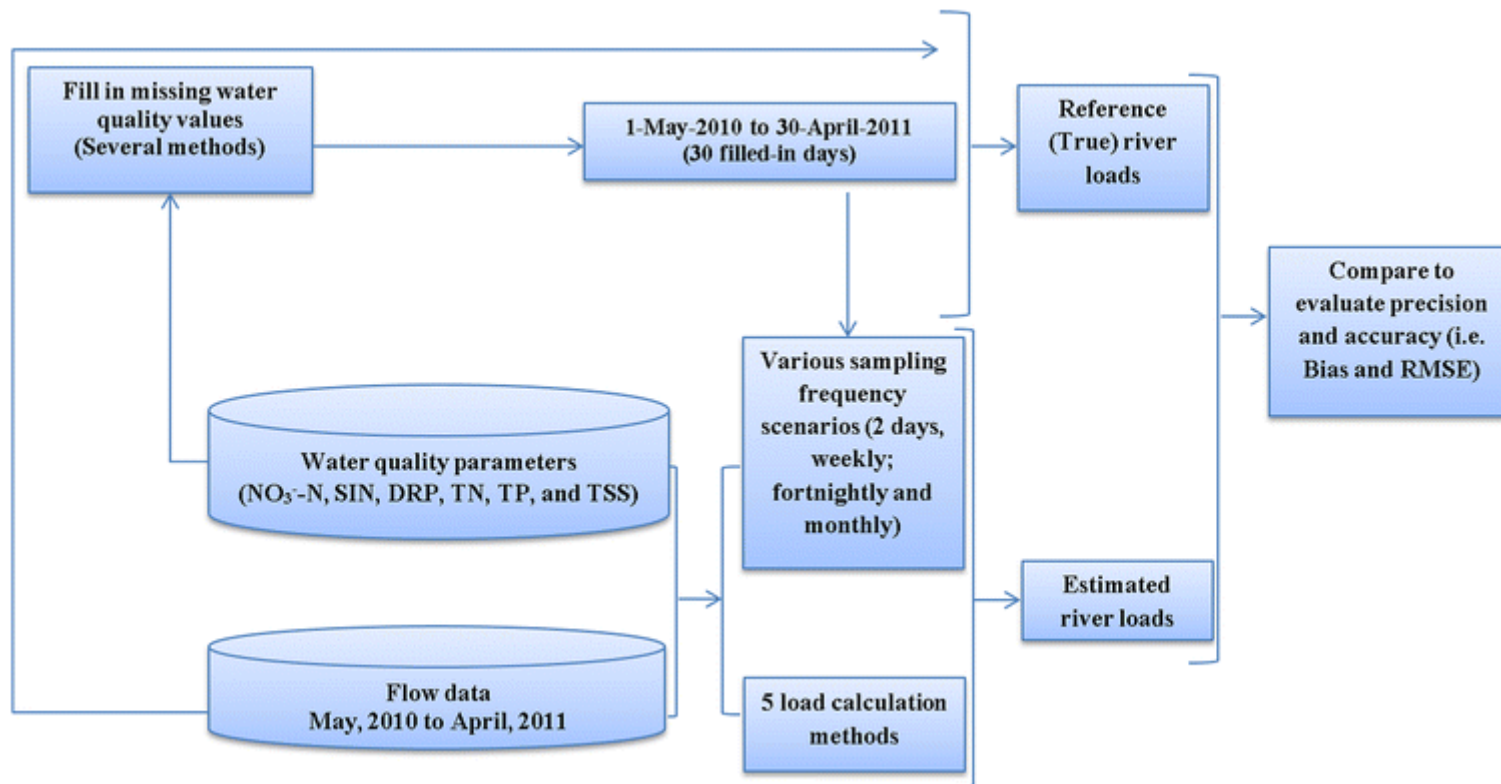


# Technology Stack

Date	12 November 2023
Team ID	Team-592258
Project Name	Project – River Water Quality Forecasting

## Technical Architecture:

A technical architecture for a river water quality forecasting project could involve several components, including data collection, data preprocessing, model development, and prediction. Here is the architecture based on various sources.



