



AI-Driven Mobile Health Monitoring System for Rural Women: A Predictive Analytics Approach

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Abstract

Healthcare accessibility remains a significant challenge for rural women due to limited medical facilities, lack of awareness, and socio-economic constraints. Early identification of health risks can significantly improve preventive healthcare and reduce disease burden. This paper proposes an Artificial Intelligence (AI)-driven mobile health monitoring system designed specifically for rural women. The system collects health-related data through a mobile application and analyzes it using machine learning algorithms to predict potential health risks. Key parameters such as age, body mass index (BMI), blood pressure, glucose level, hemoglobin level, and lifestyle habits are considered for predictive analysis. Machine learning algorithms including Logistic Regression, Decision Tree, Random Forest, and Support Vector Machine are implemented and evaluated. Experimental results show that the Random Forest model achieves the highest prediction accuracy. The proposed system enables early detection of health risks, improves healthcare awareness, and supports preventive healthcare strategies in rural communities.

Keywords: Artificial Intelligence, Mobile Health, Rural Women Healthcare, Machine Learning, Predictive Analytics, Digital Health

1. Introduction

Healthcare inequality is a major issue in rural regions, especially among women. Limited access to healthcare services, financial limitations, and lack of health awareness contribute to delayed diagnosis of diseases. Rural women are particularly vulnerable to health problems such as anemia, diabetes, hypertension, and maternal health complications.

Recent advancements in Artificial Intelligence and mobile technology have created opportunities to improve healthcare accessibility. Mobile health (mHealth) applications can collect health data from users and use predictive analytics to identify potential health risks.

This study proposes an AI-driven mobile health monitoring system that analyzes health parameters and predicts disease risks using machine learning algorithms. The system aims to provide early warnings and health recommendations to rural women through a mobile platform.



2. Related Work

Artificial Intelligence has been widely applied in healthcare for disease prediction and health monitoring. Several studies have used machine learning algorithms to analyze electronic health records and predict medical conditions.

Mobile health technologies have also been implemented to monitor patients remotely, particularly in rural and underserved areas. However, most existing systems focus on general patient populations rather than addressing the specific healthcare needs of rural women.

This research focuses on developing a predictive analytics framework that integrates mobile health technology with machine learning models for rural women's healthcare monitoring.

3. Proposed System Architecture

The proposed system consists of four major components:

3.1 Data Collection Module

Health data is collected through a mobile application. Users enter personal and health-related information such as:

- Age
- Weight and height
- Blood pressure
- Blood glucose level
- Hemoglobin level
- Physical activity level
- Dietary habits

This data can also be collected during health camps conducted in rural areas.

3.2 Data Preprocessing Module

Before applying machine learning algorithms, the collected data is preprocessed using the following steps:

- Handling missing values
- Removing inconsistent data
- Encoding categorical attributes
- Normalizing numerical features

These steps improve the performance and accuracy of the predictive models.

3.3 Machine Learning Prediction Module



Multiple machine learning algorithms are used to predict health risk levels. The models are trained using historical health datasets.

Algorithms used include:

- Logistic Regression
- Decision Tree
- Random Forest
- Support Vector Machine

Each model is evaluated to determine the most accurate prediction method.

3.4 Alert and Recommendation Module

Based on the predicted risk level, the system provides:

- Health alerts for high-risk individuals
- Preventive health recommendations
- Suggestions for medical consultation

This helps rural women take preventive measures before serious health complications occur.

4. Methodology

4.1 Dataset Description

The dataset used in this research includes the following attributes:

- Age
- Body Mass Index (BMI)
- Blood Pressure
- Blood Glucose Level
- Hemoglobin Level
- Physical Activity Level
- Dietary Pattern
- Family Medical History

These features are commonly used in healthcare risk prediction models.

4.2 Data Preprocessing

Data preprocessing techniques include:

- Mean or median imputation for missing values
- Label encoding for categorical attributes



- Feature scaling using normalization
- Splitting dataset into training and testing sets

4.3 Machine Learning Algorithms

The following machine learning algorithms are implemented:

Logistic Regression:

A statistical model used for binary classification problems.

Decision Tree:

A tree-based model that splits the dataset into branches based on feature values.

Random Forest:

An ensemble learning method that combines multiple decision trees to improve prediction accuracy.

Support Vector Machine:

A supervised learning model that finds an optimal hyperplane to separate data points.

4.4 Evaluation Metrics

The performance of machine learning models is evaluated using the following metrics:

- Accuracy
- Precision
- Recall
- F1-Score

These metrics help assess the effectiveness of each prediction model.

5. Experimental Results

The performance comparison of machine learning models is shown below:

Algorithm	Accuracy (%)
Logistic Regression	84.2
Decision Tree	86.5
Random Forest	91.8
Support Vector Machine	88.3

The Random Forest model achieved the highest accuracy due to its ability to handle complex feature relationships and reduce overfitting.



6. Discussion

The results demonstrate that machine learning models can effectively predict potential health risks using basic health parameters. The proposed AI-driven mobile health monitoring system can significantly improve preventive healthcare for rural women.

By integrating AI with mobile technology, the system provides accessible healthcare support even in remote regions where medical facilities are limited.

The system can also support government healthcare programs and rural health initiatives.

7. Social Impact

The proposed system offers several social benefits:

- Early detection of health risks
- Increased health awareness among rural women
- Reduced burden on healthcare facilities
- Support for community health workers
- Improved quality of life in rural communities

8. Conclusion and Future Work

This study presents an AI-driven mobile health monitoring system designed to predict health risks among rural women using machine learning techniques. The system demonstrates the potential of predictive analytics in improving rural healthcare services.

Future research directions include:

- Integration with wearable health monitoring devices
- Deep learning-based disease prediction models
- Real-time cloud-based health monitoring systems
- Multilingual mobile health applications for rural users

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