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Advanced Machine Learning – Assignment 2

I started by running the original model from the example, which as the visual below shows, was impacted by overfitting. The training loss decreases steadily, but the validation loss continues to increase, reaching nearly 100%. The training accuracy was also much better than the accuracy of the validation data.

Original Model:
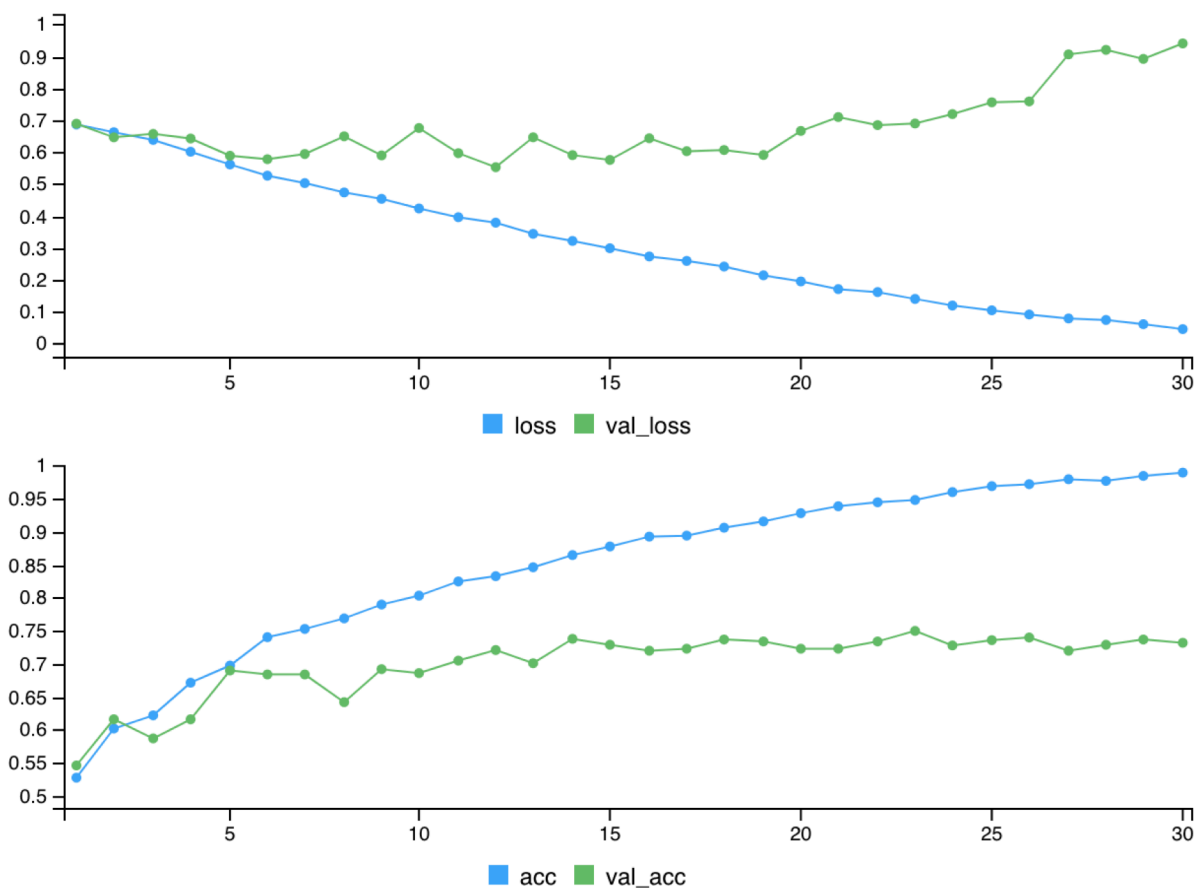
In my first attempt to reduce overfitting, I used the technique of data augmentation which introduces additional training data by randomly transforming the existing data. As seen in the graph below, this did improve performance of the validation data, but the epochs are much more sporadic, and the training accuracy has decreased slightly.

