Assignment 1: Classification Report

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1. (5%) **Explain the meaning of Precision, Recall, F1 score** and discuss how it helps in understanding the performance of the model.

Precision is the ratio of true positive predictions to the total positive predictions (true positives + false positives). It indicates how many of the predicted positives were actually correct.

Recall is the ratio of true positives to all actual positives (true positives + false negatives). It shows how well the model identifies all positive samples.

F1 Score is the harmonic mean of the precision and the recall. It is especially useful when there is an uneven class distribution. A higher F1 score means the model is performing well in terms of both precision and recall.

These metrics help in understanding the model's performance by showing how well it can balance accuracy in prediction (precision) with its ability to capture all relevant instances (recall). The F1 score ensures that both are considered together.

2. (5%) **Preprocessing & Feature Engineering**: What preprocessing (e.g. normalization) and feature engineering exhibit the better performance.

Normalization and Standardization are essential for aligning the feature scales, with Standardization providing better performance for models like neural networks and SVM. Additionally, feature engineering could involve computing moving averages for each feature to capture trends over time.

3. (5%) **What models have you implemented?** How do you modify these models to make them perform well on this task? What is the difference between these models? Please answer these questions.

Training F1 score for each trend and each model:

	1_trend	5_trend	10_trend
SVM	0.473	0.392	0.407
Neural Network	0.334	0.325	0.373

I have implemented two models for the stock trend prediction task: a Support Vector Machine (SVM) model and a neural network model.

To improve the performance of these models, I tuned hyperparameters and adjusted learning rates. For the neural network, I tried different optimizers.

The SVM model is a linear classifier that finds the hyperplane to separate different groups in high-dimensional space. In contrast, a neural network is a more advanced model with multiple layers that can learn complex, non-linear patterns in data using different functions to process information.

4. (5%) **Does longer history data present better performance?** Say, using data from the previous 60 days versus the previous 30 days. Explain the possible reasons for the differences.

Using 60 days of historical data instead of 30 does not improve performance because the extra data can introduce redundancy and noise, complicating the model's ability to identify true trends. This complexity increases the risk of overfitting, where the model learns from irrelevant patterns instead of useful insights.

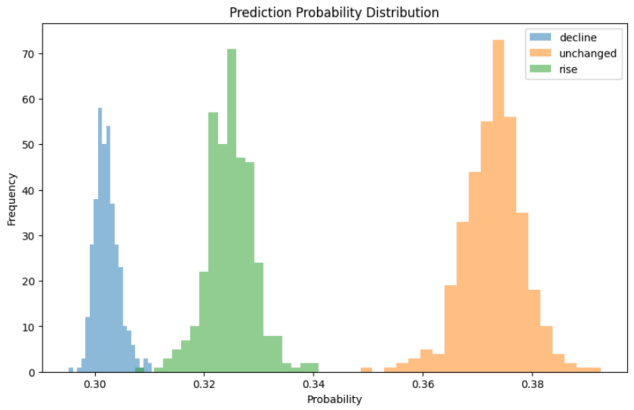
5. (5%) **Compare performance of the 3 tasks for the next 1, 5, and 10 days**.

As we can see in the graphs Short-term predictions (1 day) tend to have higher accuracy as they rely more on recent trends. As the prediction window increases (5 or 10 days), the task becomes more challenging, and performance decreases since more uncertainty

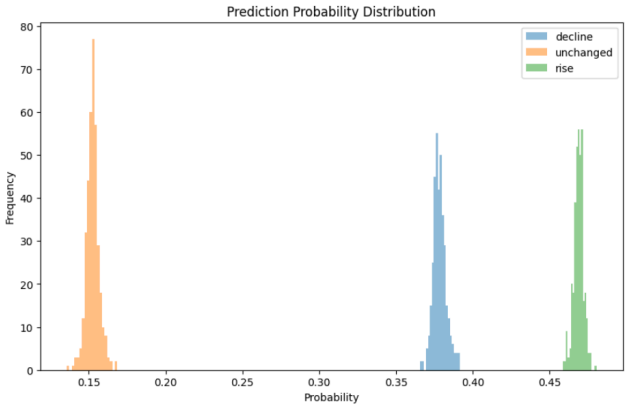
and external factors come into play over a longer period.

Example Charts

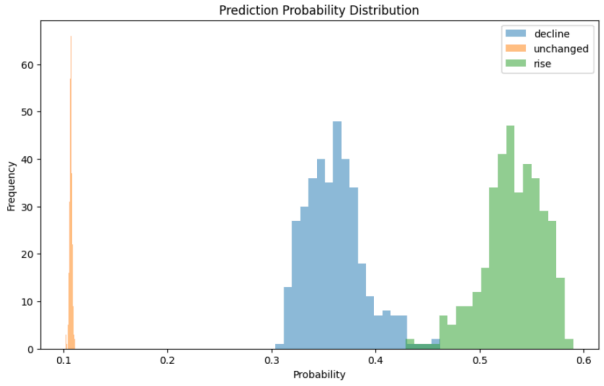
1_trend:



5_trend:



10_trend:



6. (5%) **Can we train three models together, e.g. multitasking?** Compare the performance for independent training and parallel training.

Yes, we can train three models together in a multitasking approach to predict different trends in this assignment. This method allows models to share features, potentially improving generalization and efficiency. However, in our case, independent training is much better. This approach allows each model to specialize in its specific task, leading to improved performance and more focused learning, especially since the trends we are predicting are distinct.