Innocent Bayai

2.5: Visual Applications of Machine Learning

Part 1.

Handwritten Image	Number identified
0	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	2

By correctly identifying 9 handwritten numbers out of the 10, the model has an accuracy level of approximately 90%. If perfection of the handwritten numbers is improved, the model potentially can predict identify all numbers.

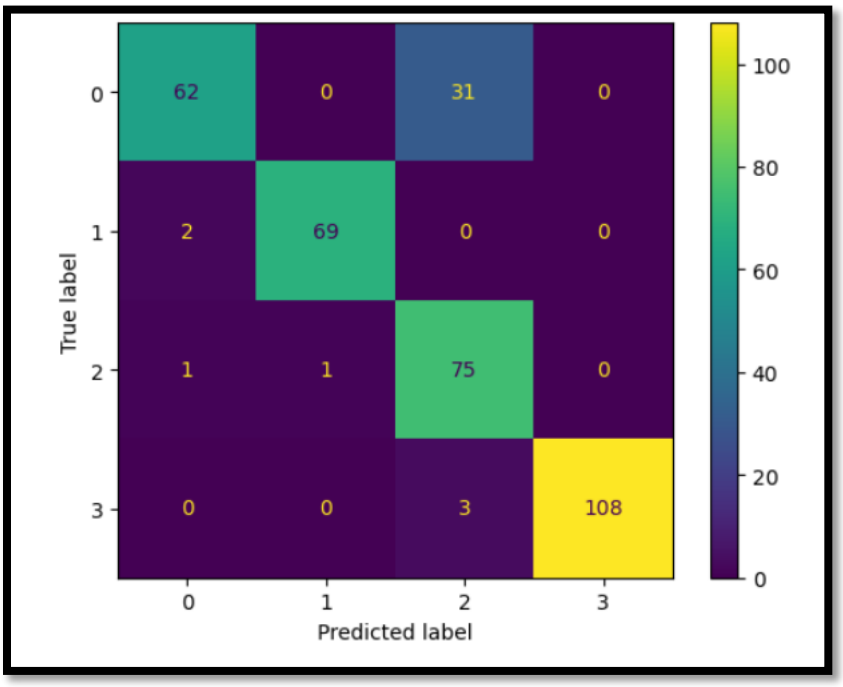
Part 2.

NB: I tried several numbers of epochs and observed that the accuracy level approaches 1 as more epochs are added. As higher numbers of epochs are assumed, the model takes longer to run. At 47 epochs, the accuracy is 90.82%, whilst at 50 epochs, accuracy is at 93.75%. By increasing epochs to 55, accuracy is at 98.01%. However, the model records accuracy of 100% several times before getting to epoch 55, e.g. epochs 6, 8, 12, 16, 18, 28, 30, 34, 36, 40, 42, 48, 52, and 54. At 55 epochs, the following are the accuracy details of the model:

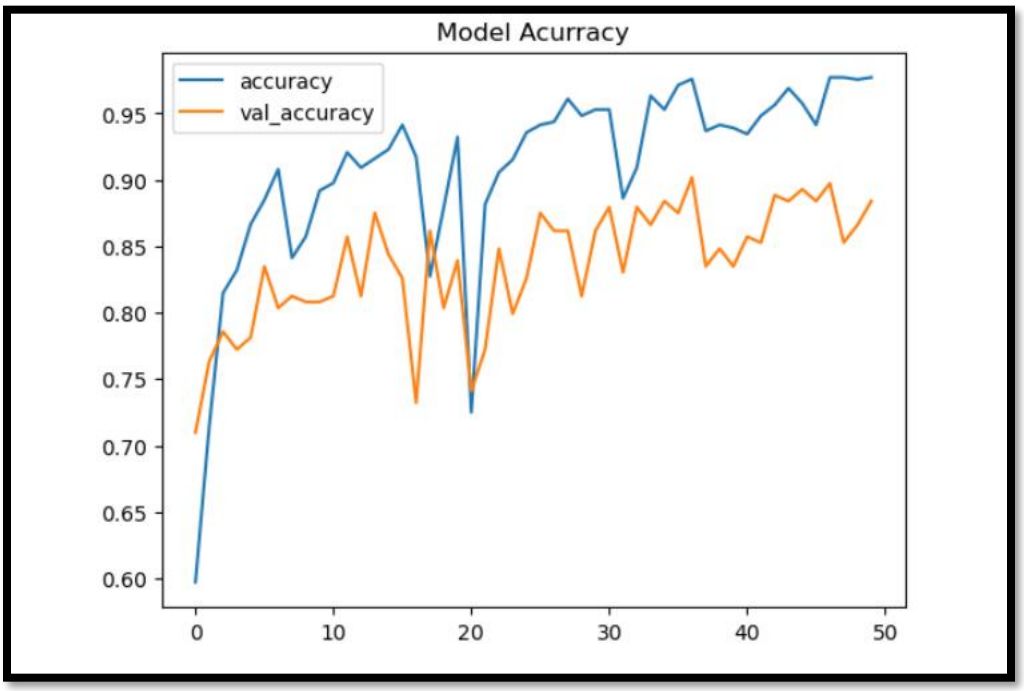
Accuracy	98.01%
Val_accuracy	87.50%
Loss	0.0098
Val_loss	0.0550

