PROJECT NAME-

Smart Water Leakage Detection System

Project Report

SUBMITTED IN PARTIAL FULFILLMENT
REQUIREMENT FOR THE AWARD OF DEGREE OF

BACHELOR OF TECHNOLOGY

SUBMITTED BY

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UNDER THE SUPERVISION OF

Mr. Atul Mishra

SCHOOL OF ENGINEERING AND TECHNOLOGY

BML MUNJAL UNIVERSITY Gurugram, Haryana - 122413

May 2025

CANDIDATE'S DECLARATION

We, Suhani Agghi, Vishal Verma, Vishesh Gupta, Harshul Saini, and Yash Soni, here by confirm that the project "Low-Cost Conductivity-Based Smart Water Leakage Detection System" as a part of fulfillment of the 2nd-semester course – Joy of Engineering as a part of Bachelor of Technology (B.Tech) program of the School of Engineering and Technology, BML Munjal University is a genuine record of work executed by us under the supervision

of Dr. Atul Mishra. All other materials employed have been properly credited in the project write-up.

This project was done in full compliance with the provided syllabus's requirements and constraints.

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Place: Gurugram

Date: May 2025

SUPERVISOR'S DECLARATION

This is to certify that the above statement made by the candidate is correct to the best of my knowledge.

Faculty Supervisor Name: Dr. Atul Mishra

Signature: 16/05/2025

ABSTRACT

The project proposes a smart leakage detection system for Indian homes. Leveraging the natural water conductivity, the system employs parallel copper wires coiled over ordinary PVC pipes with a porous insulating cover. This allows the system to detect leakage when water spans the wires, causing an alarm through an Arduino-based system. The system is cost-effective, easy to retrofit, non-invasive, and free of harmful radiation or costly sensors. It provides real-time monitoring and has scalable use for residential as well as industrial applications.

ACKNOWLEDGEMENT

We would like to express our sincere gratitude to our mentor **Dr. Atul Mishra** for his constant support and invaluable guidance throughout this project. We also thank BML Munjal University for providing the platform and infrastructure for developing and showcasing our innovation during the Joy of Engineering (TechSparX.I 2025) event. Lastly, we thank our peers and family members who encouraged us during this journey.

LIST OF FIGURES

LIST OF ABBREVIATIONS

1) PVC – Polyvinyl Chloride
2) IoT – Internet of Things
3) AI – Artificial Intelligence
4) GPR – Ground Penetrating Radar
5) TRL – Technology Readiness Level

TABLE OF CONTENTS

CHAPTER-1

INTRODUCTION

Water scarcity is perhaps the most urgent problem in modern urban society. Urban cities such as Delhi lose significant volumes of water due to leaky pipes, which go undetected until losses mount. Conventional leak detection methods such as GPR and thermal imaging are expensive, non-real time, and inappropriate for domestic use.

Our solution employs the water itself as a leakage trigger through itsconductivity. Parallel copper wires on PVC pipes will have any seepagespreading water between the wires complete a circuit, which is sensed and recorded by an Arduino-based system. The aim is to provide early detection at low cost, saving water and maintenance loads for homes.

CHAPTER-2
LITERATURE REVIEW

2.1 Existing technologies

Leakage detection systems across the globe include thermal imagers, ground-penetrating radials (GPRs), and in-pipe sensors. While effective, they are invasive, costly, and not appropriate for the typical Indian household. They also require trained staff and are typically used where leaks are suspected.

2.2 Objectives of Project

1.Develop a simple, affordable leak detection system

2.Use conductive properties of water to trigger alerts

3.Ensure compatibility with existing pipeline systems

4.Explore future integration with IoT for smart alerts

2.3 Research Gap

Technology	**Drawbacks**	**Our Innovation**
GPR/Thermal Imaging	Expensive,Periodic,Radiation-Based	Passive,Low-Cost,Real Time
In-Pipe Sensors	Invasive, Maintainance-Heavy	External and Non-Invasive
Manual Inspections	Labour-Intensive,Slow,Inaccurate	Automated and Consistent

CHAPTER-3
EXPERIMENTAL SETUP

3.1. Actual Sketch

Figure 1: Wrapped pipe sensor cross-sectional view SEP
Two copper wires in parallel are laid along a PVC pipe. A layer of insulating water-absorbing material (e.g. polypropylene sheet) covers the wires. A waterproof outer layer prevents false positives due to environmental moisture. In leaking state, the water saturates between the wires and completes the circuit.

