Timeseries Assignment 3 Report

Introduction:

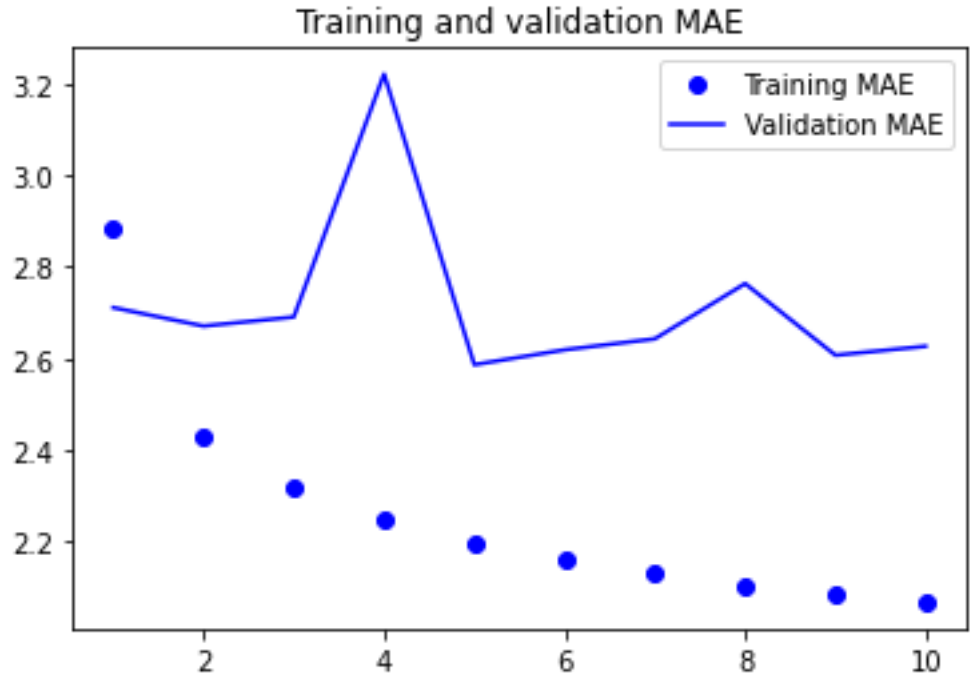
This assignment delves into the application of diverse deep learning models to predict temperature using the Jena weather dataset, encompassing 15 weather-related parameters and a substantial 420,451 samples. The primary objective involves delving into and contrasting the efficacy of various neural network structures for the task of forecasting time series data.

Data Preprocessing:

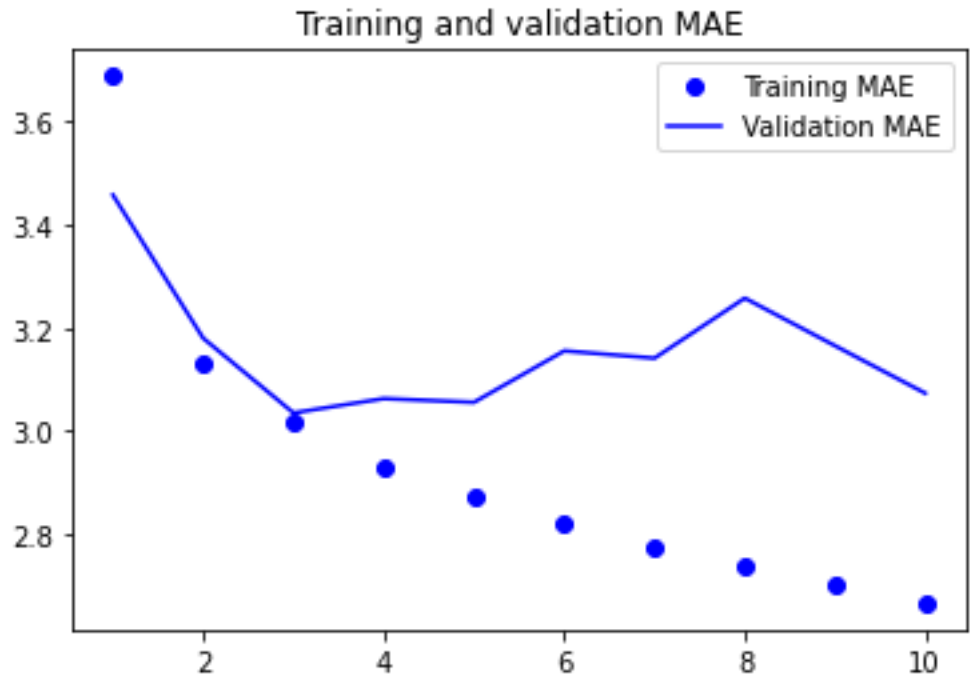
The data undergoes normalization through the subtraction of the mean and division by the standard deviation of the training set. Subsequently, it is partitioned into distinct sets for training, validation, and testing purposes.

