PREDICTING THE ENERGY OUTPUT OF WIND TURBINE BASED ON WEATHER CONDITIONS

TECHNICAL ARCHITECTURE

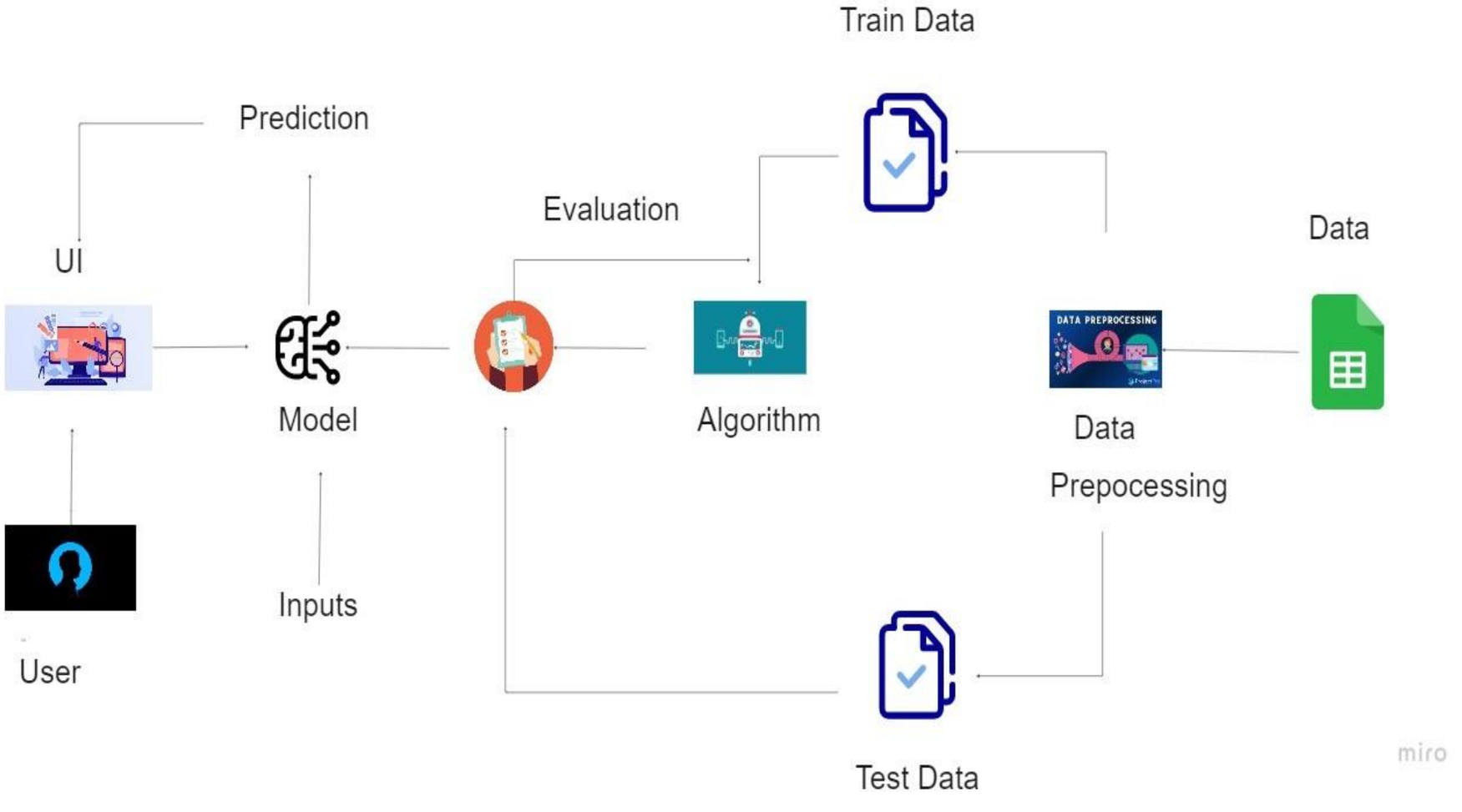

TABLE: COMPONENTS & TECHNOLOGIES

S.No	Component	Description	Technology
1.	User Interface	Through Mobile app or Web Application the information processed will be sent to the user through message or mail.	HTML, CSS, JavaScript / Angular Js / React Js etc.
2.	Application Logic-1	Predicting system is developed with a method of combining statistical models and physical models. The inlet condition of the wind farm is forecasted by the auto regressive model.	Machine learning
3.	Application Logic-2	Here we can develop the software process like creating a web application/mobile application to interface with users.	IBM Watson STT service
4.	Application Logic-3	Here the predicted data is checked with actual output to increase the power output and efficiency.	IBM Watson Assistant
5.	Database	We can save all the data in SQL or any other database so that the user can retrieve data whenever required.	MySQL, NoSQL, etc.
6.	Cloud Database	The database we created and the predefined data's like power output from external API can be combined here and can be stored safely with security for future purpose.	IBM DB2, IBM Cloudant etc.
7.	File Storage	File storage requirements	IBM Block Storage or Other Storage Service or Local Filesystem
8.	External API-1	With the help of external API only we can know the weather condition and compare with our actualoutput.	IBM Weather API, etc.
9.	External API-2	Purpose of External API used in the application	Aadhar API, etc.

10.	Machine Learning Model	Purpose of Machine Learning Model	Prediction of wind output power, etc.
11.	Infrastructure (Server / Cloud)	Application Deployment on Local System / Cloud Local Server Configuration: Through our ideas Cloud Server Configuration : Through IBM	Local, Cloud Foundry, Kubernetes, etc.

Table-2: Application characteristics

S.No	Characteristics	Description	Technology
1.	Open-Source Frameworks	MIT App Inventor, Python, Weather App API.	Technology of Opensource framework
2.	Security Implementations	Here we are using IBM Cloud and it is the very secured place where we can store the data and retrieve the information whenever needed.	IBM Cloud, MIT App Invertor , IBM Watson Assistant