Data Augmentation:
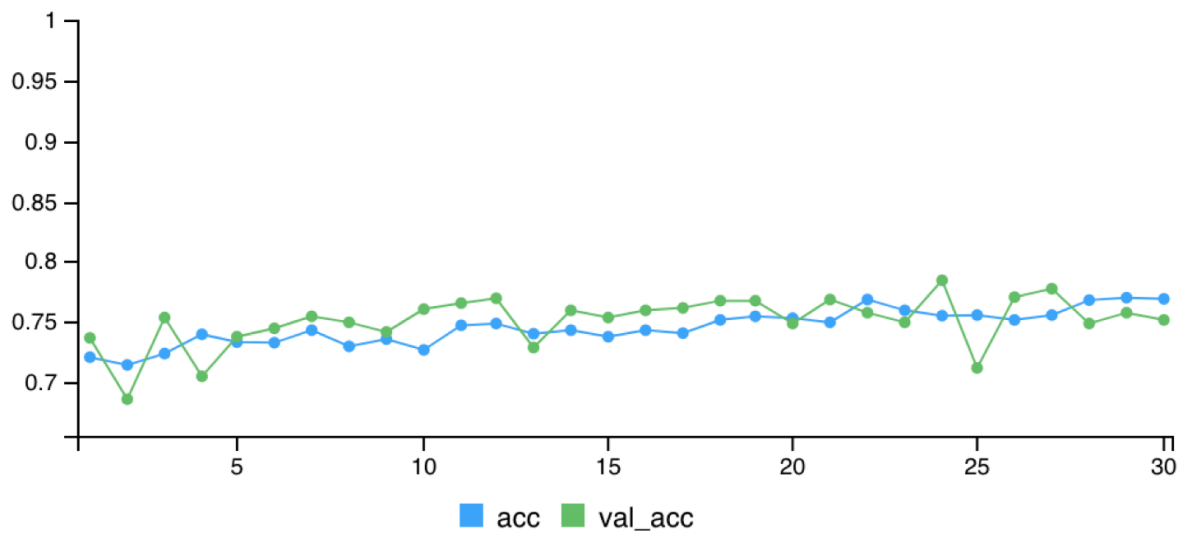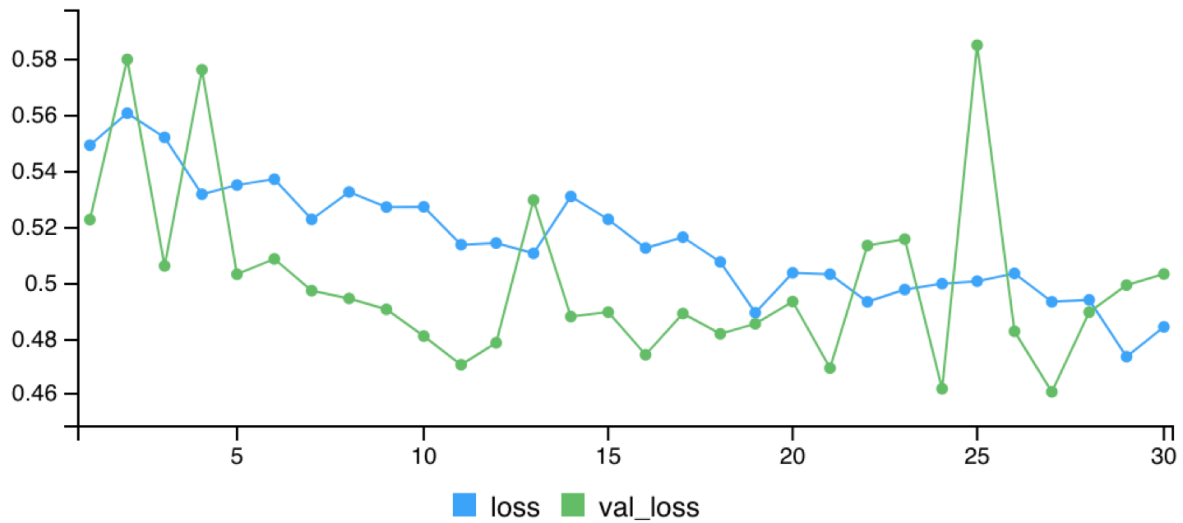
Next, I increased the training sample size to 1300 images. This did improve the validation accuracy significantly. The validation accuracy is now very closely following the training accuracy. The validation loss has also decreased from the prior two versions.

