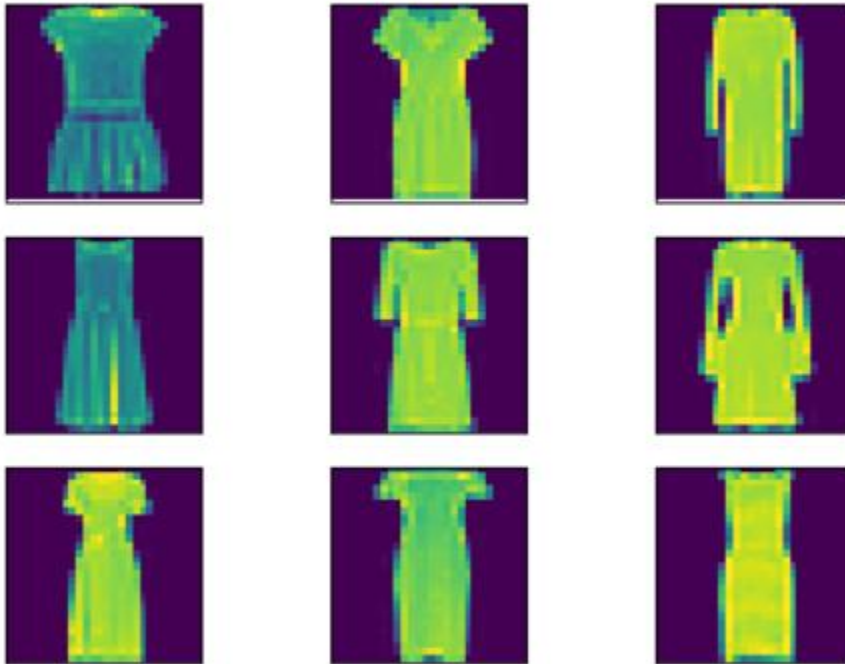


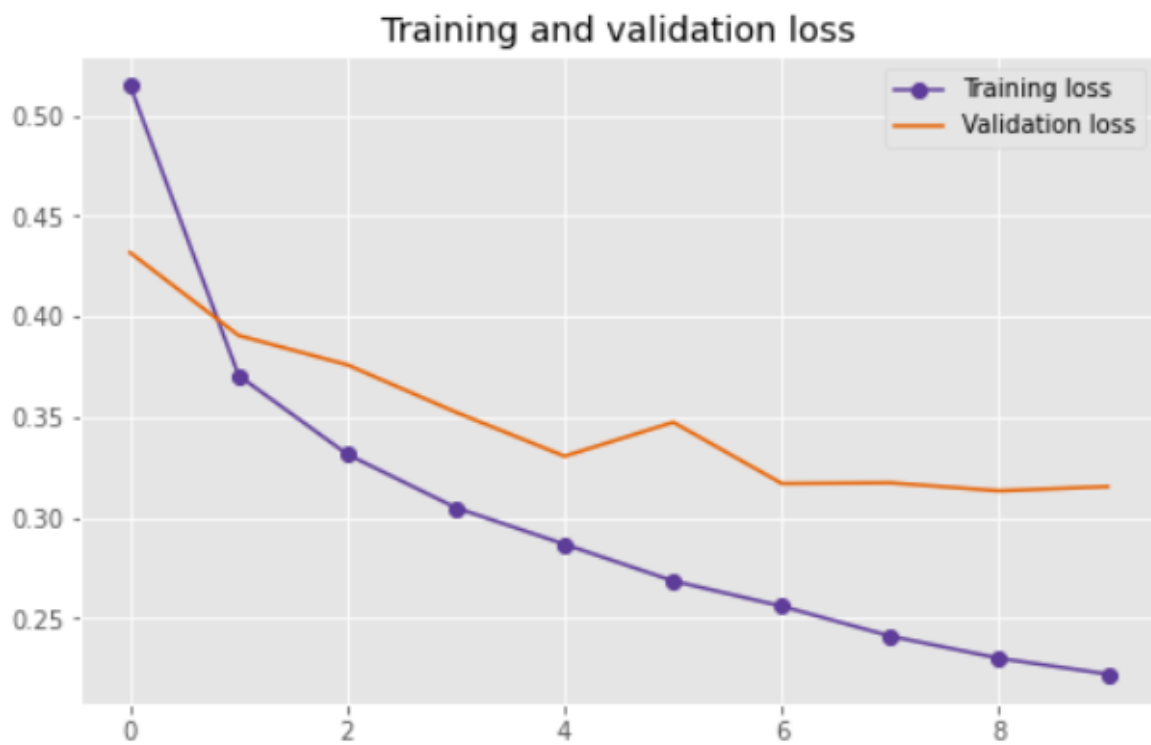
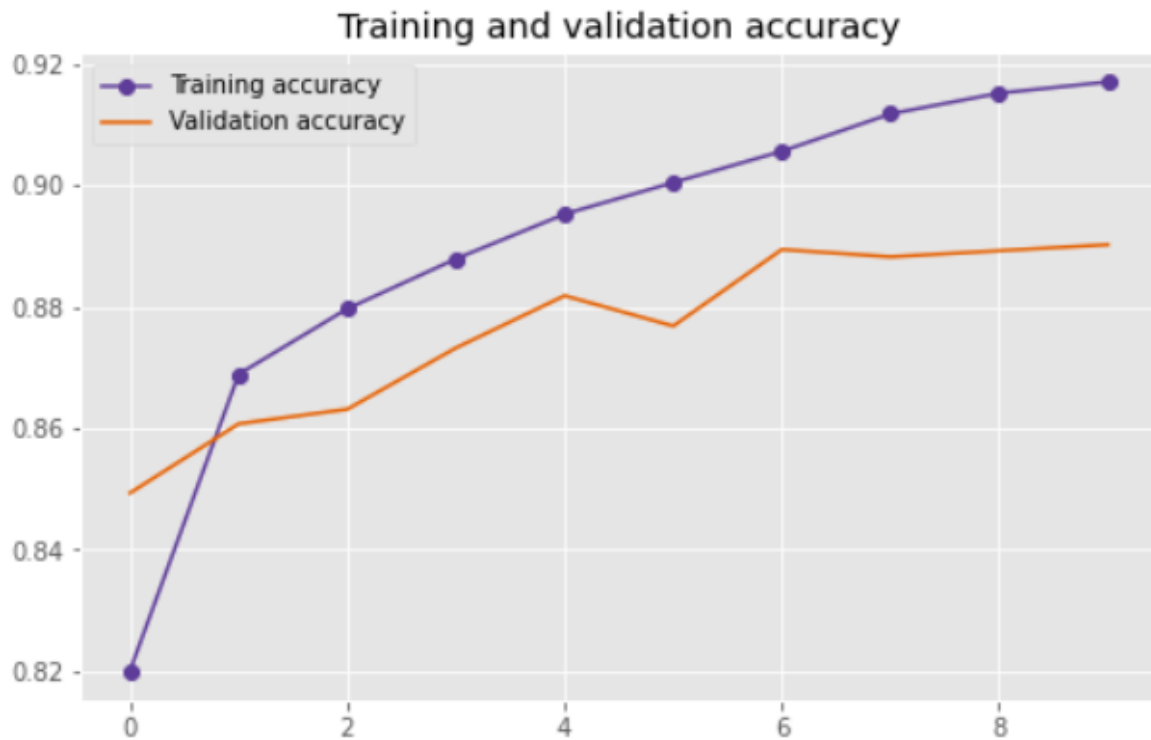
Lab Week 9

