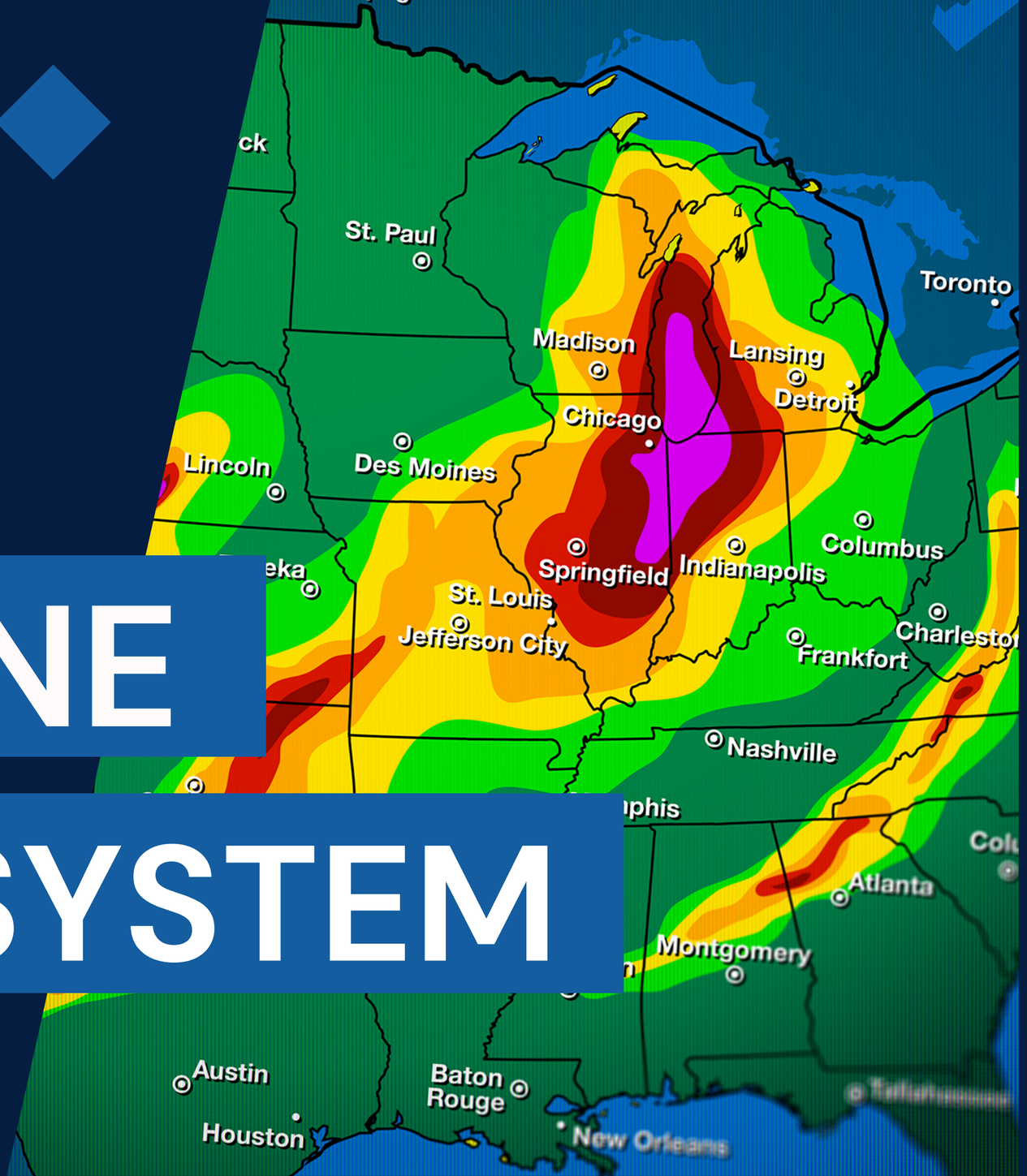
ONE-TO-ONE FORECAST SYSTEM

INDRA DYNAMICS



Overview

01
Our Team

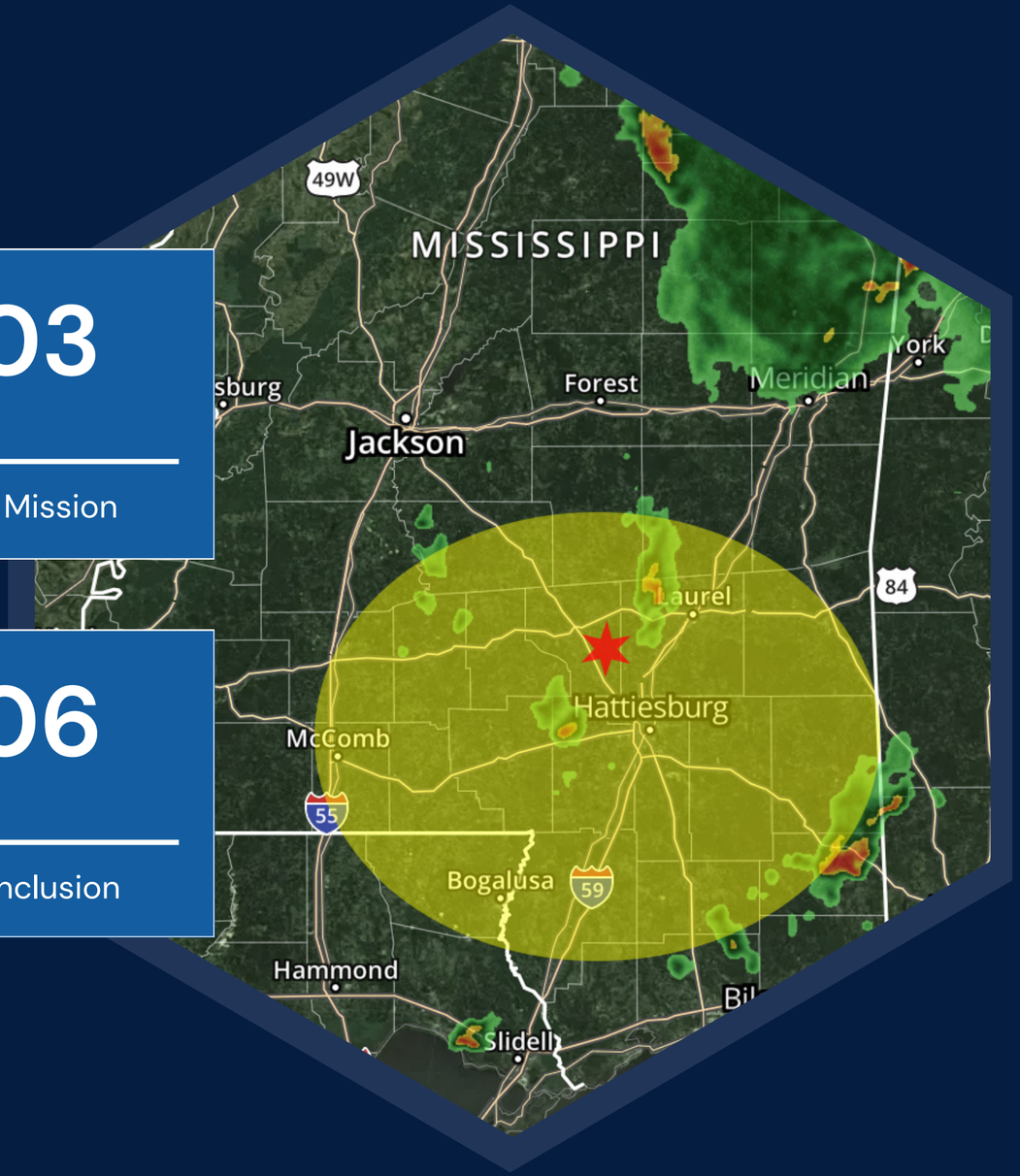
02
User Persona

03
Our Mission

04
Project Overview

05
Subsystems

06
Conclusion



Our Team

Judd

Hardware Lead

Stevie

Sensor Lead

Spencer

Communications Lead

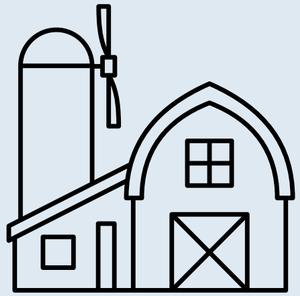
Adam

Machine Learning Lead

Kirby

User Interface Lead

The Problem



Jack

- Age: 47
- Occupation: Farmer

Jack’s Problems

- Jack lives miles away from the nearest weather station
- Weather apps report weather conditions local to the weather station, not the user.