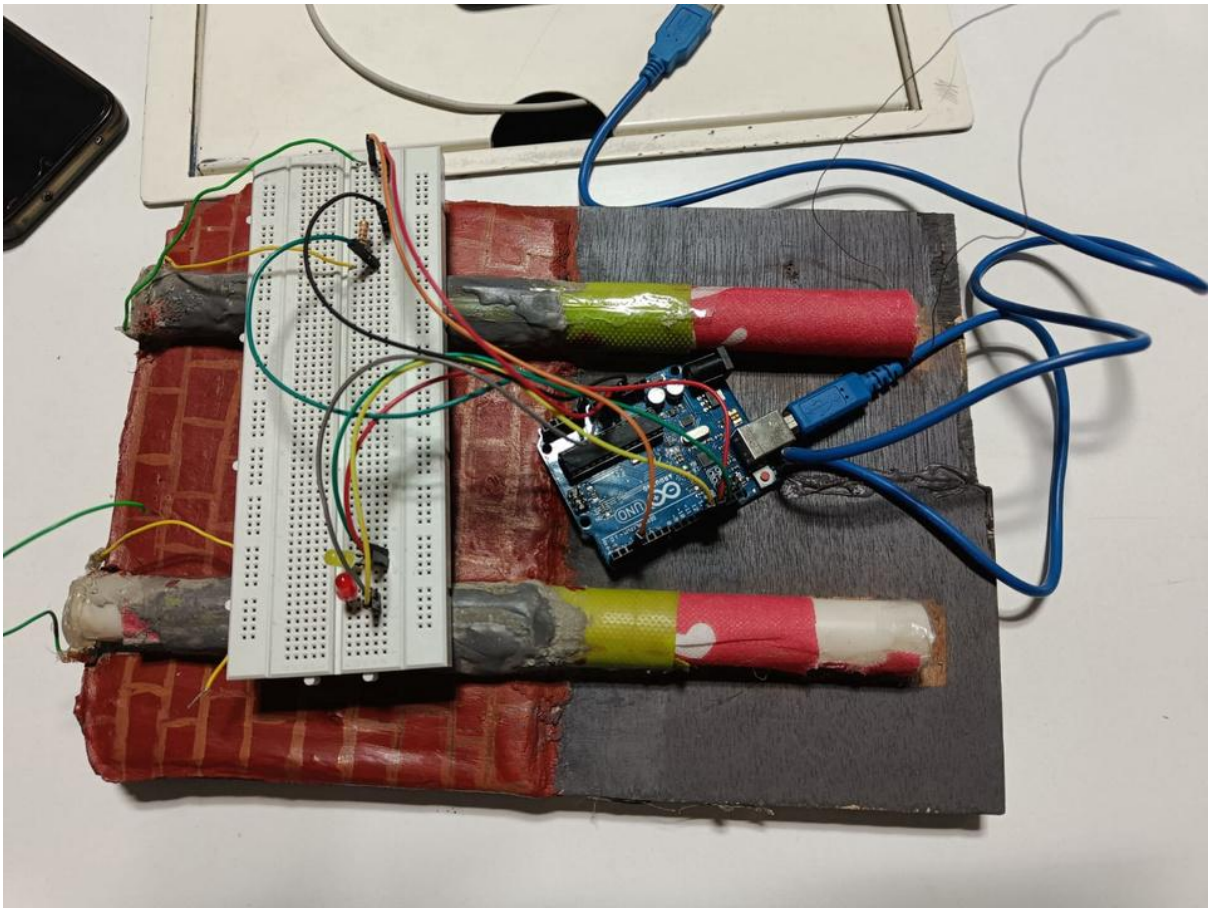
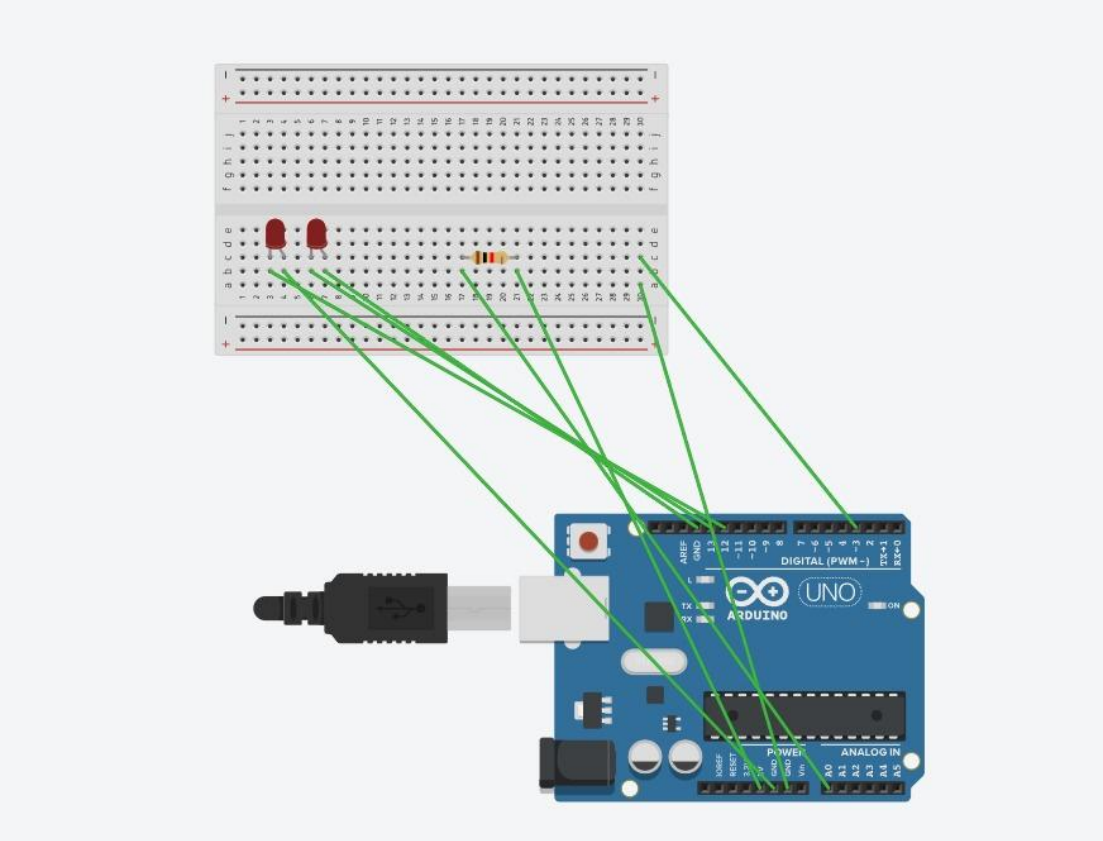


