

# **K.RAMAKRISHNAN COLLEGE OF TECHNOLOGY (AUTONOMOUS), TRICHY.**



## **DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

### **20CS5501 DESIGN PROJECT-1**

**Batch No : 1**

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# **Prediction of toxic level in lavatory and alert generating system using android application**

## **Guided by**

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# OBJECTIVE OF THE PROJECT

- To ensure a safe, clean, and hygienic environment in public and private restrooms by leveraging real-time monitoring and data-driven insights.
- To notify maintenance teams of critical conditions such as high gas levels or overuse, prompting immediate action.
- To monitor lavatory occupancy to analyze usage trends and optimize cleaning schedules.
- To utilize predictive analytics to anticipate and address potential hygiene or safety issues before they escalate.

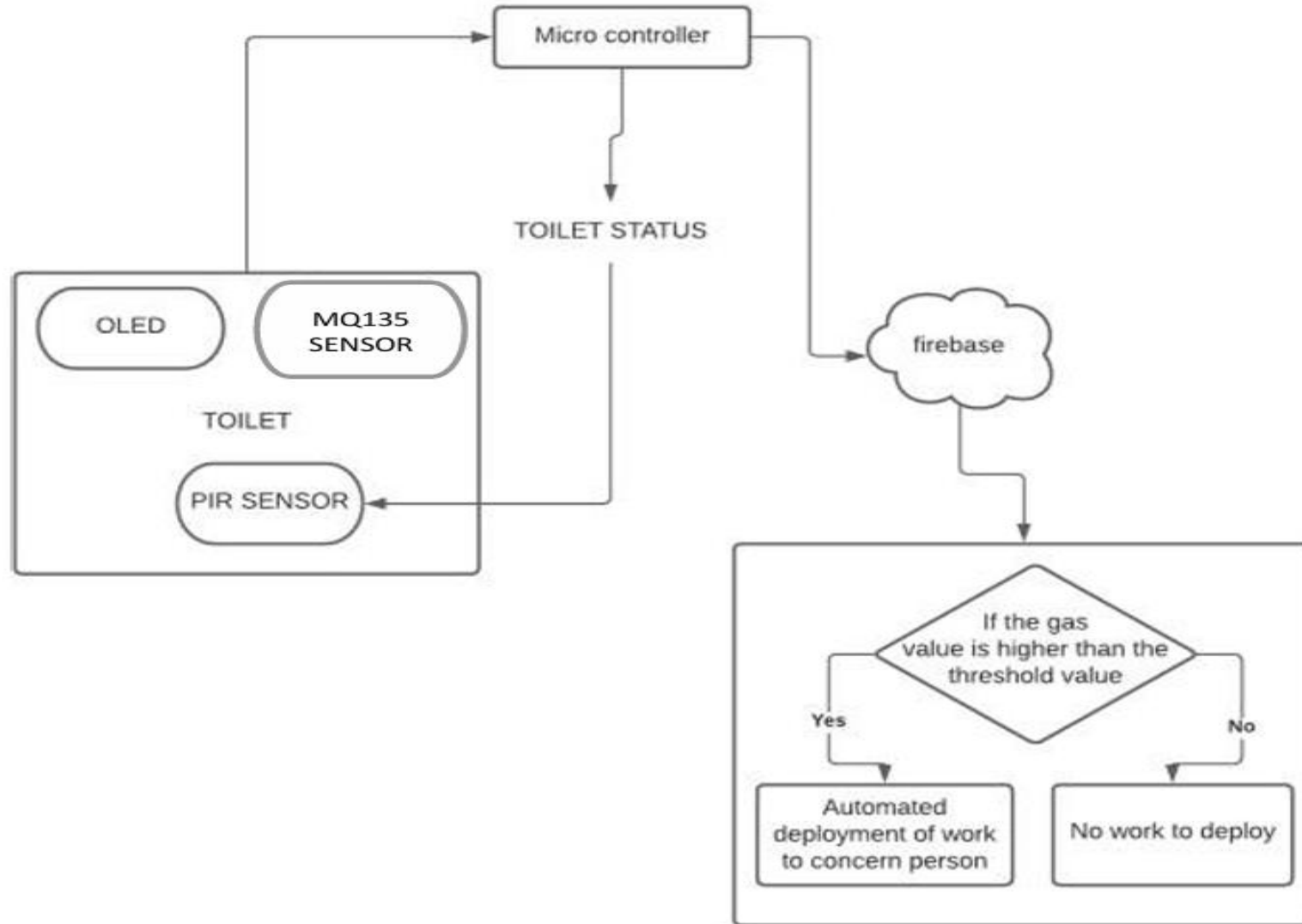
# ABSTRACT

- The project aims to develop a smart lavatory monitoring system using an Android application integrated with IoT devices.
- The system continuously monitors and records gas levels, particularly H<sub>2</sub>S, and person count in lavatories. By leveraging Exploratory Data Analysis (EDA) and linear regression, the system predicts potential toxic gas levels, enabling proactive management to ensure a hygienic environment.
- Unlike existing systems that focus mainly on reducing water wastage, this project emphasizes maintaining cleanliness and safety through data-driven insights and real-time alerts.

