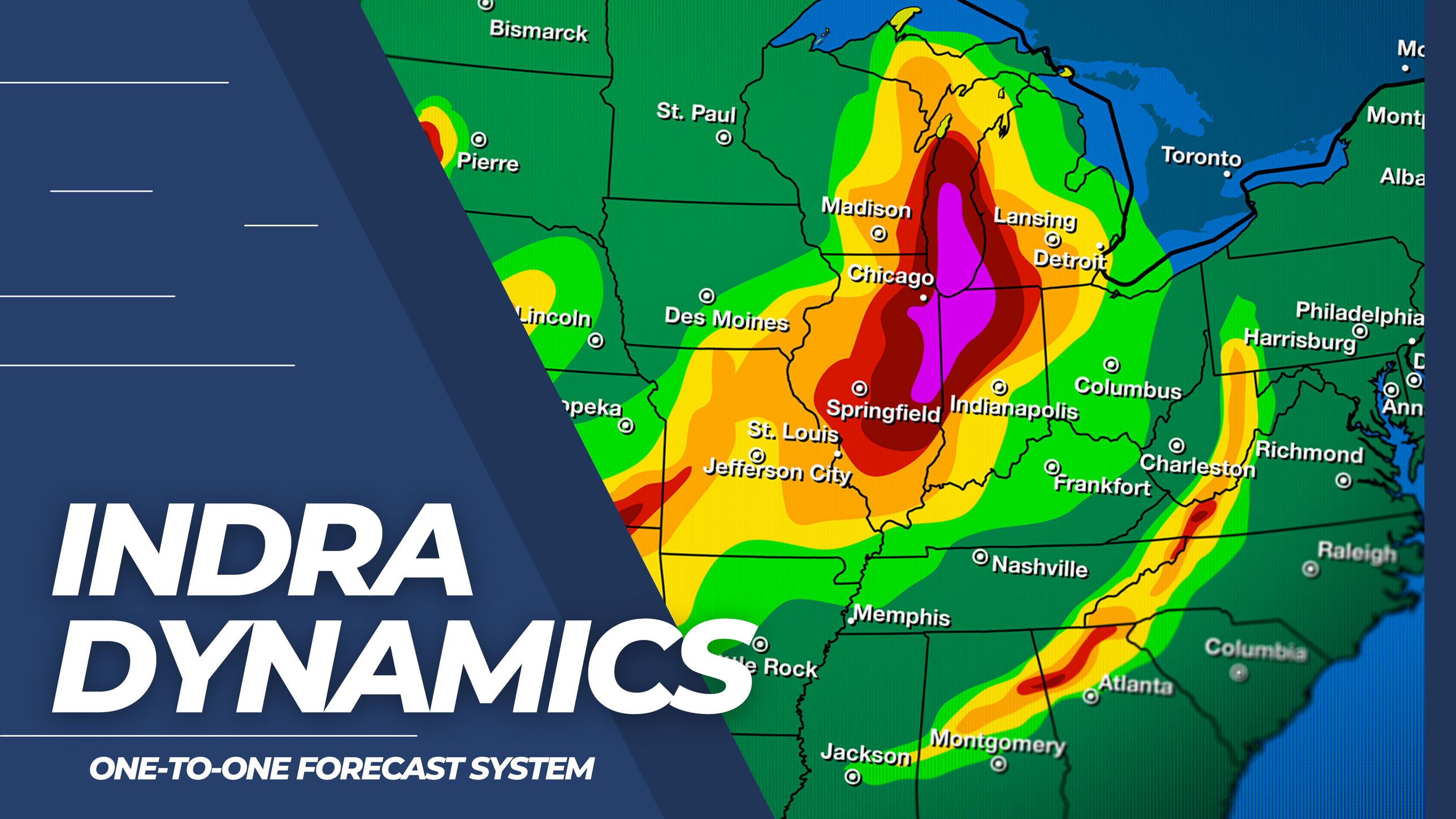


INDRA DYNAMICS

ONE-TO-ONE FORECAST SYSTEM

OVERVIEW

OUR TEAM

Judd Kasper

Structure

Steven Vaughn

Sensor Network

Spencer Bull

Communications

Adam Bushman

Forecast AI

Kirby Heathcock

User Interface

ADVISORS

Dr. Phyllis J. Beck

-Advisor-

Computer Science
Artificial Intelligence

Dr. Jamie Dyer

-Consultant-

Meteorology
Climatology

Cameron Lindsey

-Consultant-

First Alert 6
Meteorologist

Jack

- **Age:** 47
- **Occupation:** Farmer
- Uses the system to plan for cutting hay and crop irrigation
- Lives an hour away from the nearest weather station

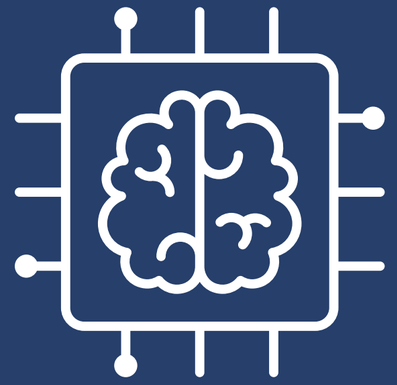
Jill

- **Age:** 25
- **Occupation:** Event Planner
- Uses the system to monitor the weather during city events
- Weather apps do not predict immediate weather

THE ADVANTAGE

Common Weather Apps

- Gives out raw forecast data
- No memory of past weather for a location
- Weather percentages suffer from lack of data resolution



