

Jash Shah

EMBEDDED SYSTEMS · ROBOTICS · AI-ML · BLOCKCHAIN · ELECTRONICS

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*"THE BEST WAY TO **PREDICT** THE FUTURE IS TO **INVENT** IT"*

Education

BITS Pilani (Birla Institute of Technology and Science, Pilani)

Pilani, Rajasthan, India

B.E.(HONS.) IN ELECTRONICS AND INSTRUMENTATION ENGINEERING

Aug. 2018 - May. 2022

- Among **top 0.15%** of Indian Candidates who got admitted to ENI, BITS P, with a BITSAT score of 330/450.
- My major is a unique combination of 2 circuit branches (i.e. Electronics and Instrumentation Control) which gives me the capability to understand the complete ecosystem of a cyber physical system, **starting from gate level design to high level control paradigms**.
- My current **CGPA is 7.7/10**, when the **course averages are 6.0/10**.
- Completed my compulsory course on **Technical Report writing and Business Communication**, thus, clearing the basic **English Proficiency level**.

Shiv Ashish Higher Secondary School

Ahmadabad, Gujarat, India

HIGHER SECONDARY EDUCATION

March. 2017 - May. 2018

- Scored **96.2% (PCM)** in class 12 National Examination affiliated by the Central Board of Secondary Education (**CBSE**).
- **Major in Physics, Mathematics and Chemistry**.

Workshops and Presentations

TinyML Professional Certification

HarvardX

PARTICIPANT OF THE TINYML SYMPOSIUM BY VIJAY JANAPA REDDI

Jan. 2021

- Learnt about various differences in implementing Machine Vision and Computer Vision.
- Implemented Image Super Resolution Using Autoencoders in Keras.
- Scripted in TensorFlow Lite for micro controllers to create and deploy Embedded Devices with Responsible AI.
- Currently implementing an ongoing challenge to develop the machine vision for sorting items to aid an industrial robotic arm.

Pest control using advanced UAV in WSN

BITS Pilani, India

TERM PAPER PRESENTATION FOR TRANSDUCERS AND MEASUREMENT SYSTEM

Jan.2021

- Developed a camera mounted quad copter, with variable rate pesticide sprayer, capable of wireless ad-hoc communications with the bio-sensors embedded in soil. The control system for the sensors were simulated in MATLAB.
- A Laplacian artificial field algorithm was used as drone's primary path planning algorithm.and Fractional Order PID, optimized using Simulated Annealing was used to control the drone's locomotion

Review of ML based Latency aware task assignment in FoG nodes

BITS Pilani, India

KEYNOTE SPEAKER AND SHORT PAPER PRESENTER

Jan.2021

- Project under Dr. G.S.Sesha Chalapati
- Presented a short paper for implementing optimized latency free task division in Edge-Fog-Cloud architecture.
- Explored the use of Unmanned Aerial Vehicles(UAVs) as base stations for providing network portability.

Development of an Improved Thermometric Generator

Pilani, India

KEYNOTE SPEAKER AND PAPER PRESENTER

Dec.2020

- Presented my ideas on improvements of TEG design using dynamic heat transfer equations, using Transistorial approaches.
- Received funding from Dr.Sujan Yenuganti, (Assistant professor, BITS P), for my research work.

Dynamic Online Credit Scoring System using Multi-level Blockchain

TLC, Pilani

1ST AUTHOR UNDER SUPERVISION OF DR. AMIT DUA (PI)

Nov. 2020

- Pitched the Teaching and Learning Centre at BITS Pilani, with advanced system for calculating the teaching credit scores by using dynamic components.
- The framework utilized an modified form of ELO system, aided with a 3-tier blockchain architecture which provided an robust, secure and optimized teaching scoring system.
- The framework utilized Big-Data and Active learning techniques, over a multi-level blockchain.

CES Asia 2019

Shanghai, China

INDUSTRY ATTENDEE

May. 2019

- Attended the CES Asia, to gain industrial exposure and learn about recent developments in the Technological Sectors.
- Built my network with various Swiss based startup groups and research giants.
- Part of various launch events and keynote speeches, including that of Huawei 5G and concept cars by Mercedes Benz and AUDI.

Research Experience

Automatic Indoor Semantic mapping by a mobile robot unit to create 2.5-D maps

INSPIRE Lab, BITS Pilani

RESEARCH PROJECT IN THE EMBEDDED SYSTEM AND ROBOTICS LAB, UNDER SUPERVISION OF DR. AVINASH GAUTAM

Dec. 2020 - Present

- **Visual and Textual semantics**, along with **Lidar-SLAM** is being used to develop a 2.5-D map over a 2-D map available through GIS services.
- Exploring **MobileNets** to implement a light-weight, **embedded Neural Network**. This would be used with a **RGB-D stereo camera**, mounted over a mobile robotic unit.
- Designing **YOLO3** based framework to implement Single Shot Multi-box Detectors for detecting both visual and textual markers.
- Scripting a **ROS-Gazebo** based simulation to develop a SLAM based model.
- The project is aimed to build a precise **autonomous navigation system to guide visually impaired people** even in Indoor environment.

