SSP 100 - 10
How Computers See

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Today's Topics

- Questions/Comments?
- Last comments on Histograms and distance between them – EMD
- Modern deep learning pipeline for computer vision
  - Artificial Neural Networks

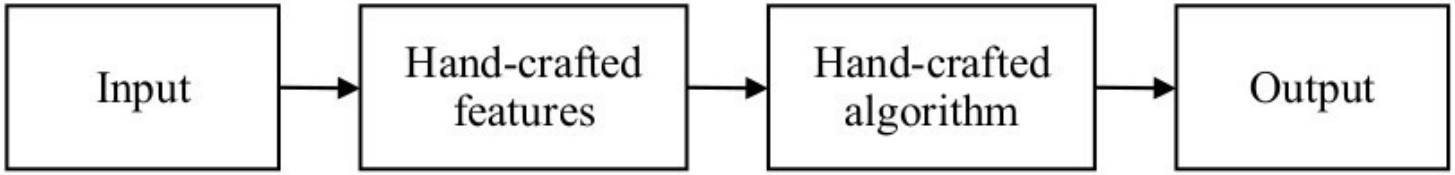
Last comments on Histograms

- L1 and L2 distances are bin to corresponding bin measures.
- When computing the distance between 2 histograms, for example, bin1 in each histogram are operated on separate from bin2 in each histogram, etc.
- Example histograms on the board.
- And Earth Mover's Distance as a distance measure to solve this problem.

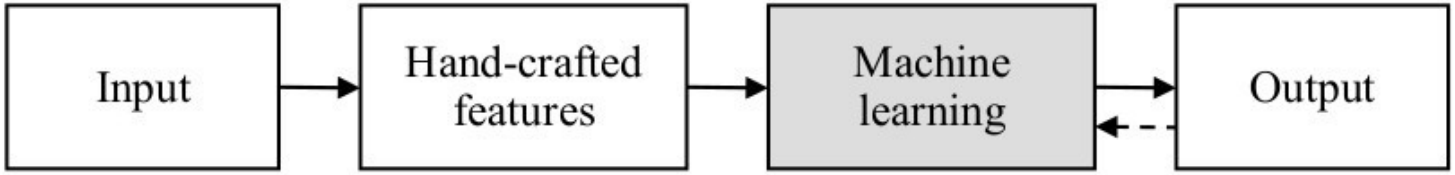
EMD

- Earth Mover's Distance that takes into account that nearby bins are more similar than bins further away.
- Measures how much work it takes to convert one histogram into another.