1300 Training Images:
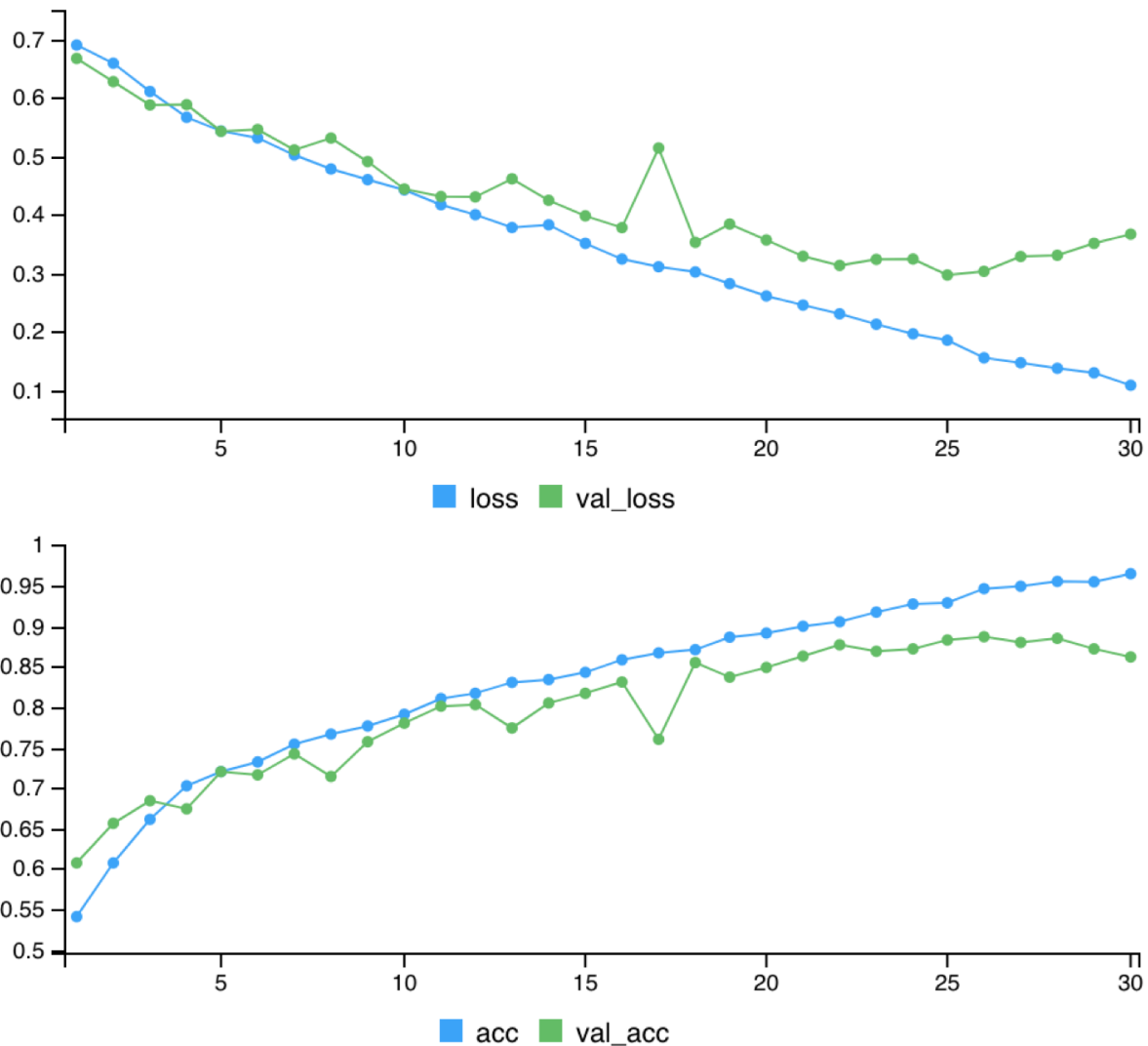
Since increasing the training size to 1300 images seemed to help reduce the problem overfitting, I decided that increasing the training amount even more would be the best option to achieve better performance. The ideal training sample size that I determined was best to use was 1800 images. As the visual below shows, this version of the model performed the best so far. The validation loss got down to only 16% and the validation accuracy was up to 93%.