3.	Scalable Architecture	Machine learning is becoming an increasingly popular and desirable solution. This work presents a specially designed architecture based on IBM Cloud services for predicting the output power of wind turbine. Used services in IBM a stress test to prove the ability of the developed architecture for data processing was completed	IBM Cloud
4.	Availability	Many important features are available in this application instead of using the repaired windmill, we can easily find the fault in windmill by comparing actual output with predicted output through machine learning in python, with this we can improve efficiency by adding components and optimize the condition of windmills and batteries.	Python for data analysis , IBM Watson, IBM Cloud , Weather API'S , Analytics

5.	Performance	**<u>Excelled efficiency</u>**: Our aim is to map weather data to energy production. Learning technique to predict the energy output of wind turbine. The model is deployed on IBM cloud to get scoring end point which can be used as API in mobile app or web app building. We are developing a web application which is built using node red service. We make use of the scoring end point to give user input values to the deployed model. The model prediction is then showcased on User Interface to predict the energy output of wind turbine Applied data science using machine learning. **Expansion :** Some 1.3 million people worldwide already work in the wind sector, but five times as many will be needed as the shift to renewable energy gather pace. Job prospects are increasing as the sector picks up worldwide. **Scalability**: To mitigate uncertainties in wind resource assessments and to improve the estimation of energy production of a wind project, this work uses a decision tree machine learning model to assess the effectiveness of hub-height wind speed, rotor-equivalent wind speed, and lapse rate as variables in power prediction. **<u>Advances in technology:</u>** As technology improves, so do the	Python for data analysis , IBM Watson, IBM Cloud , Weather API'S , Analytics

		functionalities of the structure itself, creating designs that will generate even more electricity, require less maintenance, and run more quietly and safely.	

References:

- https://www.energy.gov/eere/wind/wind-energy-basics
- https://www.energy.gov/eere/wind/maps/wind-vision
- https://justenergy.com/blog/wind-energy-pros-and-cons/