RCOS AIHWKIT Status Update #1

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AI For Everyone

Types of Learning:

Supervised learning:
- given an input, asked a question, and need to provide an output
- Learns A (input) to B (output) mapping

Unsupervised Learning:
- Given data without any labels, find something interesting about the data
- Easier to do because you don’t have to manually label data.

Transfer learning:
- Learn from task A, and use knowledge to help on task B

Reinforcement Learning:
- Let the AI loose, when it performed well -> reward signal when it performed bad -> negative reward.
- The AI will try to maximize the reward signal.
- Weakness: requires a huge amount of data/time

AI For Everyone (Continued)

Generative Adversarial Network (GANs):

- Synthesize new images from scratch

Knowledge Graph:

- Database of various things and their key information

Workflow of Machine learning project:

1. Collect data
2. Train model
    a. Iterate many times until good enough
3. Deploy model
    a. Get data back
    b. maintain/update model

AI Pipeline: multiple AI/ML components that process data one after another

“Virtuous Cycle of AI”: better product -> more users -> more data -> better product

Neural Network and Deep Learning

Neuron: implements a function, has inputs(x) and an output(y)
Types of data:

- Structured data: data in tables(databases), labelled
- Unstructured data: audio, images, text
    - Neural networks allow much better processing of unstructured data

Vectorization: get around using explicit for loops

- Can use parallelism with vector functions to speed up calculation.

Common steps for pre-processing a new dataset are:

- Figure out the dimensions and shapes of the problem (m_train, m_test, num_px, ...)
- Reshape the datasets such that each example is now a vector of size (num_px * num_px * 3, 1)
- "Standardize" the data

Neural Network and Deep Learning (Continued)

Logistic Regression: used in Binary Classification

- The y is either 0 or 1
- Loss function: calculates the error between what the neural network outputs and what the actual labelled value (0 or 1) is for a single test
- Cost function: the average of the loss function over all test examples.
- Forward pass: calculates the cost function through the neural net
- Backward pass: calculating d finaloutputvar/ dvar . The change in the final output variable over the change in an intermediate variable(input or nodes)
    - Inputs get updated by var = var - (alpha)dvar
    - Alpha = learning rate

Neural Network Representation:

- Each layer outputs an activation.
- Superscript [] => layer, () => training example,
- Subscript => node in layer