OMDENA ALGERIA GREEN MINI PROJECT – TEAM 1
WATER LEVEL FORECASTING

03/10/2022

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PROBLEM STATEMENT

OBJECTIVE

Venezia is an Italian city built on a lagoon; a body of water separated from the sea by a strip of land. However, this city is frequently subject to flooding during autumn and spring due to the "acqua alta", a tide that raises the water level to the point that the sea invades the city. This phenomenon causes great complications in the city. The forecast of the water level is therefore a fundamental task for the safeguard of the city of Venezia.

DATASET & DATA DESCRIPTION

The dataset contains hourly measurements of the water level in Veneziafrom 1983-01-01 to 2016-01-01.

To load the dataset, use the following

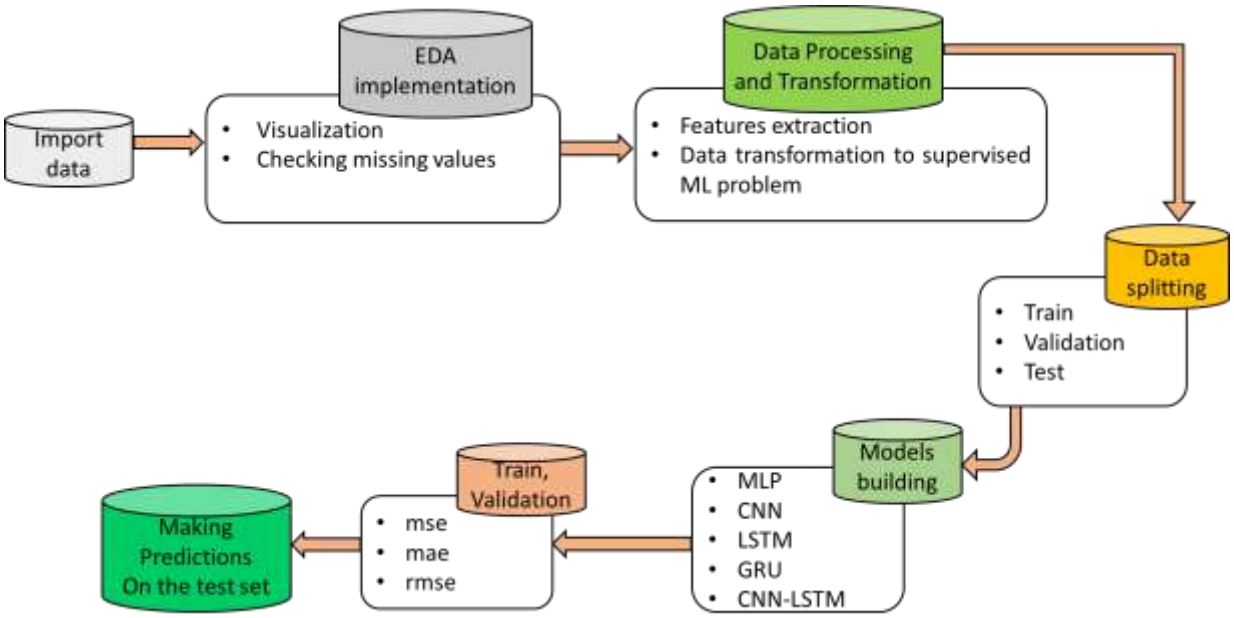
link: https://www.kaggle.com/datasets/lbronchal/venezia

Attribute Information:

- datetime: date and hour of the measurement in utc time
- level: level of the water in cm from the reference point

