18.1 Data Features

Notebook: How Computers Work [CM1030]

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Essential Question:

How does data representation affect machine learning?

Questions/Cues:

- What are features?
- What is Feature Extraction?
- What is a weight?
- What is a Neuron?
- What is a Convolutional neural?

Notes

- Features = name for the number we use to rep thing in ML
  - Pixels are an example of a feature for images, low-level or raw data feature that reps the image as it is but individual pixel don't carry much meaningful info
  - Sound signal is low-level feature for both music and human lang
    - Both music & human lang have high-level features like musical notes or written words which are better to use when working with ML
- Feature extraction = extracting more meaningful features from the raw data
- Weight = a numerical value multiplied in each existing feature to determine its contribution/importance in the calculation of a brand new feature. Weight is determined by optimization for best suited results
- Neuron = one unit of neural network
  - The word deep in deep learning means that you have many layers of neurons feeding into other neurons. Even the basic calculations are fairly simple, a deep neural network can learn very complex features
  - Simply feeding the output of one neuron into another is actually equivalent to simple neurons with different weights, it doesn't allow you to calculate any more complex features. You need to transform the output by a mathematical function called a nonlinearity
    - One common nonlinearity takes any output that's negative and sets it to zero
  - Simplest type of neuron just multiplies its input features by weight, adds them up and if the output is negative, sets it to zero. This simple network can learn very complex feature by choosing good weights

- Convolutional neural = basically a Photoshop filter that transforms an image, details of the filter can be learned by optimization

Summary

In this week, we learned about what features are, what weights are and what a neuron is.