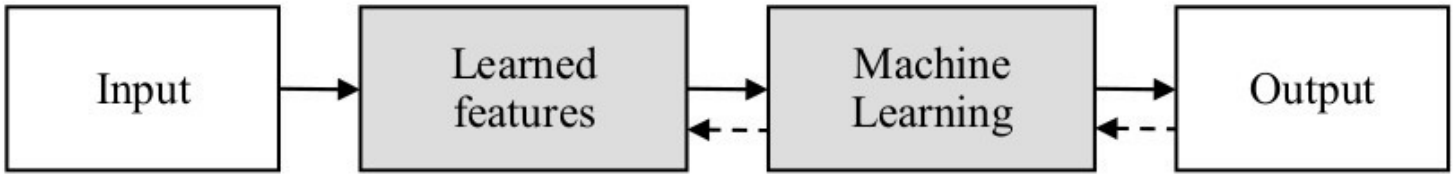
History of computer vision



(a) Traditional vision pipeline



(b) Classic machine learning pipeline

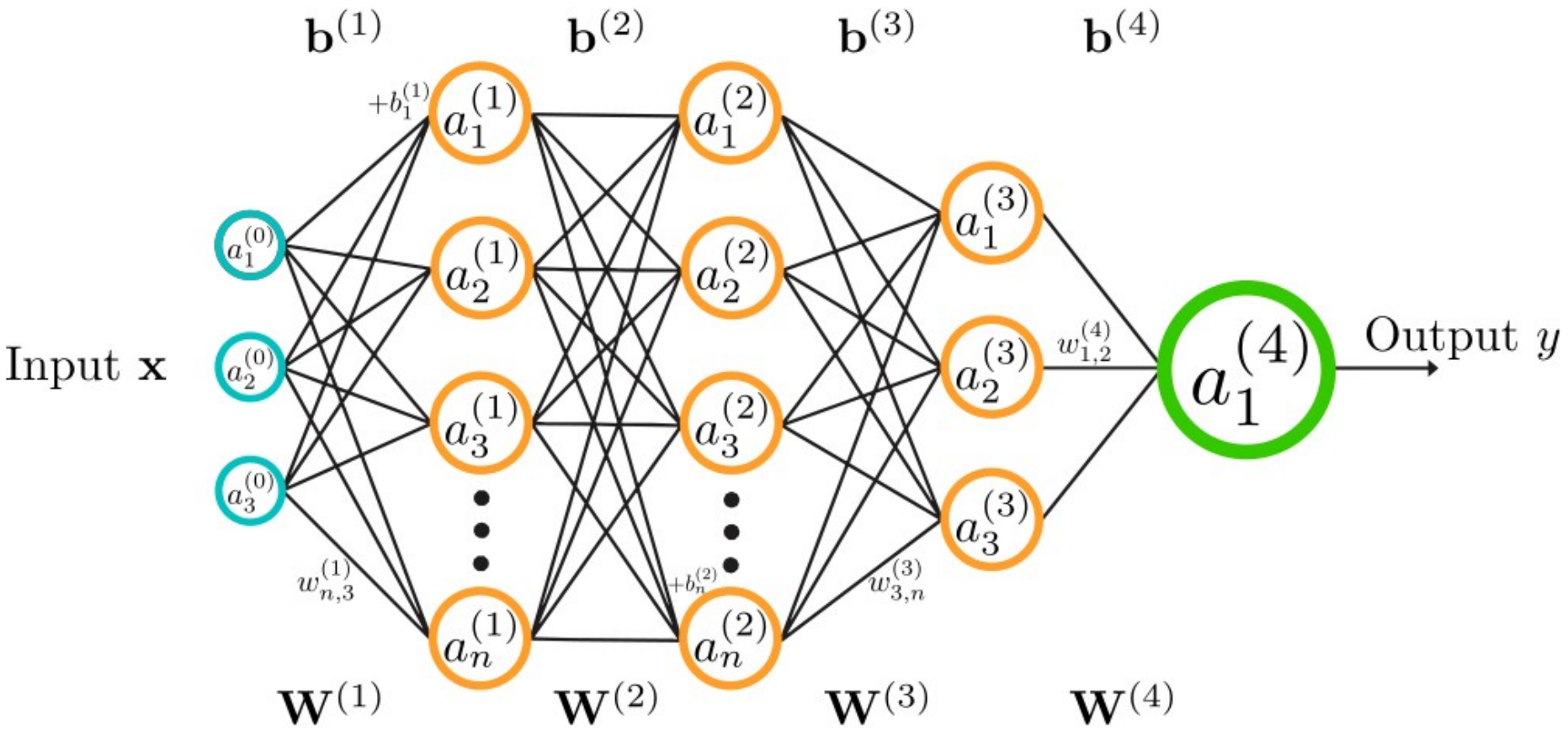


(c) Deep learning pipeline

Artificial Neural Networks

- Generally how they work:
- There is one weight (aka learnable parameter) per connection between nodes
- Each weight is a number
- The inputs are multiplied by the weights and put through a function in the node to produce an output
- The weights start off with random values and are learned during training
- Training consists of giving the network known inputs and outputs (supervised) and the weights are changed an improved over time to make better predictions

Artificial Neural Network diagram



Artificial Neural Networks

- Let’s look again at the tensorflow playground

Artificial Neural Networks

- Let me show concrete examples of how simple connections could represent
- AND, OR
- As well as exactly how the output is computed from the input.
- What function does the network on the board represent?