Int. J. Sci. R. Tech., 2025 2(3)
A Multidisciplinary peer-reviewed Journal
www.ijsrtjournal.com [ISSN: 2394-7063]

Original Article

Predicting Childbirth Modes: A Comparative Analysis of Machine Learning Algorithm

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ABSTRACT

The health of the mother and foetus, the course of labor, and the existence of any difficulties are some of the variables that might affect the complicated process of childbirth. A crucial job that can assist physicians in making better decisions regarding patient care is predicting whether a patient will give birth vaginally or by cesarean surgery. In order to evaluate and manage the risks to both the mother and the fetus, it is essential for maternal healthcare professionals to classify and anticipate childbirth. The development and comparison of several machine learning models for the categorization and prediction of delivery is the main goal of this work. The first step in the procedure is loading the information, which includes attributes like maternal education, height, weight, BMI, country of origin, age, and couple status. A comprehensive literature study is the first step in determining the importance of these characteristics and how they affect the outcomes of delivery. The dataset is refined using feature selection approaches, and then it is converted from categorical to numerical so that machine learning algorithms may use it. The training and testing datasets are then loaded for model construction and assessment. The usefulness of a number of classification techniques, such as decision trees, support vector machines, K-nearest neighbors, random forests, and stacking classifiers, in predicting childbirth is tested and compared. This work intends to improve maternal healthcare decision-making and outcomes by shedding light on the best machine learning technique for classifying and predicting delivery through testing and analysis.

Keywords: childbirth prediction, machine learning, mode of child birth, healthcare

INTRODUCTION

The use of machine learning algorithms in healthcare has grown significantly in recent years, providing creative solutions to challenging problems. Predicting the modes of delivery is one such crucial field of study, where identifying important characteristics is essential. In order to identify the most pertinent elements that lead to accurate forecasts of birthing outcomes, academics and practitioners are investigating a variety of machine learning algorithms as the healthcare sector continues to use the power of data. The desire to optimize resource allocation, improve maternity and newborn care, and eventually improve overall healthcare outcomes is what motivates this investigation. Given this, there is great potential for identifying trends and connections that might assist well-informed decisions in the delivery room through the combination of sophisticated computational methods and obstetric data. By exploring the field of machine learning, this study seeks to determine and assess the most significant characteristics that support precise delivery mode prediction, opening the door to more individualized and successful obstetric healthcare treatments. As machine learning continues to evolve, its role in predicting childbirth modes is expected to expand, offering innovative solutions that enhance maternal healthcare. This study aims to explore the effectiveness of various machine learning algorithms, compare their predictive capabilities, and highlight their potential for optimizing labor and delivery management. By addressing these aspects, the research contributes to the growing body of knowledge on intelligent healthcare solutions, paving the way for safer, more efficient, and patient-centered obstetric care. Furthermore, interdisciplinary collaboration between data scientists, obstetricians, and policymakers is crucial for refining machine learning models to align with real-world clinical applications. A combination of expert domain

Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

knowledge and computational advancements can help ensure that these models are robust, unbiased, and clinically relevant. Continuous research and validation through real-world patient data will be necessary to improve the reliability and effectiveness of predictive algorithms.

Childbirth Prediction

One of the most important areas of modern healthcare is the prediction of delivery outcomes, where the use of cutting-edge technologies has started to rethink conventional methods. The use of machine learning algorithms and predictive modeling has been a game-changer in obstetrics in recent years. A careful examination of the many variables that affect the health of both the mother and the newborn is necessary in the effort to predict the method of delivery. In order to make better decisions in the delivery room, researchers and medical professionals want to identify complex patterns in obstetric data by utilizing data analytics and computational tools. In addition to improving healthcare outcomes and allocating resources as efficiently as possible, the possibility of precisely predicting childbirth modes highlights the possibility of individualized and customized interventions, which would guarantee that every childbirth experience is as safe and ideal as possible. In order to negotiate the intricacies of obstetric settings and push the boundaries of predictive healthcare, this study explores the dynamic landscape of birthing prediction by utilizing machine learning skills. Recent advancements in artificial intelligence and big data analytics have further strengthened the ability of machine learning models to assess, classify, and predict childbirth modes with high accuracy. By integrating diverse datasets—including maternal health history, fetal monitoring data, and genetic predispositions—machine learning algorithms can offer precise predictions that assist obstetricians in making timely and well-informed decisions. These predictive models help in determining whether a vaginal delivery is feasible or if a cesarean section is necessary, minimizing complications and reducing both maternal and neonatal risks. The future of childbirth prediction lies in the seamless integration of artificial intelligence with obstetric care. By refining machine learning models through continuous training with diverse and representative datasets, the medical community can move closer to achieving highly accurate, personalized, and efficient maternal healthcare solutions. As research in this domain progresses, the development of standardized protocols and regulatory guidelines will be essential to ensure the safe and ethical deployment of predictive technologies in real-world clinical settings. Ultimately, leveraging machine learning for childbirth prediction has the potential to revolutionize maternal healthcare, reduce adverse outcomes, and provide expectant mothers with the safest possible delivery experience.