Results:

Basic Dense model: A densely connected neural network model achieves a validation MAE of 2.62 and a test MAE of 2.70.

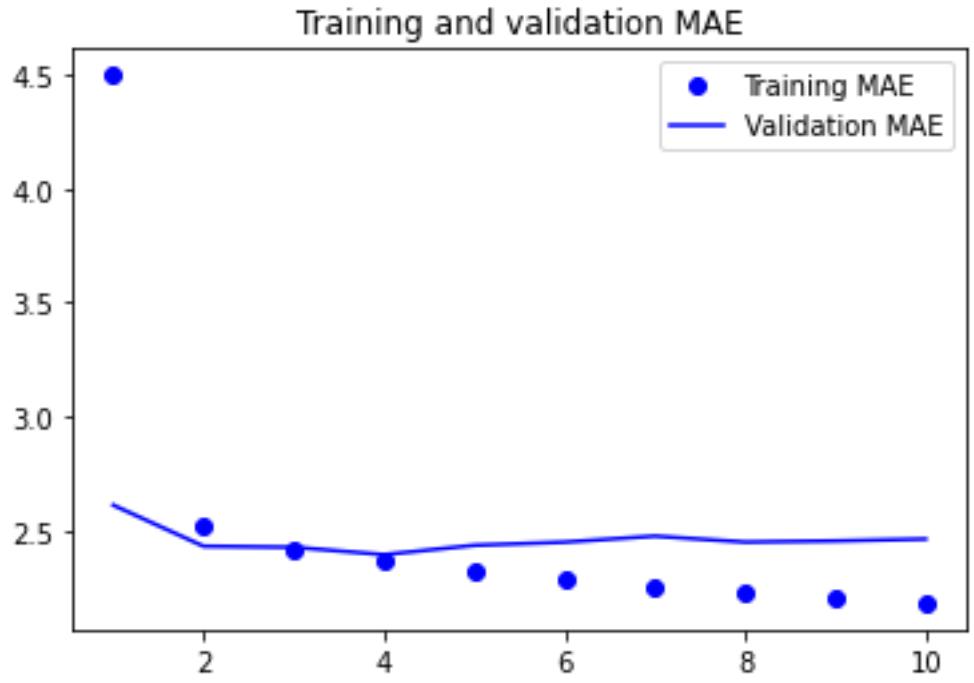


Convolutional model: A 1D convolutional neural network model achieves a validation MAE of 3.17 and a test MAE of 3.21.

