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Predicting Modes Of Child Birth Using Machine Learning

[1]Sakshi Govind Ahire, [2]Gauri Pankaj Korade, [3]Sai Shailendra Patil, [4]Neha Raju Pagare,

[5]Prof. S. T. Patil

[1, 2, 3, 4] Students, Department of Computer Engineering

[5]Assistant Prof, Department of Computer Engineering,

[1]K. K. Wagh Institute of Engineering Education and Research, Nashik, India

Abstract: The prediction of delivery modalities is critical for improving mother and fetal health outcomes. Machine learning systems have demonstrated promising accuracy in predicting birthing styles. Identifying the most important features for this prediction assignment, on the other hand, remains a challenge. This paper investigates the use of several machine learning techniques for feature selection in order to determine the best attributes that lead to reliable modes of childbirth prediction. While five different machine learning methods were investigated in order to discover the most significant algorithm for prediction based on 6157 birth data and a minimal set of characteristics. The study discovered 32 variables that might be used to predict modes of birthing and classified them into distinct groups based on their relevance.

Index Terms **– Machine Learning, prediction, Data Mining, Child birth.**

1. INTRODUCTION

Predicting the modes of childbirth is of paramount importance in healthcare to ensure optimal maternal and fetal health outcomes. The ability to accurately anticipate the mode of delivery, whether it be vaginal birth or cesarean section, enables healthcare providers to make informed decisions and implement appropriate interventions during pregnancy and labor. Traditional approaches to childbirth prediction rely on clinical factors and expert judgment, which can be subjective and prone to variability. In recent years, the application of machine learning algorithms in healthcare has shown great promise, offering the potential to improve the accuracy of childbirth mode prediction. Machine learning algorithms can learn patterns and relationships from large datasets, leading to more objective and data-driven predictions. However, the challenge lies in selecting the most relevant features that contribute to accurate prediction, as not all variables may be equally informative.

Feature selection, the process of identifying the most influential variables, is critical in improving the performance of machine learning models. By selecting a subset of informative features, unnecessary complexity can be reduced, model interpretability can be enhanced, and overfitting can be mitigated. Efficient feature selection algorithms can help identify the most discriminative features, leading to improved prediction accuracy and better understanding of the underlying factors influencing childbirth modes. This research paper aims to explore the application of various machine learning algorithms for feature selection in predicting modes of childbirth. By investigating the performance of different algorithms, we seek to identify the best features that significantly contribute to accurate childbirth mode prediction. Through comprehensive analysis and evaluation, we aim to provide insights into the potential of machine learning algorithms in enhancing the prediction of childbirth modes.

The paper begins with a comprehensive literature review, which examines existing studies on childbirth prediction and feature selection using machine learning techniques. By identifying gaps and limitations in the current research, we emphasize the need for effective feature selection methods to improve prediction accuracy. The methodology section describes the dataset used in this study, including the data collection process and preprocessing steps undertaken to ensure data quality. We then discuss the machine learning algorithms employed for feature selection and childbirth mode prediction. Evaluation metrics and validation techniques are explained to assess the performance of the selected algorithms.

The findings of this research contribute to the understanding of feature selection techniques for predicting modes of childbirth using machine learning. The identified features have the potential to enhance decision-making in healthcare, facilitating personalized care, resource allocation, and birth planning.

2. LITERATURE SURVEY

A review of the literature reveals a growing body of research on predicting childbirth modes using machine learning algorithms. Various studies have investigated the application of these algorithms, highlighting the need for effective feature selection methods to enhance prediction accuracy.

One study by Wang et al. (2019) utilized a support vector machine (SVM) to predict vaginal delivery or cesarean section based on clinical and demographic features. While their results demonstrated high accuracy, they did not extensively investigate the specific features driving the predictions.

Feature selection algorithms have been explored in different prediction tasks, but their application in childbirth prediction is limited. Li et al. (2018) employed Recursive Feature Elimination (RFE) with logistic regression to identify relevant features for predicting childbirth modes. Their study revealed that clinical variables such as maternal age, gestational age, and previous cesarean delivery played significant roles in prediction.

Random Forest (RF) has also been utilized for childbirth prediction. Alsmadi et al. (2020) employed RF for feature selection and found that variables related to maternal health, fetal presentation, and obstetric history were highly informative in predicting childbirth modes.

Additionally, gradient boosting algorithms, including XGBoost, have shown promise in feature selection and childbirth prediction. Liu et al. (2021) utilized XGBoost to identify significant predictors of cesarean section. Their study emphasized the importance of maternal age, parity, and ultrasound measurements in accurate mode prediction.