We imported the fashion mnist dataset directly from TensorFlow. I took the first nine images and plotted them to see what we may be seeing. We can see there are nine different kinds of dresses that have been reshaped.



The first model we ran was the keras model. We split the model into batches of 200 and ran it 10 times. We compared it to our test set and the more we ran, the higher we saw the accuracy. All 10 runs took about 42 seconds in total. We plotted the training and validation accuracy and loss with each other. We can see it follows a similar path, but is not very accurate.

Epoch 1/10
300/300 - 4s - loss: 0.5094 - accuracy: 0.8227 - val_loss: 0.4300 - val_accuracy: 0.8433
Epoch 2/10
300/300 - 4s - loss: 0.3699 - accuracy: 0.8674 - val_loss: 0.3832 - val_accuracy: 0.8605
Epoch 3/10
300/300 - 4s - loss: 0.3306 - accuracy: 0.8804 - val_loss: 0.3541 - val_accuracy: 0.8743
Epoch 4/10
300/300 - 4s - loss: 0.3057 - accuracy: 0.8891 - val_loss: 0.3378 - val_accuracy: 0.8796
Epoch 5/10
300/300 - 4s - loss: 0.2845 - accuracy: 0.8962 - val_loss: 0.3626 - val_accuracy: 0.8731
Epoch 6/10
300/300 - 4s - loss: 0.2732 - accuracy: 0.9001 - val_loss: 0.3306 - val_accuracy: 0.8801
Epoch 7/10
300/300 - 4s - loss: 0.2558 - accuracy: 0.9055 - val_loss: 0.3297 - val_accuracy: 0.8779
Epoch 8/10
300/300 - 4s - loss: 0.2444 - accuracy: 0.9105 - val_loss: 0.3171 - val_accuracy: 0.8863
Epoch 9/10
300/300 - 4s - loss: 0.2337 - accuracy: 0.9136 - val_loss: 0.3094 - val_accuracy: 0.8890
Epoch 10/10
300/300 - 4s - loss: 0.2246 - accuracy: 0.9168 - val_loss: 0.3100 - val_accuracy: 0.8921
Baseline Error: 10.79%
42.41596841812134