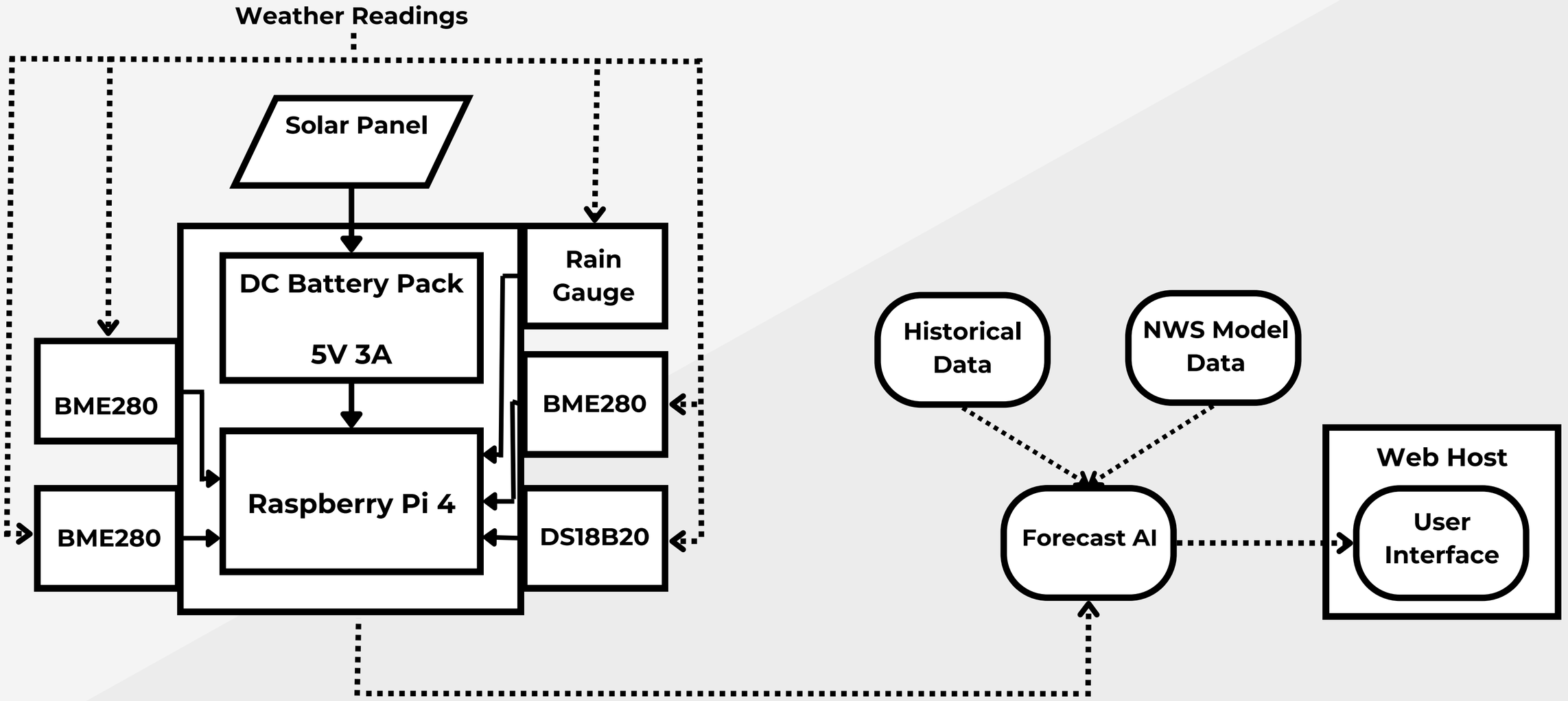
One-to-One Forecast System

- Emulates meteorologist intuition
- Trained by past weather patterns from your local area
- Data resolution enhanced by independent sensors

