

Deep Pujara

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SUMMARY

Ph.D. student at Arizona State University with a focus on Solar, Signal Processing, and Embedded Machine Learning (ML). Experienced in hardware and software development, with a track record of IEEE publications, internships in industries and research organizations, awards, and a notable presence in industry meetings and hackathons, seeking a challenging position to showcase my skills.

EDUCATION

Doctor of Philosophy in Electrical Engineering	(Jan 2024 – Present)
<ul style="list-style-type: none">Arizona State University, Tempe, Arizona, USASpecialization: Solar, Signal Processing, and Embedded Machine Learning	(GPA: 3.83/4)
Master of Science in Electrical Engineering	(Aug 2021 – Dec 2023)
<ul style="list-style-type: none">Arizona State University, Tempe, Arizona, USASpecialization: Solar, Signal Processing, and Machine Learning	(GPA: 3.82/4)
Bachelor of Technology in Electronics and Communication Engineering	(August 2017 – May 2021)
<ul style="list-style-type: none">Nirma University, Ahmedabad, Gujarat, India	(GPA: 8.11/10)

WORK EXPERIENCE

SenSIP Lab, School of ECEE, Arizona State University	Tempe, AZ, USA
Graduate Research Associate	Sep 2021 - Present
<ul style="list-style-type: none">Developed a compact embedded ML algorithm utilizing Pruning, Quantization-Aware Training, and 8-bit Post-Training Quantization for efficient and accurate topology classification in solar energy systems.Conducted experimental topology reconfiguration research on a 3*3 solar array to optimize power output in solar panels under varying shading conditions, employing both simulation modelling (via Simulink) and practical experiments.Deployed an optimized Embedded ML algorithm on an Arduino Nano BLE 33 using TensorFlow and TensorFlow Lite Micro Libraries, achieving real-time fault detection with 85.97% test accuracy. Leveraged Edge Computing for rapid identification and response to solar system anomalies.Designed a Monitoring Device Hardware using various sensors and microcontrollers to measure important PV parameters such as Voltage, Current, Temperature, and Irradiance with a better transmission rate (1 second), and high accuracy (above 95%).	
Tempe Campus, School of ECEE, Arizona State University	Tempe, AZ, USA
Graduate Teaching Associate	Jan 2023 – Present
<ul style="list-style-type: none">Providing support to students in understanding the concepts of Fast Fourier Transform, Filters, Sampling, and related topics.Conducting 2-3 interactive live sessions every semester and providing problem-solving support to students, facilitating a practical understanding of the DSP concepts and their real-life applications.	
SenSIP Lab, School of ECEE, Arizona State University	Tempe, AZ, USA
Graduate Research Mentor	May 2024 – July 2024
<ul style="list-style-type: none">Participated in an NSF-funded program to mentor undergraduate students from diverse backgrounds across the U.S. in foundational machine learning concepts and applications.Guided students in developing a machine learning model for photovoltaic (PV) system monitoring, enhancing their understanding of renewable energy applications and practical ML deployment.	
Skyworks Solution	Austin, TX, USA
Broadcast Application Engineering Intern	May 2023 – Aug 2023
<ul style="list-style-type: none">Engineered an advanced USB to SPI bridge (REV 2.0) using ORCAD, incorporating 4 chip select and reset lines. Optimized MISO, MOSI, and SCK pins, ensuring seamless replacement for Rev 1.0 with improved functionality.Built driver code in C++ enabling efficient USB-SPI communication, facilitating smooth data transfer with maintained compatibility and enhanced performance compared to REV 1.0.	
Indian Space Research Organization (SAC-ISRO) - Link	Ahmedabad, GJ, India
Student Research Intern (Co-Op)	Jan 2021 – Jun 2021
<ul style="list-style-type: none">Led a team and refined an algorithm via Covariance, Eigen Analysis, and Walsh-Hadamard Transform to identify the Initial Sequence, Scrambling Polynomial (Up to 15 degrees), and Initial Seed from the scrambled transmitted data within 1-2 minutes.Blindly identified the value of carrier frequency, bandwidth, and the modulation scheme of a signal in 0 dB or higher SNR value using FFT, Down Sampling, Down Conversion, and Convolution, and gained an Accuracy of 95% in carrier frequency and bandwidth identification.	

ACADEMIC PROJECTS

Real Time Object Detection for Edge Devices

Nov 2024 – Dec 2024

- Created a **custom dataset** by sourcing and augmenting images from the internet, resizing and preprocessing them to meet model input requirements, ensuring a diverse and balanced dataset for accurate object detection training.
- Developed an optimized object detection model using **TensorFlow Lite** and **YOLO** for real-time inference on resource-constrained edge devices.
- Implemented model **quantization and pruning** to enhance efficiency while maintaining high detection accuracy.
- Deployed the model on an embedded system for applications such as surveillance, automation, and assistive technologies.

