MEDICINE OVERDOSE DETECTION USING MACHINE LEARNING

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ABSTRACT

Medicine overdose is a significant medical issue affecting individuals of all age groups, often resulting from incorrect dosage, lack of medical supervision, or misinterpretation of drug instructions. This project introduces an intelligent system designed to predict the likelihood of a medicine overdose using two machine learning algorithms: Support Vector Machine (SVM) and Logistic Regression. Users interact with the system through a secure registration and login interface, providing personal and medical information such as age, gender, BMI, medicine type, and dosage. The data undergoes preprocessing including normalization, encoding, and feature extraction to ensure it is suitable for model training. SVM and Logistic Regression are employed to analyze the processed data and classify the risk level associated with the medicine intake. The models generate outputs that categorize the overdose risk as high, moderate, or low, thereby assisting users in identifying potentially harmful dosages. This system is especially beneficial for individuals practicing self-medication and in regions with limited access to healthcare professionals. The comparative analysis of both algorithms allows for validation and improvement of prediction accuracy, ultimately supporting safer medicine usage.

Keyword:*Medicine Overdose, Machine Learning, SVM, Logistic Regression, Dosage Prediction, Health Informatics.*

1. INTRODUCTION

Medication overdose can lead to serious health complications including organ damage and death. Despite available guidelines, the risk persists due to self-medication, dosage misinterpretation, and lack of personalized assessments. The objective of this research is to develop a predictive model that can assess the risk of overdose based on individual

health parameters. The integration of machine learning into this context offers a scalable and data-driven solution to improve medication safety.

2. PROBLEM STATEMENT

Medicine overdose remains a growing public health concern, especially affecting vulnerable groups like children and underweight individuals. Many overdoses result from self-medication, inaccurate dosage estimations, and lack of awareness. Current systems don't personalize risk prediction based on age, BMI, and medicine type. Hence, there is need for an intelligent solution that provides real-time, personalized overdose alerts. This project aims to fulfill this gap.

3.OBJECTIVE

- To design a user-friendly system that enables user registration and secure input of personal and medication-related information.
- To pre-process input data such as age, gender, BMI, medicine names, and dosage formats.
- To implement and train machine learning models—SVM and Logistic Regression.
- To compare model performance and output overdose risk levels (e.g., High, Moderate, Low). • To provide actionable output and contribute to preventive healthcare by aiding decision-making.

3. METHODOLOGY

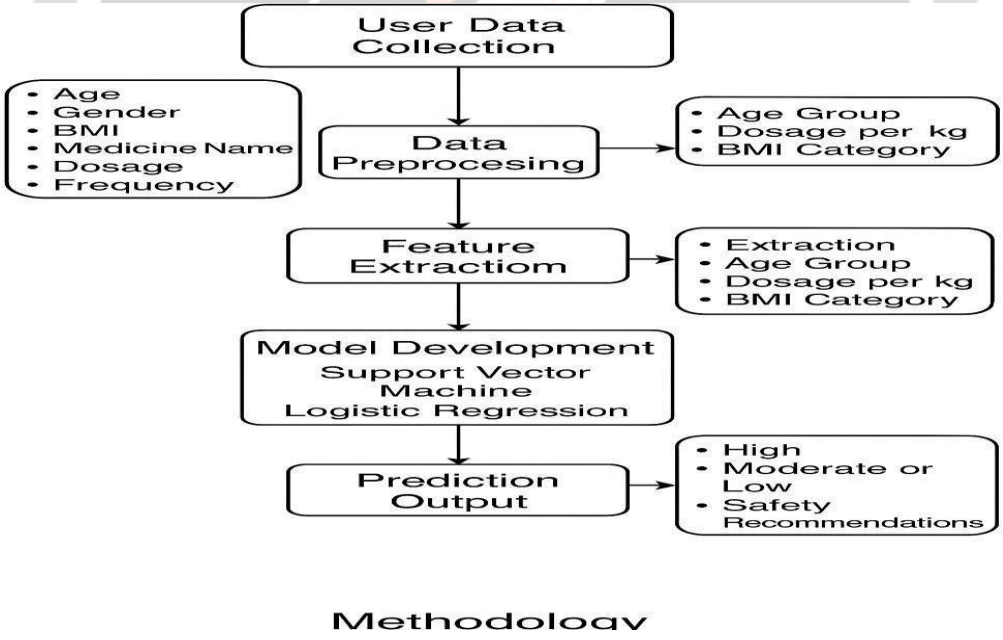

Fig -1: Methodology of Medicine Overdose Detection System

1. User Input Collection

Users begin by submitting their health and medication details through a secure system interface. These inputs include:

- Age and gender
- Height and weight (used to calculate BMI)
- Name(s) of medication(s)
- Dosage amount and frequency of intake

This data is critical for assessing the potential risk of overdose

2. Data Preprocessing

Before analysis, the raw data undergoes processing to ensure it is clean and consistent. Steps include:

- BMI Computation: Converts height and weight into BMI to categorize body type.
- Cleaning: Removes or corrects incomplete, incorrect, or duplicate entries.
- Standardization: Scales numeric values like dosage for uniformity.
- Encoding: Converts text-based data (e.g., gender, medicine names) into numerical format suitable for analysis.

3. Feature Engineering:

Key attributes that influence overdose risk are identified and extracted, such as:

- Dosage relative to body weight (mg/kg)
- Age classification (adult or child)
- BMI category (e.g., underweight, normal)
- Type and quantity of medications taken
- Dosage frequency and duration

These features help models understand patterns linked to overdose risk.

4. Model Training • Two machine learning algorithms are trained to recognize overdose risk:

- Support Vector Machine (SVM): Finds the optimal boundary between safe and risky cases using mathematical functions. • Logistic Regression: Calculates the likelihood of an overdose based on user data.
- Models are trained using a labeled dataset (with known outcomes), and performance is evaluated through validation techniques like cross-validation and accuracy testing.

5. Risk Prediction

- Once trained, the system provides:
- Risk Assessment: Categorized as High, Moderate, or Low.
- Probability Score: Indicates how confident the system is in its prediction.
- Guidance: If a high risk is detected, users are advised to consult a medical professional..

4. SYSTEM ARCHITECTURE AND DESIGN

The system consists of:

A web interface for registration, login, and data input.

A backend server to handle preprocessing, feature engineering, and model prediction. A database to store user data and prediction history.

Machine learning model integration to classify overdose risk levels.

The modular architecture ensures scalability, data security, and efficient risk evaluation.

5.RESULTS AND DISCUSSIONS

The system was tested on labeled datasets with simulated user inputs. The SVM model showed slightly better accuracy and recall than Logistic Regression, especially in cases with nonlinear feature distribution. Logistic Regression provided interpretable results useful for decision-making. The output included risk level (High, Moderate, Low) and recommendations. Performance was evaluated using metrics like accuracy (SVM: 87%, LR: 84%) and F1-score.

6. CONCLUSIONS AND FUTURE SCOPE

The system successfully predicts medicine overdose risk using machine learning techniques. It assists individuals and healthcare professionals by identifying potential overdose cases based on personalized health and medicine data. Future enhancements include real-time database integration, mobile app deployment, additional health parameter inclusion, and advanced deep learning algorithms to improve prediction accuracy.

7. REFERENCES

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