OBJECTIVE

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

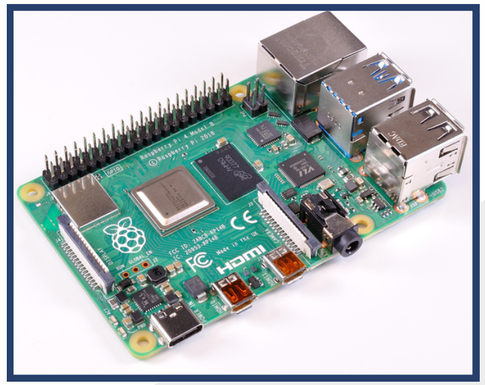
PROJECT OVERVIEW



STRUCTURE

Battery

2 LOVELEDI
15,000 mAh



Processor

Raspberry Pi 4
8 GB RAM

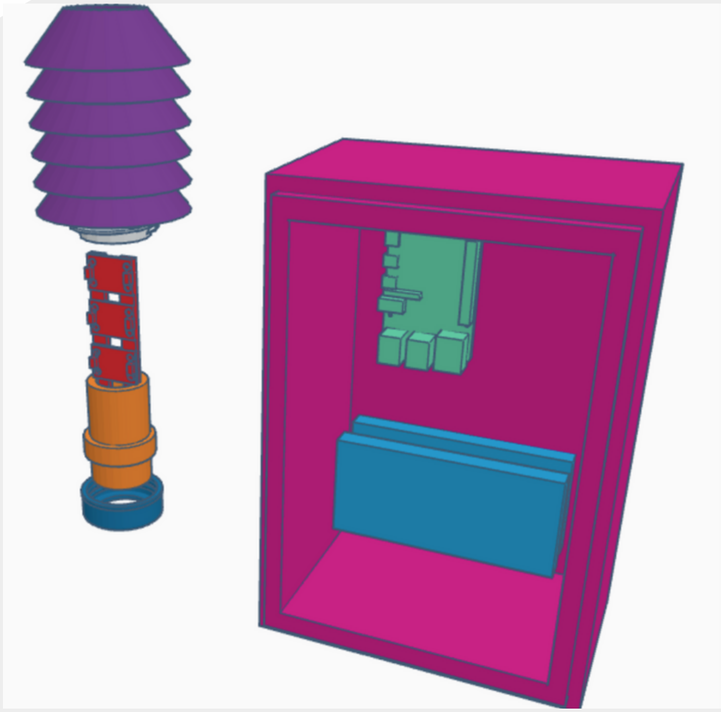
Solar

20W Solar
Panel

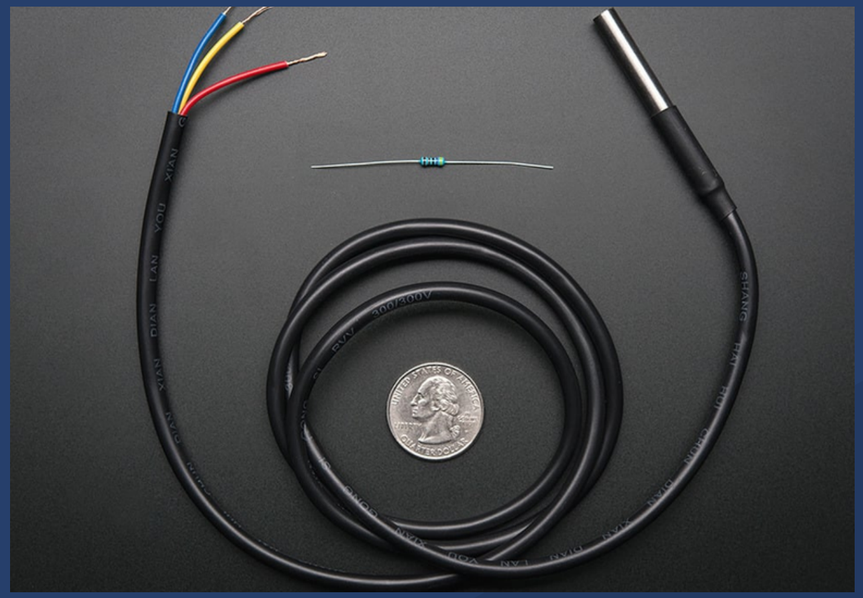
STRUCTURE

Enclosure

IP64, IK10
Rated Structure



