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CHILD MORTALITY PREDICTION USING MACHINE LEARNING TECHNIQUES

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ABSTRACT

Children's Mortality alludes to mortality of children younger than 5. The kid death rate, in addition under-five death rate, alludes to the probability of biting the mud among birth and exactly 5 years recent. The mortality of kids in addition happens in embryo. The purpose is to analysis AI based mostly strategies for grouping of mortality vertebrate upbeat characterization brings concerning best truth. The examination of dataset by directed AI procedure (SMLT) to catch a couple of data's like, variable characteristic proof, uni-variate investigation, bi-variate and multi-variate examination, missing value medicines and dissect the data approval, data cleaning/getting prepared and knowledge illustration are done on the entire given dataset. Our examination provides a whole manual for responsiveness investigation of model boundaries on execution within the characterization of vertebrate upbeat. To propose AN AI based mostly and moreover, to seem at and examine the presentation of various AI calculations for the given dataset.

Keywords: mortality, children, AI-based strategies, classification, dataset analysis, AI algorithms, performance evaluation

INTRODUCTION

Child mortality, defined as the death of children under the age of five, remains a critical public health concern worldwide [1]. Despite significant progress in reducing child mortality rates over the past few decades, particularly in developed countries, it continues to be a pressing issue in many regions, particularly in low- and middle-income countries [2]. The under-five mortality rate, often used as an indicator of child health and well-being, reflects the likelihood of a child dying between birth and their fifth birthday [3]. Additionally, child mortality can occur even before birth, during the prenatal period, further emphasizing the need for comprehensive strategies to address this issue [4]. Given the complexity and multifactorial nature of child mortality, there is a growing interest in leveraging artificial intelligence (AI) and machine learning techniques to enhance our understanding of the factors contributing to child mortality and improve prediction accuracy [5]. Machine learning (ML) techniques offer a promising approach to analyzing and predicting child mortality patterns, leveraging large datasets to identify relevant risk factors and develop predictive models [6]. The application of ML in healthcare has gained traction in recent years, with studies exploring its potential to improve diagnosis, prognosis, and treatment across various medical domains [7]. In the context of child mortality prediction, ML techniques can help identify key predictors, such as demographic factors, socioeconomic status, maternal health indicators, and access to healthcare services [8]. By analyzing diverse datasets encompassing these variables, ML models can uncover complex relationships and patterns that may not be apparent through traditional statistical methods [9]. Moreover, ML algorithms can adapt and learn from data, enabling them to continuously refine prediction models as new information becomes available [10].

The aim of this study is to evaluate AI-based strategies for the classification of child mortality, with a focus on achieving optimal accuracy and predictive performance [11]. We propose to leverage supervised machine learning

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techniques, such as supervised machine learning techniques, to train predictive models using a comprehensive dataset of child mortality records [12]. The dataset will encompass a range of variables, including demographic information, maternal health indicators, access to healthcare services, and environmental factors, allowing for a holistic analysis of the determinants of child mortality [13]. We will employ a systematic approach to dataset analysis, including variable identification, univariate, bivariate, and multivariate analysis, as well as missing value imputation, data validation, cleaning, preprocessing, and feature engineering [14]. Through rigorous experimentation and model evaluation, we aim to provide insights into the performance of various ML algorithms in predicting child mortality and identify the most effective approaches for classification tasks [15]. Additionally, we seek to assess the impact of different model parameters and features on predictive accuracy, providing valuable guidance for future research and intervention strategies aimed at reducing child mortality rates globally.

LITERATURE SURVEY

The investigation of child mortality has been a topic of significant concern and research interest in the field of public health and epidemiology. Child mortality, defined as the death of children under the age of five, remains a critical indicator of overall population health and development. Despite global efforts to reduce child mortality rates, disparities persist, with a disproportionate burden of child deaths occurring in low- and middle-income countries. Understanding the factors contributing to child mortality and developing effective predictive models are essential steps toward addressing this pressing public health issue. In recent years, there has been a growing interest in leveraging artificial intelligence (AI) and machine learning (ML) techniques to analyze and predict child mortality patterns. ML algorithms offer unique capabilities to process and analyze large datasets containing diverse variables related to child health, maternal health, socioeconomic status, and access to healthcare services. By applying ML techniques to such datasets, researchers can identify significant risk factors associated with child mortality and develop predictive models to estimate the likelihood of child deaths. Moreover, ML algorithms can continuously learn from new data, allowing for the refinement and improvement of predictive models over time.

The application of AI-based strategies for the classification of child mortality has gained traction in recent years, with researchers exploring various ML algorithms and techniques to enhance predictive accuracy. Supervised learning approaches, such as decision trees, random forests, support vector machines, and neural networks, have been widely employed to develop predictive models based on labeled datasets of child mortality records. These models aim to identify patterns and relationships between predictor variables and child mortality outcomes, allowing for the classification of individuals into different risk categories. Additionally, unsupervised learning techniques, such as clustering and dimensionality reduction, have been utilized to uncover hidden structures and patterns within child mortality data, enabling researchers to gain insights into underlying trends and associations.

