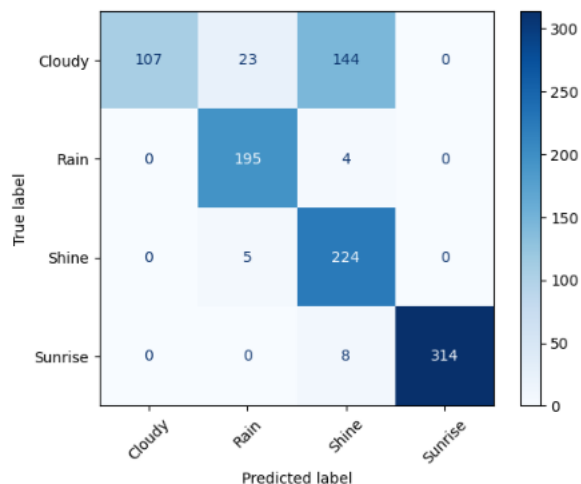
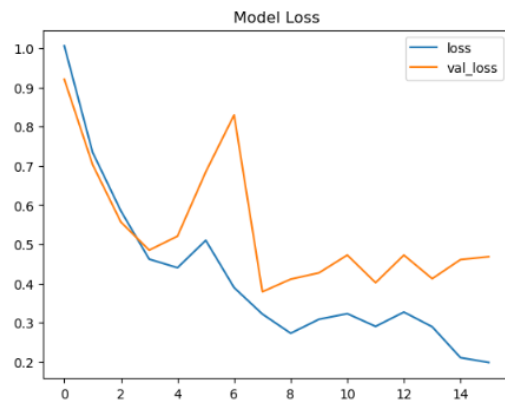
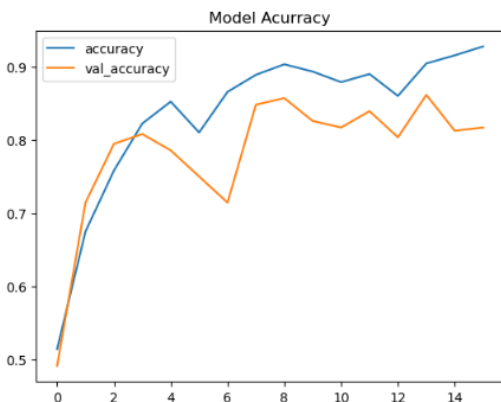


Handwriting and Radar Recognition

Handwriting model performance: With my handwritten numbers 0-9, the model was only **40% accurate**. I guess I have messy handwriting. The only 4 numbers that it got correct were **2, 3, 5, and 8**. Curiously, the model enjoyed predicting the number 2: it was used in 4 out of its 10 predictions.

Weather image classification model: I used 16 epochs on the model, however as you can see below, the accuracy and loss seemed to do most of the converging by 8 epochs, and then undulate slightly until it reached 16. The finishing accuracy and validation accuracy were **0.93** and **0.82**, respectively, while the end loss and validation loss were **0.20** and **0.47**. The confusion matrix makes it clear that while the model does well with correctly predicting sunrise, shine, and rainy conditions, it **struggles** to correctly classify **cloudy** conditions.



Using GANs in Weather Prediction

Without googling first, I can think of a few ways that GANs can be useful in weather prediction. Firstly, they can be helpful in a local sense: you can train GANs specifically in certain suburbs or areas around major cities to understand when certain events may happen soon. For instance, I live in Morrison, Colorado, which is 20 minutes west of Denver. If I train a local GAN to understand when certain precipitous events may occur (snow, hail, rain), it can be helpful in a short-term sense by alerting the neighborhoods to inclement weather. With nearby mountains playing a significant role in weather formation, having local GANs in mountainous places like Colorado can be especially useful.

Next, I think they can be helpful to use alongside other current weather detection technology as an added layer of predictive power. Computers have radars that they use to make probability decisions for various weather events, but if that were to be combined with real-life pictures that could, over long enough time horizons, provide enough info to the model to allow it to predict certain weather events with narrow error bars, then it could incrementally improve the performance of any given meteorological facility when it comes to informing the public about what's to come.

Lastly, I think we can use the generative capacity of GANs to help augment data when it comes to the weather events that are more rare- mainly hurricanes, tornadoes, or heavy rainfall or snowfall. GANs can be trained on historical data to understand the spatial and temporal behavior of said events, then they can be used to generate synthetic instances to resemble real occurrences, which could help to improve forecasting models.

Below is a link I found to a 2024 paper concerning the use of conditional GANs (cGANs) to help predict future climates and extreme weather events.

<https://essopenarchive.org/users/449031/articles/848420-a-reliable-generative-adversarial-network-approach-for-climate-downscaling-and-weather-generation>