Data 640 Summer 2022

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Assignment 4: Deep Learning

**Introduction**

Introduction:

The objective of the analysis is to use the fashion MNIST dataset that is part of the Python library, Keras, to train a convolutional neural network (CNN) to be able to identify each article of clothing based on a 28 by 28 pixel picture. The libraries TensorFlow and Keras in Python will be to take the fashion MNIST dataset and run through a convolutional neural network. The libraries Pandas, Numpy, and Matplotlib is used to load and visualize the data.

Dataset:

The dataset, fashion MNIST has a training set of 60,000 examples of 28x28 pixel grayscale images and the test set has 10,000 of these images. An example of an image in the data set can be found in Appendix C which shows a section of the code used to display the image in python. There are 10 different classes or categories of clothing that are identifiable in the dataset.

The 10 different classes or categories of clothing are: tshirt or top, trouser, pullover, dress, coat, sandal, shirt, sneaker, bag, and ankle boot. These are labeled from 0 to 9 in the first column of the dataset. The rest of the columns in the dataset are numeric values of each pixel in the images with a total of 784 pixels with values ranging from 0 to 255. The value of 0 through 255 denote the “darkness” of the pixel whether it is more black or whiter in its position of the image.

**Predictive Models**

Several variations of CNNS were developed and the parameters changed to see which model would produce the most accurate results from training the model on the 60,000 rows of training data to the 10,000 rows of data. The specifics are outlined in Appendix A the model table.

**Results**

**Conclusion**

Paragraph 1 talking about insightful and meaningful conclusions

Next steps in this project would be to try using a dense neural network as well to compare results. A more in-depth comparison can be done by using Pandas to create a data frame and run statistical analysis on the results as well for more insight to the results. Also, creating a confusion matrix based on the results of the matrix for more statistical variables to look at each of the models to make a more informed decision as to which model would be better for further input after training the model on the fashion MNIST dataset.

**References**

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Zalando Research. (2017, Dec 6). Fashion MNIST: An MNIST-like dataset of 70,000 28x28 labeled fashion images. Kaggle.com Retrieved from https://www.kaggle.com/datasets/zalando-research/fashionmnist/metadata

**Appendix**

**Appendix A: Model Table**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Model Number | # of layers | Pool Size | Filter #s | # Epochs | Activation |
| 1 | 2 | 2 | 236 128 | 10 | Linear |
| 2 | 2 | 3 | 236 128 | 10 | Relu |
| 3 | 3 | 2 | 238 126 64 | 10 | Linear |
| 4 | 2 | 2 | 236 128 | 15 | Linear |
| 5 | 2 | 3 | 236 128 | 15 | Relu |
| 6 | 3 | 2 | 238 126 64 | 15 | Linear |

**Appendix B: Model Results**

|  |  |  |
| --- | --- | --- |
| Model Number | Loss | Accuracy |
| 1 | 0.8993 | 0.8993 |
| 2 | 1.27498 | 1.27498 |
| 3 | 0.9705 | 0.9705 |
| 4 | 0.69708687 | 0.69708687 |
| 5 | 0.8934 | 0.8934 |
| 6 | 0.7808 | 0.7808 |

**Appendix C: First Image in Fashion MNIST with section of code**

**Graphical user interface

Description automatically generated**