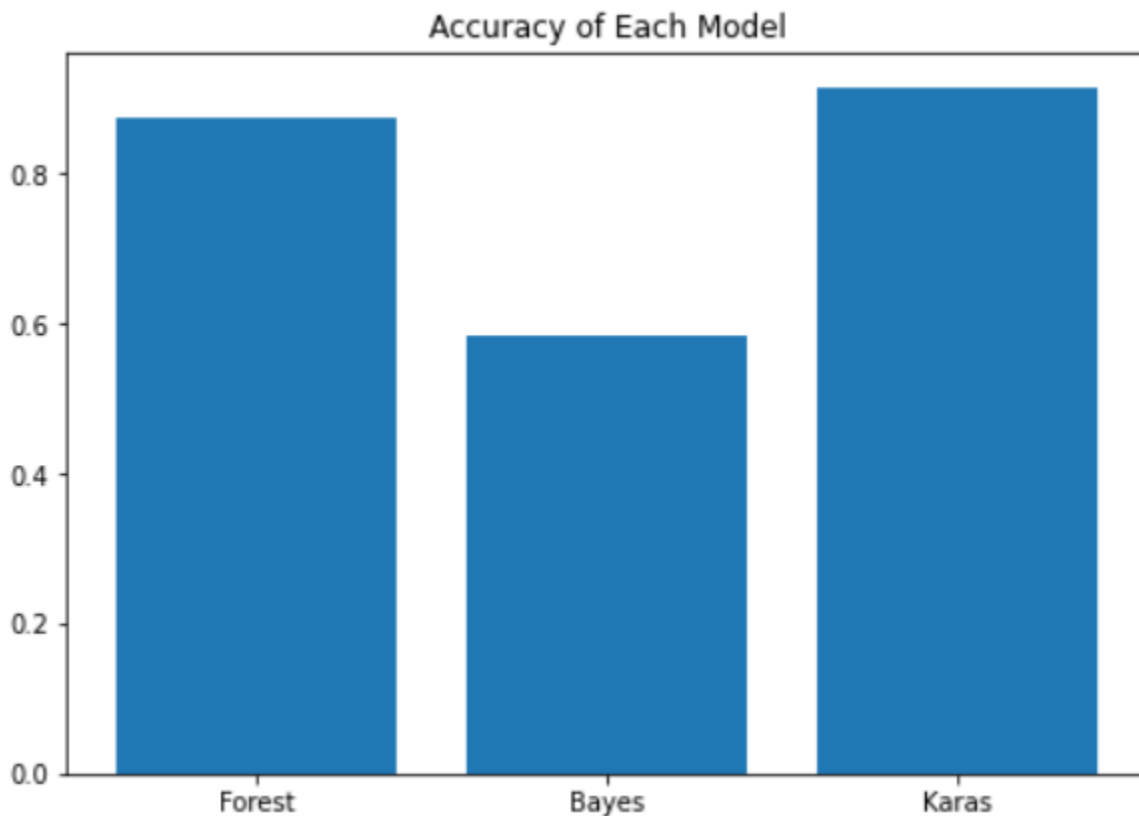
We then ran a Naïve Bayes model. It ran very quickly- in under a second- but did not accurately show the results. It had a 58% accuracy.

```

[[586  64  29 162 110   0  20   0  29   0]
 [  1 939  14  36   7   0   1   0   2   0]
 [  7  14 324  65 545   0  23   0  22   0]
 [  9 387   6 545  43   0   4   0   6   0]
 [  0  34  44 131 779   0   4   0   8   0]
 [  0   0   1   1   0 278   3 660   5  52]
[117  34 112 200 435   0  40   0  62   0]
 [  0   0   0   0   0   3   0 988   0   9]
 [  0   2  19  85 149   3  27   4 710   1]
 [  0   0   1   1   0  16   3 304   8 667]]

```

After that we ran a Random Forest model. This took the longest to run, at about 104 seconds. It seems to work pretty well, showing an 87% accuracy.



Type of Model	Accuracy	Time Taken
Karas	91.68	42.5 Seconds
Naïve Bayes	58.56	0.58 Seconds
Random Forest	87.43	104.5 Seconds

The Naïve Bayes has the most assumptions made and is the simplest model we ran. It looks just at the training set and makes its own assumptions to make the predictions. The Karas model runs it multiple times in batches. Each time it runs the accuracy of the model increases. The Random Forest uses a varying number of subclasses to find the average for the prediction model. This also helps to control overfitting.

The fastest model was the Naïve Bayes at less than a second, however this model had the lowest accuracy when predicting out test set. The highest accuracy was with the Karas model which took 42.5 seconds. It had an accuracy of 89%.