Mode of Childbirth

One of the most important aspects of maternal healthcare is the mode of delivery, which reflects the various methods a woman might give birth. This complex phenomenon includes a range of delivery techniques, such as cesarean procedures and vaginal deliveries, each of which has unique health effects on the mother and the newborn. Because it affects prenatal care, labor management, and postpartum recovery, it is essential for both expecting women and healthcare professionals to understand and anticipate the mode of birthing. The choice of the best mode is influenced by a number of complex factors, including obstetric history, fetal appearance, and mother health. Investigating predictive models and cutting-edge technology becomes crucial in the effort to guarantee the health of both mother and child. This research explores the various facets of delivery, exploring the complex interactions between medical, societal, and personal elements that influence this essential part of the reproduction process.

Machine Learning

As a subfield of artificial intelligence (AI), machine learning focuses on creating models and algorithms that let computers learn from data and make judgments or predictions without explicit programming. To put it another way, machine learning makes it possible for machines to learn from experience and get better at it, just like people do. Supervised learning, unsupervised learning, and reinforcement learning are only a few of the methods and algorithms used in machine learning. Training a computer program on a labeled dataset— where each data point is associated with a corresponding output or response—is known as supervised learning. In unsupervised learning, an algorithm is trained on an

unlabeled dataset and is required to find patterns and associations on its own. With reinforcement learning, an algorithm is trained by trial and error and is rewarded or penalized according to its behavior. Applications for machine learning are numerous and include fraud detection, recommendation systems, natural language processing, picture and audio recognition, and predictive analytics. Among other breakthroughs, it has enabled better financial modeling, more precise diagnosis, and the creation of self-driving cars, revolutionizing sectors including healthcare, banking, and transportation. The quality and volume of data that are accessible, together with the precision and efficacy of the algorithms and models employed, all affect how effectively machine learning models perform. It is anticipated that machine learning will become increasingly more potent and significant in the years to come as the quantity of data accessible keeps increasing and processing power keeps getting better. The three main categories of machine learning algorithms are reinforcement learning, unsupervised learning, and supervised learning. Training a computer program on a labeled dataset—where each data point is associated with a corresponding output or response—is known as supervised learning.

Healthcare

A dynamic and essential aspect of contemporary society, healthcare includes a wide range of services aimed at maintaining and enhancing the well-being of both individuals and communities. Healthcare is a complex ecosystem that combines medical knowledge, technology breakthroughs, and compassionate care. It is based on the concepts of prevention, diagnosis, treatment, and rehabilitation. It penetrates public health campaigns, research projects, and the ongoing quest for technologies to solve new health issues, going beyond the boundaries of hospitals and clinics. Healthcare is important not just because it treats illnesses but also because it is essential to creating a society in which people may live happy, healthy lives. The healthcare environment is constantly changing in an era marked by quick advances in medical research and a rising emphasis on patient-centered methods. The context for an examination of the complex and dynamic nature of healthcare is established by this introduction, which highlights the vital role that healthcare plays in determining the general well-being of both people and communities.