Our Solution

- Give Jack a personal weather station at his farm

The Problem

Jill

- Age: 25
- Occupation: City Event Planner

Jill’s Problems

- Jill manages outside events that can be ruined by suprise weather conditions
- The way weather apps calculate weather probabilites can be misleading

Our Solution

- Give Jill sensors that will alert her to sudden atmospheric changes

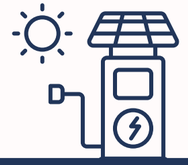
OBJECTIVE

We are giving consumers a more accurate and personalized alternative to the common weather app

One to One Forecast System

NOAA

Weather Station



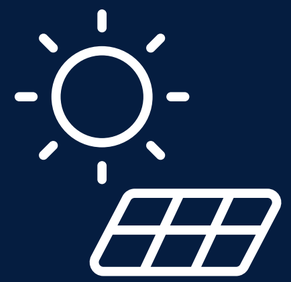
Local NWS Station

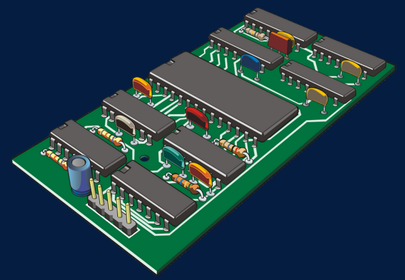
Communications

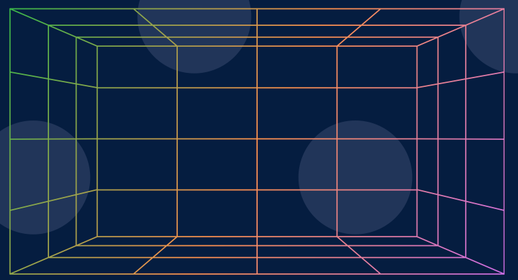
Machine Learning Program

User Interface

Hardware







Battery

Li-ion battery

Solar

Solar panel for charging

Processor

Raspberry Pi 4

Enclosure

IP64, IK10 rated
Open-air contact for sensors

Sensors

Temperature

1 DS18B20 Sensor
±.5° from -10-85°C[1]
3 BME 280 Sensors
±1° from 0-65° C[2]

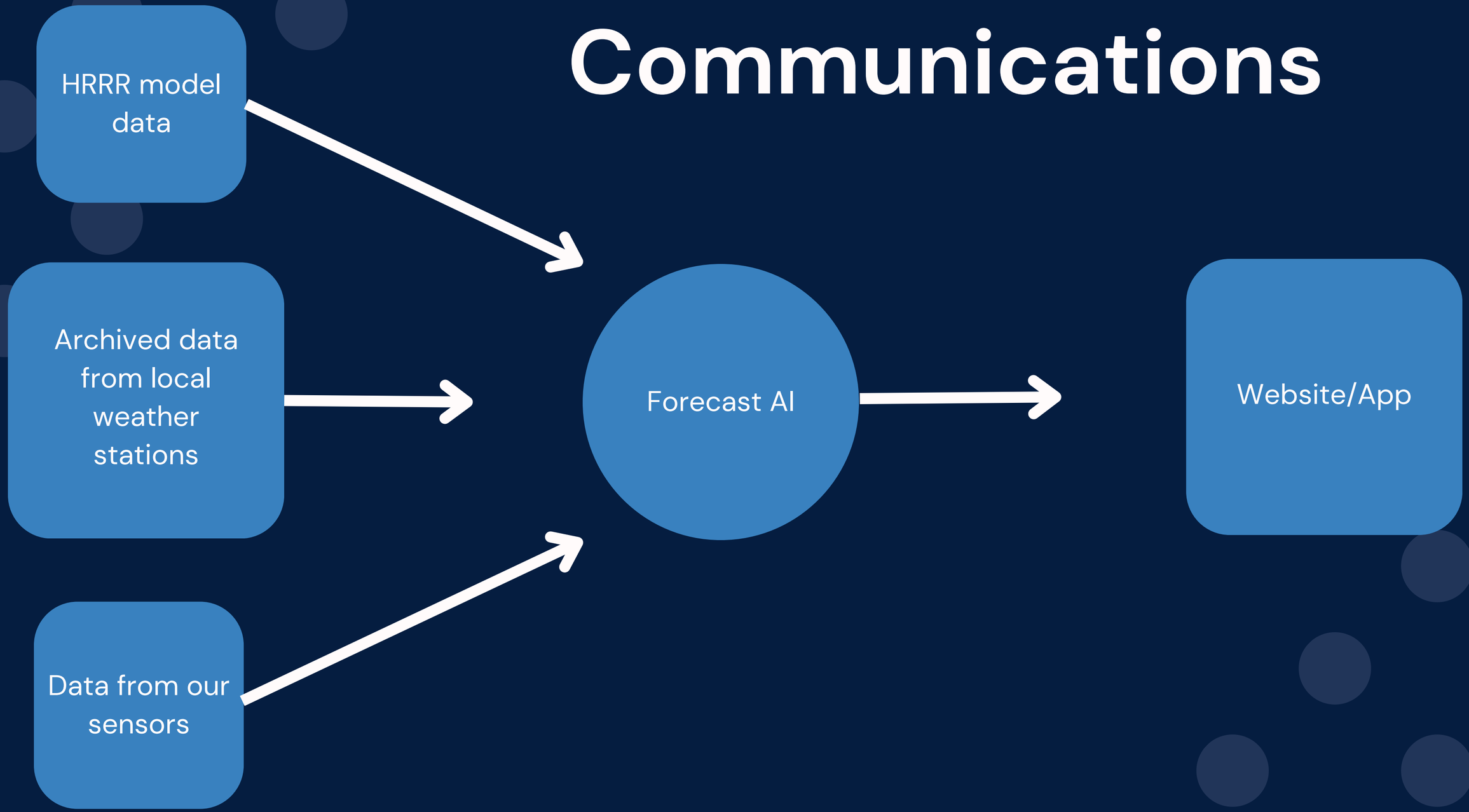
Pressure

3 BME 280 Sensors
±1 hPA from 300-1100 hPa [2]

Humidity

3 BME 280 Sensors
±3% RH from 0-100% RH at 0-60° C [2]

Communications



Forecast AI

Data Clean-up

Filter data to operate smoothly with AI structure.

AI Model

