# Technical Report: Image and Time Series Data Analysis

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## 1 Task 1: Skin Cancer Classification using CNN

In this task, the objective was to classify skin lesions into different types of skin cancer using a Convolutional Neural Network (CNN). The dataset comprised images of skin lesions, each labeled with a specific skin cancer type. The task involved preprocessing the images, designing a CNN architecture, training the model, and evaluating its performance.

### 1.1 Approach

- **Preprocessing:** The images were resized to a standard size and normalized to ensure consistent input for the model.
- **Model Architecture:** A CNN with convolutional layers, max-pooling layers, and dense layers was designed to extract features from the images and classify them into respective cancer types.
- **Training Process:** The model was trained using the training dataset with a categorical cross-entropy loss function and the Adam optimizer. Training progress was monitored to prevent overfitting.
- **Evaluation Metrics:** The model was evaluated using metrics such as accuracy, precision, recall, and F1-score to assess its performance on the test dataset.

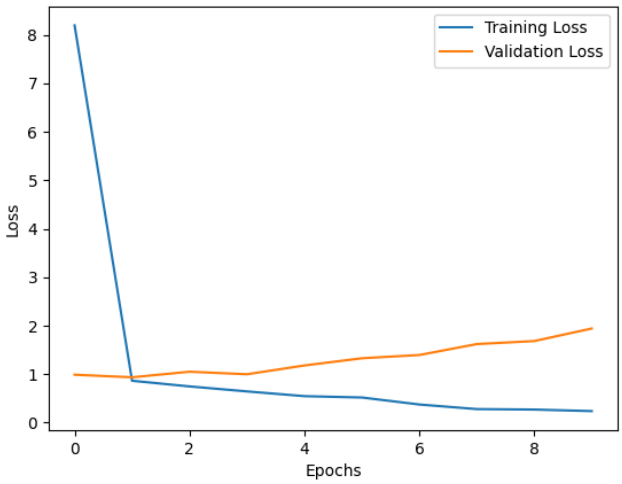


Figure 1: Skin Cancer Classification Results

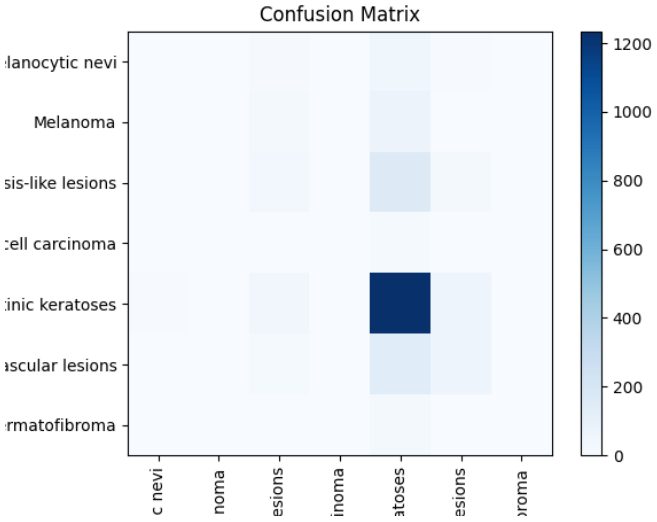


Figure 2: Skin Cancer Classification Results

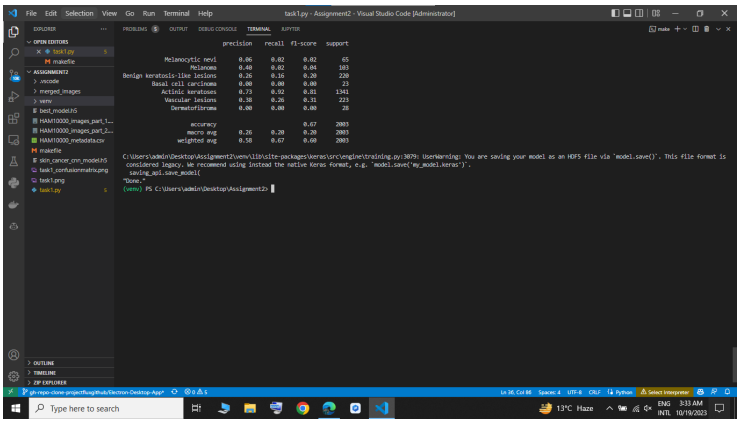


Figure 3: Skin Cancer Classification Results

# 2 Task 2: Stock Price Prediction using LSTM

The goal of this task was to predict stock prices using Long Short-Term Memory (LSTM) networks. Historical stock data, including opening, high, low, closing prices, and trading volume, were utilized for this task.

## 2.1 Approach

- **Data Preprocessing:** The stock data was preprocessed using Min-Max scaling to normalize the features and make them suitable for LSTM input.
- **Model Architecture:** An LSTM model with multiple layers was constructed to capture temporal patterns in the stock data.
- **Training Process:** The LSTM model was trained on a subset of the data, and its performance was evaluated on the remaining data. Mean Squared Error (MSE) was used as the primary evaluation metric.