LITERATURE REVIEW

In this research, Nafiz Imtiaz Khan et al. have suggested Concerns have been raised by the rising number of cesarean sections performed worldwide because of the possible short- and long-term issues that may arise for mothers. Overuse of this surgical treatment has hazards, even if it can save lives in some situations including problems during childbirth. The goal of this project is to use data mining techniques to anticipate when a cesarean section will be necessary in order to solve this issue. This will eventually improve the safety of women and newborns by preventing needless surgery. Three ensemble prediction models based on the XGBoost, AdaBoost, and Cat boost algorithms were used in the study. According to the statistics, XGBoost had the greatest accuracy (88.91%), followed by AdaBoost (88.69%) and CatBoost (87.66%). These models present a viable method for anticipating the necessity of cesarean sections, enabling better decision-making in situations including delivery. Notably, the study pinpointed some key characteristics that greatly enhance the prediction models' accuracy. The most important criteria in properly forecasting the likelihood of a cesarean section were found to be amniotic fluid levels, medical reasons, fetal intrapartum pH, the number of prior cesarean sections, and pre-induction factors. The study offers important insights that might help medical practitioners make better judgments about birthing treatments by emphasizing these significant characteristics. By reducing needless cesarean sections, this strategy may lower related risks and enhance the general health of mothers and newborns. A safer and more individualized approach to birthing may be possible with more study and the application of these prediction models in clinical settings. Regarding limitations, just 11 characteristics were taken into consideration while creating the ML models, and only three ML techniques—which are barely sufficient—were employed. For improved prediction outcomes, further ensemble techniques and learning models based on Deep Neural Networks can be developed in the future utilizing a range and combination of data. Additionally, a customized mobile application that predicts the need for a

cesarean birth in real time can be developed. A woman may experience short-term, long-term, or serious health consequences as a result of an unnecessary cesarean delivery. Therefore, it is necessary to appropriately categorize cesarean and non-cesarean births based on the necessary characteristics. However, it is still unknown what characteristics are necessary to distinguish between a cesarean delivery and one that does not, as well as what criteria are applied to these qualities. Therefore, this study used three ensemble machine learning techniques, taking into account only eleven characteristics, to predict the style of delivery (cesarean and non-cesarean). The classifier models' results demonstrated the effectiveness of this investigation [1]. In this study, Mrs. B. Vijaya et al. have suggested A woman's immediate health and her bond with her infant in the long run are significantly impacted by how satisfied she is with her delivery experience. The method of infant birth is a crucial aspect of maternal and neonatal healthcare as it ensures the safety of both the mother and the child. For doctors, however, the intricacy of making decisions during childbirth— which is sometimes limited by time—presents serious difficulties. When choosing the best delivery method, human judgment can occasionally result in poor decisions that endanger the mother's life and perhaps impair the newborn's health. This study uses computer-aided models to address the need for more precise and effective decision-making in delivery situations, acknowledging the complexity and possible dangers involved. The study uses actual birthing data from the Tarail Upazilla Health Complex in Kishorganj, Bangladesh, and uses a supervised machine learning methodology, including 32 classifier algorithms and 11 training techniques. The quadratic discriminant analysis is the model that performs the best, according to a thorough investigation and comparison of the findings using a variety of statistical factors. The effectiveness of the quadratic discriminant analysis in identifying the best delivery mode is demonstrated by its remarkable accuracy of 0.979992 and F1 score of 0.979962. The hazards related to the health of mothers and infants might be considerably decreased by putting such a concept into practice. This model might improve maternal healthcare outcomes by offering a data-driven and evidence-based approach to decision-making during labor, so improving the general safety and well-being of both moms and babies. The incorporation of machine learning models into clinical practice may be made possible by more study and confirmation of these findings, which would transform the way decisions about birthing are made for the benefit of mother and infant health worldwide. We wish to ensure the safety of both the mother and the child during childbirth. The way the infant is delivered is crucial to its safety. The corresponding physician often selects between two delivery methods: (i) vaginal birth or (ii) cesarean section (C-section). Therefore, the patient is unable to participate in the decision-making process. Gynecologists advise trying a vaginal delivery when a patient is at least 37 weeks pregnant, has a kid in the head-down position, and has a low-risk pregnancy. In this instance, the mother often provides the child with vital gut microbes. Additionally, it can aid in the removal of fluid from a baby's lungs, lowering the likelihood of a respiratory issue. This method of delivery lowers the baby's chances of obesity and asthma while also facilitating nursing. Parents will also be spared the expense and possible danger of surgery. For this reason, a normal delivery is best for the mother's and the baby's health. However, in some situations, such as when the mother has diabetes, high blood pressure, HIV, active herpes, or twins, or when the baby is not in a head-down position, the patient is required to undergo a C-section [2]. In this work, ASWAN SUPRIYADI SUNGE et al. have suggested Every woman experience childbirth after becoming pregnant, which is a life-changing event that has a number of hazards, from problems during delivery to the possibility of both the mother's and the baby's deaths. Using Caesarean sections strategically is one way to reduce these risks. Nonetheless, access to pertinent medical information and much thought must go into the decision to conduct a Caesarean section. In this regard, the use of machine learning (ML) becomes an important instrument for determining whether pregnant women need a caesarean surgery. The dataset used in this investigation is made up of 32 characteristics from external data sources, with a total of 3602 occurrences. To determine if a Caesarean section is necessary, the study uses Decision Tree, Random Forest, and XGBoost models. By taking into account every aspect, the comparison analysis seeks to determine which model performs best overall. The study also investigates how well the models perform