SENSOR NETWORK



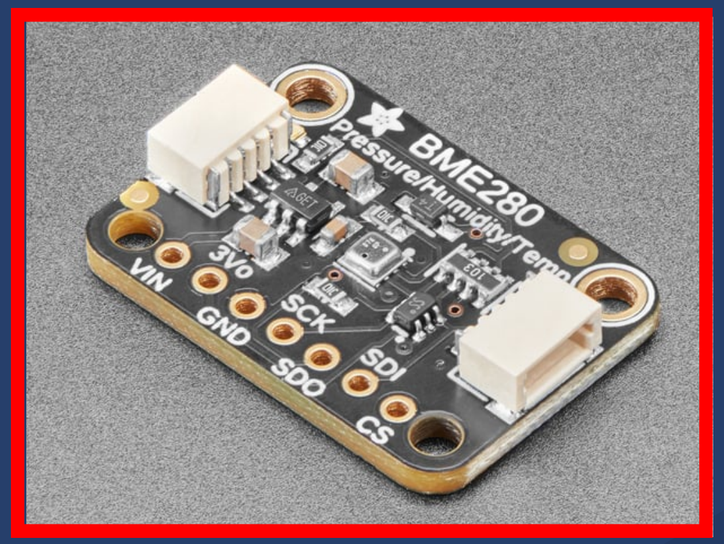
Station Interior Sensor

-Safety/ Performance

-DS18B20

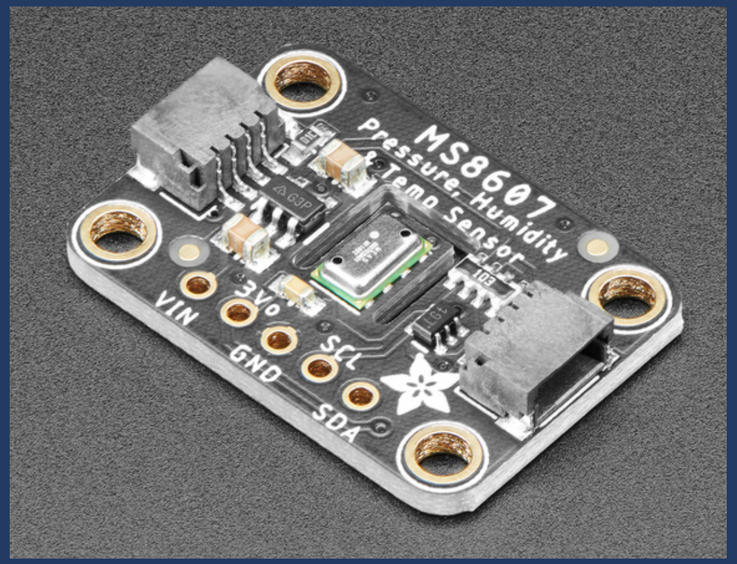
-Temperature

SENSOR NETWORK

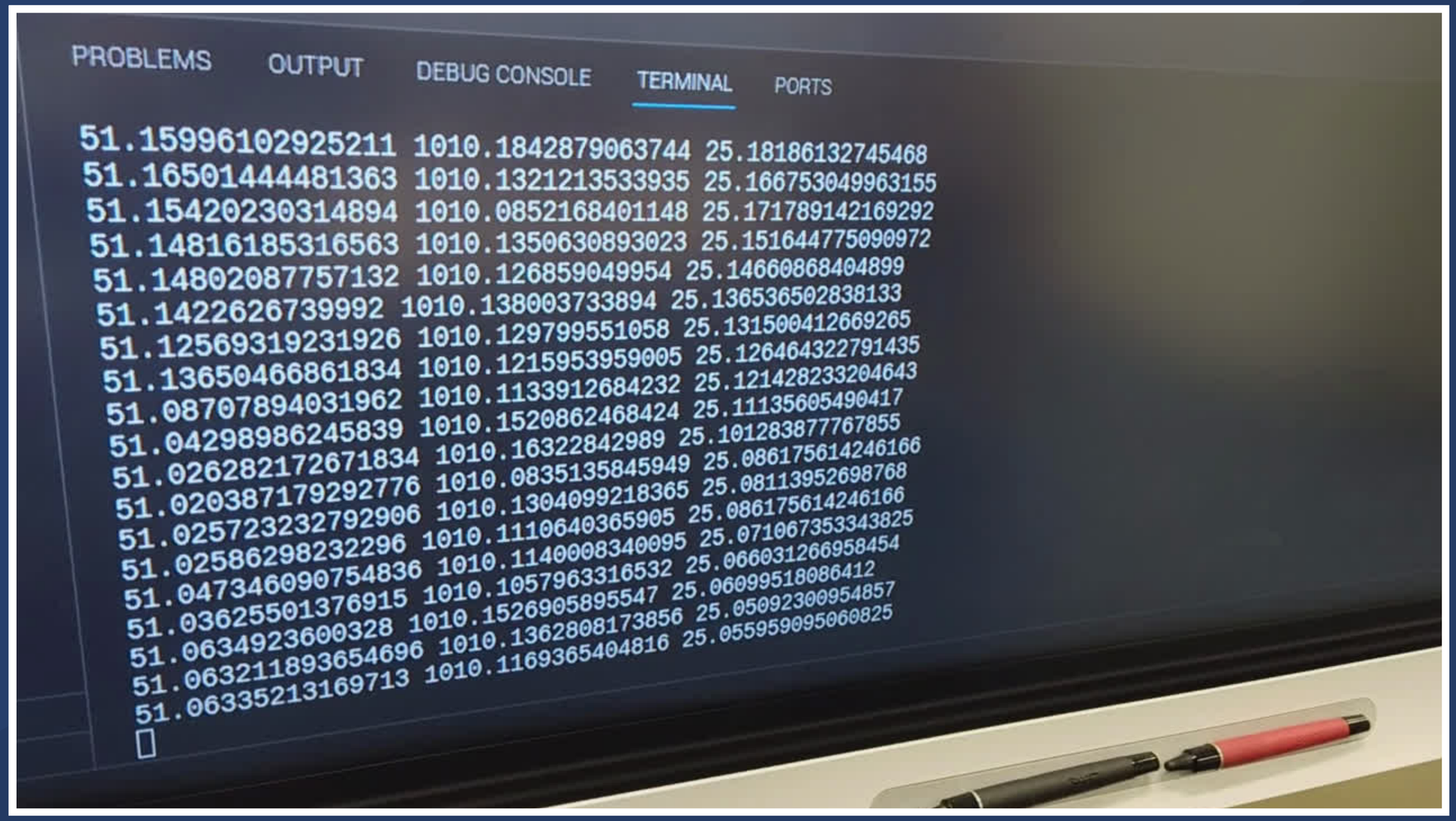


Atmospheric Sensors

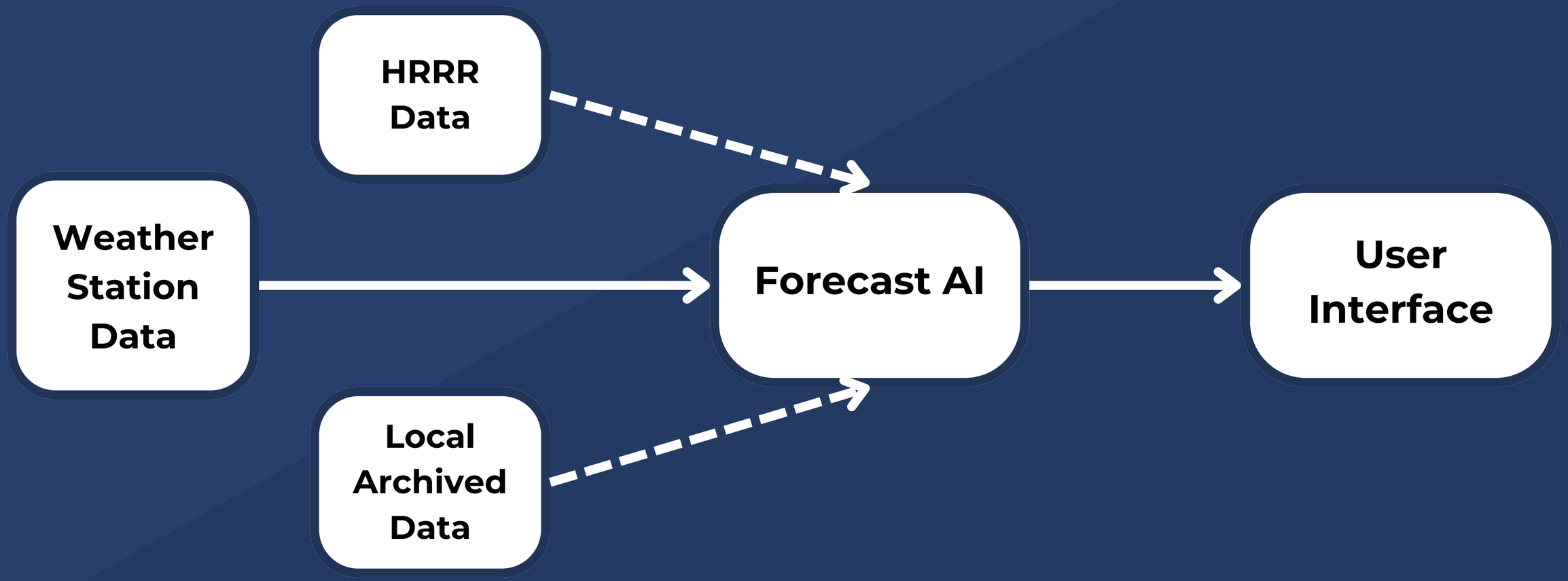
-Redundant Sensors
-BME280
-MS8607
-Temperature
-Pressure
-Humidity