Figure 2: Arduino-based circuit schematic

This Includes copper sensor terminals connected to analog pins on Arduino Uno, which triggers the LEDs if leakage is detected.



3.2. Material used

PVC Pipe – As an affordable and widely used plumbing base

Copper Wires – To create circuits using water

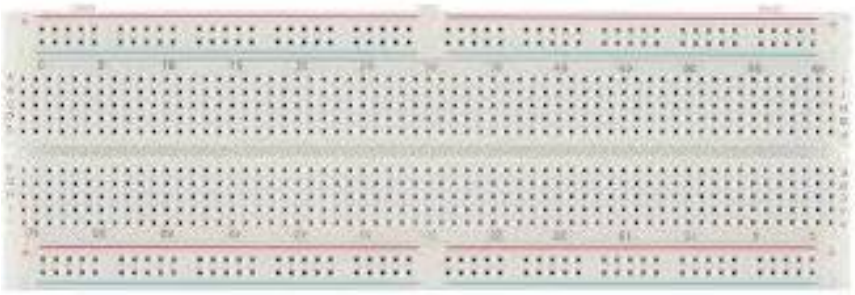
Absorbent Insulating Sheet – To control water spread

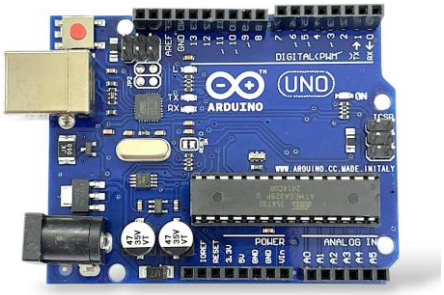
Polymer Wrap – To avoid outside moisture triggers

Arduino Uno – To read and control analog voltage

LEDs / Buzzer – For alert notification

Battery Source – 9V, best for home use





CHAPTER-4
RESULTS AND OBSERVATIONS

1) Leakage Detection Accuracy: The device accurately detected leaks in horizontal pipes and vertical pipes, alarms ringing within less than 5 seconds.

2) Prevention of False Positives: The rain or atmospheric humidity-induced activation was successfully prevented by the waterproof outer coating.

3) Costing: Cost of system under ₹400, significantly lower than any available commercial solution.

4) User Feedback: The attendees of the TechSparX.I event found the idea intuitive and promising for practical application.

CHAPTER-5
CONCLUSIONS AND FUTURE SCOPE

Conclusion:The water leakage detection system presented here demonstrated a new way of utilizing the inherent properties of water. It is economical, easy to install, and a real-time system—ideal for Indian houses and small businesses.

Future Scope: Integration of Wi-Fi/Bluetooth module to display mobile notificationsAI/ML algorithm-based predictive leak analysis Auto shut-off valves with detection system Large-scale pilot in housing societies and municipal pipelines

REFERENCES

[1] Ministry of Housing and Urban Affairs. (2020). *India Water Supply and Sanitation Assessment Report*. Government of India.
https://mohua.gov.in
(Provides data on urban water loss and the need for affordable smart solutions.)

[2] Malik, A., Yadav, A., & Singh, R. (2021). *Comparative Study of Water Leakage Detection Technologies*. International Journal of Scientific Research in Engineering and Management (IJSREM), 5(10), 1–6 *(Highlights gaps in traditional technologies like GPR and thermal imaging.)*

[3] Arduino.cc. (n.d.). *Arduino Uno Rev3*. Retrieved from https://store.arduino.cc
(Provides specifications for the Arduino used in your system.)

[4] TechSparX.I Innovation Expo (2025). *Project Abstracts – BML Munjal University*.
(Official event where our project was showcased; supports novelty and practical validation.)

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