when particular traits are chosen for examination. When all features are taken into account, the results show that Random Forest has the best accuracy (0.86). Nevertheless, XGBoost shows the maximum accuracy (0.85) when concentrating on specific factors like age, the number of days before the next pregnancy, and obesity. This sophisticated method emphasizes how crucial feature selection is to maximizing the predicted accuracy of machine learning models for Caesarean section prediction. Additionally, the study investigates the interpretability of the ML models using the SHAP (SHapley Additive explanations) model. According to this research, the two characteristics that contribute most to the prediction of the necessity for a Caesarean section are ICD10O82 (Contractions but without any reason) and ICD10O80 (Infection of the female reproductive organs). This realization not only makes the models more transparent, but it also gives decision- makers in the field of maternal healthcare useful information. In conclusion, there are encouraging outcomes when ML models are incorporated into the Caesarean section decision-making process. By utilizing predictive analytics, these models provide insights into the particular characteristics driving the choice in addition to improving forecast accuracy. The study emphasizes how machine learning (ML) might be a useful tool in helping medical personnel make well-informed decisions regarding delivery procedures, which would eventually improve the health of mothers and infants. The importance of ML in influencing the direction of obstetric care can be strengthened with more study and validation. As can be seen from the data selected from specific attributes, namely Accuracy, Recall, and F1 namely XGBoost, the highest Accuracy and Precision, namely Random Forest, and Recall and FI, namely XGBoost, are based on the overall data test results. The results of all tests, from the Confusion Matrix, are obtained from the three algorithm models, namely Random Forest. Finally, the second age has a balanced value of each characteristic in the test to see the interpretation with a very do-main SHAP, namely Duration_till_next_pregnancy. Nevertheless, there are still shortcomings in this study. Specifically, the dominating characteristic will vary from each feature of the data used, and the data used now may differ from the data used in the future with different and more diversified qualities, which in turn leads in predictions. Additionally, it is envisaged that the data will be able to be utilized as a clustering model and with other algorithms like CNN, RNN, SVM, K-NN, and others. Perhaps compare Interpretable to another model and determine which part of the presentation is the simplest to comprehend. Using a programming language, it is intended to create and construct a Caesarean prediction system or application that can be coupled with an IoT system to aid in the medical field for the protection of expectant women and their unborn children [3]. In this study, Md. Kowsher et al. have suggested Medical research makes extensive use of clever computational technology and machine learning. We have made the decision to have a baby easier by using this computer-aided technology. The doctor's choice will not be replaced by this automated conclusion; rather, it will assist the doctor in better understanding the facts and making a more persuasive scientific case for the decision. The entire computation was carried out in a computer-based programming environment as part of a research project. However, by creating a simple graphical user interface for this model, which can be used as a medical device, it is feasible to make this system accessible to physicians. In the future, we'll try to improve decision-making accuracy by taking into account additional historical data and characteristics to make the choice much more trustworthy. A larger dataset results in a larger training set, which improves accuracy. In order to select the top classifier for record-breaking performance and expand it to automatic analysis, we can also add more classifiers. We want to use this technique in the actual world to forecast what needs to be done following a baby's birth. We also have a plan in place to gather data for the entire nine months of pregnancy. The ultimate goal is to create a fully working graphical user interface that will allow both physicians and the average user to choose the method of birthing without having to comprehend machine learning classifiers. Machine learning techniques provide effective ways to extract useful information from data, and their use in a variety of domains, such as medical diagnosis, treatment, and prediction, has drawn a lot of interest. In the context of maternal healthcare, the overall objective of this project is to reduce maternal death rates by using machine learning to improve decision-making when choosing between a normal vaginal

