

# EECE 371- Embedded Learning Systems

Lab: Mon., March 18<sup>th</sup> 2019

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## Competition

Using similar model to Assignment 4, design the perceptron function in a Matrix/Vector representation on Arduino IDE.

The code should be designed to have different functions:

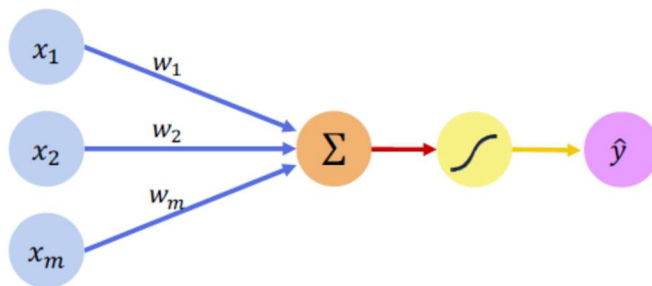
- Perceptron
- Activation Function (Supporting Relu, tanh, Sigmoid)
- Convolution (Taking a matrix of nxn convolving it by a filter of size pxp)

The best implementation is the one that achieves the least cost function below:

Cost function =  $0.25 * \text{Program Storage Utilization} + 0.5 * \text{Runtime}/(\text{Max Runtime from all implementations}) + 0.25 * \text{Accuracy (XOR test case)}$

There is a gift card for the winner

- You will need to find a way to report timing in your IDE code
- You will need to look up how to optimize matrix multiplication
- You will need to figure the best way to implement Activation function



A mathematical representation of the perceptron model. The equation is 
$$\hat{y} = g \left( \sum_{i=1}^m x_i w_i \right)$$
 Annotations include: a purple arrow pointing to  $\hat{y}$  labeled "Output"; a red arrow pointing to the summation term  $\sum_{i=1}^m x_i w_i$  labeled "Linear combination of inputs"; and a yellow arrow pointing to the function  $g$  labeled "Non-linear activation function".

Linear classifiers  
cannot solve this

