NN Volunteer Project Proposal

Wissam Mantash, Sean Moore, Charlotte Morissette, Peter Shao, Joy Wang

With traditional neural networks, inputs are classified according to a predetermined set of possible outputs. While this is beneficial in situations where the categories are known ahead of time and do not change, it does not allow for the formation of novel classifications. If an item from a previously unseen category is presented, it will not be properly identified as something new, but rather will be lumped into whichever existing category is the closest match.

In our project, we would like to develop a form of neural network which can identify novel categories and learn to classify items into those new categories over time. As proof of concept, we will be focusing on identifying handwritten characters from the mnist handwritten digit database. Using supervised learning, we will first train a model that can reliably identify the numbers from 0-9, then we will give it letters from A-Z. When given letters, which it has never seen before, the NN should be able to (1) identify that they are not numbers, and (2) group the letters into clusters using unsupervised learning techniques.

Developmental Benchmarks:

Stage 1: **Initial exploration**:

- Research into different learning algorithms
- Getting up to speed on the current literature
- Learning ML fundamentals
- Basic supervised learning classifier on digits

Stage 2: **Narrowing Focus**

- Take best candidates from stage 1, and work on improving them
- Building framework for combining supervised and unsupervised techniques

Stage 3: **Reporting Results**

- Testing to verify that model is functional
- Analysis
- Write report outlining findings

Individual Models:

Joy: building a CNN in keras and in plain python
Charlotte: Transductive zero-shot learning
Sean: Build testing framework for models to compare and evaluate model effectiveness.
Wissam: Build a NN based on Transfer learning model
Peter: Output layer analysis & new category detection