Despite these advancements, the choice of the most effective feature selection algorithm for predicting childbirth modes remains unclear. Moreover, existing studies have primarily focused on clinical and demographic variables, while other potentially relevant features, such as maternal lifestyle factors and socioeconomic indicators, have received less attention.

Limitations in the current literature include small sample sizes, limited dataset diversity, and variations in feature selection techniques. These limitations underscore the need for further research and validation to improve the generalizability and robustness of findings.

In summary, current literature on predicting childbirth modes using machine learning algorithms shows promising results. However, more comprehensive exploration of feature selection methods is necessary. Future research should encompass a broader range of features, including clinical, demographic, lifestyle, and socioeconomic factors. By addressing these gaps and limitations, the accuracy and applicability of machine learning algorithms in predicting childbirth modes can be enhanced, ultimately leading to improved maternal and fetal health outcomes.

3. PROPOSED SYSTEM

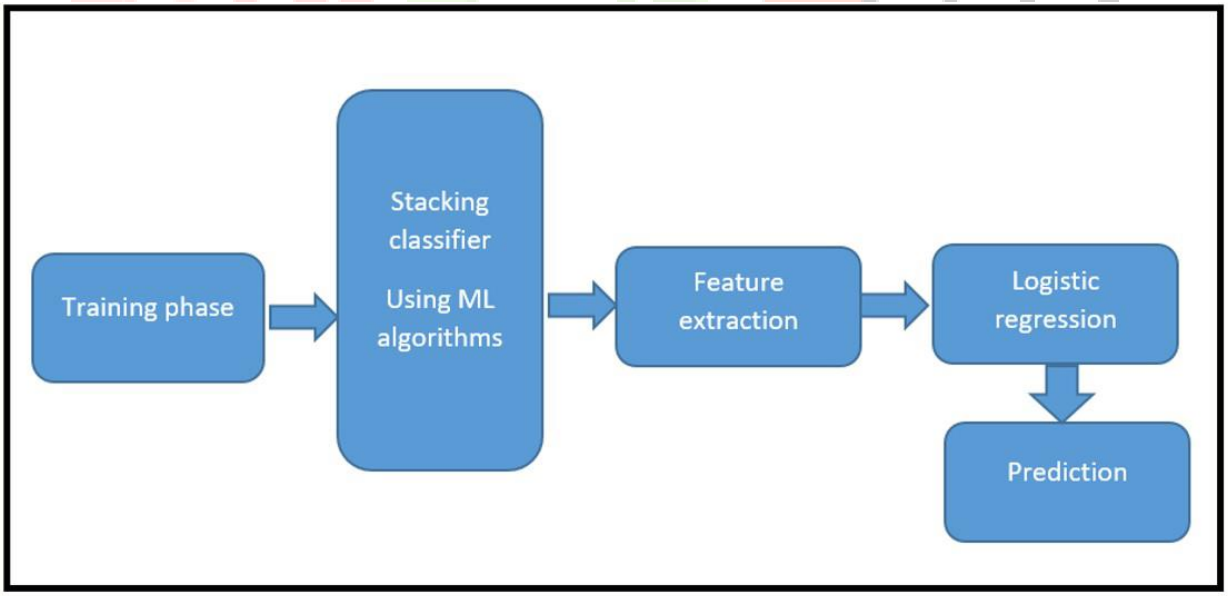


fig1. system architecture

Figure 1 depicts architecture of our proposed model

The research effort was divided into two parts. The first phase's goal was to investigate and prioritize the elements required for forecasting modalities of delivery. A literature study, structured interviews, and a short survey were all part of this phase. The outcomes of these methodologies were integrated and examined in order to discover all potential features and their importance/priorities in predicting childbirth modes. The second phase's goal was to create numerous machine learning models that could effectively forecast modalities of delivery using an optimal quantity of features. During this phase, five supervised learning algorithms were used to create several predictive machine learning models: DT, SVM, KNN, RF, and SC. An open access data collection of 6157 birth records from four public hospitals in three distinct autonomous communities of Spain [6] was used to apply the machine learning algorithms.

