

Kirteyman Singh Rajput, M.Tech.

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EDUCATION

Indian Institute of Science (IISc), Bengaluru, India
M.Tech. in Electronic Product Design
Department of Electronic Systems Engineering
CGPA: 7.9 out of 10

June 2024

Bhilai Institute of Technology (BIT), Durg, India
B.Tech. (Honors) in Electronics and Telecommunication Engineering
CPI: 8.81 out of 10

June 2021

Jawahar Navodaya Vidyalaya (JNV), Kabirdham, India
12th Grade (Higher Secondary Education)
Percentage: 80.4 out of 100

May 2016

WORK EXPERIENCE

Project Associate I

August 2024 - Current

Department of Electronic Systems Engineering, Indian Institute of Science, Bangalore, India

PI: [Dr. Hardik J. Pandya](#)

- Conducted experiments on an optical probe for breast cancer diagnosis, including fresh tissue studies at Assam Medical College.
- Performed literature reviews, data collection, and analysis.
- Managed lab equipment, ensuring proper maintenance and safety.
- Certified in Cleanroom Safety and Protocol at CeNSE Nanofabrication Facility; assisted as a buddy during microfabrication processes.

PUBLICATION AND CONFERENCE PRESENTATION

- Arif Mohd. Kamal, **Kirteyman S. Rajput**, Gayatri Gogoi, Ajay Krishnan Ajith, VSN Sitaramgupta Vangeti, Dilip Killing, Jayant Sharad Vaidya, and Hardik Jeetendra Pandya, *Multispectral Pen for Rapid Breast Cancer Diagnosis*, Nature Scientific Reports, 2024 (*Under Review*) (**Publication**)
- Arif Mohd. Kamal, **Kirteyman S. Rajput**, Gummadi K. Raju, and Hardik J. Pandya, *ESS-Dx: A Handheld Probe for Rapid Breast Cancer Diagnosis*, IEEE Sensors Journal, 2024. (*in preparation*) (**Publication**)
- Kirteyman S. Rajput**, Kritika Koushal, Vikram Singh and Suchitra Pandey, *Object Tracking Algorithms*, BITCON 2020, Department of Electronics and Telecommunication Engineering, Bhilai Institute of Technology, Durg (Chhattisgarh), November 2020. (**Conference**)

RESEARCH EXPERIENCE

Master's Thesis: Design and Development of Elastic Scattering Spectroscopy (ESS)-Based Probe for Breast Cancer Diagnosis.

Jan. 2023- Jun. 2024

Advisor: [Dr. Hardik J. Pandya](#), Indian Institute of Science (IISc)

- Developed an intraoperative handheld probe based on Elastic Scattering Spectroscopy (ESS) to accurately distinguish cancerous breast tissue in real-time during breast-conserving surgery, aiming to minimize the need for second surgery in case of positive margin.
- Designed the complete hardware setup with near-infrared (NIR) light sources, a photodetector, and a data acquisition unit (DAQ). The DAQ includes a circuit board to control the illumination of four different wavelengths. At the same time, the NIR photodetector captures the reflected light from breast tissue, which is digitized and transmitted to a graphical user interface (GUI) for processing and visualization in real time.
- Implemented a Monte Carlo simulation to model light propagation in breast tissues and back-calculate the tissue's optical properties (scattering and absorption).
- Achieved 97% accuracy in cancer detection by employing an SVM classifier followed by a voting classifier, successfully distinguishing between cancerous and normal tissue in formalin-fixed breast samples based on spectral reflectance.

- **Previous work:** Multispectral Pen using multiwavelength diffuse reflectance spectroscopy (DRS) and a CatBoost machine learning model, achieving 92% sensitivity, specificity, and accuracy in distinguishing malignant from adjacent normal tissues in formalin-fixed samples from 31 patients, demonstrating the potential of integrating DRS and AI for real-time clinical applications

Outcome: The probe could classify tissue samples with an accuracy of 97%. (A manuscript based on the findings is in preparation for submission to the IEEE Sensors Journal.)

Estimating Body Weight of a Lying Patient for Adjustment of Intravenous (IV) Contrast Dosage During CT Scans.

Apr. 2019 – Jul. 2019

GE Healthcare, Bengaluru

- Developed a system to estimate human body weight using an RGB-Depth camera (Microsoft Kinect), optimizing IV contrast dosage during CT scans to improve diagnostic accuracy and reduce the risk of overdosage.
- Performed 3D point cloud acquisition, pre-processing, and feature extraction in Python.
- Implemented a pre-trained artificial neural network (ANN) to estimate body weight based on the extracted anthropometric features from the point cloud.
- Addressed the critical issue of weight estimation in emergencies where patients cannot stand, reducing the risk of under-dosing or over-dosing in medical treatments.

Outcome: The system could estimate the patient's body weight with an accuracy of 73%.

SELECTED PROJECTS

Birds and Animal Call Detection for Edge Devices [🔗](#)

Nov. 2022 – Dec. 2022

Guide: Prof. Chetan S. Thakur (Dept. of Electronic Systems Engineering, IISc)

- Developed a real-time bird and animal call detection system optimized for edge devices. Implemented a 1D convolutional neural network (CNN) model that uses Mel-frequency cepstral coefficients (MFCCs) extracted from 3.5-second audio samples to classify various bird and animal species.
- Designed a CNN with eight filters and a kernel size of three to identify patterns in the MFCCs, followed by a fully connected layer for classification across eight categories, including various bird species and pets.
- Deployed the model on an Arduino Nano 33 BLE Sense microcontroller, utilizing TensorFlow Lite to optimize memory usage and ensure efficient model inference within constrained hardware limitations.

Wireless Intruder Detection using Pressure and Vibrational Signatures [🔗](#)

Sep. 2022 – Nov. 2022

Guide: Prof. T.V. Prabhakar (Dept. of Electronic Systems Engineering, IISc)

- Developed a wireless MQTT protocol-based intruder detection system that detects unauthorized access through pressure and vibrational signatures. The s-mat is embedded with a grid of pressure sensors to detect footprints, and the seismic geophone captures the footstep vibrations traveling through the floor surface.
- Implemented a kurtosis-based algorithm to analyze vibrational data from the geophone, distinguishing footsteps from background noise.
- Integrated sensors with an ESP32 controller connected to an MQTT server, enabling real-time, bi-directional messaging with reliable Quality of Service (QoS) delivery. Optimized the system for low-power operation to extend the device lifespan.

Architectural Design and Implementation of Cordic-Based Sine Wave Generator on FPGA [🔗](#)

Mar. 2023 – May 2023

Guide: Prof. Kuruvilla Varghese (Dept. of Electronic Systems Engineering, IISc)

- Designed and implemented a pipelined architecture for an optimized sine waveform generator using the CORDIC algorithm, targeting efficient resource usage on an FPGA for high-frequency signal generation.
- Implemented datapath and control path of the architecture in Verilog for a resource-constrained environment, utilizing Xilinx Artix-7 FPGA and Pmod DAC2 for digital-to-analog conversion and displaying the output signal.
- Achieved output frequencies up to 100 MHz with a 50 MHz Nyquist limit. This design allowed flexible frequency input control with 16 switches, with waveform frequencies ranging from 440 Hz to 6.584 KHz.

Supply Bot to Deliver Relief Aid at Flood-Affected Zones [🔗](#)

Oct. 2019 – Feb. 2020

Organizing team: e-Yantra, IIT Bombay

- Built an autonomous bot capable of delivering targeted aid in flood-affected areas. A ceiling-mounted camera emulates a geostationary satellite that communicates the location and type of relief aid to the supply bot.

- The bot was built with Arduino for control and equipped with Xbee modules for wireless communication. It also uses OpenCV for image processing to identify flood-hit zones and the aid type needed. The system featured line-following sensors for path navigation and a targeted delivery mechanism with servo motors.
- Designed the airdrop system for efficient aid delivery; the algorithm also worked well to prioritize the type of aid required by different locations.

ACHIEVEMENTS AND FELLOWSHIPS

Graduate Aptitude Test in Engineering (GATE) 2022

Electronics and Communication Engineering, Indian Institute of Technology (IIT) Kharagpur

Percentile: 99.068 (All India Rank: 506 out of 54,292 candidates)

FOSSEE Summer Fellowship 2019

Indian Institute of Technology (IIT), Bombay

SKILLSETS

- **Electronic Product Design:** Electronic Packaging, Thermal Design, EMI & EMC Compliance, Electrostatic Discharge (ESD) Testing.
- **Software:** Altium Designer, Origin lab, Ltspice, Cadence Virtuoso.
- **Programming Languages:** MATLAB, Python, Verilog, Embedded C.
- **Microfabrication**
- **Optical Instrumentation:** Infrared Spectroscopy, Microscopy, LASER, Fiber Optics.
- **Mechatronics:** Stepper Motors And Drives, Mechanical Linkages, X-Y Plotters, 3D Printing

RELEVANT COURSEWORK

- | | | |
|---|--|---|
| • Process Technology and System Engineering for Advanced Microsensors and Devices | • Digital Systems Design with FPGAs | • Hardware Acceleration and Optimization for Machine Learning |
| • Optical Instrumentation | • Analog VLSI | • Embedded System Design |
| • Internet of Things (IoT) | • Fundamentals of MOS Analog Integrated Circuits | • Mechatronics System Design |
| • High-Performance Computer Architecture. | | |

EXTRACURRICULAR ACTIVITIES

Certifications:

- **Deep Learning Specialization, DeepLearning.AI (Coursera)**
- **Semiconductor Devices and Circuits, NPTEL (National Programme on Technology Enhanced Learning), IISc Bengaluru**
Percentage: 70% (Elite)
- **Enhancing Soft Skills and Personality, NPTEL (National Programme on Technology Enhanced Learning), IIT Kanpur**
Percentage: 92% (Elite), Top 5% (across India)

Exhibitions and Demonstrations

- **CAHOTECH 2024**
Exhibited an in-house developed optical modality-based handheld probe for breast cancer delineation.
- **DESE Expo 2024 (Volunteer)**
Demonstrated our lab's project to industry experts, DESE alums, and project sponsors, discussing the current scenario and taking feedback.
- **IISc Open Day 2023 (Volunteer)**
Involved in finalizing, preparing, and managing the theme "From Sand to SoC," including illustrating and exhibiting the entire theme.

RELATED LINKS

[UG Transcript](#) || [PG Transcript](#) || [Research Portfolio & Projects](#) || [M.Tech Thesis](#)

REFERENCES

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