The proliferation of sensor data from IoT devices, instruments, and environmental sensors provides new opportunities for scientific discovery, but also presents challenges on how to collect, manage, access, and analyze the data. Sensor data is different from most other datasets in that it is continuously streaming; via different protocols; and in general, of large volumes. Most individual researchers who produce sensor data lack the expertise or resources to develop their own software solutions. Funded by NSF’s HDR (Harnessing the Data Revolution) program, SACI addresses these challenges by designing and deploying an easy-to-use cloud-based real time sensor data management and analysis platform (https://mygeohub.org/groups/gabbs/aboutsaci). Sensor data providers can easily register their data sources using the SACI web portal (hosted on mygeohub.org) and connect their sensors to an automatically generated SACI endpoint for data ingestion. In the backend, the data is stored in a MongoDB database which is deployed on a cloud resource provided by the XSEDE national computing CI. Data consumers can query and access the sensor data via the SACI portal or its REST API. The SACI system is implemented using an open-source software stack including RabbitMQ, node.js, MongoDB, Docker, and HUBzero.

The SACI system has been used to support several sensor data management needs including: (1) collecting and analyzing the sensor data from Leafspec handheld scanners to monitor the healthiness of crops and plants by phenotyping researchers as well as farmers in the fields; (2) ingesting data from distributed air quality sensors which are used to teach students real world knowledge on sensor technologies and big data analysis in a Purdue course; and (3) connecting to manufacturing data via the MTConnect standardized protocol and developing visual analytics tools to process the data and detect defects.

In this poster we describe the motivation, overall system architecture, software implementation, current use cases, and future work of the SACI system.