using Flutter, Dart & Firebase services and APIs such as WordPress, Instagram Analytics, Facebook Graph & Youtube Content, where we implemented responsive haptic feedback, cache storage & state preservation and WebView injection.

Embedded Software Engineer Sept 2024 – Nov 2024

Internship - Krop AI *Udupi, IN*

- Designed hardware systems and wrote I2C, SPI & UART drivers & automated initialisation tasks with python for ESP32-based autonomous agritech modules and configured an Nvidia Jetson Nano for image processing applications- utilizing SMBus, Atlas Scientific precision sensor probes & actuators and standard debugging tools like gdb, DSOs etc. to create an autonomous monitoring & actuation setup for small-scale farms with specialised requirements. Successfully demonstrated the prototype on strawberry planters to conclude the project.
- Built the ML pipeline, resulting in the training and evaluation of a crop health monitoring model built using TensorFlow & Keras, proving to be 93.47% accurate on test datasets sourced from local plantations.

RTL Design Engineer May 2024 – July 2024

Internship - CoreEL Technologies *Bengaluru, IN*

- Developed RTL design of high-speed CAN bus & I2C controllers, working on the microarchitecture spec and integrating relevant IP blocks to optimize the memories/macros required, while working with the synthesis & verification teams to ensure timing & other quality standards were met.

CEO's Office (Founding Member) Jul 2023 – December 2023

Kraftr Global Lifestyle *Bengaluru, IN*

- Secured term sheet worth $100k by developing investor decks and regularly communicating with 10+ VCs & angel investors. Formulated company strategy with CEO for sustainably sourced fashion products & scaled co. out to 3+ enterprise clients (USD 30M+ MCap).
- Co-ordinated a 6-member team across design & marketing to develop, release, track and scale out 3+ products to 10k+ users. Performed cohort-analysis and conceptualised end-user marketing campaigns, achieving a 35%+ adoption rate with 8+ monthly releases. Analysed corporate performance with 5 KPIs & suggested Target Group pivot leading to 60% MoM growth.

Community Engagement & Corporate Relations Intern October 2023 – December 2023

Open Horizon Robotics *Manipal, IN*

- Designed and delivered customized 12+ collaboration packages and elevator pitches to over 50+ organizations across sectors such as academia, corporates, electronics suppliers, student bodies, university administrations, and government organizations.
- Generated over $35k+ in kind & cash sponsorships, and onboarded 18+ partnership collaborators, directly driving 52% YoY growth by showcasing the value proposition, emphasizing on the 4 identified KPIs and incentives of the mechatronics and robotics open-source community.

UI/UX Designer September 2023 – November 2023

GramHealth *Manipal, IN*

- Designed and prototyped high-fidelity wireframes for web and mobile apps using Sketch, Adobe XD, and Figma, following the Google HEART framework to measure user happiness, engagement, adoption, retention, and task success.
- Implemented interaction design and responsive design principles to create beautiful and intuitive user interfaces that increased user satisfaction score by 20 points and user retention rate by 35%+.

CTO Jan. 2021 – Jun. 2021

Project fATE *Bengaluru, IN*

- Led a team of teen developers from over 8+ countries to build a full-stack application for connecting food-abundant establishments with food delivery, collection & distribution volunteers serving strays across localities in Bengaluru.
- Built a flutter/dart cross-platform frontend utilising the Google Maps API along with a Firebase real-time database & other serverless functions.

Student Trainee Jul. 2019 – Dec. 2019

SP Robotics Works *Bengaluru, IN*

- Designed and built a Debris Rescue Robot that used a Raspberry Pi 3B+, an Arduino Uno R3, a Logitech webcam, and various sensors to locate survivors in disaster scenarios. Developed an Android app for remote control and data transmission using the onboard HC-05. Achieved a 90% success rate in detecting signs of life and movement in simulated environments.
- Developed a Semi-Autonomous Mining Robot that featured a Cartesian Arm with a 12V DC motor and used a Zigbee for command and control. Implemented HCSR04 and L293D for navigation and obstacle avoidance. Reduced the mining time by 30% and increased the accuracy by 40% compared to manual methods.

Projects

RISC-V RV32I Core | *Verilog, SystemVerilog, RISC-V ISA, Icarus, GTKWave* Nov 2024

- Designed and implemented a 32-bit RISC-V processor core using Verilog RTL, achieving efficient instruction execution and pipeline performance.
- Conducted comprehensive testing and verification of the RISC-V core, ensuring compliance with the ISA specifications, implementing 42 out of the 47 instructions.

Manipal Hackathon | *Next, React, ThreeJS, NodeJS, Express, Tailwind, Mocha, JWT, Webpack* Oct 2024

- Developed a full-stack webapp for the Manipal Hackathon's 2024 edition, which witnessed over 35k+ DAU at its peak, optimized codebase to reduce FCP by over 68%.
- Designed for great user experience, especially given the largely opinionated tech grad audience- implenting certain Web3 features like 3D globes, bento grids & translucent timelines.

GreatHR ERP | *Java, Spring Boot, Angular, AWS ELB, Elasticsearch, Logstash, Kibana* Sept 2024

- Developed a highly scalable, MVC architecture-based minimal CRUD REST API in Spring Boot to apply my microservices, AWS & elastic load balancing system design learning.
- Served with a tasteful Angular frontend in an S3 bucket with the jar files bundled into a Docker container and hosted on a Kubernetes cluster, employing the ELK stack for cloud monitoring.

