APURVA NANDAN

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EXPERIENCE

Google Summer of Code 2019 with Apertus° Association

VHDL, C++ May 2019 – August 2019

- Developed the firmware for the USB 3.0 plugin module for streaming live 4K raw video data from the AXIOM Beta, a cinema-grade camera, at 20+ FPS to a PC through a USB 3.0 port.
- Designed the PHY layer for an inter-FPGA unidirectional data transfer using 8b/10b encoding scheme and SerDes over six LVDS lanes, providing bandwidth above 3.0 Gbps with a bit error rate $< 10^{-14}$.
- **Among the top 1K students** who successfully completed the open-source project among the other 30K applicants across the world.

PROJECTS

Intelligent Ground Vehicle Competition (IGVC)

C++, Python, ROS August 2018 – Ongoing

- Remodeled a ground vehicle and reworked its **software for autonomous navigation** in unknown outdoor terrains, to simultaneously perform way-point navigation, obstacle avoidance and lane following.
- Led the electrical division of the team in the **development of the hardware subsystem**, comprising of Pixhawk, Stereo-Camera, GPS, and LiDARs, and its integration with the software stack.
- Integrated **cyber-security controls** with the software stack, specifically an OTP-protected Secure Socket Shell (SSH), AES encrypted ROS messages, and an automatic emergency braking system.
- Trained **image segmentation CNN model** (U-Net) for lane detection and classification after labelling and augmenting dataset using Keras & TensorFlow libraries.

5G NR Testbed Development

Verilog, VHDL, C++, MATLAB August 2019 – Ongoing

- Active member of a team comprising of scholars from the top IITs and start-ups, aiming to develop a 5G NR testbed that will incorporate Millimeter Wave, Massive MIMO and Full-duplex technologies with a complete in-house hardware and software design.
- Designed and validated IP blocks for the **high & low-PHY layer (L1) of the 5G NR baseband unit (BBU)** for Physical Downlink Control Channel (PDCCH).

Hardware Accelerated Real-Time Sobel Edge Detector

Verilog, VHDL May 2018 – August 2018

- Implemented Sobel edge detector on FPGA for high FPS live HD video streams, by using custom-built circular FIFOs for convolution.

Computer Vision Based Rubik's Cube Solver

Python, OpenCV Dec 2017 – Januray 2018

- Developed a python application that outputs an **optimal solution for a scrambled Rubik's cube** after color extraction (HSV thresholding) and error estimation using OpenCV library on a live camera feed.

EDUCATION

B.Tech. in Aerospace Engineering

Indian Institute of Technology Kanpur

July 2017 – July 2021 CGPA : 6.23

CISCE Board Matriculation : XII

City Montessori School Lucknow

May 2016 Percentage : 94.66%

COURSES & SKILLS

Data Structures and Algorithms
Computer Organization and Systems

VHDL | Verilog | C/C++ | Python | MATLAB | Java | OpenCV | ROS

ACHIEVEMENTS

2^{nd} Rank Worldwide in IGVC 2019
Ranked 2^{nd} in Grand Challenge among 35+ international teams in IGVC 2019 held at Oakland University, Michigan.

Bronze Medal in Inter-IIT Tech Meet 2018
Designed a non-invasive glucometer in the BETiC Innovation Challenge, Inter-IIT Tech Meet 2018.

2^{nd} Runner Up in Techkriti 2018
3^{rd} prize in Electromania in Techkriti 2018, the annual technical and entrepreneurial festival of IIT Kanpur.

99.75%ile in Joint Entrance Exam (JEE) 2017
Secured an All India Rank (AIR) of 3028 out of 12 lakh aspirants in the Joint Entrance Exam (JEE) 2017.

LEADERSHIP ROLES

Head, Team IGVC-IITK

August'19 - Present

- **Spearheading the team** IGVC-IITK, comprising of 16 active student members, for competing in the Intelligent Ground Vehicle Competition (IGVC) 2020 to be held at Oakland University, Michigan.