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Lab 7 Convolutional Neural Networks

Introduction

Today’s lab goal was creating a Convolutional Neural Network or CNN. The CNN is going to classify images as either a muffin, or a chihuahua. Last lab, we used traditional Neural Networks, whereas in this lab, we will be using Convolutional Neural Networks. The lab does a good job of walking you through this process, as it taught me how to use CNN’s correctly. By removing certain variables, and thus testing me, I was able to learn, test, and prove I was able to understand today’s lab.

CNN Architecture

Basic Composition

CNN’s are comprised of three convolutional layers, max-pooling layers, and fully connected layers for correct classification. This means each convolutional layer applies filters to extract certain features such as textures or edges from images.

CNN vs NN

CNN’s, like the one used today, can use more complicated data than traditional NN’s. For example, the images do not need to be flattened before being used, letting the CNN’s utilize more features from the same data. This ability means we can reduce the number of parameters in the CNN, and still improve on feature extraction. This is why CNN’s are ideal for image classification tasks such as our lab today.

Model Performance

Our CNN secured an accuracy score of 93.34%! This was significantly higher than our last lab using NN’s. I believe misclassifications occurred due to viewing angles of the chihuahua, as the two misclassified images looked similar in that way. Once I visualized the model’s predictions, that was the main factor that stood out.

CNN vs NN (Extended)

When comparing the CNN to NN side by side, it becomes very evident the CNN outperforms it’s traditional cousin. The CNN was more efficient, *and* more accurate, making it the decisive victor. The CNN also did not require the same amount of preprocessing. Since the CNN can directly extract features from images, it needed a lot less user intervention.

Challenges Faced

When first opening the notebook, I struggled to understand exactly what we were doing. I understood our last lab after completing it, and was starting to realize where / what was changed here. Once the notebook became easier to visualize, and I could see our data, I was able to grasp what we were building. This led to a minor headache when solving the ? problems. I was able to recall some variables from the last lab, as well as use context clues to fill in what was missing.

Real-World Applications

This CNN, especially given it’s ease-of-use, has many immediately clear use cases. The first use case that came to mind was illness recognition. If AI could tell what ailment someone had simply through vision, this could help not only eliminate diseases, but catch them early. Also, CNN’s would vastly benefit security systems that use face recognition. After analyzing the process of facial recognition and AI, CNN’s would be perfect, allowing for more detail to be considered, and faster processing times overall.

Ethical Considerations

AI this good at image recognition definitely could be used malignantly by bad actors. Let’s say for example a security company wants to sell personalized location data backed by cameras, this becomes infinitely easier with CNNs. These AI can analyze loads of data, and with a relatively high confidence score. This could be used for over-controlling security systems, or even just stalking if done by the average person. This means AI needs some sort of regulation, if people can weaponize image generation, then image detection can be weaponized, as well.