

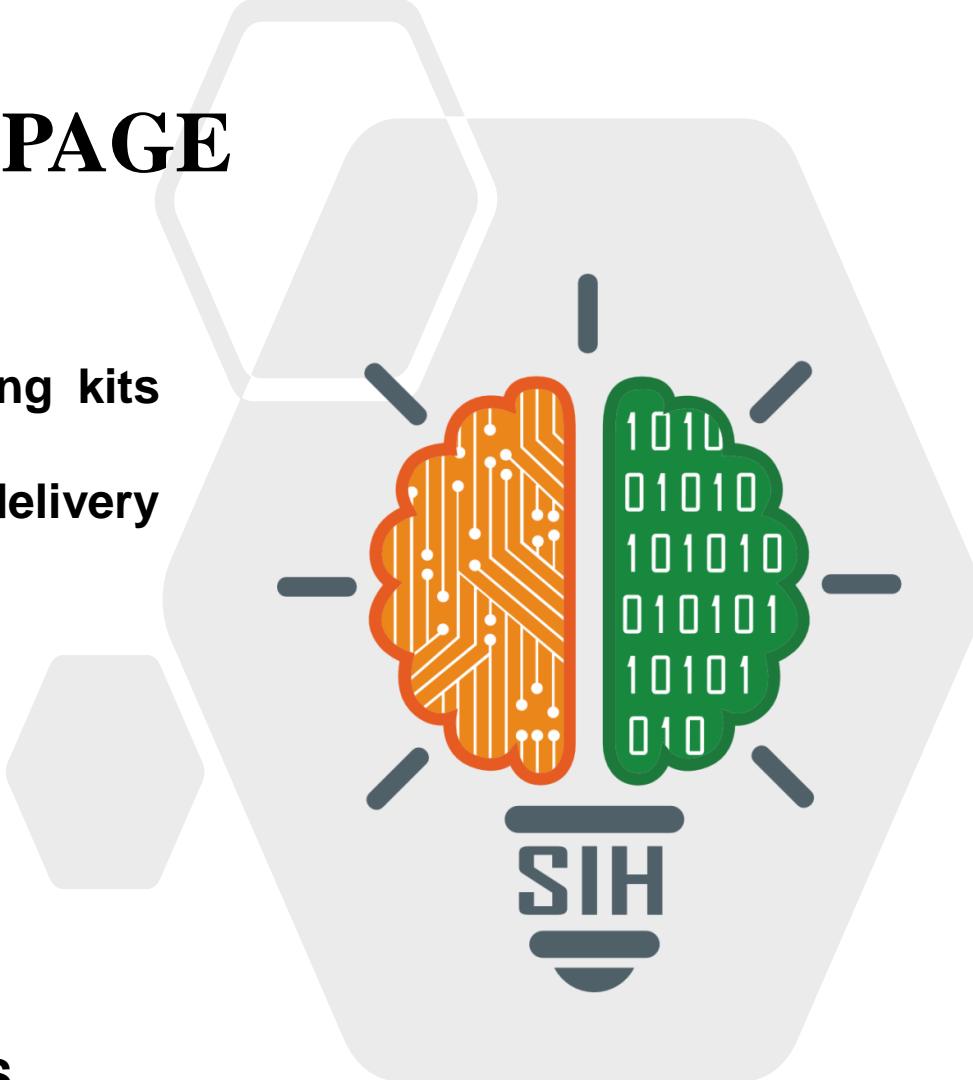


SMART INDIA HACKATHON 2024



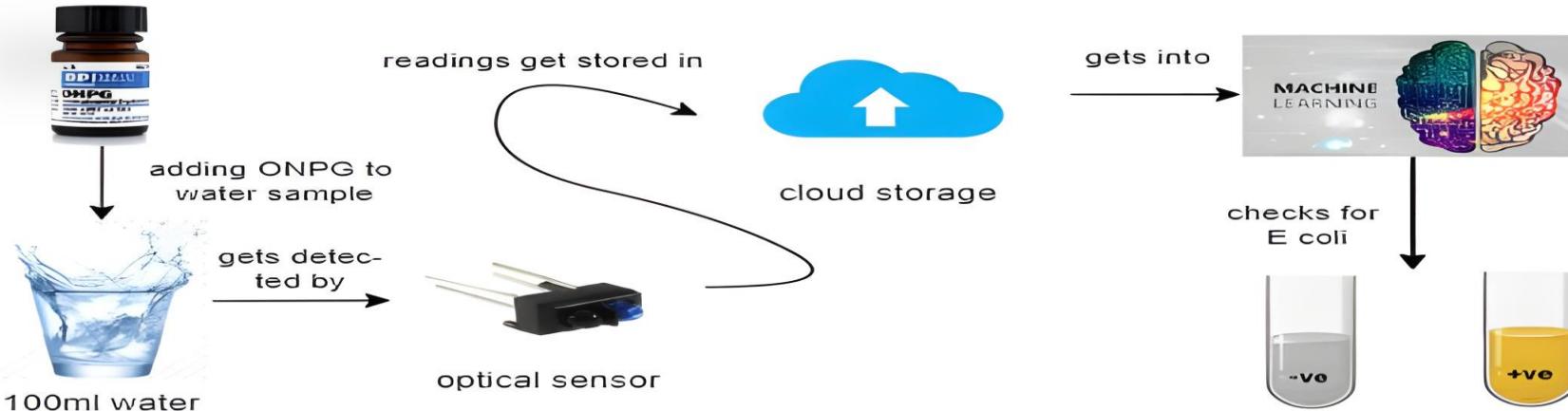
TITLE PAGE

- Problem Statement ID – 1770
- Problem Statement Title- Personalized testing kits for testing Bacteriological contamination at delivery points
- Theme- Smart Automation
- PS Category- Hardware
- Team ID- 14627
- Team Name (Registered on portal)- QUASARS





Personalized Water Testing Kit



Prototype Completion Briefing

Project overview-

- The project aims to develop a compact, autonomous prototype using an Arduino Uno to detect E. coli and Total Coli in drinking water'
- Incorporating sensors for turbidity, gas, TDS, and temperature, with output shown on a laptop.

Pending Tasks for Completion

- Optimize the prototype for compactness by reducing component sizes and improving circuit .
- Integrate the necessary voltage regulator for the LED display.
- Transition the Arduino Uno to a reliable battery-powered system for enhanced portability.

Next Steps-

- Complete the integration of the LED power supply, replace the laptop with a portable cell-based power source.
- conduct real-world testing to validate system reliability and accuracy
- ensure the output is displayed on an attached screen for user convenience.

Prototype Completion Criteria-

- The prototype must be compact and portable for rural use
- Operate independently on a battery, reliably display contaminant output on the LED screen
- Ensure seamless integration of all sensors, algorithms, and displays as a complete system.



PROPOSED SOLUTION

1)Detailed Explanation-

- Our multi-sensor system accurately detects low levels of E. coli and T. coli
- Reduces the risk of waterborne diseases