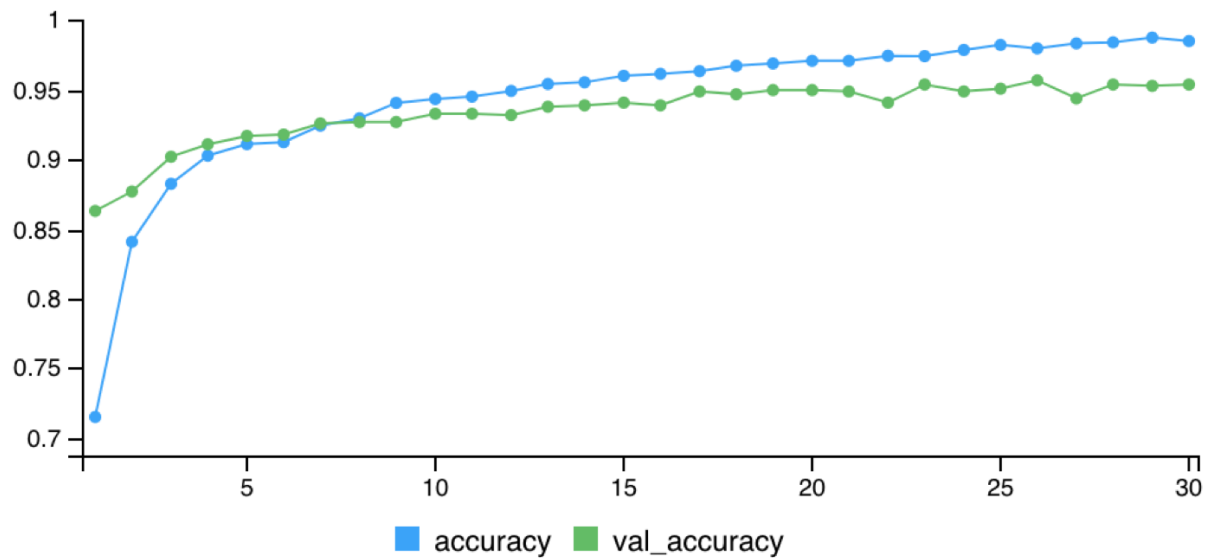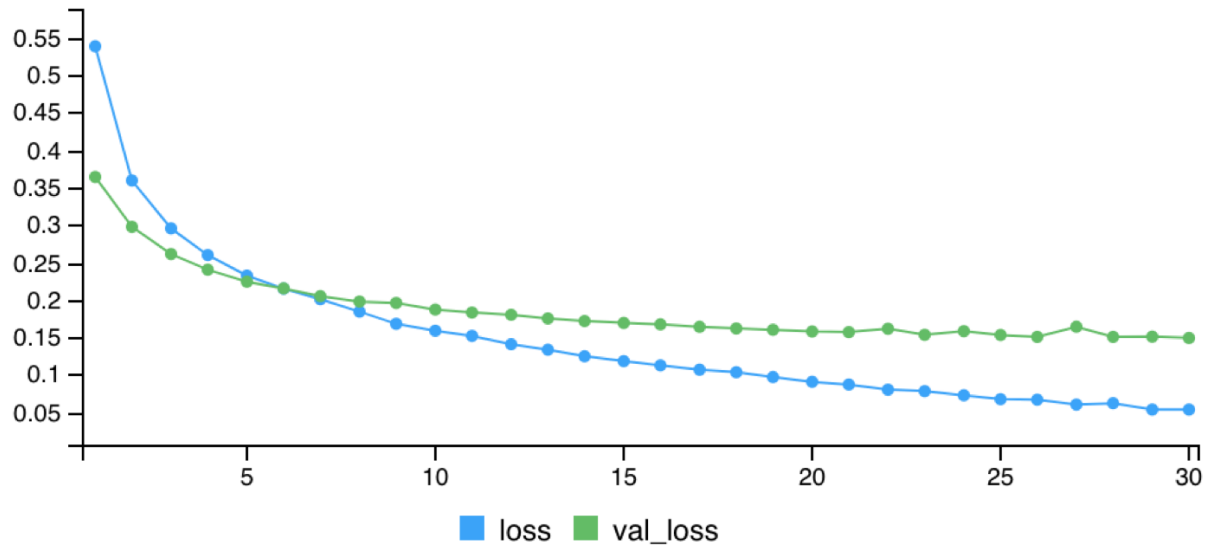
1800 Training images:
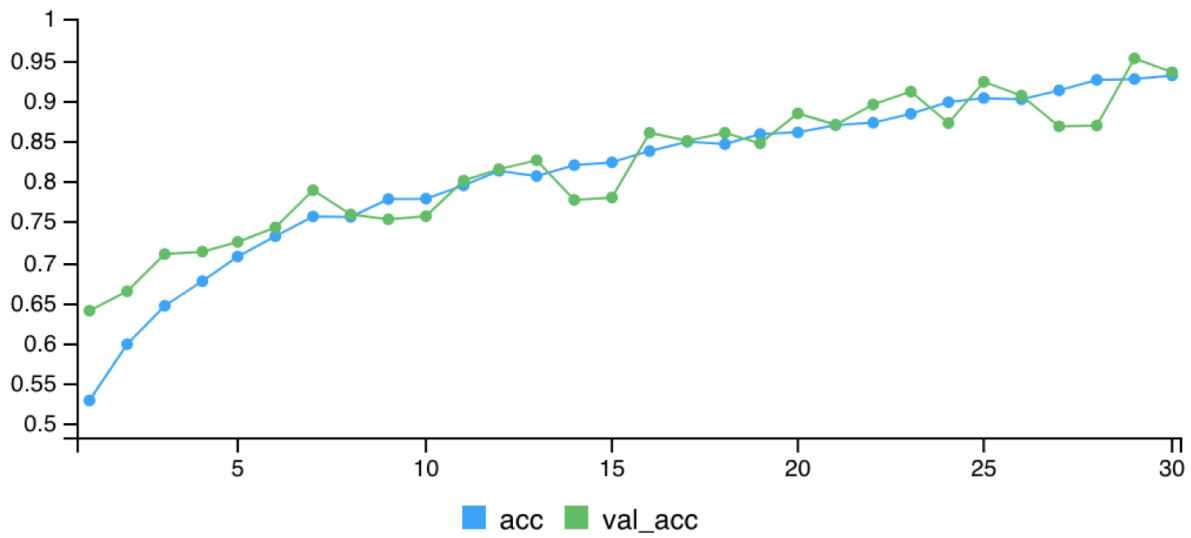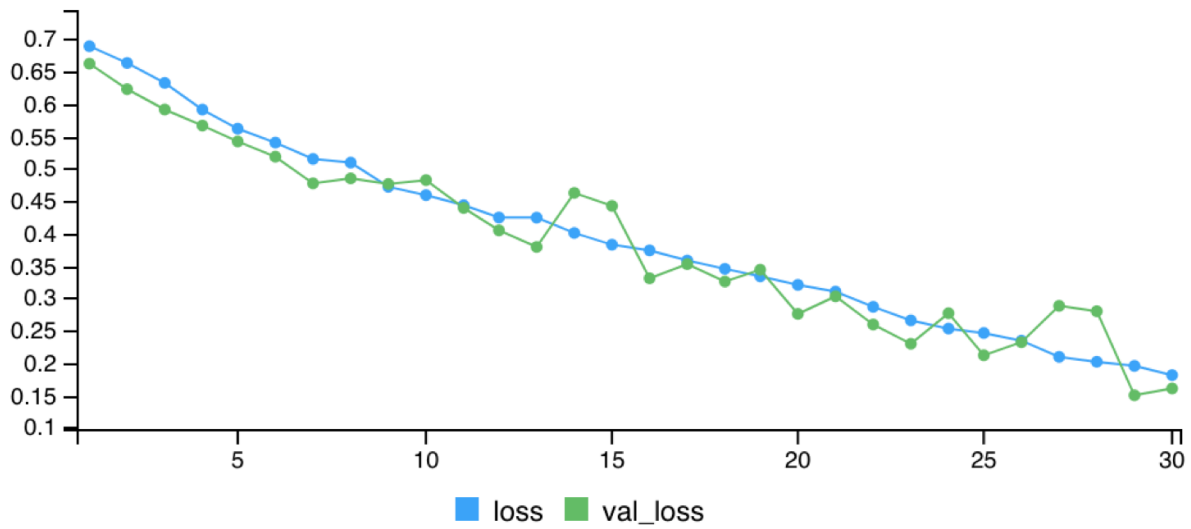
Next, I used a pretrained network to compare the results to the prior models built from scratch. This initial attempt with the pretrained network produced a validation accuracy of 90%. However, it still is impacted by overfitting.