## Components And Technologies:

Component	Description	Technologies
<b>Data Collection</b>	Involves the use of sensors and data loggers to collect data on various water quality parameters.	Sensors, Data Loggers
<b>Data Preprocessing</b>	Tools and libraries are used for cleaning and preprocessing the collected data to make it suitable for the machine learning algorithms.	Pandas, NumPy, Scikit-learn
<b>Model Development</b>	Various machine learning algorithms are used for developing a model to predict the water quality. Other advanced techniques and deep learning methods are also used.	Naive Bayes (NB), Decision Tree (DT), K-Nearest Neighbor (KNN), Support Vector Machine (SVM), Random Forest (RF), ARIMA, SARIMA, Prophet, Convolution Recurrent Basis Expansion Analysis Architecture, LSTM with Attention
<b>Prediction</b>	The developed model is used to predict future water quality changes.	Machine Learning Models
<b>Evaluation</b>	The performance of the model is evaluated using appropriate metrics.	Determination Coefficient (R2)
<b>Deployment</b>	The model is deployed in a suitable environment for real-time forecasting.	Azure, AWS, Google Cloud, Docker, Kubernetes
<b>Monitoring and Maintenance</b>	The deployed model is continuously monitored and maintained to ensure its performance and accuracy.	Grafana, Prometheus

## Architecture Characteristics:

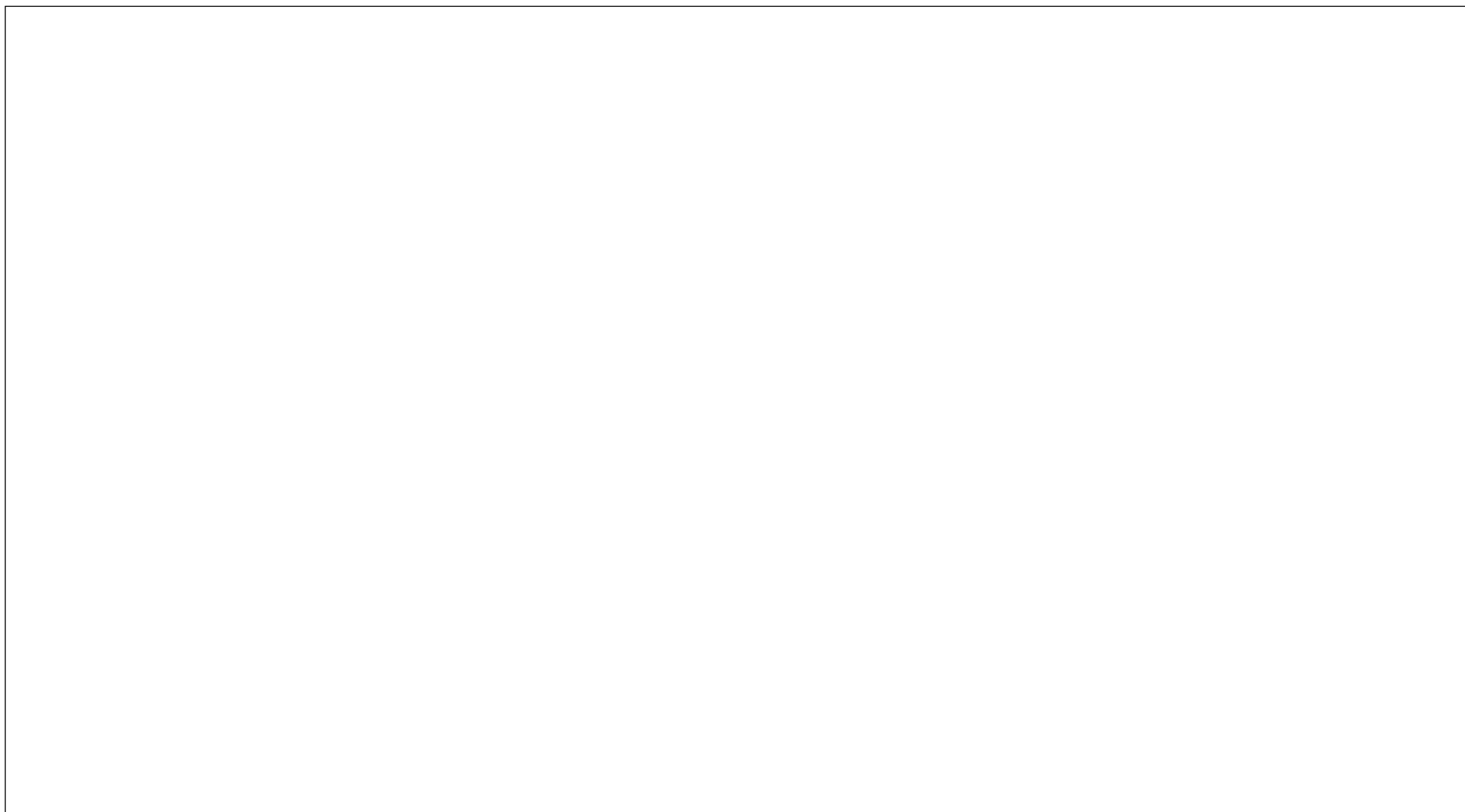
Application Characteristic	Description
Efficiency	AI in water quality monitoring and assessment is fast, efficient, and can be used for real-time monitoring and prediction of water quality.
Cost-effective	By determining the Water Quality Index (WQI) with the least amount of input data (water quality parameters), this method can lower the cost of monitoring surface water quality.
Flexibility	Artificial Neural Networks (ANNs), a type of AI, have the ability to represent both linear and non-linear relationships, and learn these relationships directly from the data being modeled.
Accuracy	Precision huge number of complex models have been developed to accurately forecast and evaluate surface water quality.
Adaptability	Artificial intelligence (AI) models have been assessed for use in water quality forecasting since they are able to adjust to data gathered from rivers' continuous water quality monitoring stations.
Ability to Predict	AI techniques have exhibited a remarkable ability to capture the nonlinearity pattern between predictors and predictand.

