AI100 Midterm Project
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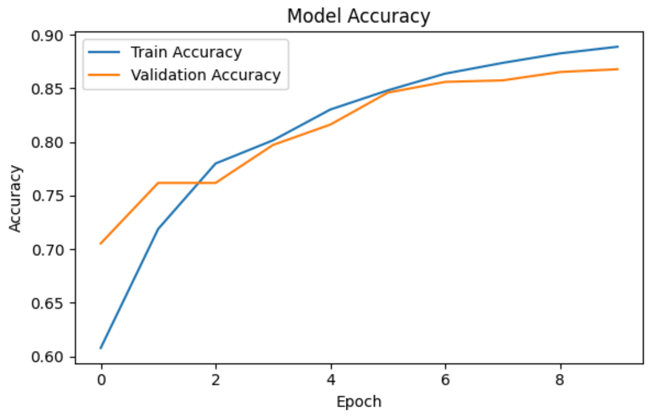
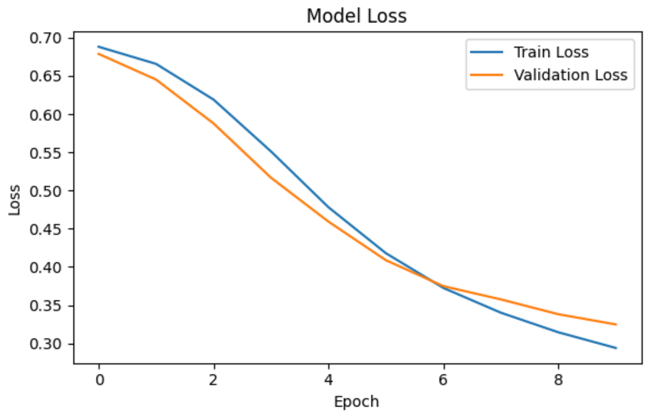
Problem definition and Dataset curation: I chose the classification problem of sentiment analysis, where a movie review is predicted to be positive or negative based on the words in the review. The model should analyze key words in the review and process these through its several layers of learning, ultimately producing a binary classification result. I was able to obtain data from Keras which was imported through Python in Google Colab, which I used. This data was a large sample of IMDB reviews, which were already processed in Keras as a sequence of numbers.

Deep Learning Model: I asked Claude AI to develop code that would enable deep learning of the database from Keras. The model starts off by associating the sequences of numbers from Keras with a smaller sample of numbers, where closely related words would be represented by similar numbers. Then, the model uses global pooling to condense the words in the reviews into an average, allowing for consistency in the algorithm when it comes to input lengths. Next, the ReLu activation function is used to analyze the previous layer of data, and sets negative values to 0, making the process more efficient. The last step, similar to what we talked about in class, is the Sigmoid activation function is used to translate all of the values into numbers between 0 and 1, which is important for the classification aspect of this process. The code then states that if a value is less than 0.5, a negative review should be predicted, and otherwise a positive review should be predicted. Overall, this code passes the raw data through several layers of processing to ultimately predict negative/positive for each movie review. The correct answers got accounted for accordingly, with certain factors being weighted more heavily to influence the future iterations to be more correct.

Results: Part of the model was outputting a test accuracy score, which was 0.8633, meaning about 86% of the time, the model classified a review correctly. The model had a test loss output as well, which in this case was 0.3289, which is moderately high but it was still generally right. Below are some plots of both the accuracy and loss, showing how more epochs (trials) of going through the data showed an upwards trend in accuracy and a downsloping trend in loss. These plots really help to show how the model self corrected throughout the process and became much more accurate as it learned how to approach the data.





Here is an example output of a review that was predicted:

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Review: This movie was absolutely fantastic, I loved every moment of it
Sentiment: Positive 😊 (score: 0.7020)
Review: This film was terrible and boring, a complete waste of time
Sentiment: Negative 😞 (score: 0.3870)
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The model clearly learned some word association to be able to classify each of these statements correctly as positive or negative sentiments, although the scores could probably be even more extreme towards either 0 or 1 considering the glaring positivity or negativity in either review.

Lessons and Experience: This project was very helpful for me to see how deep learning, multi-layered networks, and perceptrons work and how they can be used for classification problems. I had an understanding of these concepts from what we learned in class, but seeing them in practice through running code and building a model with the help of AI was very beneficial to my comprehension. I was able to see how even a simple model using code provided from Claude AI could adapt and teach itself how to understand a movie review and interpret one to be negative or positive. I'd imagine that with even more data or trials, the algorithm would become much more accurate. I think training for more "epochs" would help to optimize the model for highest accuracy. One thing that came up was the idea of movie reviews being sarcastic, which could easily mess up the model's learning because it wouldn't be able to pick up on that. This made me think that to be really accurate, the reviews/data would have to be very clear and black and white to best support the model.