SSP 100 - 10
How Computers See

10 / 27 / 2026

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Today's Topics

- Questions/Comments?
- Continue review of technical topics (CNNs)
- Modern deep learning pipeline for computer vision
  - Artificial Neural Networks vs.
  - Convolutional Neural Networks
- Discussion of YOLO and Joseph Redmon's TED videos
- Thesis statements for a homework essay

Convolutional Neural Networks

- Because regular ANNs that have fully connected layers do not maintain any relationship between the inputs --- the inputs are all individual, CNNs were created to keep the input images maintaining their 2d spatial quality
- A CNN has a convolutional layer at the beginning after the input which learns some number of filters

Convolutional Neural Networks

- For images, does is make more sense to flatten them for input? e.g. take the 28x28 grayscale images for MNIST and just list them out as a list of 784 individual values?
- Or use the images as 2 dimensional inputs into a CNN that learns filters?
- And why?
- Let me show you a page called CNN Explainer and highlight some of what's going on.
- https://poloclub.github.io/cnn-explainer/

Let’s watch another TED video

- The first half of this video explains, in an interesting way, how Neural Networks learn and predict.
- It hides much of what is truly going on (even some of the stuff we talked about last class) when I had you compute the output for inputs and weights and an activation function.
- https://www.ted.com/talks/blaise_aguera_y_arcas_how_computers_are_learning_to_be_creative

Discussion of TED videos

- In the 1st video “How computers learn to recognize objects instantly” from 2017, Joseph Redmon discusses his YOLO algorithm.
- What is YOLO and what does it do?
- What did it improve vs. prior work?

Discussion of TED videos

- In the 1st video from 2017, Joseph Redmon discusses his YOLO algorithm.
- What is YOLO and what does it do?
  - It is a machine learning technique for detecting objects in images and where they are in the images (in a bounding box)
- What did it improve vs. prior work?
  - Can do the task in 20 milliseconds, vs. prior work that took 20 seconds to process an image
  - 20 milliseconds is 1/50 of a second
  - Allows it to run in real time on video at 30 fps
    - because 1/50 < 1/30

Discussion of TED videos

- He said it is a general purpose system, that can be trained for any image domain.
- What domains did he mention?

Discussion of TED videos

- He said it is a general purpose system, that can be trained for any image domain.
- What domains did he mention?
  - Self driving cars
  - Finding cancer cells in tissue biopsies
  - Detecting animals in Nairobi National Park
  - What objects do you think it needed to train on for these domains?

Discussion of TED videos

- He said it is open source and in the public domain – free for anyone to use
- Last line in the first video:
- "can't wait to see what people will build with this technology"

Discussion of TED videos

- Second video “Computers can see. Now what?” from June 2018
- Mentions CNNs and that they sort of mimic how the human visual system works
- train it on seeing many images of different objects in a supervised manner
- Can predict identity, age, mood (e.g. happy/angry/etc.) of humans

Discussion of TED videos

- If running on a smartphone could help visual tasks for the blind
- self driving vehicles (could potentially reduce traffic accidents)
- In Congo - track western lowland gorillas and track their behavior
- At University of Oslo – a master’s student was using YOLO to find and diagnose cancer
- Underwater robot to navigate and explore the ocean

Discussion of TED videos

- Army General showed him using Yolo on drone footage to find and track vehicles on a battlefield
- Ends with Computer Vision can be used for good
- But it is being used to
  - invade privacy
  - sell advertising
  - maintain structures of power

Short article

- Written in 2020
- What did it say?

Essay

- In the past I asked you to come up with a couple of thesis statements that you could use for potential essays.
- Come up with a thesis statement related to the recent TED videos on YOLO.
- I’m going to ask you to write an essay using one of the thesis statements you came up with in the past or the one from today.