

Indo/US Collaborative Research Grants

National Science Foundation of US and Technology Innovation Hubs of India



Title: Design and Development of Microservice-Based Fog-Enabled Infrastructure for Smart Agriculture

Indian PI: Dr. Sanjeet Kumar Nayak, Assistant Professor, IIITDM Kancheepuram, Chennai, India.

Indian Co-PI: Dr. Ramnarayan Yadav, Assistant Professor, IITRAM, Ahmedabad, India.

US PI: Prof. Shivakant Mishra, Professor, University of Colorado, IN, US.

The Industrial 4.0 revolution boosts agricultural production because smart sensors are used to solve the increasing food production demand. Several IoT devices are implanted around the plants/soil in a smart agricultural system to collect data that is critical for making decisions. Since these IoT devices are resource constrained, they are unable to handle large volumes of data. To address this gap, the collaborative project aims to develop a microservice-based fog-enabled infrastructure for smart agriculture using LoRa and LoRaWAN networking protocols by using license-free sub-gigahertz radio frequency bands. Various functionality of the smart agriculture application will be implemented in isolation as separate microservices, and the overall application/service will be built by interconnecting relevant microservices. The proposed project on building a fog-enabled smart agriculture application is based on the complementary objectives of the US PI's NSF award and the India PI's Technology Development Project Grant from TIH IoT & IoE at IIT Bombay. The US PI's NSF award is focused on issues at the fog layer (and cloud layer to some extent), while the India PI's award is focused on the issues at the sensing layer and the interaction between sensing and fog computing layer. The goal of US PI's NSF award is to identify and develop system level services for fog computing layer to build latency-sensitive context-aware IoT applications, while the goal of the India PI award is to develop a communication module for precision agriculture using LoRa and LoRaWAN networking protocols. Since a smart agriculture application is comprised of sensing, fog and cloud layers, research collaboration between TIH IoT & IoE at India and NSF at USA is crucial for building such an important application that will have far reaching beneficial impact in both US and India as well as the rest of the world.