delivery and a cesarean section. The goal of the study is to create a computer-aided decision system that can choose between the two most popular infant delivery methods—a vaginal birth and a C-section—by using supervised machine learning techniques. Information from 13,527 delivery patients from Bangladesh's Tarail Upazilla Health Complex made up the dataset used in this investigation. Nine machine learning classifier techniques have been used to the complete dataset in order to meet the study's goals. To choose the most accurate and successful model for forecasting the ideal delivery method, the performances of different algorithms are methodically compared. The project aims to develop data-driven and tailored approaches to maternal healthcare by utilizing machine learning in this context. The results of this study have the potential to lower maternal death rates and enhance the general health of mothers and infants by educating medical personnel about the best delivery method for specific patients. A level of depth is added to the study by comparing several machine learning algorithms, which enables a more nuanced understanding of how well each performs in the context of predicting births. In conclusion, one potential approach to enhancing maternal healthcare is the incorporation of machine learning methods into the choice of delivery mode decision-making. The study's thorough methodology, which includes a large dataset and several classifier algorithms, improves the findings' generalizability and dependability. The use of machine learning in healthcare contexts, including predicting births, has enormous potential to improve patient outcomes and expand medical procedures as it develops further [4]. In this study, Md. Kowsher et al. have suggested to safeguard the mother and the newborn child, the finest infant delivery techniques must be used. When making this choice in an automated manner, however, the optimal feature sets still need to be investigated. For this reason, we attempt to use AI to identify the most effective way to deliver babies. These days, medical decision-making heavily relies on computerized computation models such as deep learning and machine learning. Here, we have employed binary classification algorithms based on machine learning to choose between two delivery techniques. In a relatively short period of time, this model will help the doctor make a more precise judgment. The need for clinicians to make decisions will not be replaced by this machine learning-assisted choice. Rather, it will assist the doctor in better understanding the patient's information. Making decisions using this methodology is highly automated and less prone to mistakes. Our project's dataset is not very reliable. We intend to make our model considerably more broad in the future by adding a lot more observations to our dataset. We think that more data will result in less overfitting and higher accuracy. In addition, a more thorough learning-based categorization will be used to broaden the research and select the best option for performance that breaks records. We want to use this technique to anticipate more real-life biological aspects after delivery. Furthermore, the information can be gathered during the course of the mother's nine- month pregnancy. We want to provide doctors with a graphical user interface (GUI) of this model in the future, which they may use to make decisions much like a medical equipment. It is impossible to overestimate the importance of a woman's contentment with the birthing experience since it affects her health and her relationship with her newborn kid in both the short and long term. One crucial element that has a significant impact on the health of the newborn and the delivery patient is the method of baby delivery. Because of the time limits involved, doctors have a particularly difficult decision-making process when it comes to ensuring the safety of both mother and child during birthing. Errors in human decision-making when choosing the best delivery method might raise the mother's risk of death and perhaps endanger the health of the newborn child. This study promotes the incorporation of computer-aided decision-making as an efficient way to reduce these risks, acknowledging the intricacy of this decision-making process. The creation of a decision-making model based on supervised machine learning is a step in the right direction for identifying the best delivery method and, as a result, lowering related risks. A strong and thorough methodology is shown by the study's use of 32 supervised classifier algorithms and 11 training techniques on actual birthing data from the Tarail Upazilla Health Complex in Kishorganj, Bangladesh. With the maximum accuracy of 0.979992 and an F1 score of 0.979962, the quadratic discriminant analysis model is clearly better, as demonstrated by the study and comparison of results using a variety of statistical parameters. Using this model to determine the best labor mode has the potential to have a large impact

and greatly lower the risks to the health of both the mother and the unborn child. The quadratic discriminant analysis's excellent accuracy and precision highlight how well it works to support medical practitioners in making well-informed decisions during birthing. Last but not least, including supervised machine learning into the process of choosing a delivery method presents a viable way to enhance the health of both the mother and the baby. The use of real-world data and the study's methodical methodology improve the suggested model's applicability and dependability. Such models have the potential to transform obstetric procedures as machine learning advances, offering moms and newborns throughout the world safer and more individualized care. The use of these sophisticated decision-making tools in clinical contexts can be strengthened with more study and validation [5].