PROPOSED WORK & CONTRIBUTION

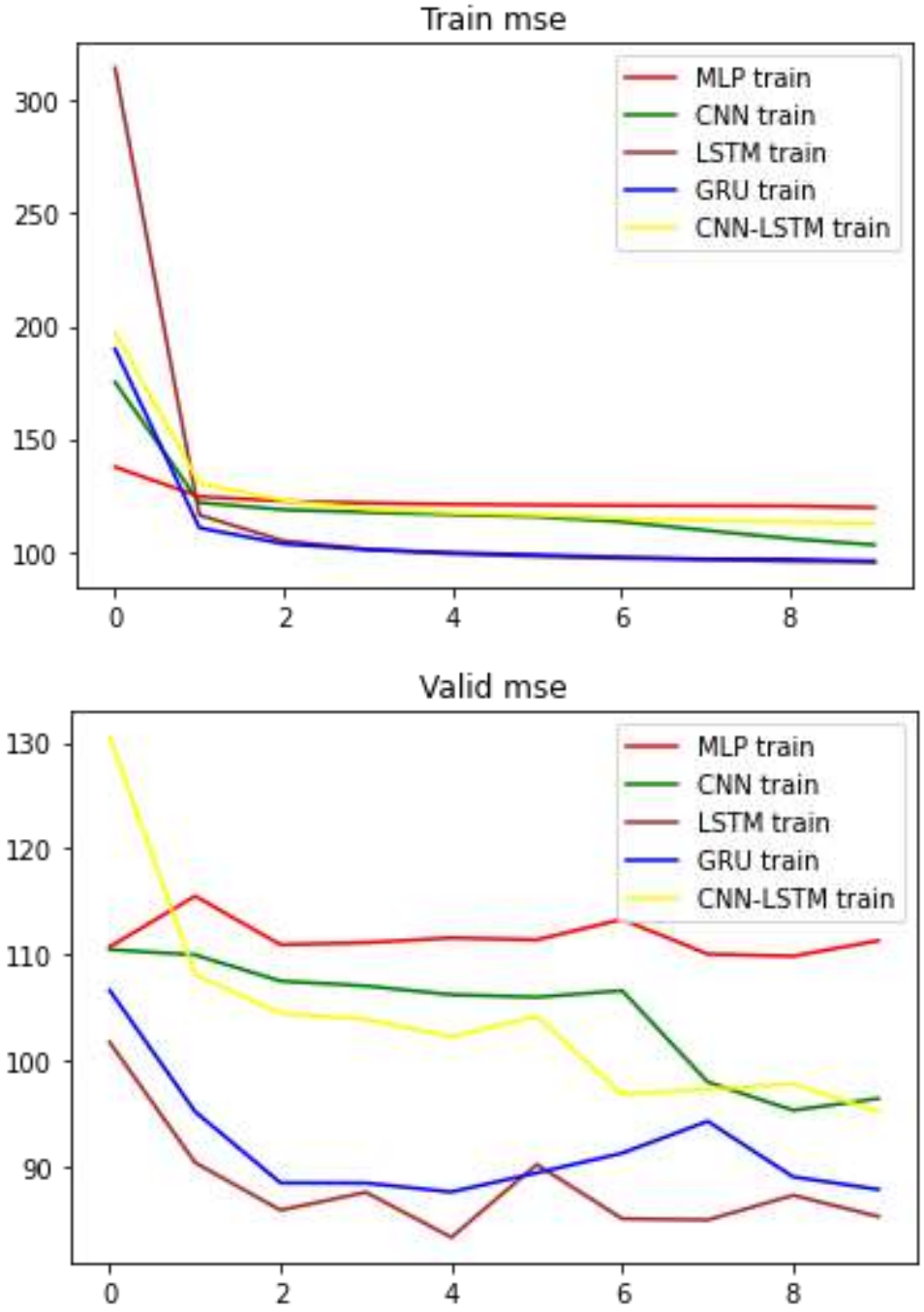
FLOW GRAPH OF OUR WORK



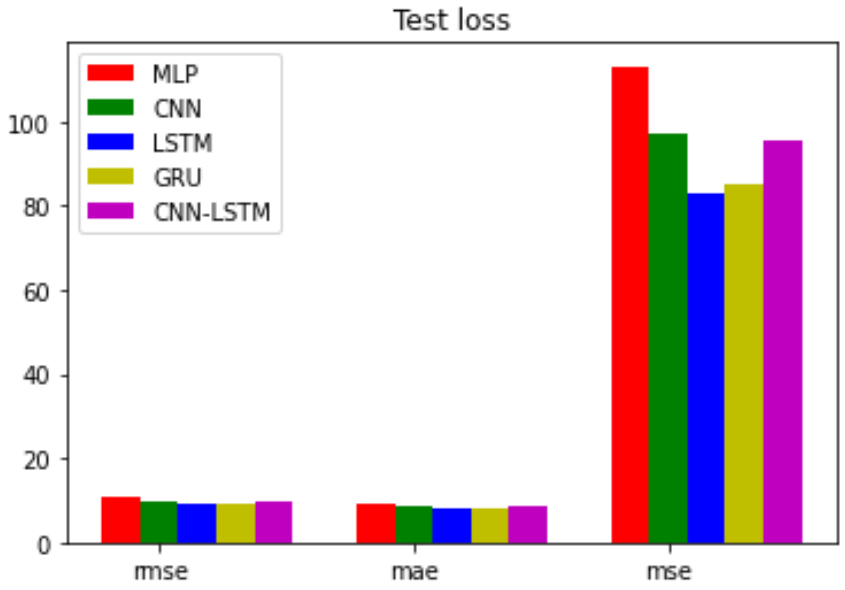
OUR CONTRIBUTION

In contrast to previous studies on forecasting systems based on classical statistical methods such as integrated moving average (ARIMA), seasonal autoregressive integrated moving average (SARIMA), and Random Forest (RF), our work involves the use of efficient deep learning approaches that employ CNN, LSTM and GRU to improve water level forecasting.

RESULTS


Train mse
MLP train
CNN train
LSTM train
GRU train
CNN-LSTM train
300
250
200
150
100
0
2
4
6
8
Valid mse
MLP train
CNN train
LSTM train
GRU train
CNN-LSTM train
130
120
110
100
90
0
2
4
6
8

RESULTS


Test loss
MLP
CNN
LSTM
GRU
CNN-LSTM
100
80
60
40
20
0
rmse
mae
mse

CONCLUSION

Forecasting water level changes is essential for better planning to mitigate any flood risk. In this study, 5 different models, including Multi-Layer Perceptron (MLP), Convolutional Neural Network (CNN), Long Short Term Memory (LSTM), Gated Recurrent Unit (GRU), and CNN-LSTM, were investigated and evaluated to predict water level changes in a river in Venezia, Italy, using data collected between 1983 and 2016. The comparison of the different models showed that the LSTM performs better in capturing water level changes. This is due to its ability to process input data as sequences, which allows it to learn relevant features better than the others, especially features from long sequences. The results show that data-driven forecasting systems based on deep learning approaches enable better decision making, paving the way to be used in work to mitigate potential risks from natural events that may occur in the future.