EdgeVoice: Real-Time Wake Word Detection on Embedded Systems

July 2024 – Sep 2024

- Collected and curated a **custom speech dataset** using recorded audio samples and publicly available data, preprocessing it with **Audacity** for noise reduction and normalization.
- Engineered a **Convolutional Neural Network (CNN)** architecture optimized for low-power devices, utilizing **MFCC feature extraction** (13 coefficients, 256 FFT length) to recognize speech with **78.63% test accuracy**.
- Implemented the model on **Arduino Nano 33 BLE Sense** with **TensorFlow Lite for Microcontrollers**, enabling **efficient real-time voice command processing** for edge AI applications.

PUBLICATIONS

1. J. Larson, **D. Pujara**, D. Ramirez, L. Miller, T. Patel, N. Babar, A. Spanias, "WIP: Building a Research Experience for Undergraduates in Quantum Machine Learning" *2024 Frontiers in Education (FIE)*, Washington DC, USA.
2. D. Ramirez, **D. Pujara**, C. Tepedelenlioglu, D. Srinivasan and A. Spanias, "Infrared Computer Vision for Utility-Scale Photovoltaic Array Inspection," *2024 15th International Conference on Information, Intelligence, Systems & Applications (IISA)*, Volos, Greece, 2024. *(Paper recently presented at the conference)*
3. **D. Pujara**, D. Ramirez, C. Tepedelenlioglu, D. Srinivasan and A. Spanias, "Real-time PV Fault Detection using Embedded Machine Learning," *2024 IEEE 7th International Conference on Industrial Cyber-Physical Systems (ICPS)*, St. Louis, MO, USA, 2024, pp. 1-5.
4. W. Chao, A. Sharma, G. Uehara, L. Miller, **D. Pujara**, W. Barnard, J. Larson, and A. Spanias. "Introducing Quantum Computing in a Sophomore Signals and Systems Course." *2023 IEEE Frontiers in Education Conference (FIE)*, pp. 1-5. IEEE, 2023.
5. **D. Pujara**, D. Ramirez, C. Tepedelenlioglu, D. Srinivasan and A. Spanias, "Design of a New Photovoltaic Intelligent Monitoring and Control Device," *2023 14th International Conference on Information, Intelligence, Systems & Applications (IISA)*, Volos, Greece, 2023, pp. 1-4.
6. S. Rao, **D. Pujara**, A. Spanias, C. Tepedelenlioglu and D. Srinivasan, "Real-time Solar Array Data Acquisition and Fault Detection using Neural Networks," *2023 IEEE 6th International Conference on Industrial Cyber-Physical Systems (ICPS)*, Wuhan, China, 2023, pp. 1-5.
7. **D. Pujara**, P. Patel and S. Gajjar, "Geo Tracking of Waste, Triggering Alerts and Mapping Areas with High Waste Index," *2020 IEEE 17th India Council International Conference (INDICON)*, New Delhi, India, 2020, pp. 1-5.
8. **D. Pujara**, P. Kukreja and S. Gajjar, "Design and Development of E-Sense: IoT based Environment Monitoring System," *2020 IEEE Students Conference on Engineering & Systems (SCES)*, Prayagraj, India, 2020, pp. 1-5.

INVITED PRESENTATIONS

- **D. Pujara**, C. Tepedelenlioglu, D. Srinivasan and A. Spanias, "Design and Implementation of a Photovoltaic Monitoring Device," *2022-2023 SenSIP Industry Consortium*, Arizona State University, Arizona, USA, 2022-2023.
- **D. Pujara**, D. Ramirez, C. Tepedelenlioglu, D. Srinivasan and A. Spanias, "Real-time PV Fault Detection using Embedded Machine Learning," *2024 SenSIP Industry Consortium*, Arizona State University, Arizona, USA, 2024.
- **D. Pujara**, D. Ramirez, C. Tepedelenlioglu, D. Srinivasan and A. Spanias, "Design of a New Photovoltaic Intelligent Monitoring and Control Device," *2023-2024 Arizona Student Energy Conference*, Arizona, USA, 2023.

SKILLS AND EXPERTISE

- **Programming:** Python, MATLAB, C++
- **Packages:** Scikit-Learn, TensorFlow, TensorFlow Lite, PyTorch, NumPy, Matplotlib, Pandas
- **Software:** Microsoft Office, Visual Studio Code, Arduino IDE, Raspberry Pie, LaTeX, Jira, Confluence, Simulink, Git
- **Sensors Used:** Arduino UNO, Arduino BLE 33 Sense, ESP 32 (Wi-Fi), XBee S2C, MCP2210 (USB to SPI Bridge)
- **Relevant Coursework:** Digital Signal Processing, Communication System, Machine Learning, Embedded ML (Edge Computing), Deep Learning, Speech Processing, Artificial Neural Computation, Python Programming, Random Signal Theory, Microcontrollers, and Microprocessors