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Sponsors: NC State University College of Agriculture and Life Sciences & IBM

System Blocks:

1. R-Pi Edge Computing

- Deep learning model deployed on the Raspberry Pi (R-Pi)
- The R-Pi will transmit the water stress level predicted by the deep learning model to the cloud, which will then be shown on the website

2. Cloud Platform

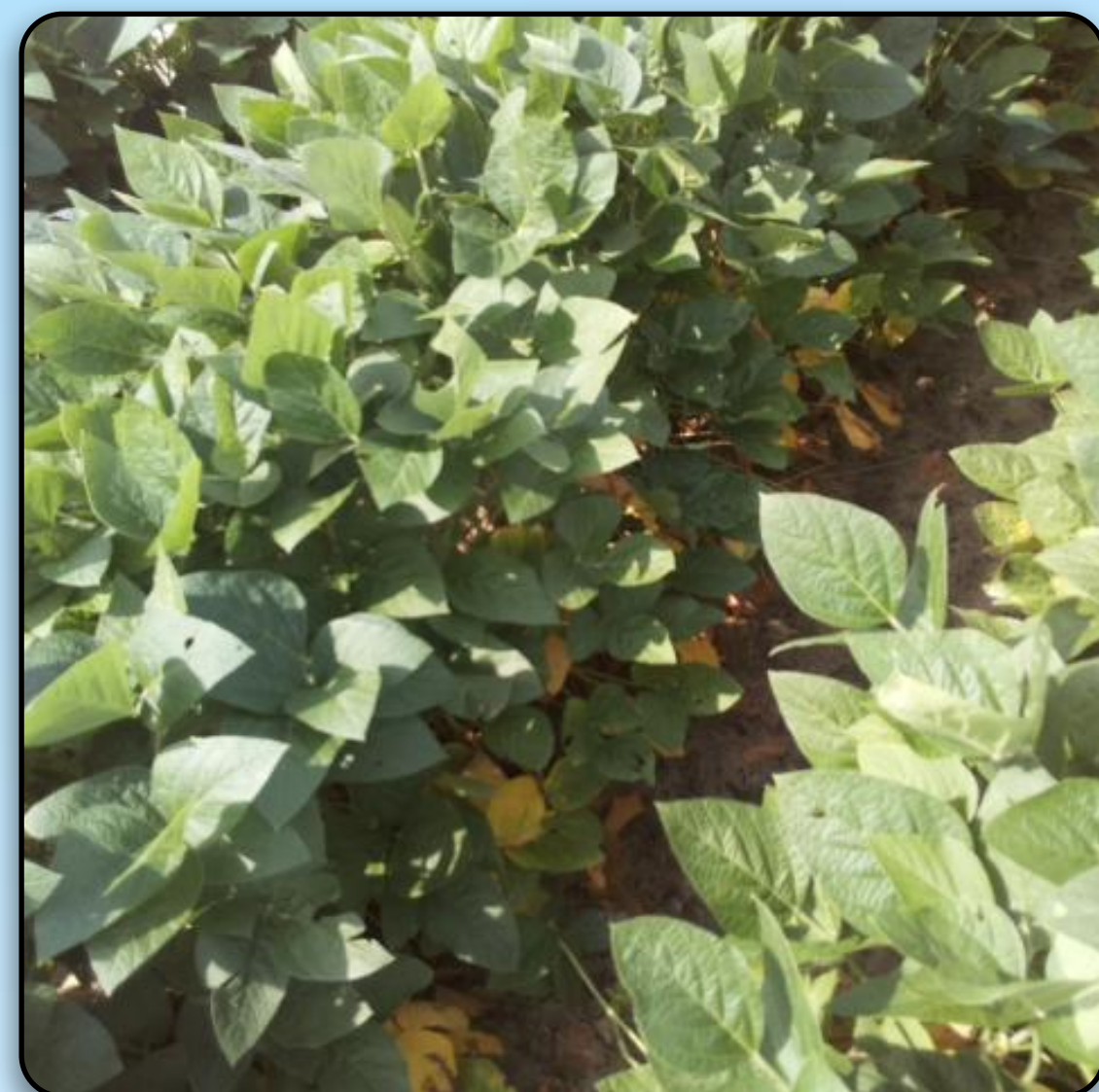
- Uses IBM's IoT Platform for device management and registration
- Through the cloud platform, the connected historical/analytical databases and dashboards will be visible on the website
- Allows user access management

3. Web Platform

- Features a simple user interface
- Facilitates data-driven decisions through historical and daily plots
- Plots display water stress level, and canopy and air temperature
- Can connect and send commands to multiple camera nodes

Project Objective

- Develop an IoT platform that sends pictures and sensor data from soybean fields, analyzes the data, and predicts the crop's water stress level
- The web platform must feature data visualization and device management features
- This system will be used by crop researchers at NC State to identify drought tolerant genotypes