2)How it addresses the problem-

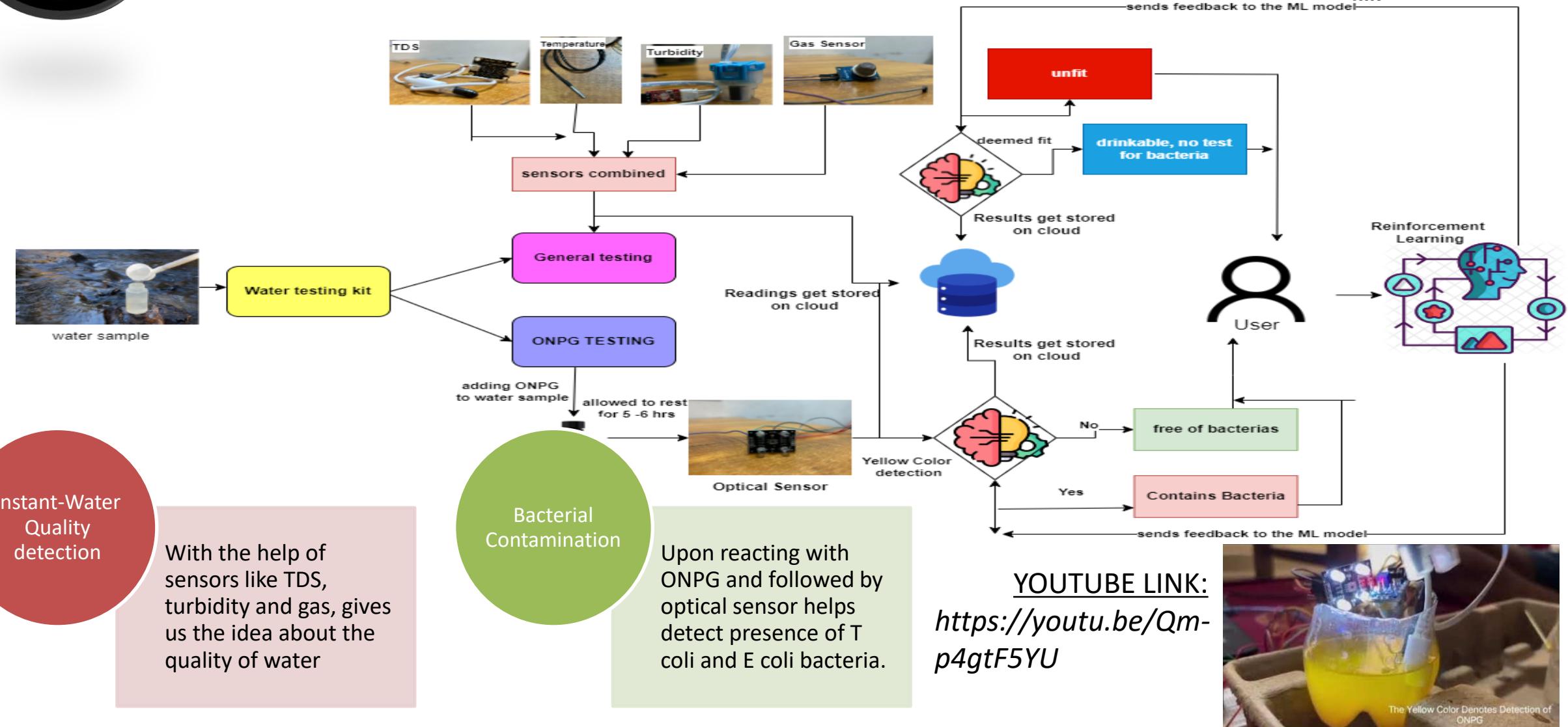
- It integrates optical, TDS, GAS sensor to accurately
- Delivers instant, accurate results for continuous water safety assurance

3)Uniqueness of the problem-

- Combines multiple sensors for precise water quality analysis.
- Portable, durable, and easy to use and long lasting.



TECHNICAL APPROACH



Instant-Water Quality detection

With the help of sensors like TDS, turbidity and gas, gives us the idea about the quality of water

