RCOS AIHWKIT Status Update #2

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Neural Network and Deep Learning

Hidden layers should use nonlinear functions

Gradient descent to train parameters:

- Initialize parameters randomly
  - If they were 0, all hidden nodes in a layer will be symmetric (have the same values, computing the same thing)
  - Initialized to very small random values
- For each iteration:
  - Compute predictions ⇒ Forward propagation
    - a = Activation functions, z = hidden layer function
  - Compute derivatives ⇒ Backward propagation
  - Update parameters using learning rate and derivative
- Repeat this until parameters converge.

Types of Neural Networks:

- Deep Neural Networks (DNN): A neural network with multiple hidden layers

- Convolutional Neural Network (CNN): deep learning algo
  - Input: image
  - Learn different aspects of the image (assign weights and biases)
    - Convolutional layer - Kernel/Filter: a matrix that is multiplied to a portion of the picture at a time, add up the values in the resulting matrix of size = (height)(width)(# channels)
      - The purpose is to capture low-level features such as edges, color, gradient orientation, ect.
      - More layers capture high-level features as well
    - Pooling layer:
      - Purpose: reduce the computational power required to process the data