

ID5030: Machine Learning for Engineering for Science Application

Homework 7

To be submitted by April 14th, 2023 11:59 pm

1 RNN in PyTorch

1. Load the required libraries such as Pandas, NumPy, Matplotlib, Pytorch and Sklearn.
2. Download the dataset from the given [link](#) and read it into a Pandas dataframe.
3. Do a train-validation-test split of the data. The recommended split is 70-15-15, i.e., 70% of the data for training, 15% for validation, and 15% for testing.
4. Create a new data frame where the features are the previous 100 values, and the label is the current value. This can be done using the Pandas shift() function
5. Train a recurrent neural network (RNN) on the created data frame. We can use Pytorch, a high-level neural network library for Python, to create and train the RNN.
6. Evaluate the performance of the trained RNN by calculating the Mean Squared Error (MSE), Root Mean Squared Error (RMSE), and R-squared (R^2) values for the predictions on the test set. These metrics can be calculated using Sklearn's mean_squared_error(), mean_absolute_error(), and r2_score() functions, respectively.
7. Plot the learning curves for the RNN. This can be done using Matplotlib to plot the training and validation loss against the number of epochs.
8. Instead of using the previous values as features, use the hour, day, day of the week, week of the year information, as well as the periodicity information, along with checking whether the day is a holiday using the holiday module as features to predict the current value using RNN. This can be done by creating a new dataframe with these features and labels.
9. Train an RNN on the new dataframe using the same architecture as before
10. Evaluate the performance of the trained RNN by calculating the MSE, RMSE, and R^2 values for the predictions on the test set.
11. Plot the learning curves for the new RNN.
12. Compare the performance of the two RNNs and determine which feature engineering method is better for the given dataset.
13. Submit the Jupyter notebook for evaluation.