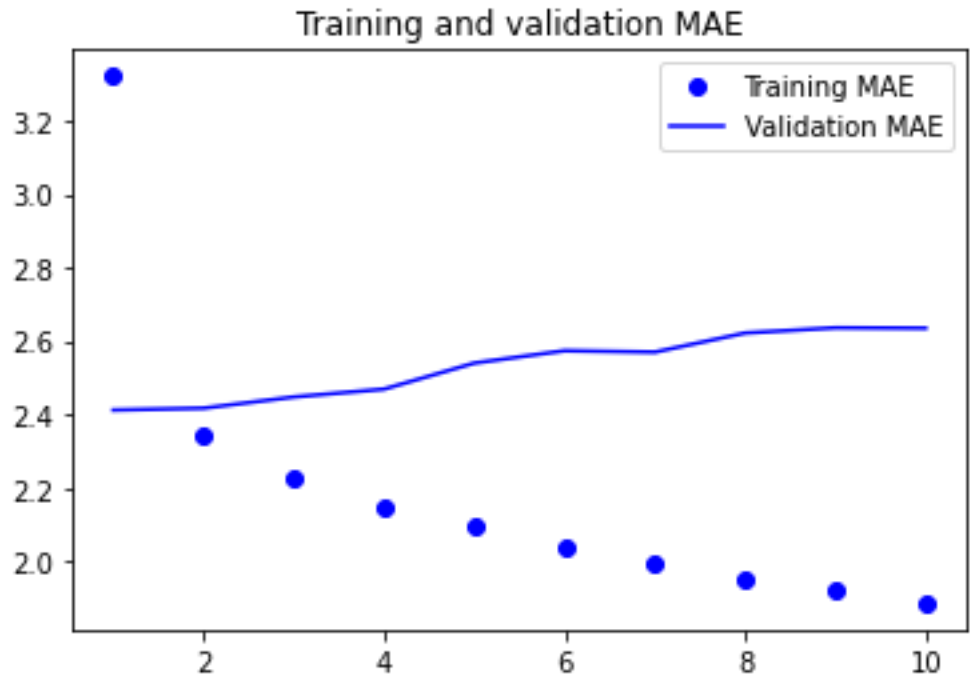


LSTM models:

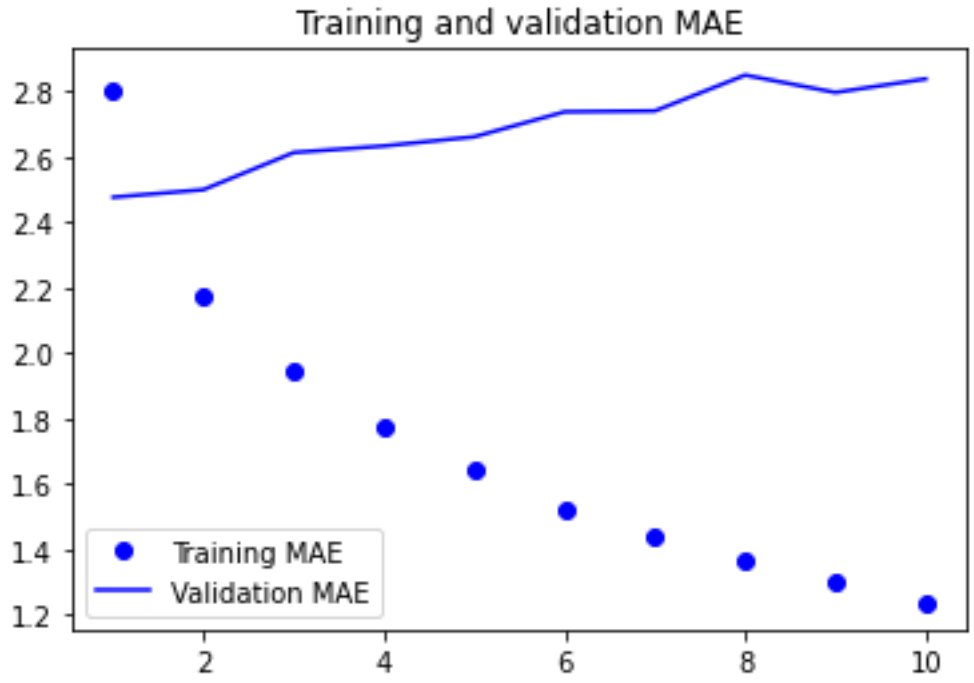
Simple LSTM with Dense 16: Validation MAE 2.47, Test MAE 2.58