Related Work

The number of cesarean sections performed worldwide is rising at a startling rate. Depending on the circumstances of childbirth, a cesarean section may save the mother's life as well as the child's, but it may also cause various short- and long-term problems for the mother. In order to increase the safety of the mother and infant during and after childbirth by preventing unnecessary cesarean sections, the goal of this project is to use data mining to predict whether or not a cesarean section is necessary. Three distinct ensemble prediction models based on XGBoost, AdaBoost, and CatBoost were created in order to achieve the goal. This study also showed that the most important factors for correctly predicting the desired outcome are amniotic fluid, medical indication, fetal intrapartum phone number of prior cesarean sections, and pre-induction.

METHODOLOGY

By utilizing machine learning approaches, the proposed system seeks to create a strong framework for classifying and predicting births. A dataset with relevant characteristics, including age, couple status, height, weight, BMI, country of origin, and maternal education, is loaded into the system at the start. The importance of each variable in birthing outcomes is investigated through a thorough literature evaluation, which directs the feature selection and categorical to numerical conversion processes for better model compatibility. The training dataset is then prepared for model creation, while the testing dataset is prepared for assessment. The usefulness of many machine learning algorithms—such as decision trees, support vector machines, K-nearest neighbors, random forests, and stacking classifiers—in forecasting the outcomes of childbirth is tested and compared. With an accuracy of 95% and precision, recall, and F1 score above 90%, the Stacking Classifier (SC) was the clear winner.

Load Dataset

This module loads the system with a dataset that includes pertinent characteristics including age, marital status, height, weight, BMI, country of origin, and maternal education. The basis for further investigation and model building is this dataset.

Exploring the Features Via Literature Review

In order to investigate the importance of each aspect in delivery outcomes, this module entails undertaking an extensive literature research. This review sheds light on the ways in which each characteristic affects the dangers that both the mother and the fetus face during childbirth. After the review, the dataset is refined using feature selection techniques, and categorical characteristics are transformed into numerical values so that machine learning algorithms may use them.

Load Training Dataset

A subset of the loaded dataset, known as the training dataset, is ready for model training in this module. In order to train machine learning models on tasks involving the categorization and prediction of births, this dataset includes labeled samples.

Load Testing Dataset

In a similar manner, this module prepares the testing dataset—an additional subset of the imported dataset—for model assessment. This dataset is used to evaluate how well the trained models perform on unseen data and includes labeled instances that are distinct from the training dataset.

Decision Tree Based Classification and Prediction:

In this module, a classification method based on decision trees is implemented to forecast the results of childbirth. The feature space is recursively divided into smaller sections by decision trees, which use feature values to make binary judgments at each node.

Support VectorMachine Classification and Prediction

Here, the prediction of childbirth is done using a support vector machine (SVM) classification system. SVM seeks to maximize the margin between classes while identifying the hyperplane that optimally divides the data points into distinct classes.

Knn Classification and Prediction:

The K-nearest neighbors (KNN) technique is used in this module to classify and predict births. Based on the majority class of its closest neighbors in the feature space, KNN gives a data point a class label.

Random Forest Classification and Prediction

This module uses random forest classification to forecast childbirth. To increase overall prediction accuracy and resilience, Random Forest builds several decision trees and votes to merge their forecasts.

Stacking Classifier Classification And Prediction

Lastly, a stacking classifier is used to predict and classify births. In contrast to utilizing individual classifiers alone, stacking uses a meta-classifier to integrate predictions from many base classifiers, producing predictions that are more accurate and nuanced. trees, RF reduces overfitting and improves generalization. With an accuracy of 95% and precision, recall, and F1 score above 90%, the Stacking Classifier (SC) was the clear winner. SC showed strong predicting ability by utilizing the advantages of many methods.