Traditional linear regression and neural network options are being considered.

Validation

AI model tested for under- or over-fitting.

Forecast AI

NEURAL NETWORK

- Multi-Output Regression [3]
- LSTM -> Convolutional layers
- Temporal nature of the weather data set lends well to a recurrent network of varying layer types (LSTM, Conv, ReLU)

TRADITIONAL REGRESSION

- Less resource intensive
- Each output needs a model [4]
- Requires more data analysis experience

User Interface

Information Assessment

Generation

Content Delivery

Conclusion

The One-to-One Forecast system is making accuracy more accessible.

Citations

[1] Adafruit Industries, “DS18B20 programmable resolution 1-Wire Digital Thermometer,” DS18B20 datasheet, March. 2007 [Revised April. 2008].

[2] Adafruit Industries, “BME 280 Digital Humidity, Pressure, and Temperature Sensor,” BME280 datasheet, Nov. 2014 [Revised Jan. 2022].

[3] G. Song and W. Chai, “Collaborative Learning for Deep Neural Networks,” *arxiv.org, 2018*. Available: https://arxiv.org/abs/1805.11761 [Accessed: Oct. 4, 2023]

[4] AnkanDas22, “Decision Tree Regression Using Sklearn,” *geeksforgeeks.org,* 2023. [Online]. Available: https://www.geeksforgeeks.org/python-decision-tree-regression-using-sklearn/ [Accessed: Oct. 4, 2023].

ONE-TO-ONE FORECAST SY

INDRA DYNAMICS