School of Electronic Engineering and Computer Science
Computer Engineering department
Classifier number and the name of the Master's program
09.04.01 «Informatics and computer engineering (IOT)»

South Ural State University
National Research University

Digital model for prediction power consumption based on data mining technique

Head of work,
D.V. Topolsky, PHD, Associate Professor

Author of work
Student of Master's program of KE-228 group A. A. Al-Mahdawi

Chelyabinsk 2022

Introduction

This project involves the creation a predication model to enable running of deep learning algorithms for power consumption predication on dataset with higher accuracy and faster predication.

South Ural State University
National Research University
1943

Relevance and Novelty

This project lies in the effective data analysis and accurate prediction of power consumption based on IOT technologies and data mining to find the relationship between time and power consumption in India between the years (2019-2020) as well as to help control power consumption in India, identify a capital with high electrical power consumption and determine which month of the year the power consumption is very high to take necessary action.

South Ural State University
National Research University

Tasks necessary to achieve the goal:

1. Analyzing of the time series in IOT environments.
2. Analyzing technological solutions to use to solve the problem.
3. Design a model architecture for power consumption prediction.
4. Training the power consumption prediction model.
5. Testing the model.
6. Testing the library and provide an example implementation of the interfaces.
7. Testing the model to find the cities with the maximunm and minimum consumption of electric energy.

South Ural State University
National Research University

Task 1: Analyzing of the time series in IOT environments

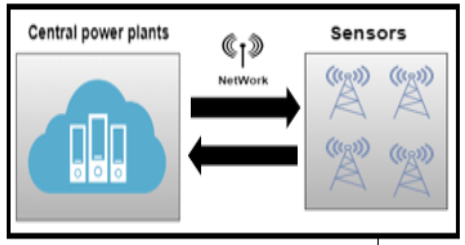
- Short –term power consumption prediction
- Mid –term power consumption prediction
- Long –term power consumption prediction

South Ural State University
National Research University

Task 2:Technological Solutions

1. Power Consumption Dataset
2. Tensorflow
3. Scikit-learn
4. Programming Technologies

Task 3: Architecture Design



IoT Sensors to receive power consumption data

SERIES TO SUPERVISED

Preprocesses the input to checking the quality data and ultimately improving the types of input and time frames

DATA NORMALIZATION

Normalization Data of the Features to be Suitable to feed into a predication models