Table 1. comparison table

algorithm	accuracy	precision	recall	f1 score
DT	57	61	58	59
SVM	64	68	70	68
KNN	65	72	74	72
RF	83	71	78	74
SC	95	97	93	94

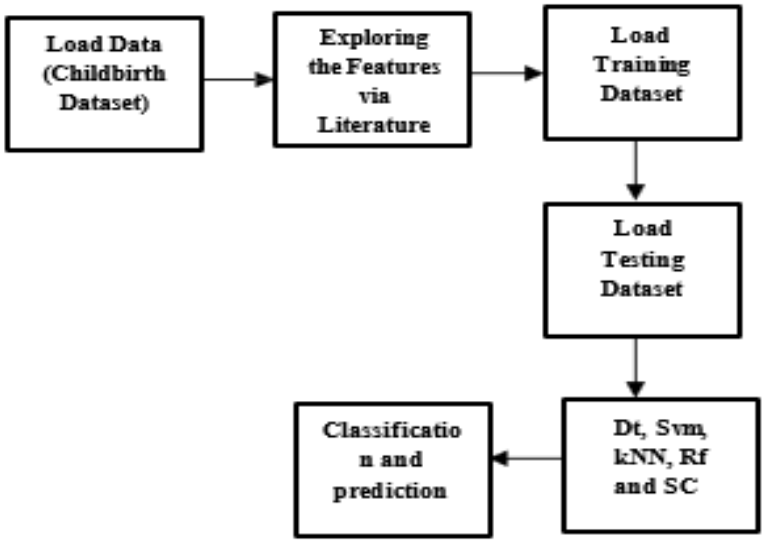


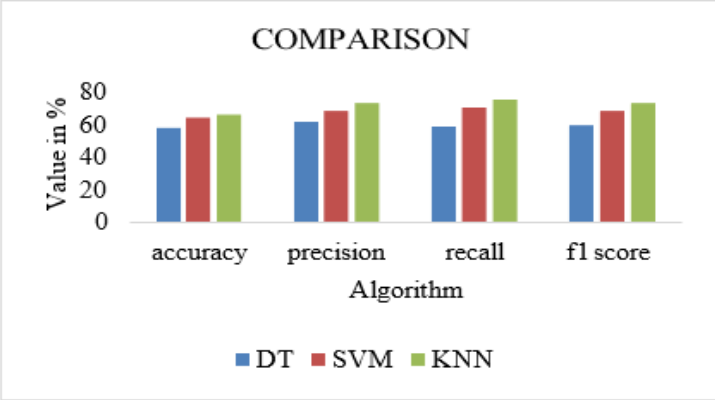
Figure 1. Block diagram

RESULT ANALYSIS

Different performance features are shown by analyzing the outcomes of different classification algorithms on the childbirth prediction job. With precision, recall, and F1 score around 60%, Decision Tree (DT) produced an accuracy of 57%, suggesting a modest level of predictive ability. Despite its ease of use and interpretability, DTs may have trouble with complicated datasets because of their propensity for overfitting. With an accuracy of 64% and precision, recall, and F1 score measures in the 68–70% range,

Support Vector Machine (SVM) demonstrated better performance. Although SVMs aim to identify the best hyperplane for class separation, kernel selection and parameter adjustment significantly affect how effective they are. With an accuracy of 65% and precision, recall, and F1 score values of almost 70%, K-Nearest Neighbors (KNN) showed encouraging results. However, KNN's performance could be impacted by its choice of distance measure and dependence on local similarity. With a precision, recall, and F1 score metrics close to 70–80% and an accuracy of 83%, Random Forest (RF) fared better than other algorithms. By combining many decision

Table 1. comparison graph



CONCLUSION

In summary, the framework for classifying and predicting delivery that has been built shows how machine learning may improve the way that mothers make healthcare decisions. The technology delivers prediction capabilities for healthcare practitioners and offers insights into factors impacting birthing outcomes through thorough feature study and assessment of several categorization algorithms. The system helps to reduce maternal and fetal risks during childbirth by utilizing data-driven methods, which eventually improves maternal healthcare outcomes.

Future Work

A bigger and more varied dataset of expectant mothers will be gathered in subsequent research. This might increase the system's accuracy and generalizability by enabling it to be trained on a larger variety of data. Future research will also focus on creating strategies to make the system's predictions easier to understand. In addition to giving patients more confidence in the system's predictions, this would assist physicians comprehend why the system produces the predictions that it does.

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HOW TO CITE: Vizhiyarasi S., Matheswari S.*, Meaga J., Nishani S., Predicting Childbirth Modes: A Comparative Analysis of Machine Learning Algorithm, Int. J. Sci. R. Tech., 2025, 2 (3), 440-449. https://doi.org/10.5281/zenodo.15078387