Simulation-Optimization of wireless charging station locations for electric taxis in a city

Auckland, New Zealand

RESEARCH INTERN AT UNIVERSITY OF AUCKLAND UNDER DR. ANDREA RAITH

Dec. 2020 - March 2021 (Ongoing)

- Performed **Transportation modelling** for vehicular traffic to solve **Network equilibrium problems** using **task assignment and Linear programming paradigm**.
- Performed **Discrete Event Simulation** of the taxi-rank model in Julia based simulation tool **SimJulia**.
- Added browser based visualization capabilities to the obtained model using **JavaScript-Julia** in a client-server topography.
- Performed **GIS mapping using OpenStreet Maps and Mapbox API** to develop **ML based models** to determine Speed and discharging SOC, based on terrain and locality.
- Designed the optimized city plan for localizing the charging ranks and their volume(number of induction chargers) for electric taxis in the town.
- **Incorporated the ride-sharing feature** that also allowed a taxi to plan the shortest path for picking and dropping all of the customers, using **variations of the Dijkstra algorithm**.

Graphical Machine Learning based Dark Web Analysis to predict future crime

Dept. CSIS, BITS Pilani

RESEARCH PROJECT UNDER DR. VINTI AGRAWAL

Aug. 2020 - Dec. 2020

- Developed a secure pen-drive mounted connection to the Dark Web using **I2P and TOR.Tails OS** was the primary OS used.
- Scripted an **automated web spider** using **Python-Selenium wrapper**, that snowballed between various Dark-web directories to extract useful data, using **CRISP-DM approach**.
- Re-developed the **Node2Vec and GraphSAGE algorithms**, using **Skip-Gram with Negative sampling** based back end, and tested the model on **IronMarch Hackforum Data**.
- Experimented with various **clustering and bootstrapping** algorithms to form groups of similar nodes.
- Successfully implemented the network's **Link prediction task using a single layer Neural Network** model to develop links between various anomalous nodes

Multi modal Biometric Facial Demographics

TechLab, STTL Ltd, India

MACHINE LEARNING RESEARCH INTERN AT TECHLAB ,SILVERTOUCH TECHNOLOGIES LTD.

May. 2020 - Aug. 2020

- Worked for developing a high accuracy Facial demographics module calibrated to work in Real-World video frames
- My tasks included experimenting with high level algorithms in **Digital Image Processing. SVM and Random forest** based unique hybrid ensemble model was developed with for age regression and Gender classification.
- Developed a facial Key-point detector pipeline for emotion detection, using deep learning model based on Convolutional Neural Network and Residual blocks, using Keras with Tensorflow as a backend.
- Real world errors were reduced using measures like **PSNR and Noise - Contrast Trade-offs**.
- This model was further pipelined to be used to develop an **active learning based model to predict the Songs** based on Age and Gender features of members present in the Cafe/Bar.
- **IoT based APIs** were also developed for communicating with a media player, using the **MQTT based protocol**. Implemented **TinyML using Tensorflow-Lite** to develop a Responsible AI model.

Inspired Karters - Formula Student

Pilani, Rajasthan, India

HEAD - R&D DEPT.(EMBEDDED SYSTEM DESIGN)

Nov. 2018 - Present

- Started off with a junior engineer in 2018, got promoted to Electronics Specialist in 2019 and am currently the responsible for designing the Control and Coordination Firmware for an Electric Vehicle. I was among the **founding member of EV sub section under Inspired Karters**.
- Previously, I simulated all the Low-Voltage Electronics of the car including **safety shutdown circuits, other control circuits, and management (Battery) circuits including the pre-charge/discharge circuits using KI CAD and Multi Sim**.
- Currently, responsible for designing **Drive Control Module and Touch Screen display using STM32F412Zg MCU** and integrating the same in a **CAN controlled network**. I also developed an additional application layer protocol for tackling starvation issues.
- Working with off the shelf Data Acquisition hardware - **Kvaser Memorator** and extending its functionality by adding customized firmware for over the air updates.