Interactive Hologram | *STM32, Altium, Laser Distance Sensor, Linux, Yocto, Buildroot* Aug 2023

- Developed a gesture-controlled vertical display utilising a 2D precision laser distance sensing array along with a standard LCD projection.
- Currently working on expanding this to actual holographic displays and developing an ecosystem around the new interaction design paradigm.

Embedded Voice Assistant | *ESP32, Altium, AWS, GCP, Kotlin, Arduino, TensorFlow, Keras* Feb 2023

- Built a custom web server and voice assistant for an ESP32-based development board. Utilized an AWS Ubuntu EC2 instance & RDS to access Google Cloud NLP and AWS Poly TTS APIs over HTTP requests and perform pre-programmed tasks using Arduino-enabled UART writing such as forecasting the weather, and offline appliance control.
- The board came with a pre-trained wake word recognition model that I customized for my project. It won the 2nd prize at our intercollegiate science fair '20 and fetched me two job offers(more on this below)

Centrifugal Space Station | *Structural Fabrication, Adhesives, Machining, Fuel Process Engineering* Feb 2023

- Built a rotating wheel space station prototype that placed first at a reputed high school science fair. Co-ordinated chemical process engineering efforts to synthesize rocket fuel with the right proportion of ingredients to ensure maximization power output and duration.
- Also led structural design efforts to design an optimized chassis and ensure the most efficient mounting of fuel cannisters to minimize drag, along with the most aerodynamically efficient shape to maximize spin time in a single round of ignition

Research

Review of Doped Bismuth Chalcogenide Compounds for Thermoelectrics December 2023

Dr. Ashwatha N. Prabhu, Dept. of Physics, Manipal Institute of Technology (MIT) *Manipal, IN*

- Currently being mentored by Dr. Ashwatha N. Prabhu, Associate Professor, Dept. of Physics, Manipal Institute of Technology, Manipal on a comprehensive and definitive review of the existing literature on Doped/Composite Bismuth Chalcogenide Compounds for Thermoelectric Applications, emphasizing on their synthesis techniques and challenges in achieving the industrially required figure of merit.
- This will lead to the publication of a review article by Feb 2025 in pursuit of further research in the field of Bismuth chalcogenide compounds and sister thermoelectric materials.

Advanced Driver Interface for Solar Racing Electric Vehicles October 2024

Dr. Shrirang A. Kulkarni, Dept. of Information Technology, Manipal Institute of Technology (MIT) *Bengaluru, IN*

- Developed a novel driver interface system for solar racing EVs, prioritizing situational awareness and performance, dynamically displaying critical parameters. Utilized TouchGFX for embedded graphics, optimizing graphical transitions and memory management. The interface integrates real-time data polling from RTOS tasks, offering adaptable configurations for various racing conditions.
- Actively involved in the process of filing a design patent under the aegis & sponsorship of the Directorate General of Intellectual Property, Manipal Academy of Higher Education (MAHE), Manipal

Power Projection of the Indian & Chinese Navies in the Indo-Pacific May 2024

Dr. Amrita Jash, Directorate General of International Relations, Manipal Academy of Higher Education *Manipal, IN*

- Actively mentored by Dr. Amrita Jash to work on data analysis and image processing of satellite imagery of potential overseas bases & civil-military liasion complexes across several sites in the Indian Ocean Region (IOR), commissioned by a renonwned Indian think tank.
- Should result in the publication of the whitepaper on the think tank's page & relevant media outlets in the summer of 2025.

Resurgence of the Indian Economy & Industry after the Covid-19 Pandemic August 2022

Ms. Jayalekshmi M. P., Dept. of Physics, St. Francis De Sales Public School *Bengaluru, IN*

- Co-authored a paper on "The Resurgence Question: A Critical Study from the Lens of Industry and Democracy" with an intended audience of legislative, agency, and executive leadership, which was presented at the Junior Social Scientist Conference organised at the Christ Junior College, Christ University, Bengaluru.
- Won the Outstanding Student Presentation Award for the paper which included discussion on emerging patterns such as the demands of the working class, global food insecurity, revolutionary Government-backed reforms, increased socio-political activism powered by the rapid dissemination of news and digital transformation in the age of equitable internet access and their socio-economic impact across three sectors - Agriculture, Infrastructure and Digital Journalism.

Achievements

- Defaced a Chinese military housing website (81.cn) with web penetration testing techniques like SQLi at the age of 14
- Built and hosted a dark web LAMP stack WordPress version of gossip girl for my high school's confession & tea page
- Got 2 job offers during my tenth grade science fair from a Deloitte SVP & a cloud cybersec entrepreuner, who were pretty impressed with my embedded NLP project
- Successfully organised 2+ hackathons, witnessing a participation of over 150+ teams & 1000+ participants
- Built a gadget detector for university exams after leading unrest due to a harassment case under the pretest
- Having trouble learning skateboarding, I built a R/C electric skateboard to make navigating turns easier
- Got elected as house captain and reversed a 10y+ losing streak for the house in the annual cultural fest
- Spent a night in juvie after building an electronic metronome resembling a ticking bomb that spooked the principal

Professional Affiliations

Core Committee: Association for Computing Machinery (ACM), Manipal Student Chapter
Managing Committee: Institute of Electrical and Electronics Engineers (IEEE), Student Branch Manipal
SMIE: Institution of Engineers (IEI), India
Member: The American Society of Mechanical Engineers
Sub-Head: Google Developer Student Clubs, Manipal Chapter
Sub-Head: Apple Developers' Group, MIT Manipal

Interests

Cinematography, Geo-politics, Defence, Music Production, Existentialism, Reading, Milkshakes & Deserts, Punjabi Cuisine

Thanks for reading all the way until here, expecting a favourable response in my mailbox soon!