Low Water Stress Level



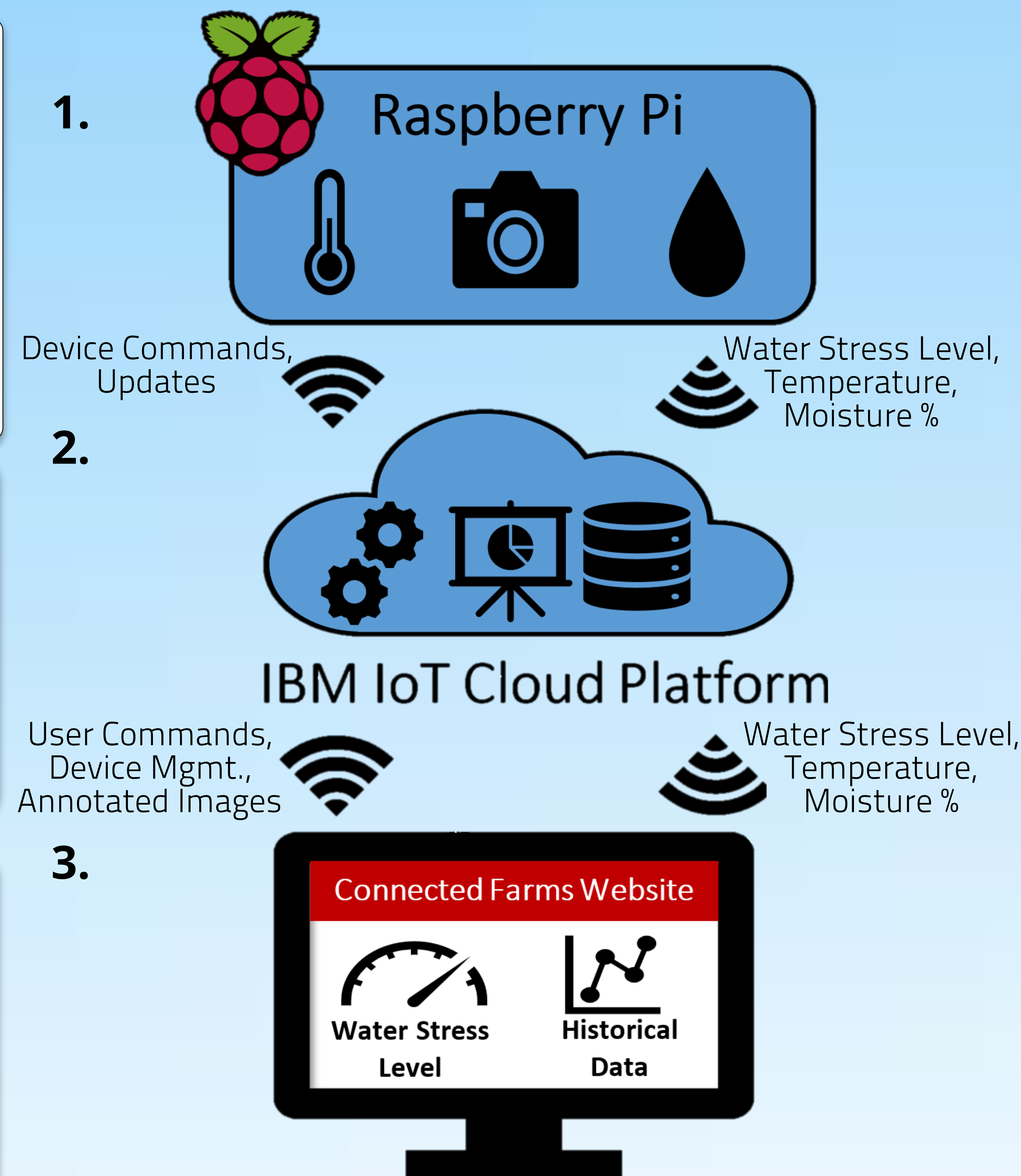
High Water Stress Level

Product Requirements

- Automatically determine water stress levels in crops by training a deep learning model
- Create a web platform that will feature data visualization and device management
- Results are stored in a Db2 database without corruption and can be accessed by Cognos

Design Challenges

- Keeping user interface simple and easy to use to allow adoption by farmers
- Connecting multiple camera nodes to the IoT platform in areas with extremely limited internet connection speeds



Results

- Machine learning algorithm with 74% classification accuracy and a loss of 1-2
- Fully functional web platform that visualizes data sent from devices in the field and is able to control devices
- Data was not corrupted and able to be accessed by Cognos

Future Work

- Annotate uploaded images either locally, Drive, or Dropbox
- Wireless image transfer between Raspberry Pi and website