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AML Laboratory

Weather Forecasting System

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Background

weather forecasting

01

Personal travel planning, agricultural production, aviation planning

02

The development of the computation ability

03

Neural network technology has a better performance

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Introduction

Aim： Predict the weather conditions around the test site.

Rainy

Sunny

Cloudy

Overcast

Temperature, Humidity, Atmospheric pressure and Light intensity

Challenges:

1. Work out and implement the nonlinear model.

2. The great demand for different kinds of data for training and testing.

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Proposed Approach

Multi-classification problem

Four weather patterns (rainy, sunny, cloudy and overcast)

ANNs/CNNs, RNNs, LSTM

Recurrent connection, parameter sharing, long-term memory

Data changes with time

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Performance Assessment

1. Calculate performance measures, draw intuitive graphs, tabulating data

2. Mean square error (MSE) , Mean absolute error (MAE)

3. Graphs recording predicted and actual weather

etc

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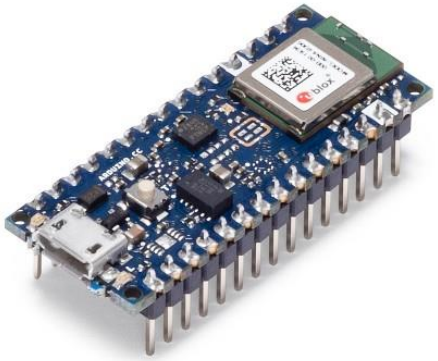
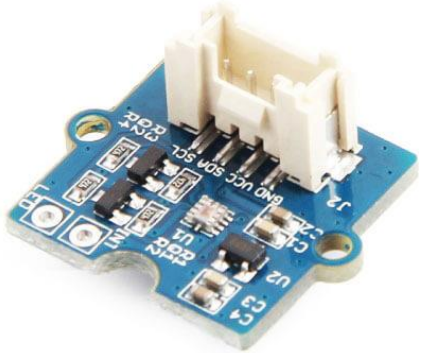
Hardware

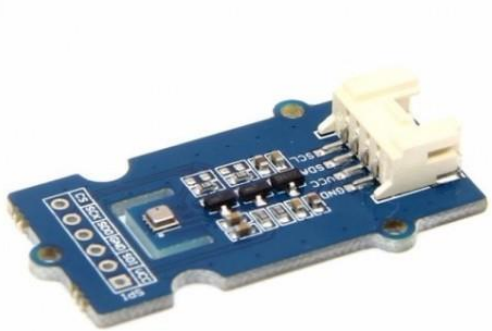
Arduino Nano 33 BLE Sense with headers

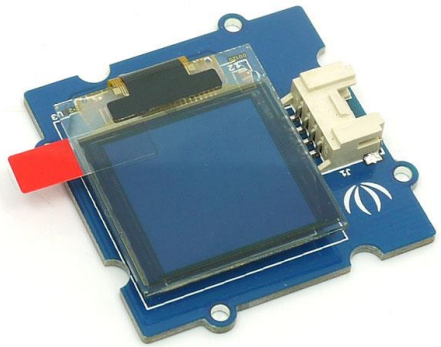


Grove - Sunlight Sensor



Grove - Temp & Humi & Barometer Sensor (BME280)





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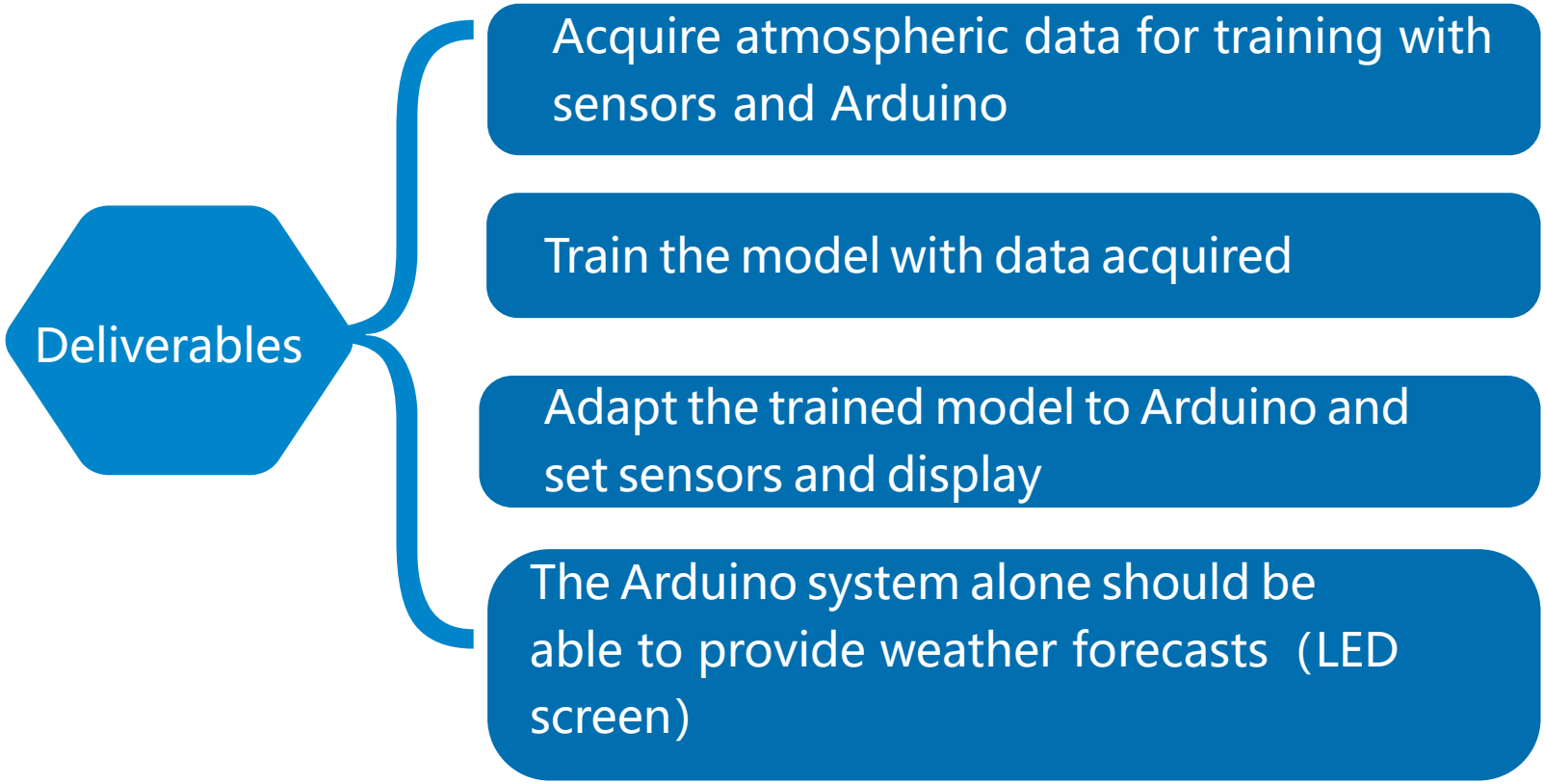
Deliverables