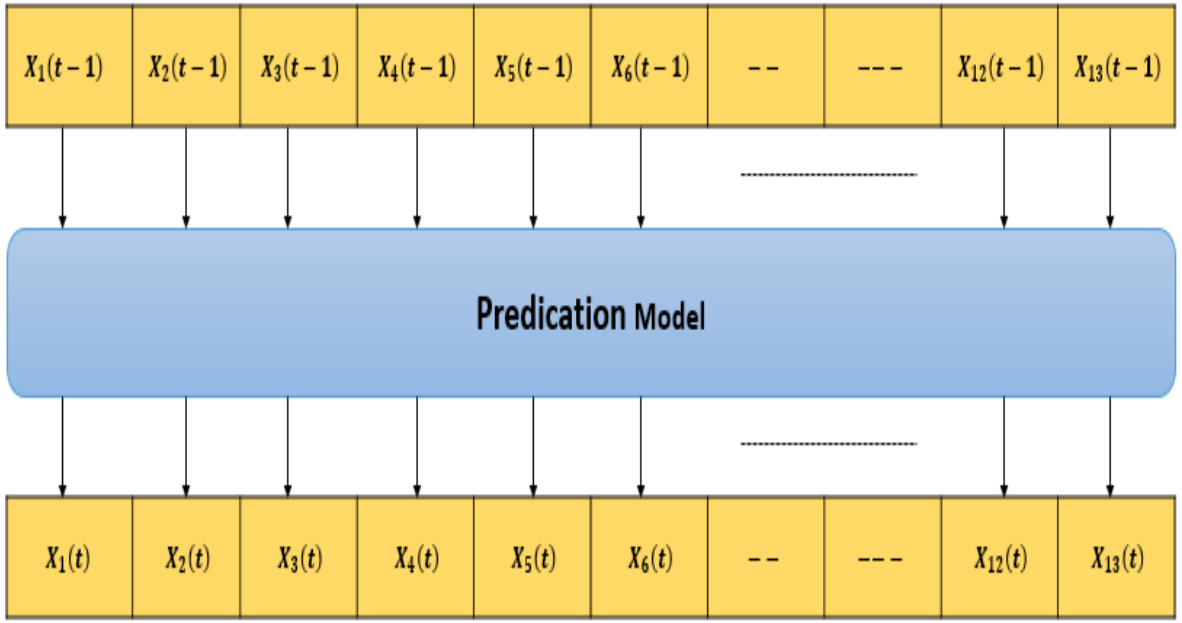
LSTM+GRU PERDICATION

Run hybrid model on the processed input

Predication TIME SERIES

Task 4:Training the prediction model

a) Series To Supervised

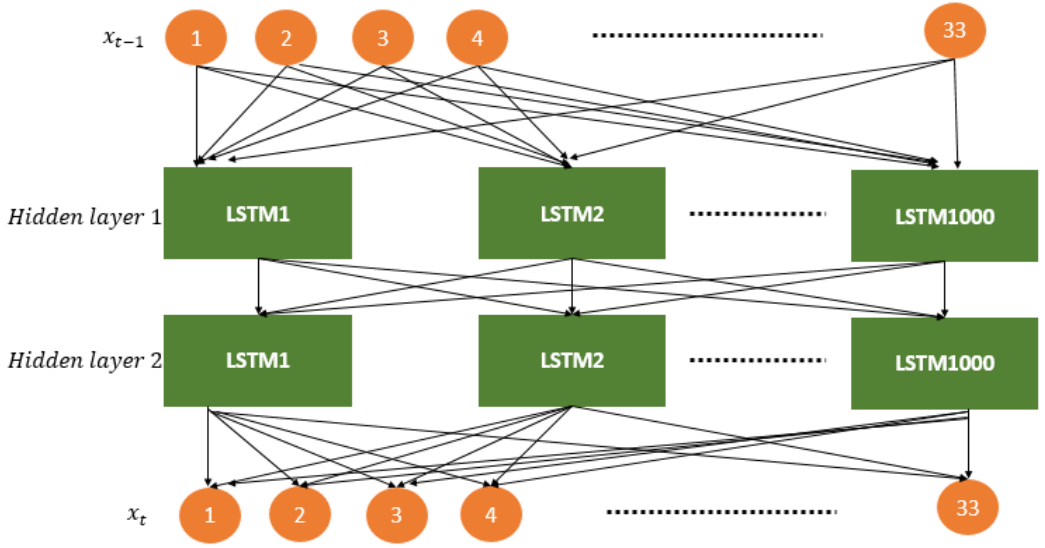


b) Data Normalization

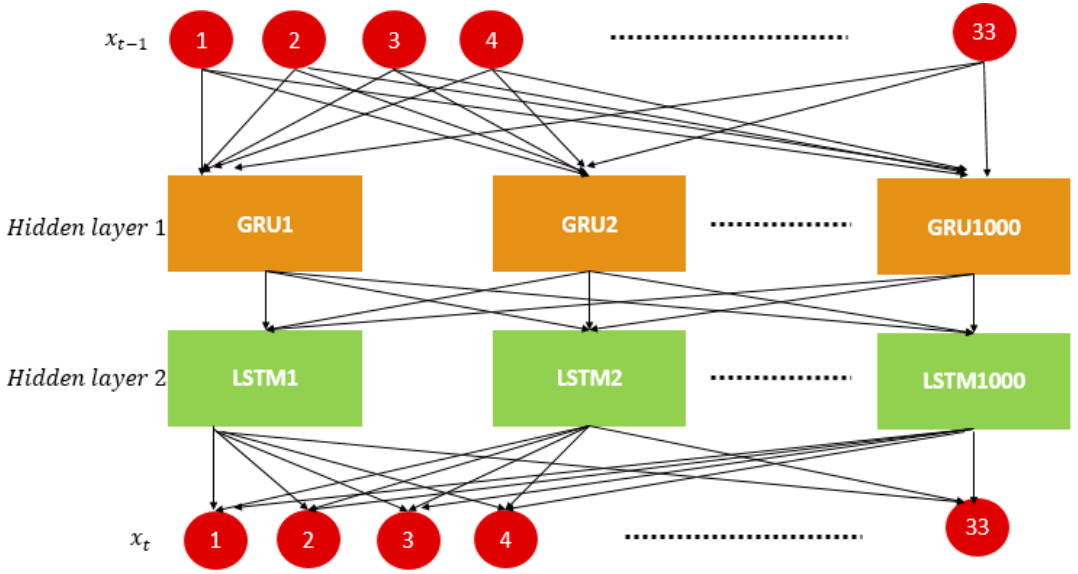
South Ural State University
National Research University

