



UNIVERSITY OF OXFORD

GROUP DESIGN PRACTICAL

GROUP 14

Machine Learning in the Browser with the BBC Micro:Bit

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1 Introduction

The Group Design Practical is a course taken by all 2nd year undergraduate students at the University of Oxford studying for a degree in Computer Science, Mathematics and Computer Science, or Computer Science and Philosophy. This report details the work of Group 14 from February to May 2024 to design, implement, and deploy a product satisfying the specification as provided by Micro:Bit.

1.1 Technical context

1.2 Project Specification

In consideration of the existing context, the specifications set out by Micro:Bit were designed with a view to utilise our work for experimental purposes, and to provide a benchmark for evaluating the feasibility of future projects. On this basis, the specification gave the following requirements of a final product:

- That a user should be able to train any model on not just the Micro:bit’s accelerometer, but also an additional sensor.
 - The user should be able to choose which sensor’s data is to be streamed into the training data (and thus, which sensor’s data is polled once the model is trained).
 - Information given by the sensor should be visualised to the user in real-time in a manner which is understandable.
 - The sensor data should be amenable to machine-learning analysis via the models available.
- In addition to the Dense Neural Network, and the k-Nearest Neighbours models of the base application, a new neural network architecture should be investigated for implementation.
 - This network should be capable of predicting on simple patterns with reasonable accuracy.
 - The technical details of the network should be of pedagogical value, in addition to being amenable to high-level explanation.
 - The trained model should be of a size that could fit on the micro:bit itself, rather than needing to run on a connected device.
 - Model training should be responsive on standard browsers ran on computers with low-end modern hardware.

2 Logistics

2.1 Timeline

2.2 Role Delegation

3 Implementation

3.1 Sensors

3.2 Models

4 Areas of Further Development

5 Concluding Remarks