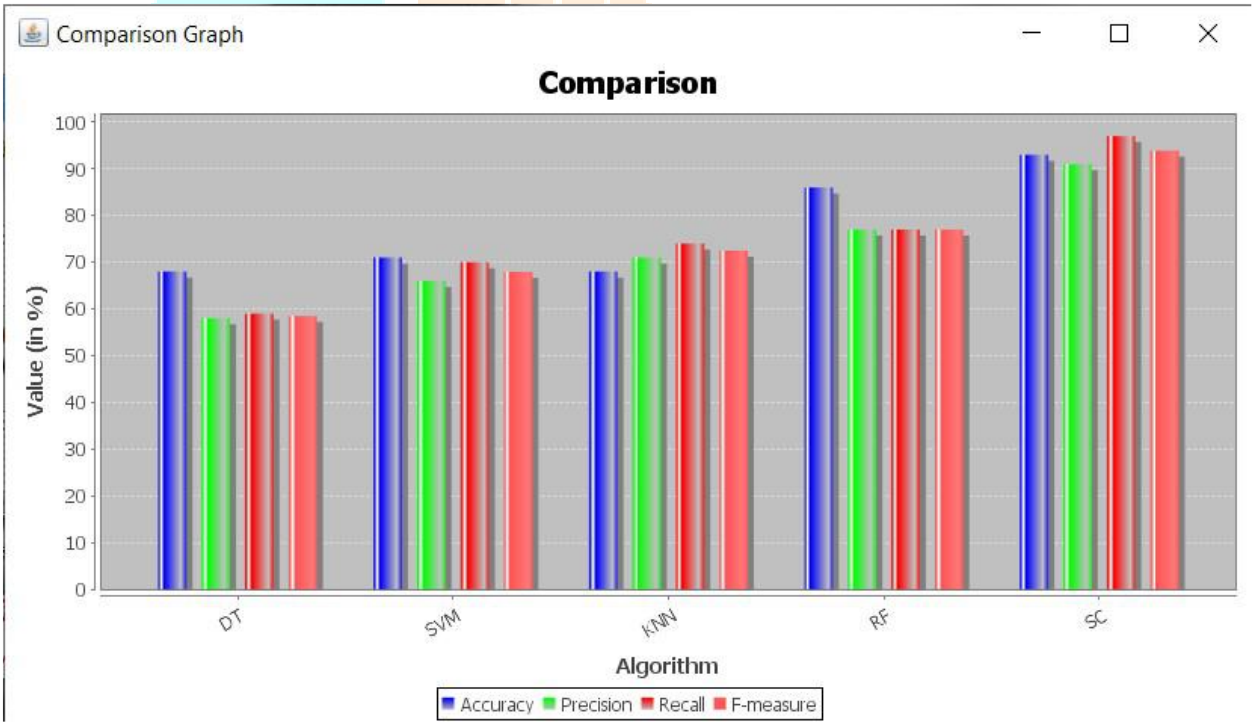
DT is a non-parametric supervised learning method that may be used for classification and regression; however, for this classification task, DT was applied to preset classes of features, and the f1 scores for all classes were determined. RF is an ensemble learning approach for classification, regression, and other tasks that works by training a large number of decision trees and then outputs the class that is the mode of the classes (classification) or mean prediction (regression) of the individual trees. KNN is a non-parametric, lazy learning algorithm that predicts the classification of a new sample point by using a database with data points divided into many classes.

SVM implementation is distinct from other machine learning algorithms in that it can handle several continuous and categorical variables. Stacking is an ensemble learning strategy that combines the best predictions from numerous classifiers to create a new training set for a meta-classifier.

4. RESULTS

The propose system is implemented in java and results are generate over accuracy, precision, recall, fmeaures.

Figure 2 shows the comparative analysis of all the algorithms.



From the above figure we can see that stacking classifier has achieved the highest accuracy

5. CONCLUSION

In conclusion, our research highlights the promising potential of machine learning algorithms in predicting childbirth modes and improving maternal and fetal health outcomes. Through the application of various machine learning algorithms and feature selection techniques, we have demonstrated their effectiveness in accurately predicting childbirth modes. The identified features, including maternal age, gestational age, previous cesarean delivery, maternal health indicators, fetal presentation, and obstetric history, have proven to be significant predictors in this context. These findings emphasize the importance of effective feature selection methods to enhance prediction accuracy by identifying the most influential features. Overall, machine learning algorithms offer a valuable approach to predicting childbirth modes and have the potential to positively impact decision-making, resource allocation, and birth planning strategies in healthcare settings. Further research and validation using larger and more diverse datasets will contribute to refining and improving the accuracy and applicability of these algorithms in predicting childbirth modes and optimizing maternal and fetal health

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