Sensor Network



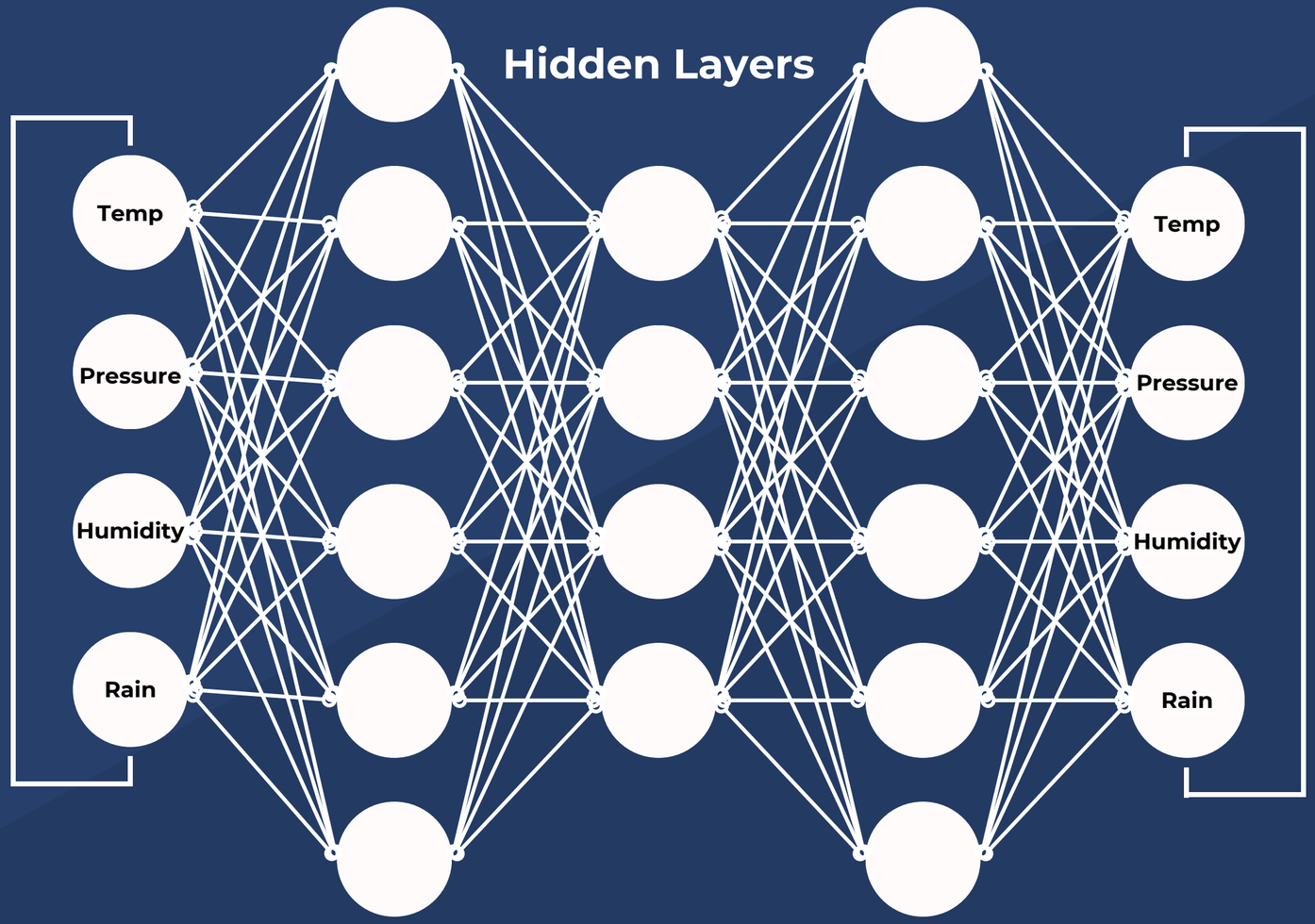
COMMUNICATIONS



FORECAST AI

Input:

Predicted HRRR model data



Output:

Predictions refined with historic data

Multi-Output LSTM

FORECAST AI

Hidden Layer 1

- LSTM Layer
- ReLU Activation
- 150 Neurons

Hidden Layer 2

- Dense Layer
- ReLU Activation

Output Layer

- Dense Layer
- Linear Activation
- 4 Outputs

Loss Function

Mean squared error

Data Normalization

Min-Max Scaler

Optimization

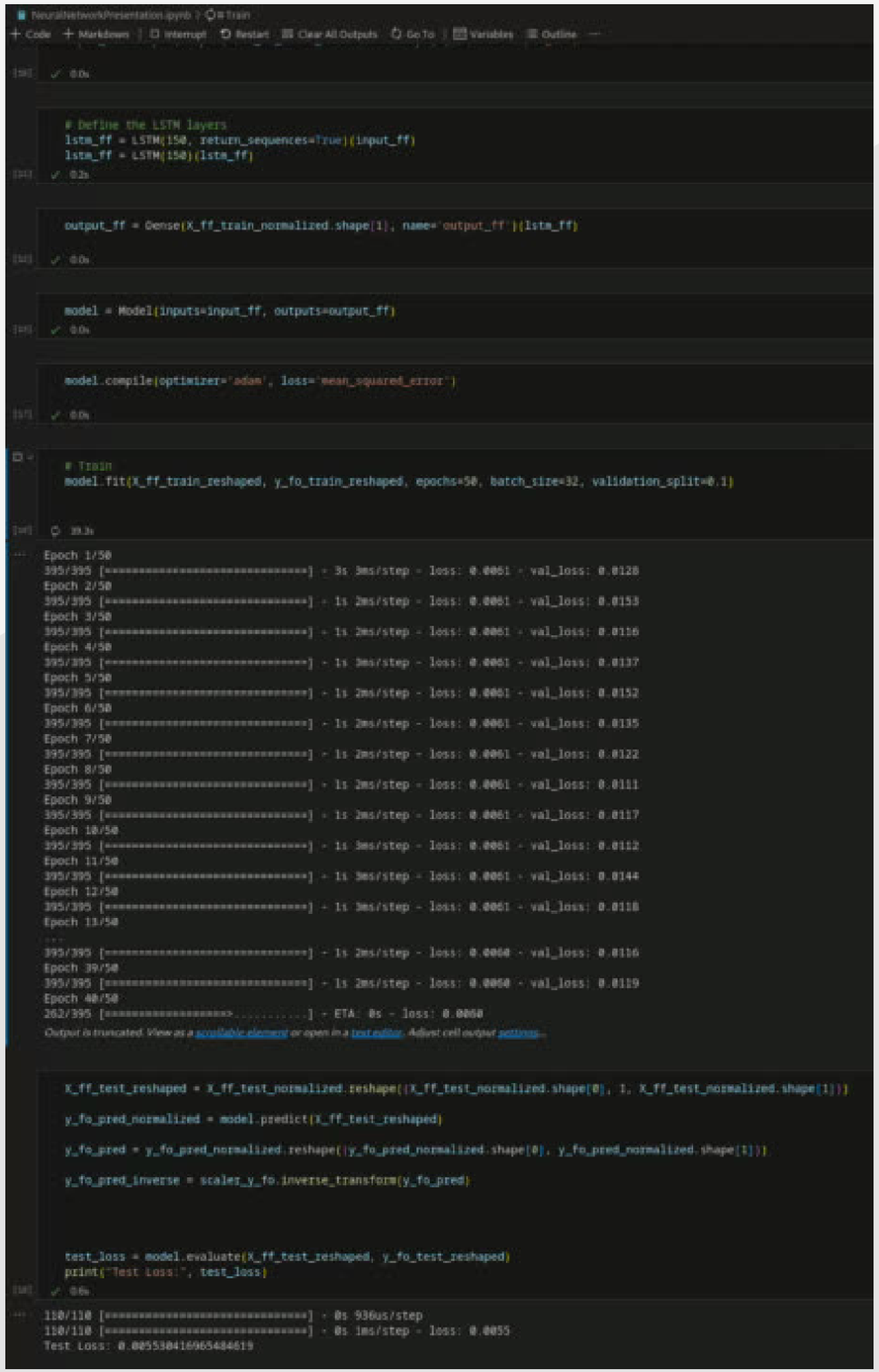
Adam optimizer

FORECAST AI

Training

- 80/20 training split
- 50 epochs

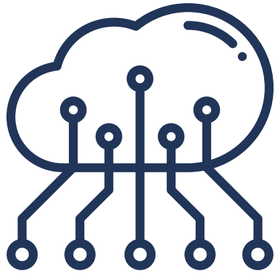
Loss:	Validation Loss:
0.00468	0.011



USER INTERFACE

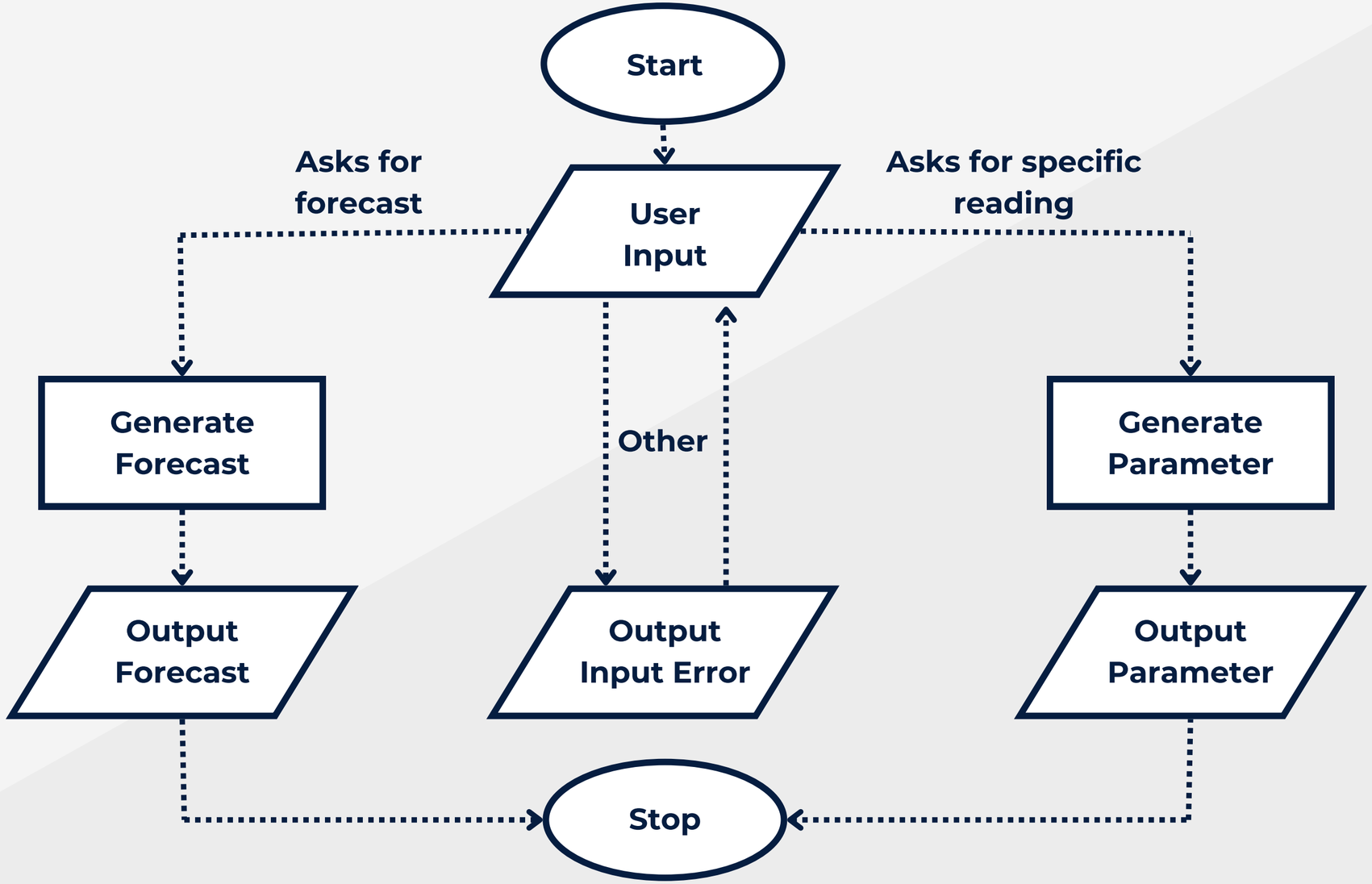
