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Project #2 Revised Proposal Submission

Project Proposal

I am working alone and my project is on machine learning. Topics I will be ingratiating myself with is linear regression and back propagation and how those concepts apply to a machine learning algorithm. Additionally, I will be learning about loss functions, activation functions, matrices, and how memories are imprinted in a neural network's weights and biases.

The primary goal of this project is to create a set of generic neural network Java files that can be applied to any situation. Said Java files will include, but are not limited to, Layer.java, Network.java, and Process.java. The secondary goal, of which is the problem that I am to solve with my neural network—and by extension, iterate upon my generic files—is determining what digit (0-9) a hand-written digit is (the database used for these hand-written digits is the MNIST database). Beyond the primary and secondary, some potential stretch goals are facial recognition, object recognition, and or a checker AI player.

(Non-stretch) Goals in bullet-form:

- Layer.java: A Java program to represent a layer/grouping of nodes in a neural network.
    - Contain multiple activation functions such as binary step, RELU, sigmoid, etc.
- Network.java: A Java program to represent a network/grouping of layers in a neural network (acts as the network itself).
    - Be able to save the network to local so that it can be accessed between runtimes if the user wishes.
- Population.java: A Java program to represent a "population" or group of neural networks.
- Process.java: An abstract class for giving the AI a "task" to complete.
    - This generic program must be able to be extended.
- Simulation.java:
    - Allow multi-threading so that neural networks can be assessed and trained faster.
- SimulationThread.java:
    - Extend the Thread class.
    - Implement Java Reflections for child classes of the abstract class Process.
- Determine the digit (0-9) of a hand-written digit. (Hand-written digits are provided by the MNIST database).
    - Take in 784 inputs. Each input represents one pixel in a 28x28 image where the input’s value ranges from 0.0-1.0, 0 being black, 1 being white.
    - Train it to where it will have at least a 99% accuracy when determining digits.
    - The neural network returns 10 outputs (that aligns with the 10 digits of 0-9) and the output with the greatest value is the neural network’s decision.