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Time Line

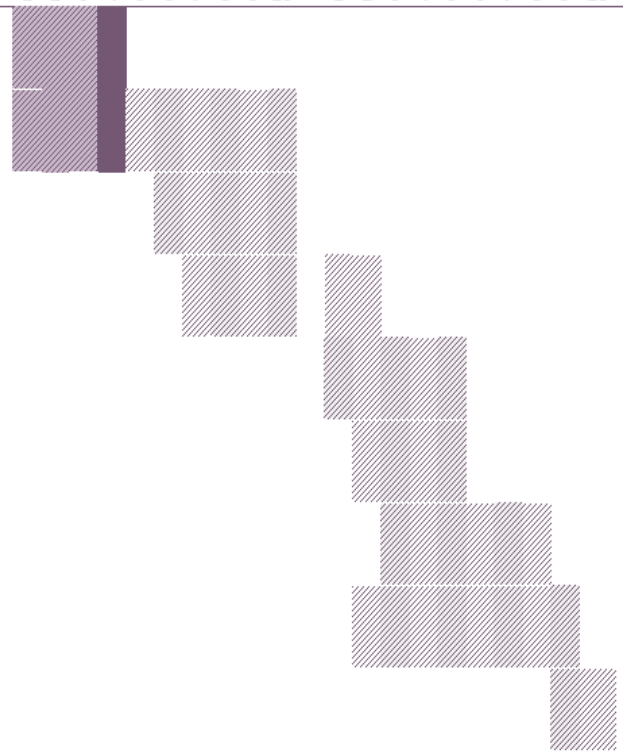
Project Planner

Select a period to highlight at right. A legend describing the charting follows.

Period Highlight: 51

Plan Duration | Actual Start | % Complete

ACTIVITY	PLAN START	PLAN DURATION	ACTUAL START	ACTUAL DURATION	PERCENT COMPLETE
Project Discussions& proposals	1	7	2		50%
Literature review	1	10	2		20%
Hardware purchase	6	5			0%
Sensors assembly and debugging with Arduino	7	6			0%
Atmospheric data collection	1	5			0%
ML model implement in python	2	4			0%
ML experiment testing and adjusting	3	6			0%
Final report	1	9			0%
Project presentation	9	2			0%



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Estimated Budget

Hardware Components	Prices/GBP
Arduino Nano 33 BLE Sense with headers	26.12
Grove - Sunlight Sensor	8.92
Grove - Temp & Humi & Barometer Sensor (BME280)	17.92
Grove - OLED Display 1.12"	13.06
Total	66.02

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References

[1] Pal, N.R., Srimanta Pal, Jyotirmoy Das, and Kausik Majumdar, “SOFM-MLP: A Hybrid Neural Network for Atmospheric Temperature Prediction.” IEEE Transactions on Geoscience and Remote Sensing, Vol.41, No, 12, pp.2783-2791. 2003

[2] S. E. Haupt, J. Cowie, S. Linden, T. McCandless, B. Kosovic and S. Alessandrini, "Machine Learning for Applied Weather Prediction," 2018 IEEE 14th International Conference on e-Science (e-Science), Amsterdam, 2018, pp. 276-277, doi: 10.1109/eScience.2018.00047..

[3] Y. Radhika and M. Shashi, "Atmospheric temperature prediction using support vector machines", International Journal of Computer Theory and Engineering, vol. 1, no. 1, pp. 1793-8201, 2009.

[4] M. Hossain, B. Rekabdar, S. J. Louis and S. Dascalu, "Forecasting the weather of Nevada: A deep learning approach," *2015 International Joint Conference on Neural Networks (IJCNN)*, Killarney, 2015, pp. 1-6, doi: 10.1109/IJCNN.2015.7280812.

[5] Dr S. Santosh Baboo and I. Khadar Shareef, "An efficient Weather Forecasting Model using Artificial Neural Network", International Journal of Environmental Science and Development, Vol. 1, No. 4, October 2010.

[6] A. G. Salman, Y. Heryadi, E. Abdurahman and W. Suparta, "Single layer & multi-layer long short-term memory (LSTM) model with intermediate variables for weather forecasting", Procedia Comput. Sci., vol. 135, pp. 89-98, Jan. 2018.

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Q&A