Application Characteristic	Description
<b>Selection of Important Parameters</b>	Some studies have used AI techniques like the Bayes method (BMA) to select important parameters (BOD5, NH4+, PO43−, turbidity, TSS, coliform, and DO).

### References:

<https://link.springer.com/article/10.1007/s40808-020-01041-z>

<https://ieeexplore.ieee.org/document/9528216/>





**Table-1 : Components & Technologies:**

S.No	Component	Description	Technology
1.	User Interface	How user interacts with application e.g. Web UI, Mobile App, Chatbot etc.	HTML, CSS, JavaScript / Angular Js / React Js etc.
2.	Application Logic-1	Logic for a process in the application	Java / Python
3.	Application Logic-2	Logic for a process in the application	IBM Watson STT service
4.	Application Logic-3	Logic for a process in the application	IBM Watson Assistant
5.	Database	Data Type, Configurations etc.	MySQL, NoSQL, etc.
6.	Cloud Database	Database Service on Cloud	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	Purpose of External API used in the application	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	Object Recognition Model, etc.
11.	Infrastructure (Server / Cloud)	Application Deployment on Local System / Cloud Local Server Configuration: Cloud Server Configuration :	Local, Cloud Foundry, Kubernetes, etc.

**Table-2: Application Characteristics:**

S.No	Characteristics	Description	Technology
1.	Open-Source Frameworks	List the open-source frameworks used	Technology of Opensource framework
2.	Security Implementations	List all the security / access controls implemented, use of firewalls etc.	e.g. SHA-256, Encryptions, IAM Controls, OWASP etc.
3.	Scalable Architecture	Justify the scalability of architecture (3 – tier, Micro-services)	Technology used

S.No	Characteristics	Description	Technology
4.	Availability	Justify the availability of application (e.g. use of load balancers, distributed servers etc.)	Technology used
5.	Performance	Design consideration for the performance of the application (number of requests per sec, use of Cache, use of CDN's) etc.	Technology used

#### References:

<https://c4model.com/>

<https://developer.ibm.com/patterns/online-order-processing-system-during-pandemic/>

<https://www.ibm.com/cloud/architecture>

<https://aws.amazon.com/architecture>

<https://medium.com/the-internal-startup/how-to-draw-useful-technical-architecture-diagrams-2d20c9fda90d>