ASU Sensor, Signal & Information Processing (SenSIP) Center

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SenSIP Seminar Series

Design of a New Photovoltaic Smart Monitoring and Control Device

Presenter: Deep Pujara, Ph.D. Candidate in ECEE

October 26, 2023, 3:00 PM / MTW Room 3654 and Zoom: https://asu.zoom.us/j/84377030681

Abstract

The growing demand for solar energy has created a need for efficient solar fault detection systems. Among the most challenging problems is to detect and classify Photovoltaic (PV) faults that may change gradually over time. These faults can reduce the overall energy output and cause damage to the PV cells. An existing PV smart monitoring device (SMD) provided by Mitsui acquires voltage, current, and temperature. The existing device (2010) has several features and shortcomings including data security, slow sampling rate, and non-programmable hardware. This presentation discusses the development of a new smart monitoring and control device (SMCD) that makes provisions for embedded machine learning, increased sampling rates, ambient temperature and Irradiance measurement, and data security. The hardware consists of two main parts. The first part comprises various sensors that are connected to an Arduino microcontroller. These sensors collect PV data, such as voltage, current, ambient temperature, and Irradiance. The second part is a local server/HUB that wirelessly receives, processes, and stores the data. This division of the SMCD into two parts enables efficient data collection and processing, thereby facilitating an accurate assessment of the PV system's performance. Overall, the new SMCD hardware enables effective and real-time fault detection using an Arduino Nano microcontroller enhancing the reliability and safety of solar energy systems. The presentation will also provide information about a solar testbed utilized to validate the proposed system and the use of Neural Field Radiance (NeRF) to create a 3D model of the SenSIP solar facility.

Biography:

Deep Dhavalbhai Pujara received his bachelor's degree in Electronics and Communication Engineering from the Institute of Technology, Nirma University, Gujarat, India. Currently, he is in the direct Ph.D. program in the School of Electrical, Computer, and Energy Engineering (ECEE) at Arizona State University, Tempe, Arizona. As a Research Associate at the SenSIP Center Lab at ASU, Deep works on projects including solar monitoring, signal processing, and machine learning. Under the mentorship of Professors Spanias and Tepedelenlioglu, he is making contributions to the field. In addition to his research associate appointment, Deep is also a graduate teaching associate for the course EEE 407/591 (Digital Signal Processing). Last summer, Deep was working at Skyworks Solutions as a broadcast application engineering intern. Moreover, during the summer of 2022, he provided his mentorship in the Research Experience for Undergraduates (REU) and Research Experience for Teachers (RET) programs organized by the SenSIP center and supported by the National Science Foundation.

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