Bacterial Contamination

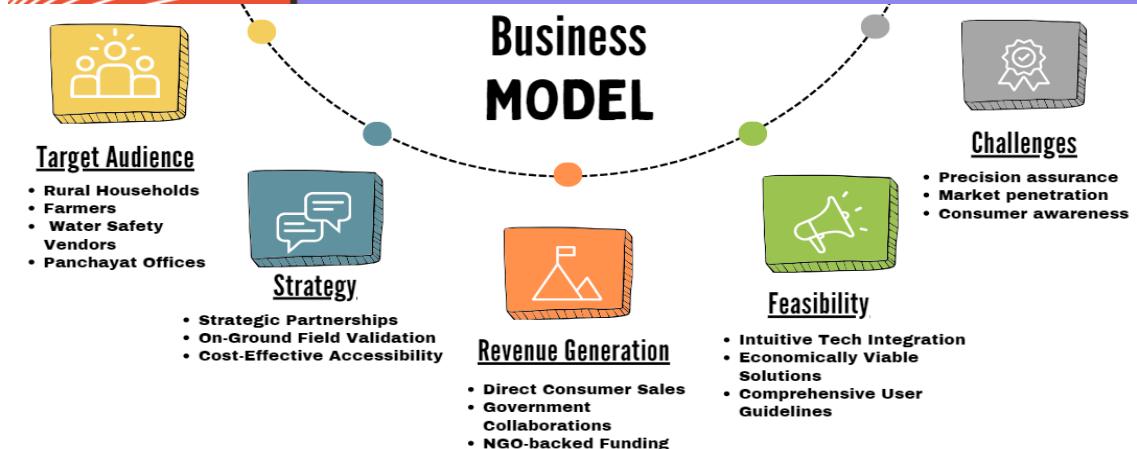
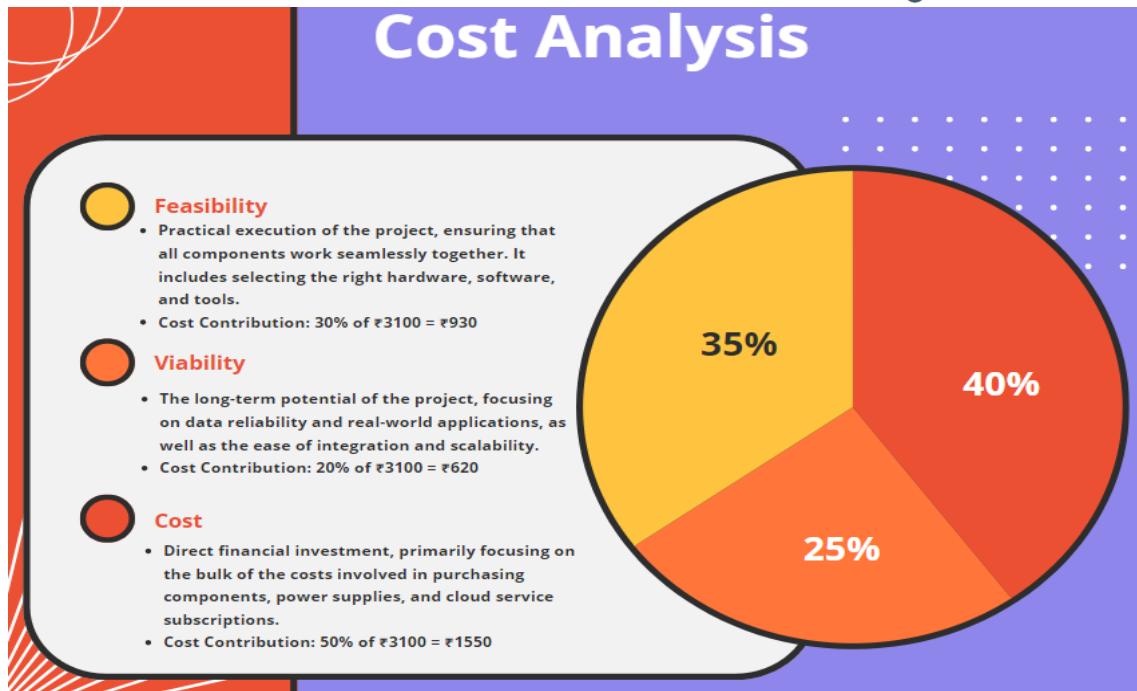
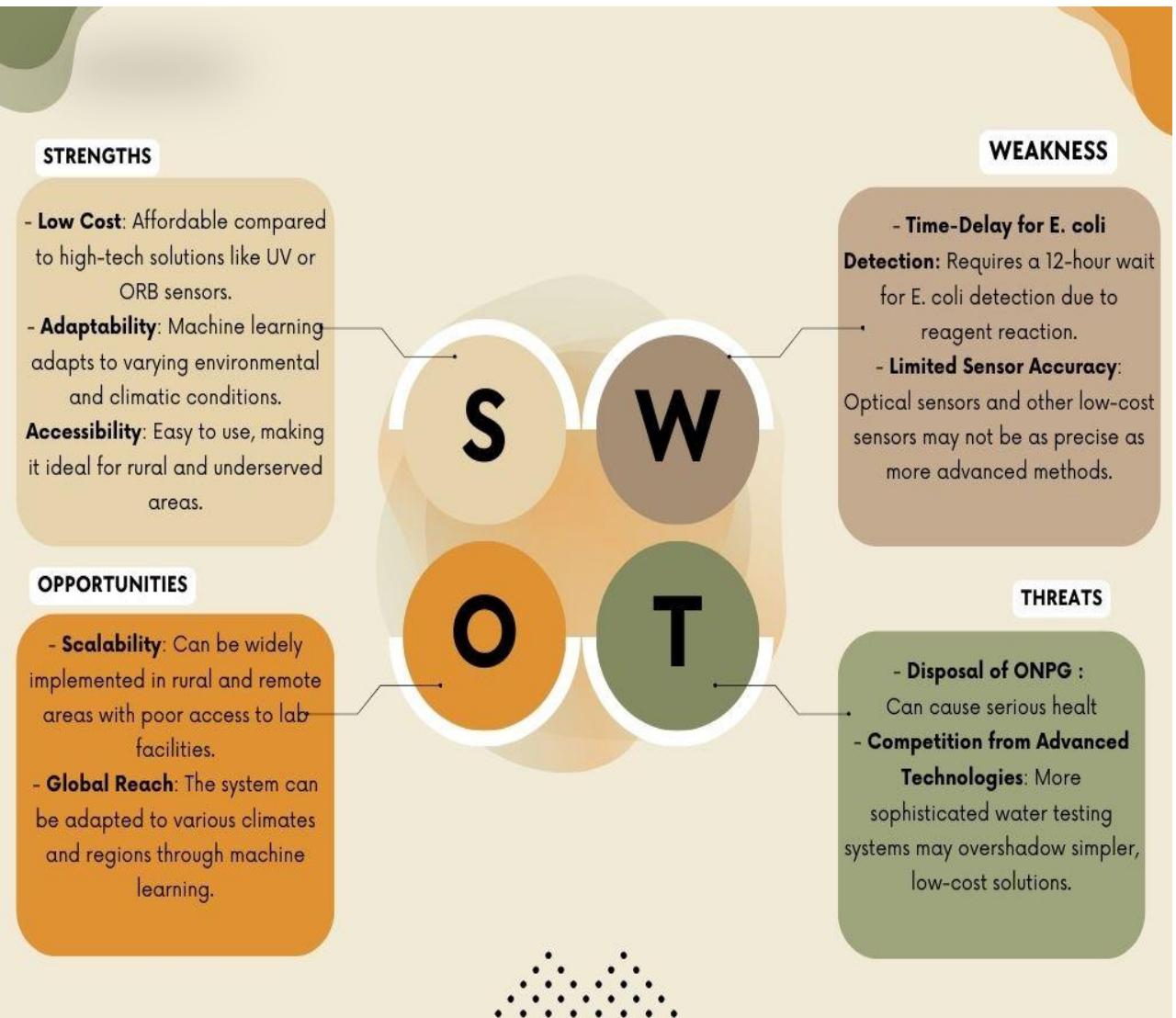
Upon reacting with ONPG and followed by optical sensor helps detect presence of *T* *coli* and *E coli* bacteria.

