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Assignment L06

Neural Networks

A basic neural network for image detection works by using multiple layers of interconnected neurons to process and learn patterns in data. It starts with the input layer, which takes raw image pixels and passes the information to several hidden layers. These hidden layers, also known as multi-layers, gradually learn to detect features like edges, shapes, and textures as the data moves deeper into the network. Each neuron in these layers applies a mathematical function, and the results are passed to the next layer. Finally, the output layer predicts what the image represents, such as recognizing whether it's a chihuahua or a muffin. During training, the network adjusts its internal weights to improve its predictions, becoming more accurate over time.

Testing and Tuning

In this workshop we were challenged to try and achieve 100% accuracy. Some of the parameters I modified to try and achieve this level of accuracy were the number of epochs, the learning rate, the image size, layers and dimensions and so on. This was very helpful in learning how the different parameters affect accuracy. All these different parameters all work together and there is a balance when trying to achieve a certain level of accuracy, the main problem with this is overfitting. I did have overfitting issues but in the spirt of trying to achieve 100% accuracy I was okay with it and wanted to experiment more with the parameters and this to me made it an excellent lab for learning how the different parameters all work together.

Real World Applications

Basic neural networks are used in many everyday things, especially for recognizing images. For example, they help with facial recognition, which can unlock phones or help with security. In healthcare, they are used to looking at medical images like X-rays to find problems such as tumors. They also help self-driving cars by recognizing things on the road, like people, signs, and other cars. These networks learn from data, which makes them useful for automating tasks that involve recognizing objects in pictures or videos.

Personal Reflections

This workshop was a great opportunity to get hands-on experience with machine learning. It helped me build a better understanding of how image classification works and how to apply it to real-world problems. The challenges I faced encouraged me to think critically and develop problem-solving skills. Overall, I feel more confident in my ability to use machine learning techniques in future projects and am excited to explore more in this field. This experience was a stepping stone in my learning journey, and I look forward to applying these concepts to new challenges in the future.

References:

<https://github.com/patitimoner/workshop-chihuahua-vs-muffin>

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7778711/>

https://neptune.ai/blog/self-driving-cars-with-convolutional-neural-networks-cnn