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# AI-Powered Water Quality Detection and Purification Recommendation System using Refractive Index

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# TARGETS OF THE MAIN PROJECT WORK

| ACTIVITIES | STATUS | ACTIVITIES | STATUS |
|---|---|---|---|
| Domain & problem identified | Yes | Development of prod-uct | No |
| Literature Review | Yes | Testing | No |
| Objectives formulated | Yes | Obtained Result | No |
| Methodology / Design | No | Documentation | No |
| Created work plan and | No | Report submission | No |

# INTRODUCTION

- Water pollution from industrial and domestic waste poses serious **health risks** and **degrades water** quality.
- Regardless of **time—past, present, or future**—we must know our water before consuming it to protect health and ensure well-being.
- To consume water safely, ones must first **identify the impurities** and then choose the **right purification method**.
- The base paper reviews traditional physico-chemical analysis techniques like **pH, turbidity, TDS, and hardness**.
- Introduce **refractive index** as a novel parameter and **integrate AI** to enhance detection accuracy and suggest purification strategies.

# PROBLEM STATEMENT

- Water quality monitoring is vital for safe usage, but current practices often separate pollutant detection, data analysis, and purification. This **fragmented approach** leads to delays in identifying harmful substances like TDS, turbidity, and pH, making water treatment **less effective** and increasing health risks.

# LITERATURE REVIEW

| SL | NAME OF THE PAPER | OUTCOME | AUTHOR AND PUBLICATION DETAILS |
|---|---|---|---|
| 1 | AI-Driven Transformation of Water Treatment Technology | Explored AI's role in optimizing water treatment processes and industry innovation. | Lili Jin, Hui Huang, Hongqiang Ren, Frontiers of ESE, 2025 |
| 2 | Emerging Trends in Real-Time Water Quality Monitoring | Highlighted IoT and sensor-based systems for global water sanitation challenges. | Preeti Verma, Pankaj Mehta, IntechOpen, 2025 |

# LITERATURE REVIEW (Contd.)

| SL | NAME OF THE PAPER | OUTCOME | AUTHOR AND PUBLICATION DETAILS |
|---|---|---|---|
| 3 | Effect of Temperature and Wavelength on Refractive Index of Water | Measured refractive index variations using fiber-optic sensors for water purity analysis. | Esra Kendir, Şerafettin, Indian Journal of Physics, 2022 |
| 4 | Science and Technology for Water Purification: Achievements | Surveyed advanced purification technologies including membrane filtration and adsorption | Yuanfeng Qi and Kai He, MDPI Water, 2025 |

# LITERATURE REVIEW (Contd.)

| SL | NAME OF THE PAPER | OUTCOME | AUTHOR AND PUBLICATION DETAILS |
|---|---|---|---|
| 5 | Recent developments in water purification | Shows that advanced water-purification technologies: hybrid oxidation systems, advanced membranes, AI-driven purification | Ramakant, Shuchi, Manvi, IJ Advanced Chemistry Research,2025 |
| 6 | AI for clean water: efficient water quality prediction | Real-time prediction of multiple water quality parameters enabling optimization | Ansari et al, Water Practice & Technology, 2024 |

# LITERATURE REVIEW (Contd.)

| SL | NAME OF THE PAPER | OUTCOME | AUTHOR AND PUBLICATION DETAILS |
|---|---|---|---|
| 7 | Water Expert (rule-based DSS) | Hybrid rule-based expert system for water decontamination decisions | Gutenson ,Drink. Water Eng. Sci. Discuss ,2015 |
| 8 | DOxy: A Dissolved Oxygen Monitoring System | Low-cost IoT system calibrated for DO sensing using pulse-oximetry in water environments | Shaghaghi, MDPI ,2024 |

# LITERATURE REVIEW (Contd.)

| SL | NAME OF THE PAPER | OUTCOME | AUTHOR AND PUBLICATION DETAILS |
|---|---|---|---|
| 9 | Water Quality Monitoring System Based on IoT | Arduino-based system with pH, temp, water level + automation | Dr. B. Shravan Kumar, G. Rohith, A. Sai Balaji, E. Tanishq, IJETRM, March 2025 |
| 10 | Low-Cost IoT System for Turbidity Measurement | Real-time turbidity monitoring using low-cost sensors | Nur Amalina Binti Rosle, Bin Alias, IEEE, 2024 |

# OBJECTIVES

- review key **physico-chemical** parameters such as pH, turbidity, TDS, and hardness that influence water quality and health risks.
- introduce **refractive index** as an additional parameter for enhancing the accuracy of water impurity detection.
- simplify the water testing process by **automating** impurity identification and purification suggestions using AI.
- support informed water usage decisions by providing users with clear, actionable **purification recommendations** based on detected contaminants.

# SCOPE OF PROJECT

- Foundation for future integration with **IoT-based** water monitoring networks, enabling continuous and remote data collection.
- Extended to mobile platforms, making water testing accessible through smartphones and **portable devices**.
- Opens avenues for further **research** in AI-driven environmental monitoring and smart purification systems.
- Serve as a prototype for **smart city infrastructure**, contributing to automated water safety networks.

# Thank You