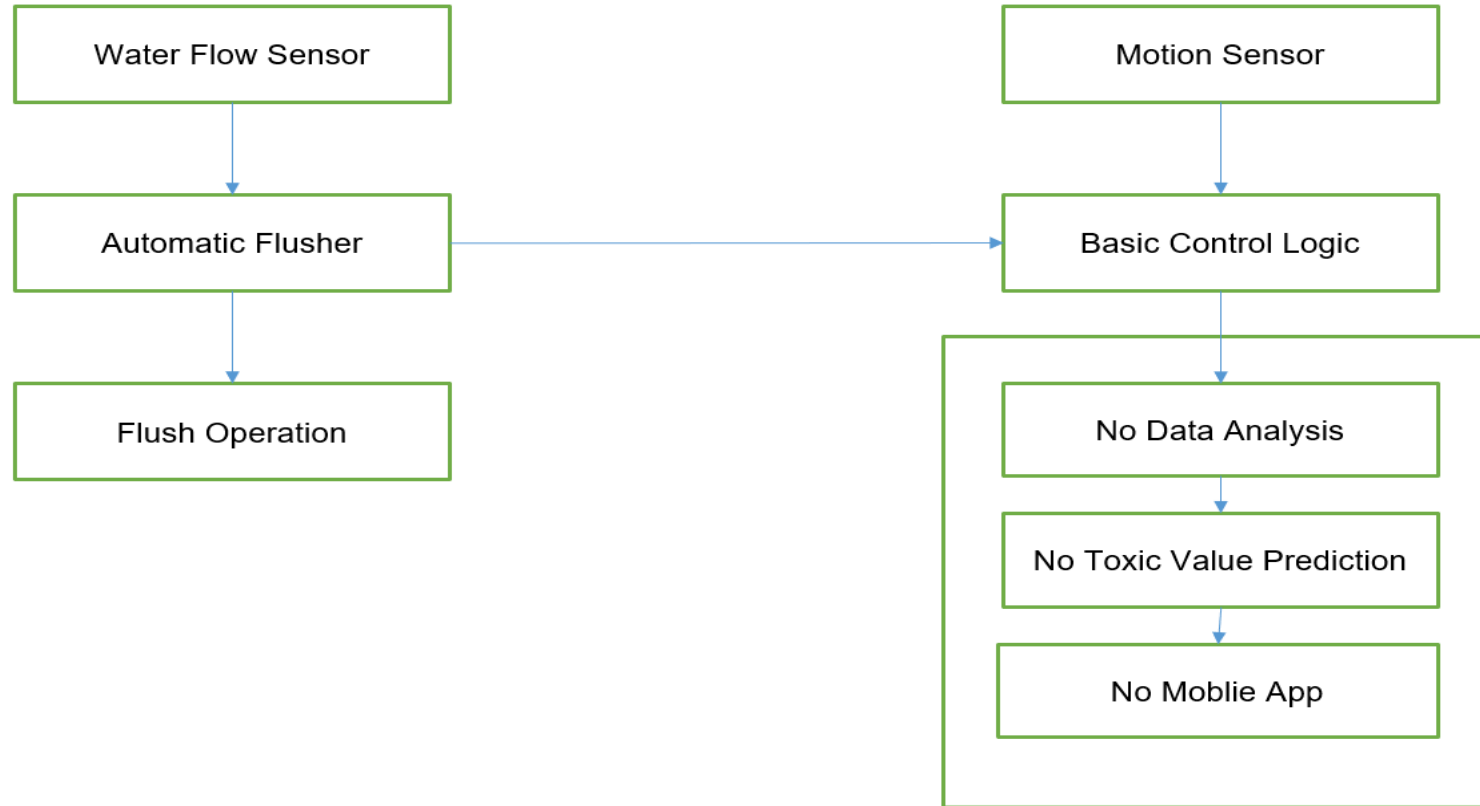
# LITERATURE SURVEY

TITLE OF THE PAPER	AUTHOR (S)	PUBLISHER	PAPER GIST	TECHNOLOGY USED
The Why And How Of Exploratory Data Analysis In Python	Edureka Team	edureka	The article discusses the importance of Exploratory Data Analysis (EDA) in Python, focusing on techniques for data cleaning, visualization, and pattern summarization to derive insights.	Python, Pandas, Matplotlib, Seaborn.
A Beginner’s Guide to Exploratory Data Analysis with Linear Regression — Part 1	Medium Contributor	Medium	The guide outlines how to use Exploratory Data Analysis (EDA) before linear regression, emphasizing data exploration and visualization to improve regression models.	Python, Pandas, Matplotlib, Seaborn, Scikit-learn.
Exploratory Data Analysis (Beginner), Univariate, Bivariate, and Multivariate — Haberman Dataset	Medium Contributor	Medium	The article covers EDA with univariate, bivariate, and multivariate visualizations using the Haberman dataset to reveal patterns and relationships	Python, Pandas, Matplotlib, Seaborn.
Smart-Alert-App	MariosP	GitHub	Smart-Alert-App is a real-time alert system that notifies users during natural disasters like	Python, IoT sensors, APIs for messaging, Real-time data processing

# PROPOSED SYSTEM ARCHITECTURE



# EXISTING SYSTEM ARCHITECTURE



# SOFTWARE AND HARDWARE REQUIREMENTS

## HARDWARE

- Nodemcu Board
- PIR Sensor
- MQ135 Sensor
- Bread Board
- Jumper Wire
- USB Cable

## SOFTWARE

- Android Studio
- Anaconda
- Jupiter Notebook
- Fire Base
- Arduino IDE
- Python
- Java
- C



# MODULES

- Sensor Module
- Data Analysis Module
- Linear regression Algorithm
- Splitting Date into month,year,day,time,
- Application module
- Thershold analyzing Module

# SUMMARY OF MODULE-1

## Sensors Module

The Sensor Module monitors toilet occupancy and air quality. It uses PIR and MQ135 sensors to detect presence and gas levels. MQ135 detects unpleasant/potentially harmful gases, indicating air quality. Sensor data is sent to a microcontroller for processing. Exceeding gas threshold triggers an alert for cleaning/maintenance.