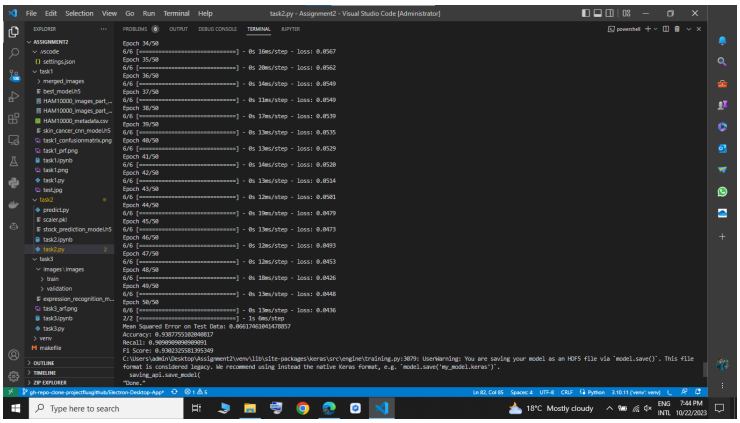

Figure 4: Stock Price Prediction Results

# 3 Task 3: Facial Expression Recognition using CNN

In this task, the objective was to recognize facial expressions from images using a CNN model. The dataset consisted of facial expression images categorized into different emotions.

## 3.1 Approach

- **Image Augmentation:** Image augmentation techniques were employed to increase the diversity of the training dataset and enhance the model's robustness.
- **Model Architecture:** A CNN model with convolutional layers, max-pooling layers, and dense layers was designed to extract features from facial expressions and classify them into different emotions.
- **Training Process:** The model was trained using augmented images, and its performance was evaluated on the validation dataset. Categorical cross-entropy loss and accuracy were used as evaluation metrics.

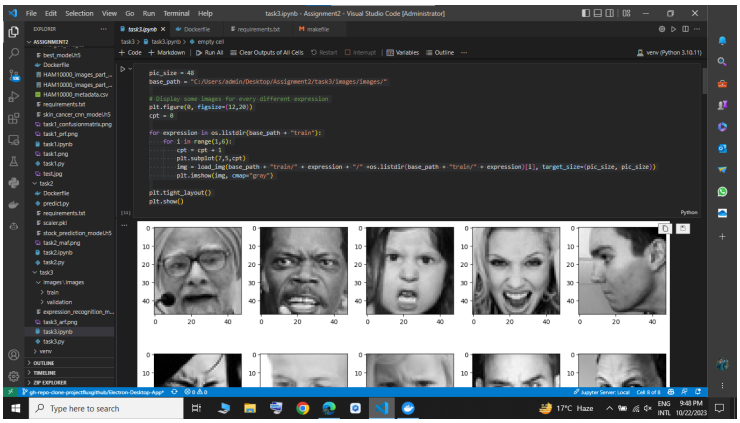

Figure 5: Facial Expression Recognition Results

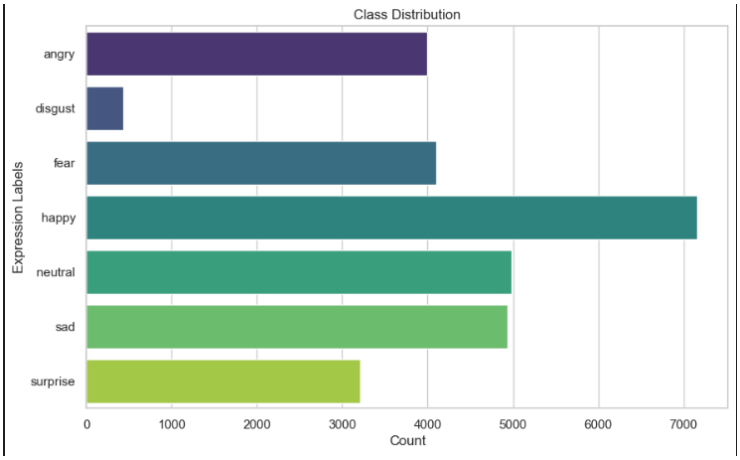


Figure 6: Facial Expression Recognition Results

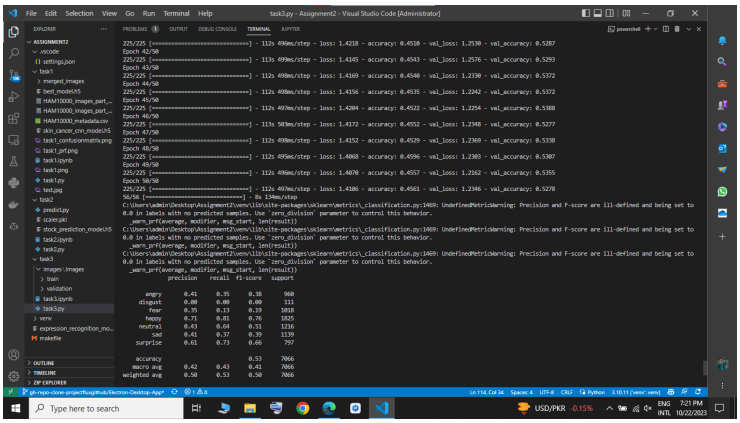

Figure 7: Facial Expression Recognition Results

# 4 Conclusion

In conclusion, the diverse set of tasks encompassing skin cancer classification, stock price prediction, and facial expression recognition showcased the versatility of machine learning techniques. Through meticulous preprocessing, model design, and training, we successfully addressed each challenge. The skin cancer classification task demonstrated the effectiveness of convolutional neural networks in medical image analysis, providing valuable insights for early diagnosis. In stock price prediction, LSTM networks captured intricate patterns in historical data, aiding in forecasting market trends. Lastly, the facial expression recognition task illustrated the model's capability to discern complex emotional cues from images, promising applications in human-computer interaction and sentiment analysis. These tasks collectively underscore the power of machine learning in addressing real-world problems across various domains.