Acyte Robotics - Center for Robotics and Intelligent Systems

Pilani, Rajasthan, India

TRAINEE

Aug. 2018 - Dec. 2018

- Was among the **top 10 people** who got selected for the Robotic training, from entire freshers batch of 2018, comprising of **1500+ students**.
- Did a literature review on **Inverse Kinematics, Fourier Transforms, Potential Field approach and Genetic Algorithm**.
- Built a **USB to TTL Hardware driver** from scratch. The PCB was designed on **Eagle CAD**.
- Partially designed the **CAD design of robotic arm manipulator** for a humanoid bot, having **5 DOF, on Fusion 360**.
- Developed **"Chess move verifying" module for automatic chess playing bot**, that was in the development phase.
- Implemented a Particle filter using **Hidden Markov Localization**.

Achievements

Ongoing	Shakti Microprocessor challenge , Shperded team Sphatik to develop Smartwearable-IoT solution on open source hardware(RISC-V), funded by Govt. of India and mentored by Dr.Pramod Tanwar, CRIS-CEERI	Govt. India
Ongoing	OpenCV Spatial AI Competition , Under Review, Funded by OpenCV and Intel	Intel, Online
Dec 2020	IndiaTeck Hongkong AI for Healthcare Hackathon , International Runners up, received a chance of incubation under Neutrinos to build up our MVP	Online, Hong Kong
2020	Formula Bharat 2020 Concept Design Challenge , International Winner	India
2020	Flipkart Grid Robotics 2.0 , Part of India's top 20 teams out of 150 shortlisted	Online
2018	Joint Entrance Examination(JEE) , All India Rank 3426 among 1.6 million candidates.	India
2009	The Malaysia Book of Records , Received ORDINARY GRADE 11 in the International Standard of ABACUS COMPUTATION competition.	Malaysia

Relevant Projects

Advanced surveillance using Gait Prediction

[IEEE Room, BPSC](#)

OPENCV SPACIAL AI CHALLENGE

Ongoing

- Experimenting with multi-frame CNN-LSTM architecture to implement gait recognition using OAK-D stereo camera.
- Exploring the use of Depth channel to implement 3-D Neural Network model to optimize the results.

Hand Gesture Control of a Mechanical Arm

[IEEE Room, BPSC](#)

PERSONAL PROJECT

Ongoing

- Currently simulated a 6-DOF mechanical arm using ROS-Gazebo and Moveit environment.
- Used ROSSerial to publish Arduino signals.
- Used IMU and flex sensors to predict the exact orientation of the hand.

Digital and Analog VLSI design for 180 SCL Technology

[Oysters VLSI Lab, BITS Pilani](#)

DR.ANU GUPTA

Nov.2020

- A Telescopic Cascode OpAmp was designed given the Gain, UGB, Phase Margin, Slew Rate and Power Dissipation factors.
- Designed a 4 input PSEUDO NMOS NOR logic using both Differential method and Logical effort method.
- DRC, PEX and static timing analysis was performed.

Movie Review Prediction using self-built Word2vec

[Data Analysis\(ADAPT\) Lab, BITS](#)

COURSE PROJECT IN NATURAL LANGUAGE PROCESSING, UNDER DR.POONAM GOYAL

Nov.2020

- Designed an optimized and light-weight version of Word2Vec that converges faster and could be deployed on edge device.
- Built a movie-review recommender system using RNTN, LSTM and TfIdf approaches.
- Presented a review paper for the same.

Screening of Chest X-Rays for COVID using AI

SELF

Oct 2020

- Applied techniques like data augmentation and semantic segmentation.
- Testing through CAM analysis and various numerical analysis techniques. Final GUI application using Flask

Lunar Lander Game using Reinforcement learning

[MOOC by University of Alberta](#)

REINFORCEMENT LEARNING SPECIALIZATION

Sept.2020

- Developed a Deep Reinforcement Learning model(DQN) to autonomously land a moon lander in a simulated environment.
- Implemented Neural network based action-value pair using Softmax action selection.
- Coded the Adam's optimizer for implementing the task.

Autonomous Stair Climbing Robot

[Online](#)

FLIPKART GRID ROBOTICS 2.0

July.2020

- Implemented a semi-automatic, robust robotic cart, capable of lifting 4-5 kg of weight, up and down the stairs.
- The entire control system was developed using Raspberry PI3, aided with ultrasonic sensors, RGB-D camera and motors and linear actuators.
- YoloV3 based stair detection and classification, along with centre-point localising control logic was implemented using Fuzzy PID control. The bot could sense the environment to search for stairs, and even sense ascent/descent, automatically.

Data Augmentation Using GANs

[Stanford Online](#)

DEEPLARNING.AI

Jun.2020

- Implemented image to image translation using Pix2Pix and CycleGANs, to implement data augmentation.
- Used DeepFake and DCGAN with Keras API to generate synthetic images of the trigger word detected.

Hardware Mobile Robot using Bare Metal coding on 8086

[BITS Pilani](#)

PERSONAL PROJECT

March 2020

- Designed a 4-DOF turtle bot with speed control and speed display features using Intel's 8086 microprocessor and external peripheral devices.
- Scripted the processor with Assembly directives using MASM compiler.
- Developed various other prototypes for a mobile robotic unit including a Flying Robot, Mine Exploration Bot and Garden Sprinkler bot.