Task 4:Training the prediction model

c) LSTM and Hybrid



LSTM



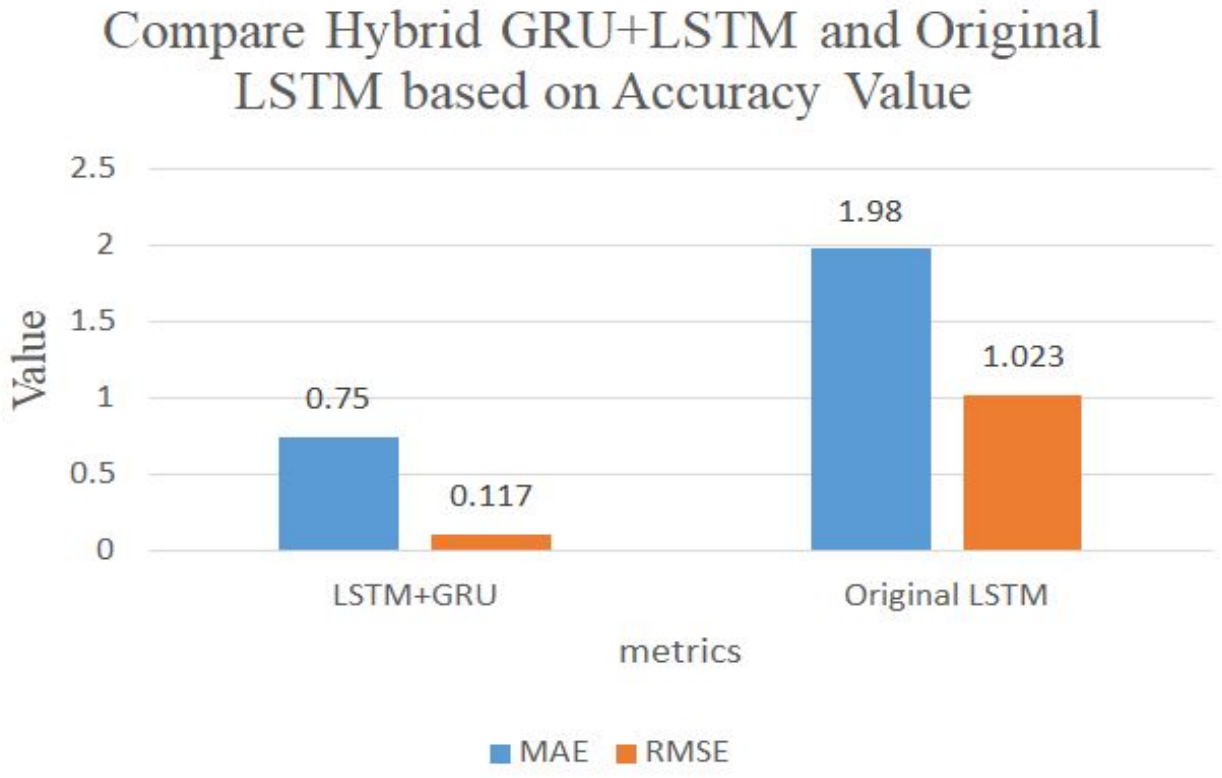
Hybrid

South Ural State University
National Research University

Task 5:Testing the model - Mean absolute error and Root mean squared error