Information Assessment

Process and Generation

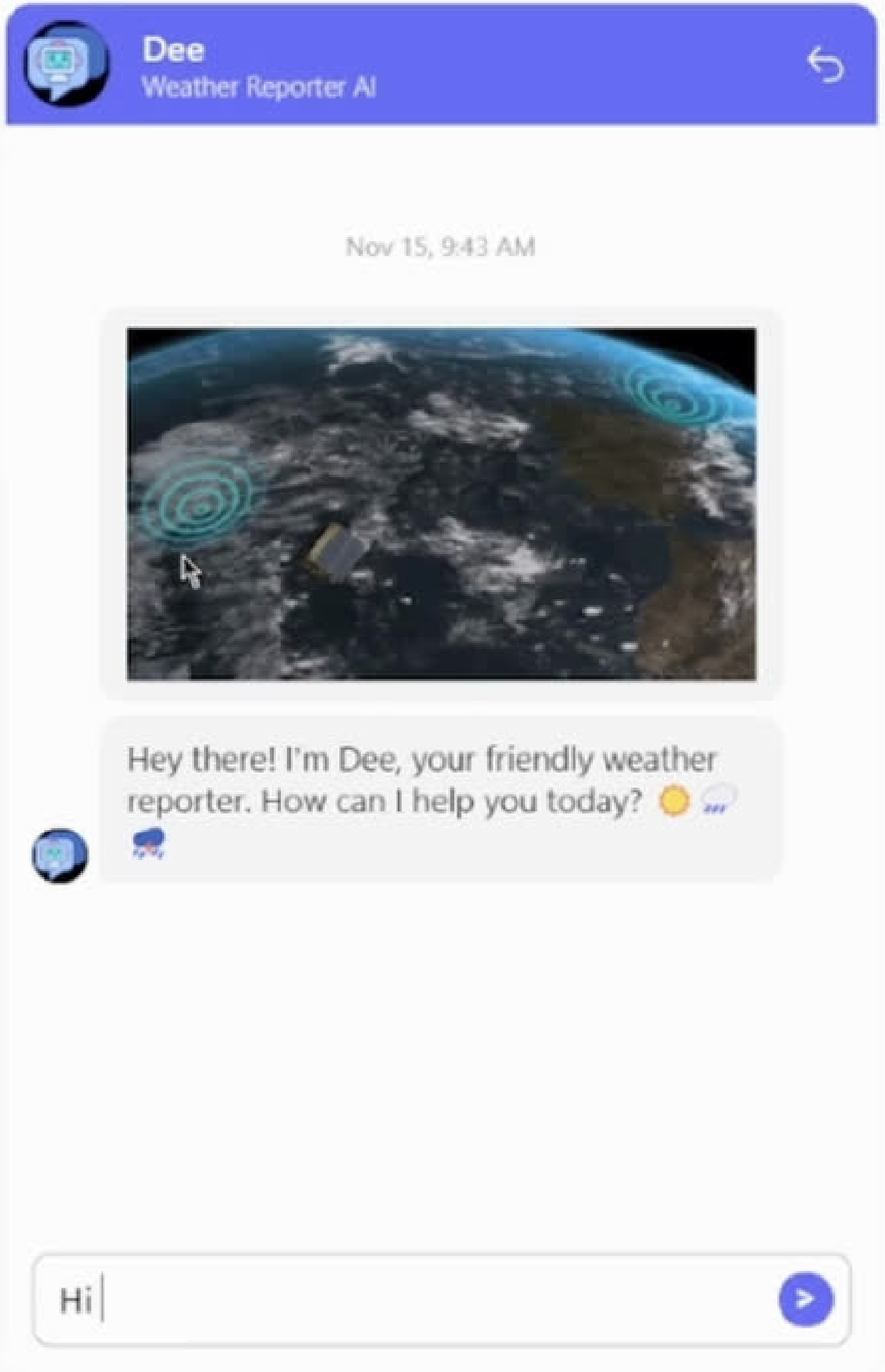


Content Delivery

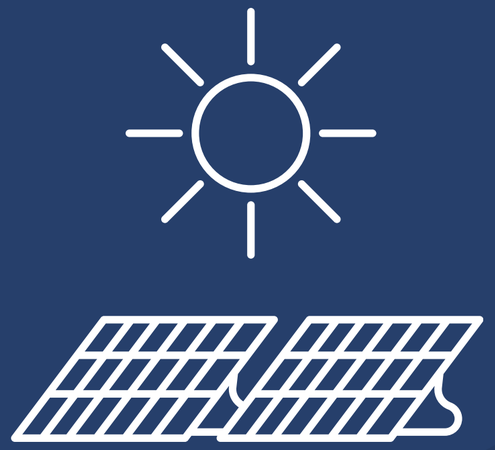
USER INTERFACE



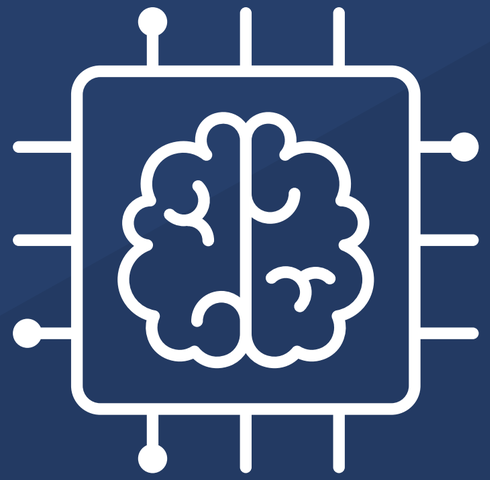
USER INTERFACE



FUTURE WORK



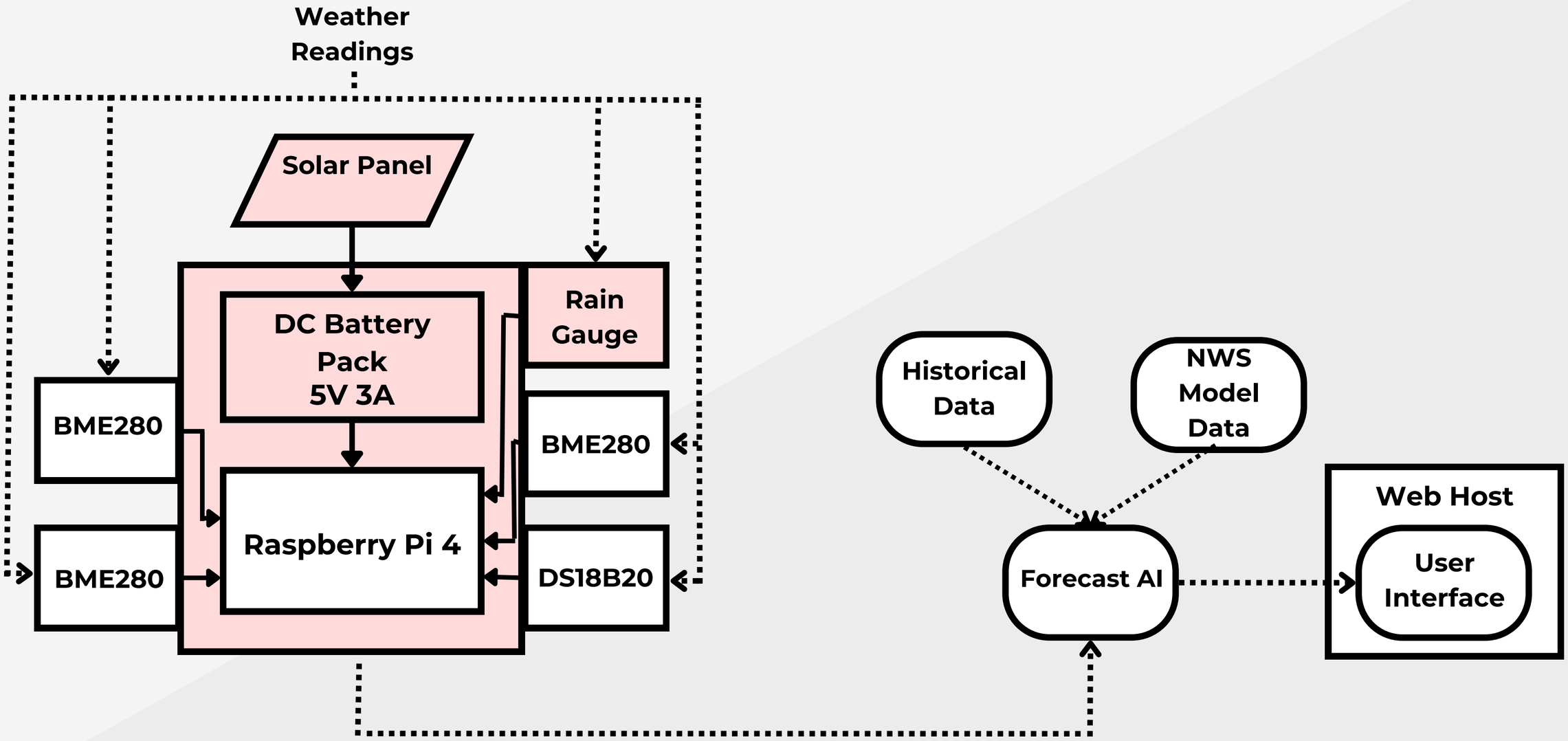
Solar Power



Onboard AI

Rain Gauge

FUTURE WORK


Weather Readings
Solar Panel
DC Battery Pack 5V 3A
Rain Gauge
BME280
BME280
BME280
Raspberry Pi 4
DS18B20
Historical Data
NWS Model Data
Forecast AI
Web Host
User Interface

CHALLENGES

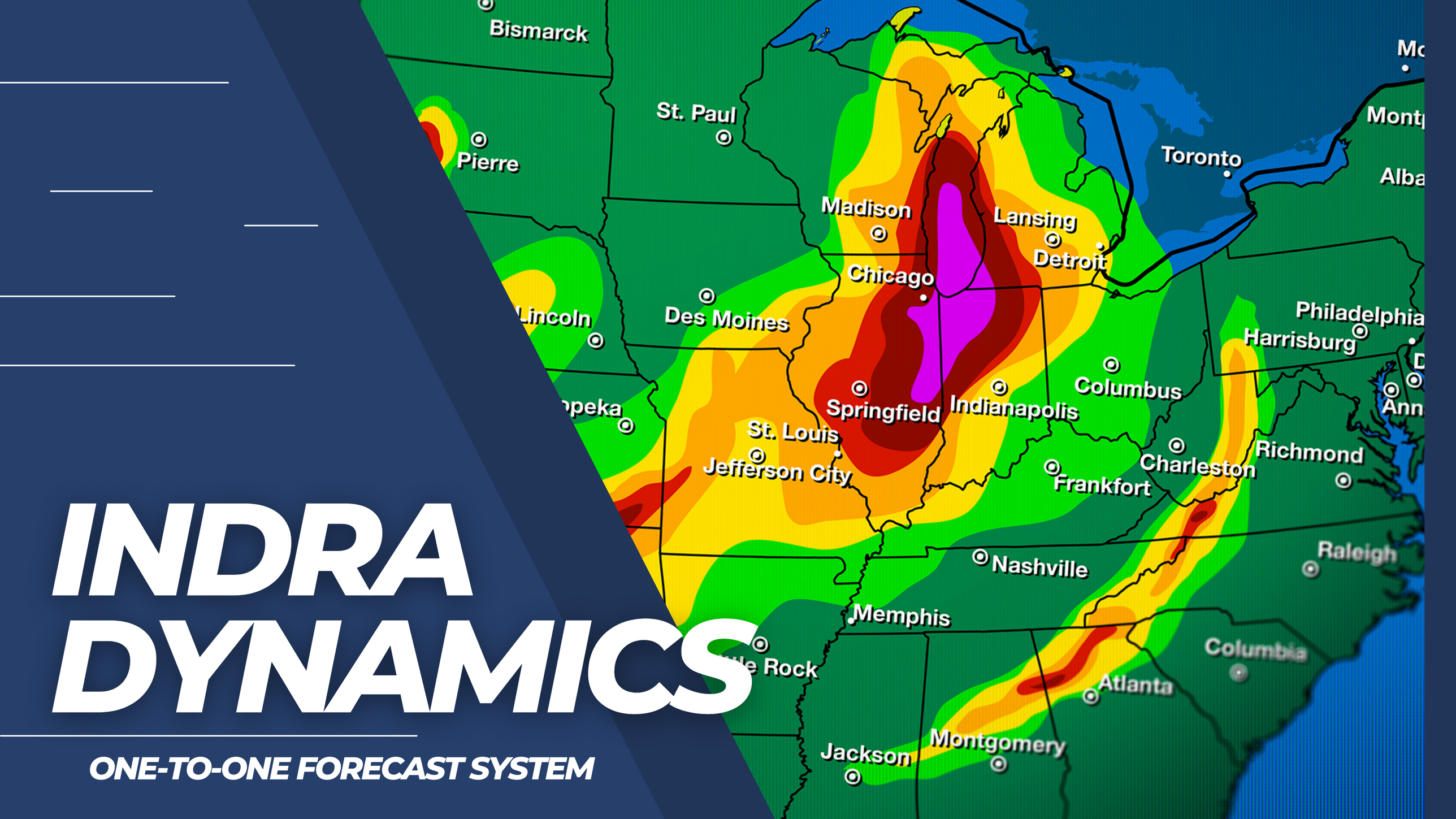
-Battery Amperage
-Sensor Control Timing
-Format of Weather Data
-UI Data Reading Problems

CONCLUSION

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

REFERENCES

[1] Maxim, “DS18B20 Programmable Resolution 1-Wire Digital Thermometer,” DS18B20 datasheet, Mar. 2007 [Revised Apr. 2008].
[2] Bosch, “BME 280 Digital Humidity, Pressure, and Temperature Sensor,” BME280 datasheet, Nov. 2014 [Revised Jan. 2022].
[3] TE Connectivity, “MS8607-02BA01 PHT Combination Sensor,” MS8607 datasheet, Sep. 2015 [Revised Jun. 2017]



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