

CST 476-2 Deep Learning

Lab Sheet 04

Activity: Weather Prediction with Recurrent Neural Networks (RNNs)

Aim:

The aim of this lab session is to use RNNs for time series forecasting by predicting daily temperatures based on historical weather data.

Dataset:

Weather Dataset

Description of the Dataset:

The dataset, `whether_data`, consists of daily weather data recorded over a specific period. It contains two columns: Date and Temperature. The Date column represents the day of observation in the format MM/DD/YYYY, while the Temperature column records the daily temperature in degrees Celsius. This dataset is ideal for time series analysis and forecasting tasks as it provides a continuous sequence of temperature values, allowing us to model historical trends and predict future temperatures effectively.

Tasks:

- Download the dataset (`whether_data`) from the VLE.
- Open your Jupyter Notebook environment and import the required libraries, including `pandas`, `numpy`, `matplotlib`, `sklearn`, and `keras`.
- Normalize the temperature values to the range `[0, 1]` using the Min-Max normalization technique.
- Split the dataset into training and test sets by using a Fixed Index-Based Splitting approach.
- Create sequences for time series forecasting, where past temperature values serve as input, and the next day's temperature is the output.
- Build an RNN model using the Keras Sequential API for sequence learning and a Dense layer for output prediction.
- Compile the model by specifying the optimizer and the loss function.
- Train the model on the training dataset, setting appropriate values for epochs and batch size, and observe the training and validation loss.
- Evaluate the model's performance on the test dataset by comparing actual and predicted temperature values and visualizing the results.
- Experiment with the model by varying the sequence length and adjusting hyperparameters like the number of RNN units, epochs, and batch size to analyze their impact on performance.