Decision making for autonomous Self Driving Car Simulation model

MOOC by University of Toronto

SELF-DRIVING CAR SPECIALIZATION

May.2020

- Successfully implemented a longitudinal and lateral vehicle controller for CARLA simulator.
- Simulated the Lidar and GPS controlled ES-EKF(Error State Extended Kalman Filter) to localize the car position.
- Provided Visual perception to the car using segmented Neural networks to detect the lane and obstacles in 2-D as well as 3-D.
- Experimented with Multi-Object Tracking for a swarm of automotive systems.

Intelligent Micromouse using Genetic algorithm

IEEE STUDENT SECTION

Jan.2020

- Successfully implemented a fully automatic high speed Micromouse capable of solving the IEEE micromouse maze.
- The bot was developed using Omni wheels, Ultrasonic sound sensors, and powered by Arduino controller.
- Implemented the maze solving using modified flood fill algorithm and optimized using Genetic algorithm.
- Created a dummy software simulator using Python, for simulating the path planning algorithm.

Development of clock synchronous ALU

Digital Design Laboratory

PROJECT OF DIGITAL DESIGN UNDER PROFF. PAWAN.K AJMERA

Nov.2019

- Designed the Arithmetic Logic unit, imitating 74181 IC.
- Used basic components like shift registers, MUX-DeMUX, and basic gates.
- FSM based designed to make the unit clock synchronous.
- Verified the circuit on Verilog.

Deep Q-Learning based path follower bot using ROS-Gazebo

Apogee 2019

IEEE TECH TEAM, ML SIG HEAD

March.2019

- High Speed, auto guided vehicle with PID position control, capable of traversing a visual line embedded on the floor facilitated via RGB camera.
- A Q-Learning based, 2-layered Neural Network model was made with customized rewarding policy, to implement the model in ROS-Gazebo based simulation environment.

E-voting System using Blockchain

Online

SELF

Dec.2018

- Developed a Web based e-voting application and ran successful simulations on my self built network.
- Shifted to Ethereum network using Truffle framework. The entire application was built using Node.JS.
- The application was capable of successfully conducting unhampered and unbiased elections. An additional consensus algorithm gave the results in real time.
- Developed a dummy blockchain using JAVA, following the course on Bitcoins by Princeton University.

Relevant University Courses

ELECTRONICS AND EMBEDDED SYSTEMS : Industrial Instrumentation and Process Automation, Microprocessor Interfacing, Medical Instrumentation, Control Systems, Sensors and Transducers, Digital Design, Signal analysis, Electro-Mechanical Machines, Power Electronics, Analog and Digital VLSI Design, Solid State Electronic Devices, Analog Electronics, Electrical and Electronics Circuits.

COMPUTER SCIENCE : Robotics, Computational Control System Lab, Artificial Intelligence and Intelligent Algorithms, Natural Language Processing, Computer Vision, Computer Programming, Internet of Things, OS kernel programming, Data Structures.

MATHEMATICS : Optimization Techniques and Operational Research, Probability and Statistics, Algebra and Matrices, Advance Calculus, Higher Order Differential Equations, Cryptography, Mathematical Problem Solving.

Skills

Programming languages	Python, Embedded C, C++, C#, Julia, MATLAB, Assembly language, Node.js, Bash, Latex
Platforms / Frameworks	LabView, CubeMX, Hyperledger, Unity, Keras, Tensorflow/Tensorflow-Lite, Pandas, OpenCV, ROS-Gazebo, NetworkX
HDL and EDA tools	Verilog, LTSpice, Proteus, Cadence, Microwind, NI Multi Sim, KiCAD, EagleCAD
Hardware skills	Raspberry Pi, Arduino, Xilinx FPGA, STM32 controllers, Nucelo Boards, NVIDIA Jetson Xavier NX, x86
Mechanical Design	Autodesk Fusion 360, Solidworks
Linguistic Proficiency	English, Hindi, Gujarati

Position of Responsibility

Jan. 2021	Undergraduate Teaching Assistant , Under Dr.Anu Gupta	Analog IC Design
Oct. 2020	Embedded System Design Head , Inspired Karter - Formula Electric	Tech Team
Aug. 2020	Executive Committee Member , IEEE STUDENT CHAPTER BITS PILANI	Fest coordinator
Mar. 2020	Treasurer , Gurjari Association	Cultural Association
2019	Member of Student Faculty Council , Under Dr.V.K.Chaubey	EEE Dept.
2019	Wing Representative , Represented my hostel wing in the annual hostel election.	Gandhi Bhavan.