KSHITIJ BITHEL

ENGINEER

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PROFESSIONAL EXPERIENCE

Qualcomm Technologies

- **Engineer (Jul,22 – Present)**
  - Worked in DFT Team to generate and validate Logic built-in self test (LBIST) patterns for automotive chips with ADAS functionalities to comply with ISO 26262 standard's ASIL-B safety level
  - Worked on multiple automotive SOC projects in an organized VLSI SOC development lifecycle
  - Developed python automation scripts to expedite debugs and decrease simulation turnaround time (TAT)
- **Interim Engineering Intern (Jun,21 – Aug,21)**

  Implemented IEEE standards 1687(IJTAG), 1149.1(JTAG Boundary Scan) and 1500 (Serial Wrapper) using Siemen's Tessent Tool.

Swaayatt Robots

- **Summer Internship (May,20 – Jul,20)**
  - Implemented classical and deep reinforcement learning methods (Q-learning, DQN, DDPG) for adaptive path tracking of autonomous vehicles in CARLA simulator
  - Generated 2D occupancy grid using LIDAR sensor point cloud data for mapping and obstacle avoidance
  - Applied control algorithms (LQR, Stanley, Pure pursuit) for lateral vehicle control in CARLA simulator

EDUCATION

B.Tech. Electrical Engineering (Indian Institute of Technology, Roorkee) | CGPA – 8.461

Higher Secondary School (Delhi Public School, Haridwar) | Grade – 96.2%

AWARDS / ACADEMIC ACHIEVEMENTS

- **Singhal's Tech for society award (IITR Convocation 2023)** for innovative, impactful bachelor's project
- **Chanakya UG Fellowship 2021 (Technology Innovation Hub, IIT Roorkee) :** 10-month fellowship for undergraduates to conduct research on Cyber Physical Systems
- **NTSE Scholarship (N.C.E.R.T., Govt. of India) :** Prestigious national scholarship for Indian students to pursue studies in STEM-related fields
- **National Standard Examination in Astronomy (Indian Association of Physics Teachers) :** 1st rank in state and among top 1% in India
- **JEE Advanced 2018 :** All India Rank 1652**, JEE Mains 2018 :** All India Rank 3243

RESEARCH EXPERIENCE

RL based stabilization of liquid surface in ground vehicle payloads (Aug'21 – May'22)

B.Tech. Capstone project, funded by ARTPARK @ IISc Bangalore under Student Innovation Grant Program

- Analyzed the problem of minimizing liquid slosh inside a payload container placed on an AGV during motion
- Built a hardware AGV prototype using 4Wheel Mecanum drive equipped with a novel 2D slosh measurement sensor using copper tape and TI's FDC1004 IC
- Modelled the system using pendulum analogy and applied super twisting algorithm (STA) for slosh control
- Implemented model-free RL based controller using DDPG algorithm trained using simulation and fine-tuned on hardware with Jetson Nano onboard computer

Design and development of IOT based health monitoring system (Jan,21 – Jun,21)

Funded by Dept. of Science & Technology, Govt. of India under Science & Technology of Yoga and Meditation (SATYAM)

- Designed a wearable health device to wirelessly measure the vitals (Body Temperature, Pulse Rate, SPO2, Respiration Rate) of a patient and send them to a server over Wi-Fi.
- Developed a server capable of collecting data from multiple patients, displaying it live on a website for remote monitoring and storing it in a database for future analysis

COMPETITIONS

Smart India Hackathon 2020, Hardware Edition: Underwater ROV (Apr,20 – Aug,20)

Winner (Team Epsilon), organized by Ministry of Power, Govt. of India

- Analyzed the problem of unmanned inspection of Head Race Tunnels (HRT) in hydroelectric plants by building an underwater ROV capable of autonomous damage location, debris removal and video feedback
- Developed vision-based crack detection algorithm, a tracker-based underground tunnel localization system, a P-D based depth controller using pressure sensor feedback and implemented it on a hardware prototype.

ABU Robocon 2020: Rugby playing robots (Aug,19 – Mar,20)

3rd in India (Team Robocon IITR), organized by Asia-Pacific Broadcasting Union

- Built 2 fully autonomous robots capable of picking, throwing, catching, placing and kicking rugby balls while communicating with each other to complete the problem statement in the fastest manner
- As a member of electronics and control team, designed paths using quadratic spline interpolation, performed localization using sensor fusion of perpendicular encoders, perpendicular lasers and gyroscope, implemented fuzzy logic controller for path tracking and designed dual-layer PCB for actuator control and sensor interfacing

COURSE PROJECTS

Efficient Inference and Training Techniques for DL Models | *TinyML and Efficient Deep Learning Computing*

Implemented multiple techniques for efficient model inference and training on hardware, namely pruning (fine-grained, channel level), quantization (k-means, linear quantization), Neural Architecture Search (Once-for-all Network) and AWQ(activation aware weight only quantization).

Automated cough detection for remote treatment of COPD patients | *Artificial Neural Networks and Applications*

Developed a CNN based classifier to discern cough from normal noise and estimate cough frequency of COPD patients by using spectrogram of Mel frequency cepstral coefficients (MFCCs), achieving F1 score of 94.95%

Position Control of DC Motor on FPGA | *Embedded Systems*

Implemented PID based DC motor position controller using finite state machine architecture on Xilinx Spartan 3E FPGA with angular position feedback from quadrature rotary encoder and PWM output to motor driver

PUBLICATIONS

[1] A. K. Shakya, K. Bithel, G. N. Pillai, and S. Chakrabarty, “Deep Reinforcement Learning based Super Twisting Controller for Liquid Slosh Control Problem,” IFAC-PapersOnLine, vol. 55, no. 1, pp. 734–739, 2022, doi: 10.1016/j.ifacol.2022.04.120.

SKILLS

- **Programming Languages** : Python, MATLAB, C++, Verilog
- **Software** : MATLAB & Simulink, Arduino IDE, CARLA, ROS, EDA Tools (VCS, Verdi), EAGLE