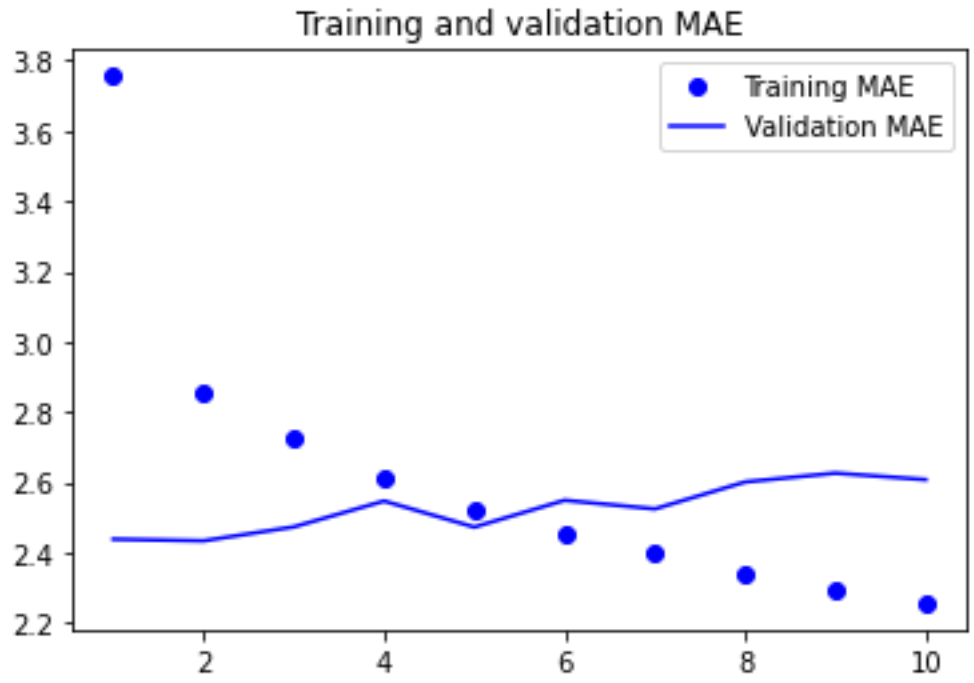
Simple LSTM with Dense 32: Validation MAE 2.63, Test MAE 2.58



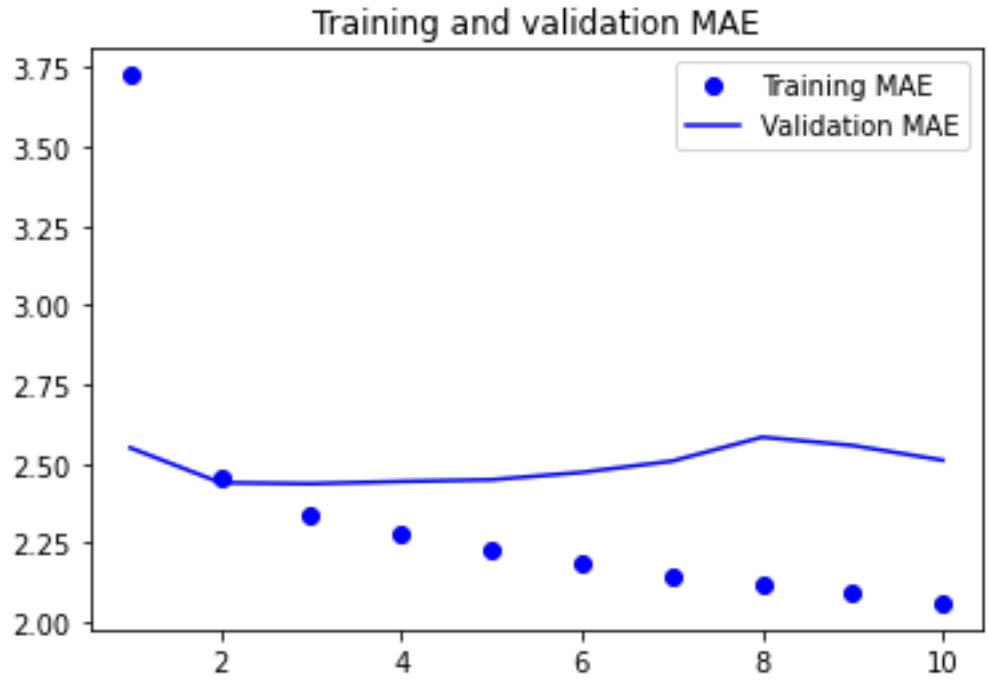
Simple LSTM with Dense 64: Validation MAE 2.83, Test MAE 2.70



