**Electricity Consumption Forecasting: A Short Report**

**Overview**

This project aims to predict electricity consumption using historical data and deploys the model as a Gradio web application on Hugging Face. The project involves training an LSTM-based deep learning model to forecast electricity consumption based on time features such as hour, day, and month. Two Python scripts are used:

1. **electric\_predict.py**: For data preprocessing, model training, and uploading the model to Hugging Face Hub.
2. **app.py**: For deploying the trained model as an interactive web application.

**Dataset**

The dataset used for training and testing is household\_power\_consumption.txt, which contains historical household power consumption data. Key preprocessing steps include:

1. Parsing the datetime column and setting it as the index.
2. Replacing missing values with forward-filling.
3. Aggregating the data to hourly intervals.
4. Adding features for hour, day, and month.

The data is split into training (80%) and testing (20%) sets.

**Methodology**

**Model Architecture**

An LSTM (Long Short-Term Memory) model is used for time series prediction:

* **Input Size**: 4 (hour, day, month, and historical power consumption).
* **Hidden Size**: 50.
* **Number of Layers**: 2.
* **Output**: Predicted power consumption for the next time step.

**Training**

* **Loss Function**: Mean Squared Error (MSE).
* **Optimizer**: Adam with a learning rate of 0.001.
* **Epochs**: 10.
* **Batch Size**: 32.

The training process updates the LSTM weights to minimize the error between predicted and actual power consumption.

**Deployment**

The trained model is saved as electricity\_forecast\_model.pt and uploaded to Hugging Face Hub using the huggingface\_hub library. A Gradio-based web interface is developed to enable interactive predictions.

**Results**

The trained model demonstrates the ability to predict power consumption trends based on the given time features. The evaluation metrics can be further computed by testing on the held-out dataset, but the results are promising for demonstrating proof-of-concept predictions in the deployed web application.

**How to Run the Code**

**1. Training the Model**

Running code below:

python electric\_predict.py

**2. Using the Application**

The model has been deployed on huggingface, you can assess it through url below: <https://huggingface.co/spaces/AldehydeQuan/lab3>

**Conclusion**

This project demonstrates the use of an LSTM model for electricity consumption forecasting and its deployment as an interactive web application. The approach provides a framework for similar time series forecasting tasks and real-world applications.