- MAE for (LSTM+GRU)= 0.75
- RMSE for (LSTM+GRU)= 0.117

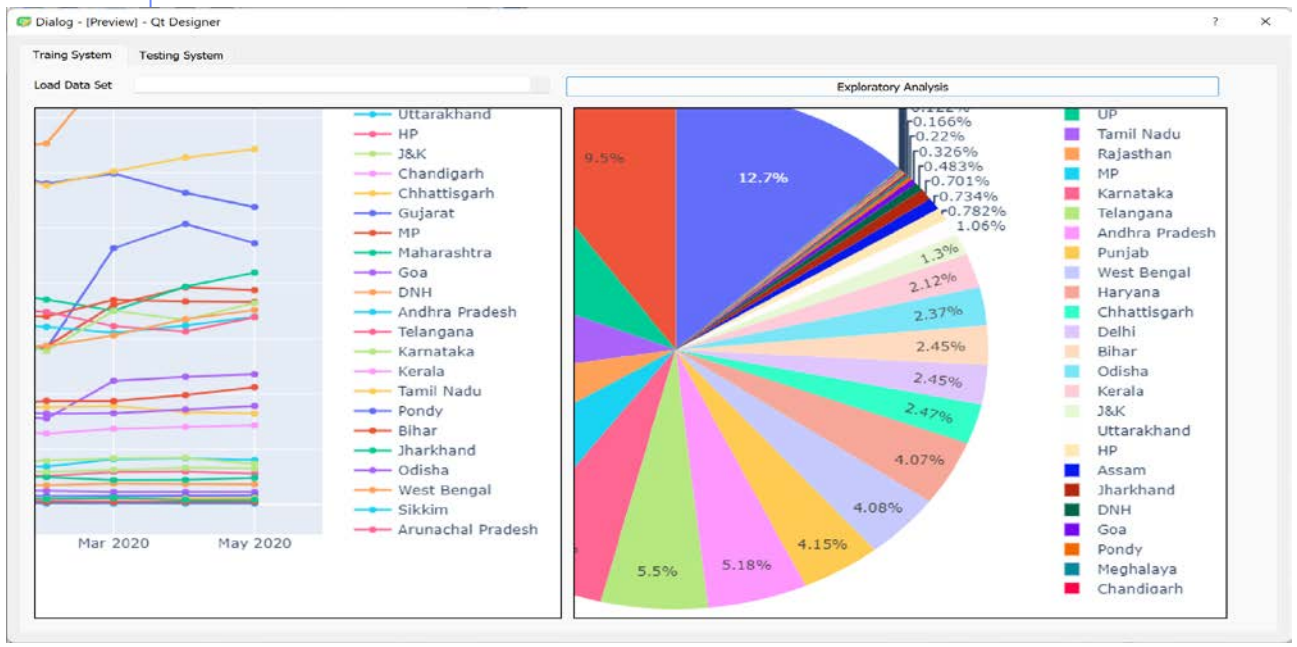
- MAE for original LSTM= 1.98
- RMSE for original LSTM=1.023



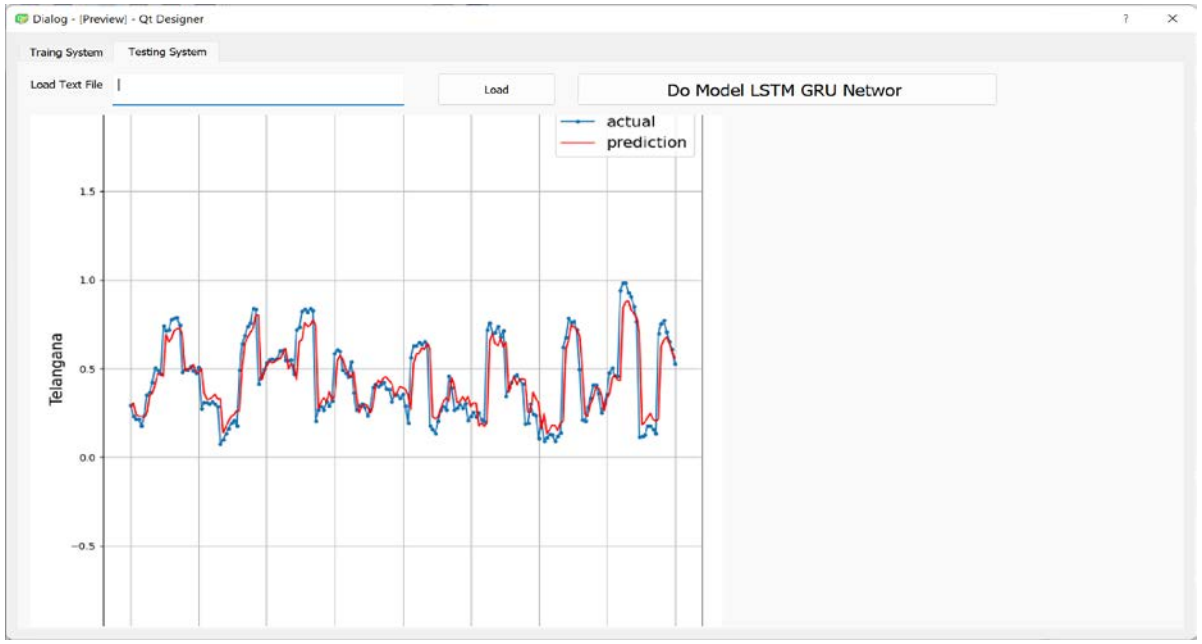
South Ural State University
National Research University

Task 6:Testing the library and provide an example implementation of the interfaces

a) Implementation of the Training interface

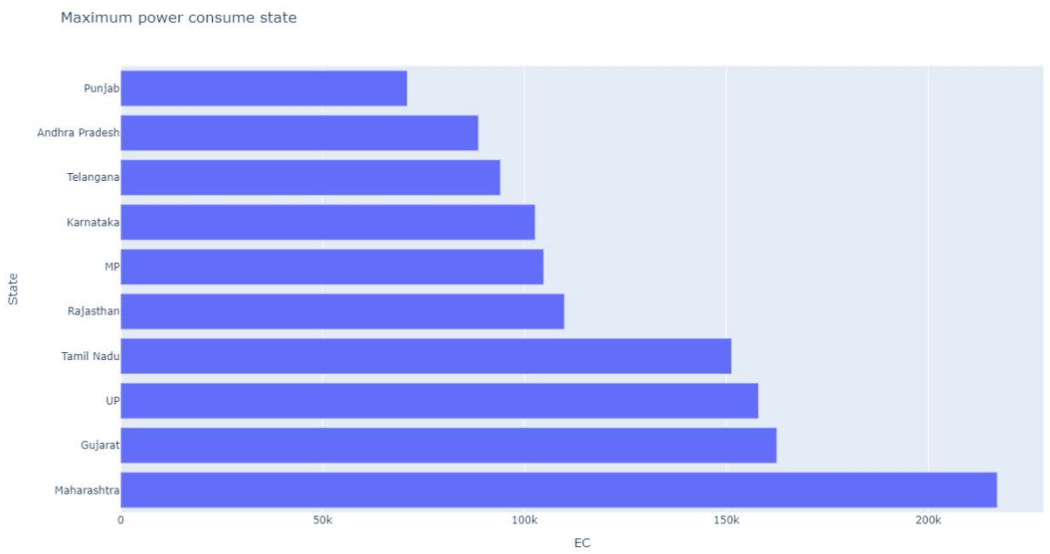


b) Implementation of the Testing interface

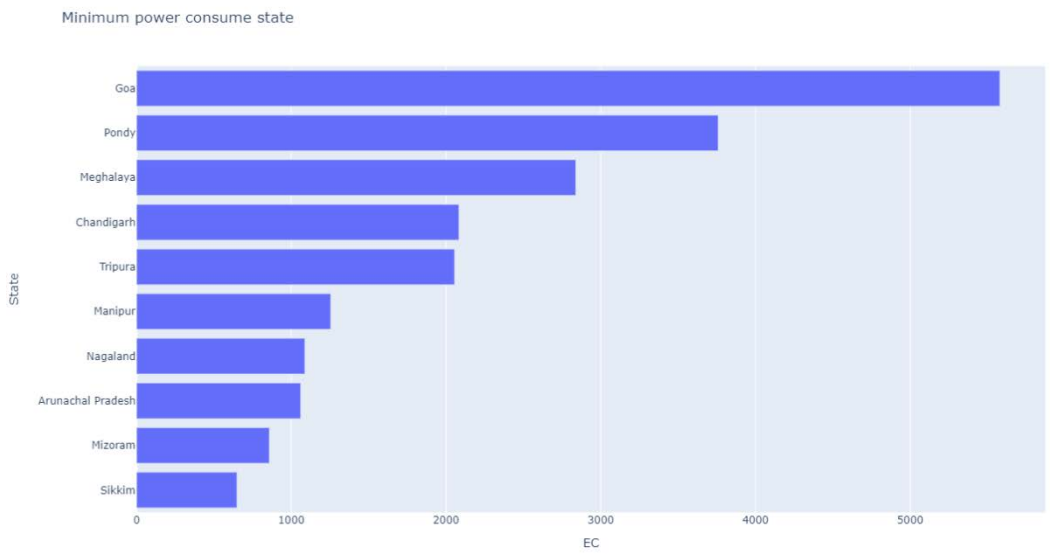


South Ural State University
National Research University

Task 7: Testing the model to find the cities with the maximunm and minimum consumption of electric energy .



Maximum of the Power Consumption



Minimum of the Power Consumption

Future considerations

- Optimizing latency
- Optimizing power usage
- Optimizing model and binary size

South Ural State University
National Research University
1943

Conclusion

The project will enable us to help the institutions in India to give accurate indicators and predictions of the amount of electrical energy consumption for 13 cities in India and to know the most energy consuming city and thus help these institutions to develop future plans to control the consumption of electrical energy.

South Ural State University
National Research University

THANK YOU