Pretrained Network:

loss   val_loss

accuracy   val_accuracy
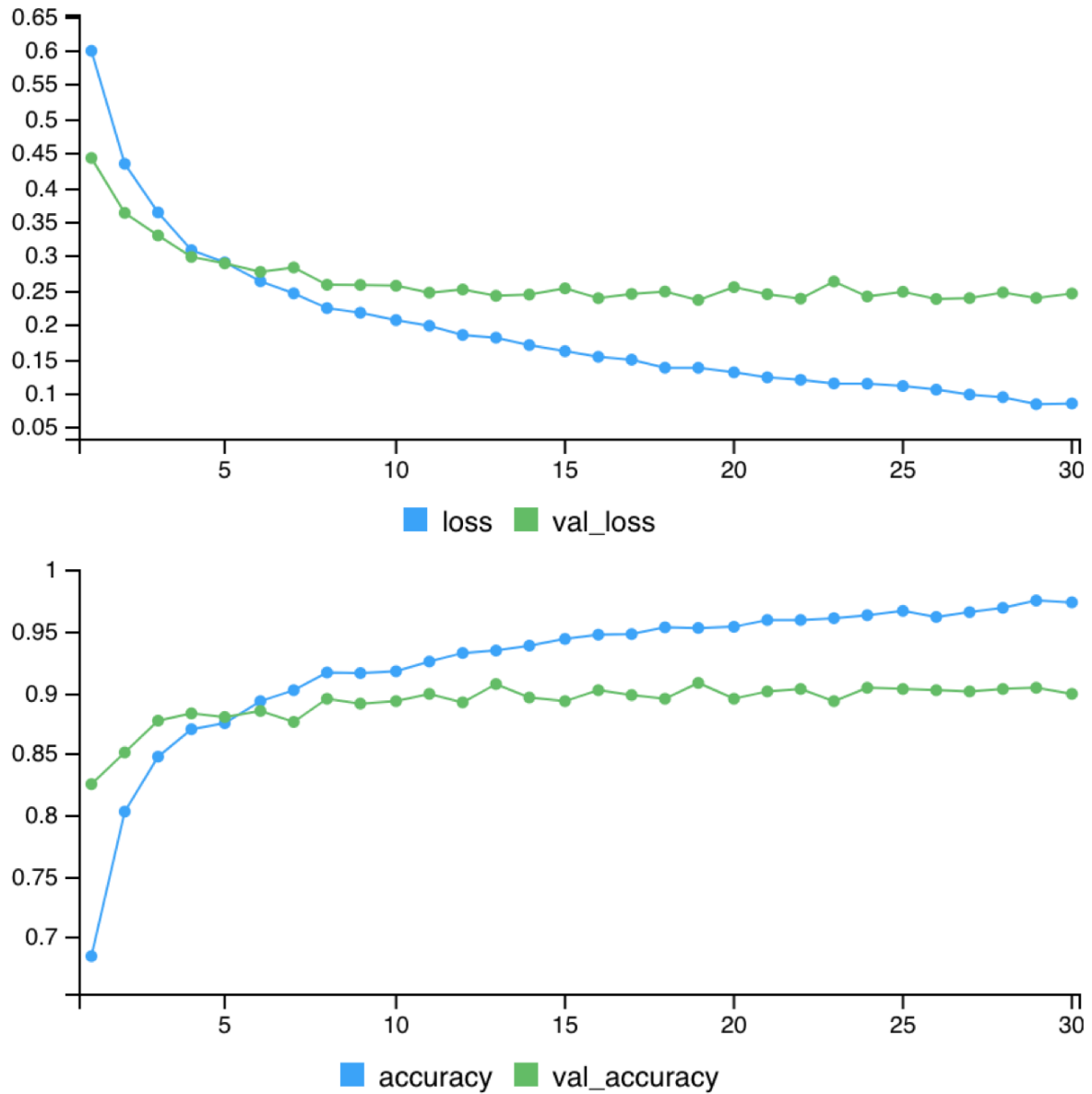
For the next test, I used the pretrained network and adjusted the training data amount using the same sample sizes as my previous tests with the models from scratch. This model performed well and the validation accuracy improved from the previous model.

Pretrained Network 1300 training images:

As my final test, I used my predetermined optimal training amount of 1800 images with the pretrained model. This resulted in the highest validation accuracy of all the models I have tested with 97% accuracy. Overall, this appears to be the optimal option.

Pretrained Network 1800 training images: