SE4050 – Deep Learning
Lab – 05

Year 4 - Semester 1, 2024

Task 1: Understanding Basic RNN Architecture

Objective: Implement a simple RNN to predict the next value in a small sequence of numbers.

Task:

- Upload the Q1.ipynb to Jupyter notebook (or Google Colab).
- Rename the Q1.ipynb file with your IT number (ITxxxxxxQ1.ipynb).
- Read the descriptions and instructions given in the notebook.
- Modify the units parameter in the SimpleRNN layer to see how the number of hidden units affects the model's ability to learn the sequence.
- Adjust the epochs and batch_size during training to optimize the model's learning process and performance.
- Analyze the resulting plot. If the predicted values deviate significantly from the actual values, experiment with different model configurations and training parameters to improve accuracy.
- Describe your observations. You can add a text cell and type your answers.

Task 2: Implementing LSTM for Time-Series Forecasting

Objective: Implement an LSTM model to predict stock prices using historical data.

Task:

- Upload the Q2.ipynb to Jupyter notebook (or Google Colab).
- Upload the google.csv file to the root (content) directory of the VM.
- Rename the Q2.ipynb file with your IT number (ITxxxxxxQ2.ipynb).
- Modify the number of units in the LSTM layers and consider adding more layers or changing the dropout rate to see how these adjustments affect the model's performance.
- Adjust the epochs and batch_size during the training phase to optimize the model's learning process and its ability to generalize.
- Examine the plot comparing predicted stock prices with actual prices. If the model's predictions are inaccurate, experiment with different configurations and training parameters to achieve better results.
- Answer the following questions. (You can type answers in a text cell)
    1. What is the purpose of normalizing the 'Close' prices before feeding them into the LSTM model?
    2. What is the purpose of the Dropout layer in the LSTM model?
    3. In the plot showing actual vs predicted stock prices, what does it indicate if the predicted line closely follows the actual line?

Task 3: Sentiment Analysis using LSTM

Objective: Implement an LSTM model for sentiment analysis on a text dataset (IMDB movie reviews).

Task:

- Upload the Q3.ipynb to Jupyter notebook (or Google Colab).
- Upload the IMDB Dataset.csv file to the root (content) directory of the VM.
- Rename the Q3.ipynb file with your IT number (ITxxxxxxQ3.ipynb).
- Modify the output_dim in the Embedding layer and the units in the LSTM layers. Consider adding dropout for regularization.
- Adjust the epochs and batch_size to observe how different training configurations impact the model's performance.
- After training, review the accuracy and F1-score. If the scores are unsatisfactory, experiment with different model architectures, training configurations, and hyperparameters.

In the above exercise, we used a bidirectional LSTM model

1. Compare the performance of the bidirectional LSTM with a unidirectional LSTM using the same dataset. (You have to change the model to unidirectional.)
2. Analyze the impact of each architecture on model accuracy and F1-score.

   (You can use the same notebook and type your answers in a text cell.)

SUBMISSION

1. Download the updated ITxxxxxxQ1.ipynb, ITxxxxxxQ2.ipynb and ITxxxxxxQ2.ipynb.
2. Upload those **three** files to GitHub.
3. Provide the Github link to the form in CourseWeb.