**TOPIC: WATER POLLUTION MONITORING AND ALERT SYSTEM FOR RIVERS AND LAKES**

1. **Project Objectives**
* Develop a real-time water quality monitoring system to detect pollution at an early stage.
* Apply AI & Big Data to analyze pollution trends and predict potential risks.
* Integrate an automated alert system to notify authorities and the public.
1. **System Structure**

**a. Hardware Components**

* Central Processing Unit:
* ESP32: Collects data from sensors and transmits it to the server.
* Water Quality Sensors:
* pH Sensor: Measures the acidity or alkalinity of water.
* TDS Sensor: Measures total dissolved solids in water.
* Turbidity Sensor: Detects water pollution caused by sediments and waste.
* Water Temperature Sensor: Monitors abnormal temperature changes.
* Data Transmission Devices:
* Wi-Fi Module: Connects sensors to the server.
* Solar Power System: Provides continuous energy for system operation.

**b. Software Platform**

* Data Storage and Visualization:
* Node-Red: Builds an interactive monitoring interface.
* InfluxDB + Grafana: Stores historical data and displays monitoring charts.
* Communication Protocols:
* MQTT: Facilitates communication between ESP32 and the server.
* Wi-Fi/4G: Connects devices to the monitoring system.
1. **AI and Big Data Applications**
* AI-based Pollution Prediction: Analyzes historical data to detect unusual patterns.
* Automated Alerts: Sends notifications when pollution levels exceed safe thresholds.
* Monitoring Optimization: AI reduces device power consumption when monitoring is not required, saving energy.
1. **System Benefits**
* 24/7 water quality monitoring with real-time data.
* Early pollution detection to help authorities take timely action.
* Rapid alerts to residents and relevant organizations.
* Cost reduction by replacing manual water testing with an automated system.