YOUTUBE LINK:
<https://youtu.be/Qm-tF5YU>

The Yellow Color Denotes Detection of ONPG

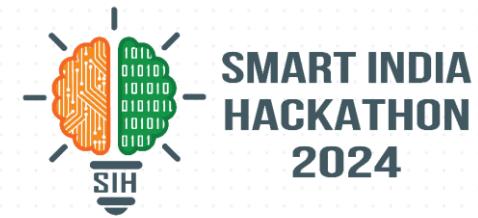


FEASIBILITY AND VIABILITY



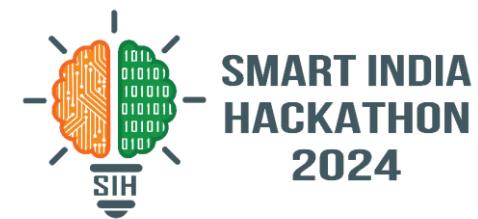


IMPACT AND BENEFITS





RESEARCH AND REFERENCES



- Traditional lab methods for E. coli are accurate but slow and inaccessible in rural areas.
- Optical sensors with reagents detect E. coli via colour change (yellow) after 12 hours.
- Multiple sensors (turbidity, gas, TDS, temperature) enable instant water checks.
- Machine learning enhances accuracy by adapting to different climates.
- Offers a cost-effective alternative to advanced tech like UV or ORB sensors.

Progress in methods for the detection of viable *Escherichia coli*

•E. coli Detection Using Colorimetric Sensors:

- Nguyen, T., Kim, Y., & Song, S. (2020). Development of a colorimetric sensor using gold nanoparticles to detect Escherichia coli rapidly. *Journal of Nanoscience and Nanotechnology*, 20(12), 7617-7622.
- DOI: 10.1166/jnn.2020.18589
- Link : <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5587108/>

Molecular testing devices for on-site detection of *E. coli* in water samples

- Carlos Manzanas, Elise Morrison, Young S. Kim, Morteza Alipanah, George Adedokun, Shouguang Jin, Todd Z. Osborne & Z. Hugh Fan
- Link: <https://www.nature.com/articles/s41598-023-31208-4>