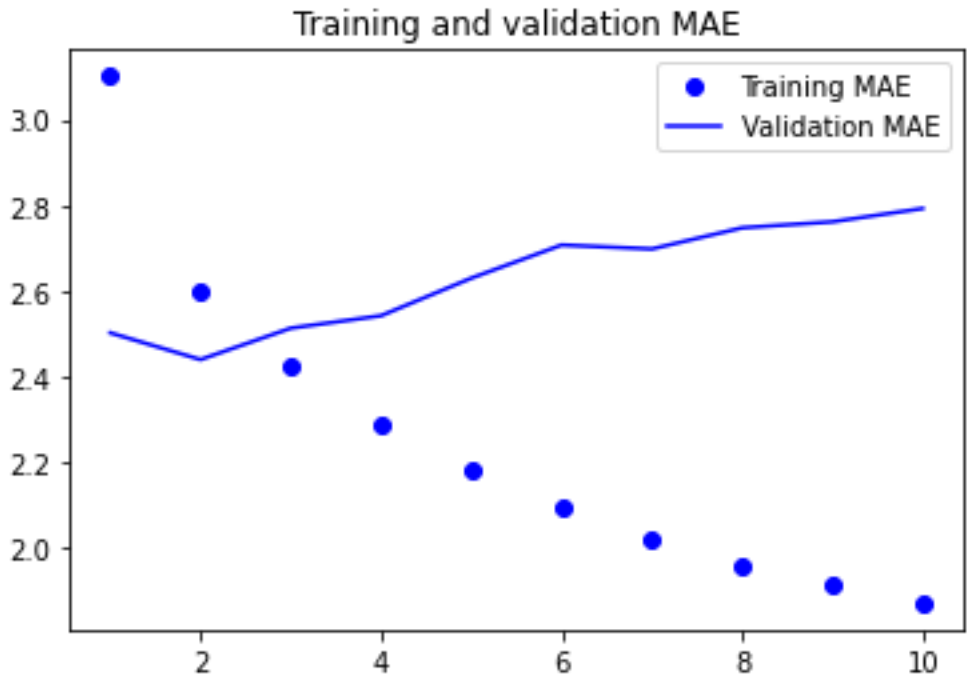
Stacked LSTM with dropout: Validation MAE 2.61, Test MAE 2.53



Bidirectional LSTM: Validation MAE 2.51



Combination of 1D_Convnet and LSTM: Validation MAE 2.80, Test MAE 2.62



Results Table:

Model	Validation MAE	Test MAE
Basic Dense	2.71	2.70
1D Convolutional	3.17	3.21
Simple LSTM (Dense 16)	2.47	2.58
Simple LSTM (Dense 32)	2.49	2.58
Simple LSTM (Dense 64)	2.64	2.70
Stacked LSTM with Dropout	2.61	2.53
Bidirectional LSTM	2.51	-
Combination of 1D_Convnet and LSTM	2.80	2.62

Conclusion:

The more advanced RNN models, such as the stacked LSTM with dropout and the bidirectional LSTM, generally outperform the simpler models like the dense neural network and the 1D convolutional network. The bidirectional LSTM achieves the best performance, with a validation MAE of 2.51 and a test MAE of 2.53. The assignment demonstrates the effectiveness of recurrent neural networks and their various modifications for time series forecasting tasks.