The confusion matrix show that the accurately predicted values are definitely of the highest count compared to false predictions, i.e. the 0, 1, 2, and 3 – constituting the loss. The confusion matrix, accuracy and model loss are shown hereunder.

Confusion matrix

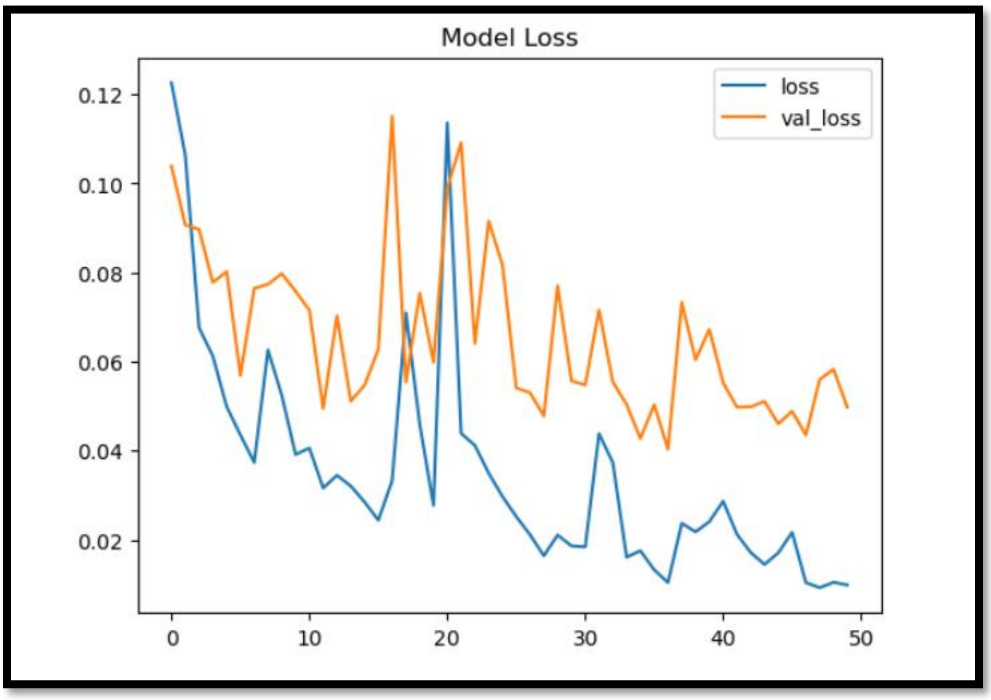


Model accuracy



Comment: As epochs increase, accuracy increases.

Model loss



Comment: As epochs increase, the model loss get lower.

Generative Adversarial Networks (GANS) are a class of machine learning models composed of two neural networks—the generator and the discriminator—that are trained together in a competitive setting. Their use in weather prediction is confirmed by the following:

1. Weather Prediction using GANs – This research applies GANs specifically to weather prediction tasks such as cloud cover forecasting and wind speed prediction. [1805.12178] Magnonic band gap and mode hybridization in continuous Permalloy film induced by vertical coupling with an array of Permalloy ellipses
2. Using GANs for High-Resolution Weather Forecasting" – This paper delves into the application of GANs for improving the resolution of weather forecasting models. Relativistic Strings
3. Generative Adversarial Networks for Climate Modeling" – This paper explores how GANs can be used to simulate and improve climate models, including their use in weather prediction and extreme event forecasting. [1903.01813] Biharmonic wave maps: Local wellposedness in high regularity