

Kirteyman Singh Rajput

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Education

Indian Institute of Science (IISc) M.Tech. in Electronic Product Design CGPA: 7.9 out of 10	Bangalore, India June 2024
Bhilai Institute of Technology (BIT) B.Tech. (Honors) in Electronics and Telecommunication Engineering CPI: 8.81 out of 10	Durg, India June 2021
Jawahar Navodaya Vidyalaya (JNV) 12th Grade (Higher Secondary Education) Percentage: 80.4 out of 100	Kabirdham, India May 2016

Research Experience

Research Assistant Indian Institute of Science, Bangalore, India (PI: Dr. Hardik J. Pandya)	August 2024 - Current
<ul style="list-style-type: none">Designed and conducted experiments using a developed fiber optic-based probe for breast cancer diagnosis in fresh and formin-fixed tissue samples, including clinical studies at Assam Medical College (~1,490 miles from IISc).Developed PDMS-based tissue-mimicking phantoms to simulate biological properties for optical probe validation and testing.Implemented machine learning models using Python to develop a classification model for distinguishing cancer tissue from adjacent normal.Processed and visualized experimental datasets using Python (NumPy, Pandas, scikit-learn) and OriginLab for statistical analysis and interpretation.Contributed to manuscript preparation for peer-reviewed publications, including data analysis, literature review, and technical writing.Prepared Scientific and Technical Progress Reports (STPR) documenting research milestones, experimental results, and future objectives.Certified in Cleanroom Safety and Protocols at CeNSE Nanofabrication Facility, assisting researchers in microfabrication processes.	

Master's Thesis

Indian Institute of Science, Bangalore, India (Advisor: Dr. Hardik J. Pandya)	Jan. 2023- Jun. 2024
Title: Design and development of elastic scattering spectroscopy (ESS)-based probe for breast cancer diagnosis.	

- Designed and developed a handheld intraoperative probe using elastic scattering spectroscopy (ESS) to enable real-time, accurate differentiation of cancerous breast tissue during breast-conserving surgery, addressing a critical challenge in surgical oncology by reducing re-excision rates.
- Engineered the complete hardware system, integrating four NIR light sources, a high-sensitivity detector, and a custom data acquisition unit with a control circuit for multi-wavelength illumination. Captured and digitized reflected tissue spectra, transmitting data to a real-time GUI for processing and visualization.

- Developed a Monte Carlo simulation to model light propagation in breast tissue and inversely extract optical properties (scattering and absorption coefficients).
- Achieved 97% classification accuracy using an SVM-based voting classifier, validated on formalin-fixed breast tissue samples.
- **Previous Work:** Designed a Multispectral Pen leveraging diffuse reflectance spectroscopy (DRS) and a CatBoost ML model, attaining 92% mean sensitivity, specificity, and accuracy in distinguishing malignant vs. normal tissues in N=25 patient samples, demonstrating the clinical potential of DRS-AI integration.

Outcome: The probe could classify tissue samples with an accuracy of 97%. (manuscript is under review)

Publications and Conference Presentation

Publications

- Arif Mohd. Kamal, **Kirteyman Singh Rajput**, Apurva Dahake, Gayatri Gogoi, Ajay Krishnan Ajith, VSN Sitaramgupta Vangeti, Dilip Killing, Jayant Sharad Vaidya, and Hardik Jeetendra Pandya, “*Multispectral Pen for Rapid Breast Cancer Diagnosis.*” [\[Link\]](#)
Revised and resubmitted to Nature Scientific Reports (Post Major Revisions), April 2025 (Under Review).
- Arif Mohd. Kamal, Apurva Dahake, **Kirteyman S. Rajput**, Gummadi K. Raju, and Hardik J. Pandya, “*ESS-Dx: A Handheld DRS-based Optic Fibre Probe for Rapid Breast Cancer Diagnosis and Margin Delineation.*” [\[Link\]](#)
Submitted to IEEE Sensors Journal, April 2025 (Under Review)

Conference Presentation

- **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. [\[pdf\]](#) [\[certificate\]](#)

Projects

AI-Based Body Weight Estimation for IV Contrast Dosage (CT scans) GE Healthcare, Bangalore

- Designed and implemented a 3D vision-based weight estimation system using Microsoft Kinect (RGB-D) to optimize IV contrast dosage in CT scans
- Designed and implemented an end-to-end workflow using Python for 3D point cloud acquisition, denoising, and anthropometric feature extraction.
- Trained and deployed an artificial neural network (ANN) to predict body weight from depth data, achieving 73% accuracy
- Critical clinical solution: Enabled accurate dosing for non-ambulatory patients, directly reducing risks of under/over-dosing in emergency scenarios

Edge-AI for Birds and Animal Call Classification

Indian Institute of Science (IISc) (Instructor: Prof. Chetan S. Thakur)

- Developed a real-time bird and animal call detection system optimized for edge devices.
- Implemented a 1D convolutional neural network (CNN) model (8 filters, kernel_size=3) that uses Mel-frequency cepstral coefficients (MFCCs)

extracted from 3.5-second audio samples for classification across eight categories, including various bird species and pets.

- Implemented hardware-aware optimizations:
 - Quantized model via TensorFlow Lite for microcontrollers.
 - Deployed on Arduino Nano 33 BLE Sense (ARM Cortex-M4, 64KB RAM)
 - Achieved real-time inference on 3.5s audio windows

Wireless Smart Intruder Detection System

Indian Institute of Science (IISc) (Instructor: Prof. T.V. Prabhakar)

- Developed a multi-modal intrusion detection system combining pressure-sensitive mats and seismic geophones for robust footprint and vibration detection via floor surface.
- Implemented a kurtosis-based algorithm to analyze vibrational data from the geophone, enabling the distinction of intruder's 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.

FPGA-Based CORDIC Signal Generator

Indian Institute of Science (IISc) (Instructor: Prof. Kuruvilla Varghese)

- Designed and implemented an optimized CORDIC algorithm in Verilog for sine wave generation on Xilinx Artix-7 FPGA
- Developed a fully pipelined architecture with:
 - Custom datapath and control path design
 - Resource-efficient implementation
 - PMOD DAC2 interface for analog output
- Achieved output frequencies up to 100 MHz with a 50 MHz Nyquist limit with tunable output frequency controlled via a 16-bit switch interface.

Achievements and Fellowships

Graduate Aptitude Test in Engineering (GATE) 2022 [\[scorecard\]](#)

- Discipline: Electronics and Communication Engineering
- Percentile: 99.068 (All India Rank: 506/54,292)

FOSSEE Summer Fellowship 2019 [\[certificate\]](#)

- Indian Institute of Technology (IIT), Bombay, India

Technical Skills

Hardware: electronic packaging, thermal design, EMI/EMC, ESD testing

Optics: NIR spectroscopy, optical instrumentation, lasers, fiber optics

Mechatronics: motion control, 3D printing, embedded systems

Software: Altium, Cadence, LTSpice, MATLAB, Python, Verilog, Embedded C

Microfabrication Fundamentals:

- Certified in cleanroom (Class 1000/10,000) protocols and safety procedures
- Process knowledge in:
 - Thin film deposition (PVD, CVD)
 - Photolithography techniques

- Wet/dry etching principles

Certifications

Deep Learning Specialization [\[certificate\]](#)

DeepLearning.AI (Coursera)

- *Course 1: Neural Networks and Deep Learning*
- *Course 2: Improving Deep Neural Networks: Hyperparameter Tuning, Regularization, and Optimization*
- *Course 3: Structuring Machine Learning Projects*
- *Course 4: Convolutional Neural Networks*
- *Course 5: Sequence Models*

Semiconductor Devices and Circuits [\[certificate\]](#)

Indian Institute of Science (IISc), Bangalore, India | Percentage: 70% (Elite)

Enhancing Soft Skills and Personality [\[certificate\]](#)

Indian Institute of Technology (IIT), Kharagpur, India | Percentage: 92% (Elite), Top 5%

Demos and Volunteering

CAHOTTECH 2024: Exhibited an in-house developed optical handheld probe for breast cancer delineation.

DESE Expo 2024 (Volunteer): Demonstrated lab project to industry experts, alums, and sponsors, gathering feedback.

IISc Open Day 2023 (Volunteer): Curated and exhibited the theme "From Sand to SoC," including preparation, illustration, and exhibition.

Related Links

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

References

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