- PIR SENSOR (detects infrared radiation emitted by objects, low power consumption, high sensitivity, compact size)
- MQ135 SENSOR (used to check air quality monitoring, industrial safety, environmental monitoring, high sensitivity, fast response time, low cost)

# SUMMARY OF MODULE-2

## **Data Analysis Module**

- The Data Analysis Module processes sensor data for optimized facility management. It aggregates data from occupancy, air quality, supply, and usage sensors. Real-time analysis identifies immediate issues, triggering alerts when thresholds are exceeded.
- Historical analysis reveals long-term patterns, optimizing staffing and scheduling. Predictive capabilities ensure timely supply replenishment and maintenance.
- Data analysis supports predictive maintenance, preventing equipment issues. Univariate and multivariate analysis methods are used to identify trends. Insights from data analysis enhance user experience, cleanliness, and facility efficiency.

# SUMMARY OF MODULE-3

## Linear Regression Module

- The Linear Regression model predicts gas sensor values in public toilets. Ensures timely maintenance, minimizing health risks and promoting hygiene. Uses equation  $y = \beta_0 + \beta_1x + \varepsilon$  to predict values.
- **Model workflow:** data collection, preprocessing, training, testing, prediction.
- **Advantages:** accurate predictions, real-time monitoring, efficient maintenance.
- **Limitations:** assumes linearity, sensitive to outliers, multicollinearity. Compatible with various gas sensors, requires Python 3. Optimizes public toilet maintenance, reducing health risks and promoting hygiene

# SUMMARY OF MODULE-4

## Splitting date into month,year,day,time

- Splitting date information into components (month, year, time) enhances alert systems. Enables flexible sorting, filtering, and conditional triggers based on temporal criteria. Date manipulation libraries (e.g., Python's datetime) parse standard formats. Split components are stored separately for efficient retrieval and analysis.
- Supports real-time alerts, historical analysis, and trend detection. Precise threshold management reduces false positives and optimizes alert relevance.
- Time-specific analysis enhances forecasting, risk management, and strategic planning. Date-Time Splitting Module extracts and separates date/time information for efficient processing

# SUMMARY OF MODULE-5

## Application Module

- The Lavatory Alert-Generating System's Application Module maintains hygiene and efficiency. Collects IoT sensor data on occupancy, odor, and supply levels. Triggers alerts for maintenance/cleaning based on real-time sensor data.
- Intuitive dashboard for live monitoring, alert tracking, and historical analysis. Customizable alert thresholds, notifications, and access permissions. Incident tracking system records alerts and resolutions for accountability.
- Generates reports on usage, issues, and supply consumption for data-driven decisions. Enhances user satisfaction and operational efficiency through proactive lavatory management.

# SUMMARY OF MODULE-6

## Threshold Analyzing Module

- The Threshold Analyzing Module sets and monitors alert levels based on predefined criteria. It distinguishes between normal and abnormal values in real-time data.
- Thresholds can be fixed or adaptive, adjusting to historical or real-time analysis. The module detects deviations, generates alerts, and prioritizes based on severity.
- Multi-level thresholds enable layered alerting for critical and non-critical issues. Feedback mechanisms adjust thresholds to optimize alert accuracy. Trend and anomaly detection identify subtle deviations from typical patterns.
- Historical data analysis informs facility management decisions and adjusts cleaning/ventilation routines

# RESULTS AND DISCUSSION

- The results of the study demonstrate the effectiveness of the proposed system in predicting toxic levels in lavatories and generating alerts to authorities and users.
- The high accuracy of the machine learning model and the fast response time of the system make it suitable for real-time applications.
- Future enhancements to the system could significantly improve its functionality and adaptability. One potential enhancement would involve the integration of more advanced machine learning models, such as deep learning algorithms, to refine the system's ability to predict and assess gas levels, occupancy patterns, and other environmental factors.



# CONCLUSION

- The Smart Alert Toilet Management System revolutionizes hygiene monitoring by integrating sensors and predictive analytics to ensure clean and safe public restrooms.
- By utilizing real-time data analysis and machine learning, the system provides proactive alerts and maintenance scheduling, significantly reducing health risks associated with unclean toilets.
- Adopting this advanced technology can enhance public health standards, minimize water wastage, and pave the way for future innovations in automated sanitation solutions.

THANK YOU