# PRANVEER SINGH INSTITUTE OF TECHNOLOGY

## Major Project Proposal

**Team Id: 26_CS_AIML_4A_12**

**Team Details:**

| S No | Full Name | Roll No | Branch & Section | Mob No |
|------|-----------|---------|------------------|--------|
| 1 | Vandna Shukla | 2201641530194 | CS-AIML-3A | 6394003458 |
| 2 | Divya Laldinani | 2201640310048 | CS-AIML-3A | 8303651115 |
| 3 | Saumya Singh | 2201641530155 | CS-AIML-3A | 9555778313 |
| 4 | Yaggya Chopra | 2201641530197 | CS-AIML-3A | 9305082294 |

**Project Title:**

| |
|---|
| **BlueAlert** |

**Domain:**

| | |
|---|---|
| **1.** Software-Web Application | 2. Software-Mobile Application |
| 3. Artificial Intelligence/Machine Learning/Deep Learning | 4. Computer Vision/Image Processing |
| 5. Blockchain | 6. Internet of Things |
| 7. Natural Language Processing | 8. Big Data / Cloud Computing |

9. Others (Specify if any):

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## Problem Statement:

Water pollution poses a severe threat to ecosystems, human health, and agriculture, yet traditional monitoring methods remain slow, expensive, and reactive rather than preventive. Current systems rely on manual sampling and lab testing, leading to delayed responses to contamination events. There is an urgent need for a real-time, predictive water quality monitoring system that can provide early warnings and actionable insights.

BlueAlert addresses this challenge by integrating IoT and machine learning to automate data collection and predict water quality trends. By using Arduino-based sensors to measure key water parameters and leveraging ML algorithms for predictive analysis, BlueAlert enables real-time monitoring and contamination forecasting. This AI-driven approach empowers researchers, environmentalists, and the public with accessible, accurate water quality insights, enabling proactive intervention. Bridging the gap between traditional monitoring and intelligent automation, BlueAlert revolutionizes water management and pollution prevention for a sustainable future.

## Proposed Solution:

To address the limitations of traditional water quality monitoring, **BlueAlert** integrates **IoT-based real-time data collection** with **machine learning-driven predictive analysis**. Using **Arduino compatible sensors**, the system continuously measures essential water parameters like **pH, turbidity, and dissolved oxygen**. The collected data is transmitted to the **Blynk platform**, where it is processed and analyzed using **ML algorithms** to detect trends and predict potential contamination events.

The **BlueAlert user dashboard** will serve as an intuitive interface, providing **real-time updates, historical analysis, and predictive insights**. Researchers, environmentalists, and water management authorities can use this information for **early contamination detection and intervention**. Unlike traditional methods, this solution offers a **scalable, automated, and cost-effective** approach to water quality monitoring.

By combining **IoT and AI**, **BlueAlert revolutionizes water pollution monitoring**, making it more **accessible, efficient, and proactive**, ensuring safer water for communities and ecosystems worldwide.

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## Unique/Distinctive feature of the solution:

1. Unique and Distinctive Features:

Our water quality monitoring system provides real-time, continuous assessment of water parameters such as pH, turbidity, temperature, dissolved oxygen, and conductivity. It leverages IoT and cloud-based analytics for instant alerts and remote monitoring. The system integrates AI-driven predictive maintenance, reducing downtime and ensuring long-term efficiency. With solar-powered operation and wireless connectivity, it is ideal for remote areas. Its user-friendly dashboard provides comprehensive data visualization, making it accessible for both technical and non-technical users.

2. Competitive Advantage:

Unlike traditional water testing methods, which are time-consuming and require manual sampling, our system offers automated, real-time data collection. Compared to competitors, our solution provides a cost-effective, scalable, and modular design with enhanced sensor accuracy. The AI powered anomaly detection system ensures proactive water quality management, preventing contamination risks. Additionally, our cloud-based platform allows seamless integration with existing smart city and industrial systems. The use of energy-efficient sensors and self-calibration technology further enhances reliability and longevity, setting it apart from existing solutions.

## Tools/Technology Uses:

1) Hardware Requirements:

a) Processor: 1) For IoT Device: Arduino UNO

2) For ML Model Training: Intel i5/i7, AMD Ryzen 5/7 (or better) b) RAM: 1) For IoT Device: 80 KB (ESP8266) / 520 KB (ESP32)

2) For ML Model Training: 16GB

c) Storage: 1) For IoT Device: MicroSD card

2) For ML Model Training: SSD with 512GB storage d)

Graphics Card: 1) For ML Training: NVIDIA RTX 3060+

e) Others: 1) Sensors: pH sensor, Temperature sensor, TDS sensor, Moisture sensor

2) Microcontrollers: Arduino UNO, NodeMCU

3) Display: LCD Screen for real-time data monitoring

2) Software Requirements:

a) Operating System: 1) For IoT Development: Windows

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2) For ML Training: Windows 11

b) Development Tools: 1) Arduino IDE (for microcontroller programming)

2) IoT Blynk (for remote monitoring)

3) Python (for ML model development)

4) Google Colab (for training ML models) 5) Kaggle (for datasets used for training) c) Database: 1) Firebase Realtime Database

2) PostgreSQL (for structured ML data storage)

3) Google Sheets API (for small-scale data logging) d) Web Browser: 1) Chrome

e) Others: 1) ML Frameworks: Scikit-learn, TensorFlow

2) Data Processing: Pandas, NumPy

3) Visualization: Matplotlib, Seaborn

4) API Development: FastAPI

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(To be Filled by Faculty/Evaluator)

**Proposal Evaluation:**

1. Right Identification of the Problem (Appropriate selection of the problem)?
   a) Excellent          b) Good          c) Needs Improvement          d) Unacceptable

2. Relevance of the Solution (Adequately addressing the problem/need)?
   a) Excellent          b) Good          c) Needs Improvement          d) Unacceptable

3. Innovativeness in the Solution (Distinctive innovative components/features of the solution)?
   a) Excellent          b) Good          c) Needs Improvement          d) Unacceptable

4. Uniqueness of the Solution (Intellectual Property Component)?
   a) Excellent          b) Good          c) Needs Improvement          d) Unacceptable

**Improvements/ Suggestions by the Evaluator:**

1.

2.

3.

4.

**Name of Faculty:**

**Designation:**                                         **Head of Department**
**Signature with Date:**                                 **Signature with Date:**