CSE 421 – Embedded Machine Learning

Homework 4 – Q4 (Section 11.9): Estimating Future Temperature

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1. Objective

The objective of this task is to predict future temperature values from past measurements using a lightweight regression model suitable for embedded deployment.

2. Dataset and Preprocessing

Two temperature time-series files are used. The data contains date and temperature columns. Only the numeric temperature values are extracted, and the series is downsampled to reduce noise. Sliding windows of five previous samples are used to predict the next temperature value.

3. Model

A linear regression model is trained using the least squares solution. Input features are normalized using z-score normalization based on the training set. The model consists of five weights and a bias term.

4. Results

Training performance: MAE = 0.1828, RMSE = 0.6007.
Test performance: MAE = 0.1767, RMSE = 0.5655.

5. Embedded Implementation Plan (Mbed/STM32)

The learned weights, bias, and normalization parameters are exported to C source code. On the STM32 platform, the previous temperature values are normalized and passed through the linear regression model to estimate the next temperature value.

6. Conclusion

The results demonstrate that a simple linear regression model can accurately predict future temperature values while remaining computationally efficient for embedded systems.