Concept Note Submission:-

1. **My Team: hackWave2**

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2. We are solving the problem in 2 stages. The first stage uses historical data like Water Level, Volume, Inflow, Outflow and Weather data for the past period (period k sliding window) as input and predicts reservoir volume and water level for a future period (up to 90 days) using a Multi-variate LSTM model. The second stage takes the result of the first model as input along with open-source weather data for the same and trains a Neural Network model.

3. Pytorch based deep learning model deployment using Flask REST API framework on Azure virtual machine.

4. Historical Humidity, Temperature and Rainfall and other weather data in the catchment areas of the districts from which reservoirs take their inflow for the past 10years from openweathermap.org free API and other open-source API's. Up to 90-day weather forecast in the catchment areas of these districts.

5.

Training the First Stage:- We will be using Autoregression or Fourier Transform to find the approximate period of the reservoir water cycle. Then we will train a Multivariate LSTM using past period Reservoir Level, Volume, Inflow, Outflow and Temperature, Rainfall, Wind and Humidity data applicable to the particular reservoir. The output of this trained LSTM model will be water level and reservoir volume forecast up to 90days.

Training the Second Stage:- For this 90 days forecast of the first model, we have historical weather data available as input at training time. If we use data from January 2012 to July 2012 to forecast the next 3 months then for these 3 months we have weather data available. We will fine-tune the first stage outcome on this weather data using a Neural Network model training.

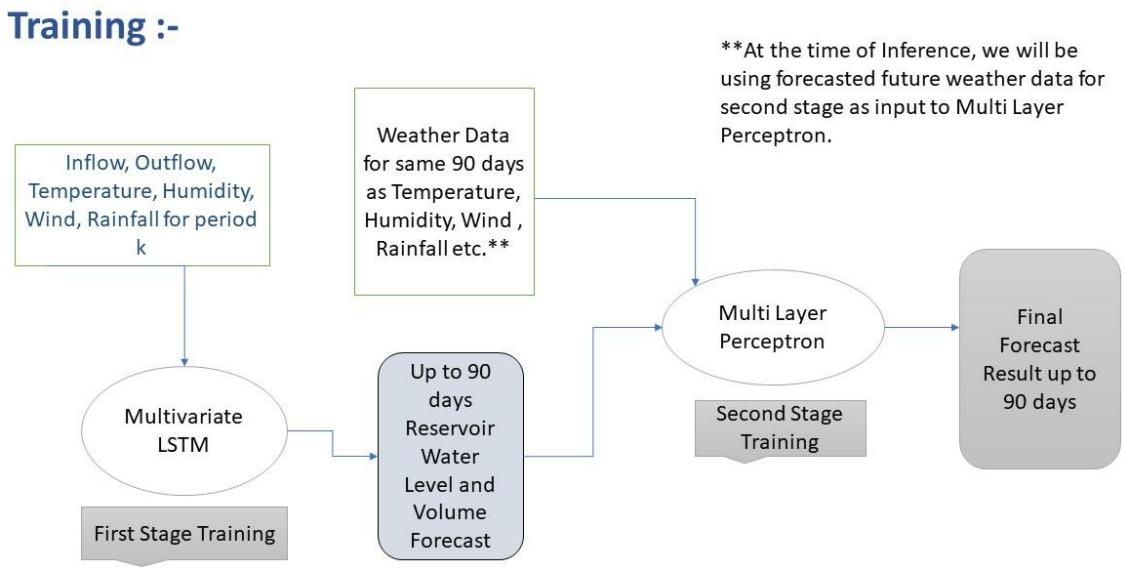
Inference: - At test time the first stage is trivial, using past period data (last sliding window of size k) to predict reservoir forecast up to 90 days. But for the second stage, we will not have 90 days of actual weather data available as we had at training time. So we will be using forecasted open source weather data for the next 90 days as input to our second stage model. The final result will be Water Level and Reservoir Volume forecast up to 90 days.

6. From the current date, the user will be able to see the water level and volume in the reservoir for up to 90 days using a line chart or histogram of data on a web portal.

7. The Second stage of our model will use forecasted weather data at inference time, so the result of this fine-tuning will get impacted by the accuracy of the weather forecast data we will be using.

A possible solution to that will be to train the model in 2 variations. The first model which will give up to 30 days forecast will be accessing highly accurate weather forecast data to fine-tune the first-stage model. And the second long-duration model will only use historic data and it will be only one stage prediction.

8.



9. We are in search of an open and accurate weather forecast data source at the catchment area of these reservoirs for a longer period of 18 to 90 days.

10. https://iith-my.sharepoint.com/:v:/g/personal/sm20mtech12003_iith_ac_in/ETor3KITEBFJmxXlfwpG7R8BL-6CLXrSgHVtvj2dQ_ZG7Q?e=ttPJCU