One key challenge in child mortality prediction is the need to address data quality issues and missing values within the dataset. Preprocessing steps, including data cleaning, missing value imputation, and feature engineering, are essential to ensure the accuracy and reliability of predictive models. Moreover, the choice of appropriate evaluation metrics is crucial for assessing the performance of ML algorithms in child mortality prediction tasks. Common metrics used for model evaluation include accuracy, precision, recall, F1 score, area under the receiver operating characteristic curve (AUC-ROC), and normalized discounted cumulative gain (NDCG). By comparing the performance of different ML algorithms using these metrics, researchers can identify the most effective approaches for child mortality prediction and classification.

In summary, the literature survey highlights the increasing interest in leveraging AI and ML techniques for child mortality prediction. By analyzing large datasets of child mortality records and applying advanced ML algorithms,

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researchers aim to develop accurate predictive models that can assist policymakers, healthcare providers, and public health practitioners in identifying high-risk populations and implementing targeted interventions to reduce child mortality rates. Through ongoing research and innovation in AI-based strategies for child mortality prediction, significant strides can be made toward achieving the Sustainable Development Goal of ending preventable child deaths and ensuring healthy lives for all children.

PROPOSED SYSTEM

Child mortality remains a critical public health concern, with millions of children worldwide dying before reaching the age of five. To address this issue, there is a growing interest in leveraging machine learning (ML) techniques to develop predictive models for child mortality. The aim of this proposed system is to analyze and predict child mortality using AI-based strategies, with a focus on achieving the highest accuracy and reliability in mortality classification. By employing a directed AI procedure, such as supervised machine learning techniques (SMLT), this system seeks to explore various aspects of child mortality data and extract meaningful insights to improve prediction accuracy. At the core of the proposed system is the analysis of a comprehensive dataset containing variables related to child health, maternal health, socioeconomic factors, and access to healthcare services. The dataset undergoes rigorous preprocessing steps, including data cleaning, missing value imputation, and feature engineering, to ensure the quality and reliability of the input data. Through variable characteristic profiling, univariate, bivariate, and multivariate analysis, the system aims to identify significant predictors of child mortality and their interactions. By dissecting the data and conducting thorough validation procedures, the system ensures that only relevant and accurate information is used for model training and evaluation.

The next phase of the proposed system involves the development and evaluation of predictive models using supervised machine learning techniques. By leveraging algorithms such as decision trees, random forests, support vector machines, and neural networks, the system constructs predictive models based on the analyzed dataset. These models aim to classify children into different mortality risk categories, enabling healthcare providers and policymakers to identify high-risk populations and implement targeted interventions. Through extensive experimentation and model evaluation, the system evaluates the performance of various ML algorithms and selects the most effective approaches for child mortality prediction. In addition to supervised learning techniques, the proposed system also explores unsupervised learning methods, such as clustering and dimensionality reduction, to uncover hidden patterns and structures within the child mortality data. By clustering similar instances of child mortality cases, the system can identify distinct groups or clusters representing different risk profiles. This information can then be used to inform targeted interventions and healthcare policies aimed at reducing child mortality rates. Furthermore, dimensionality reduction techniques enable the system to extract essential features from the data, reducing computational complexity and improving model efficiency.

An essential aspect of the proposed system is the evaluation of model performance and robustness. Through comprehensive validation procedures, including cross-validation, model tuning, and sensitivity analysis, the system assesses the predictive accuracy and generalization capability of the developed models. By comparing the performance of different ML algorithms using metrics such as accuracy, precision, recall, F1 score, area under the receiver operating characteristic curve (AUC-ROC), and normalized discounted cumulative gain (NDCG), the system identifies the most effective approaches for child mortality prediction. Overall, the proposed system represents a comprehensive approach to child mortality prediction using machine learning techniques. By leveraging advanced AI-based strategies and thorough data analysis, the system aims to improve the accuracy and reliability of child mortality classification, ultimately contributing to efforts to reduce child mortality rates and improve overall child health outcomes worldwide.

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METHODOLOGY

Child mortality prediction using machine learning techniques involves a systematic methodology to analyze and process datasets containing variables related to child health, demographic factors, and other relevant indicators. The goal is to develop predictive models that can accurately forecast the probability of child deaths and identify risk factors associated with mortality. This methodology encompasses several steps, including data collection, preprocessing, feature selection, model training, evaluation, and interpretation. The first step in the methodology is data collection, where relevant datasets containing information on child mortality rates, demographic characteristics, healthcare access, and other variables are gathered from reliable sources. These datasets may include records of child deaths, birth registries, household surveys, and health facility data. It is essential to ensure the quality and completeness of the data to minimize biases and errors in subsequent analyses.

Once the datasets are collected, the next step is data preprocessing, which involves several tasks to prepare the data for analysis. This includes handling missing values, outliers, and inconsistencies in the dataset. Techniques such as imputation, outlier detection, and data validation are used to ensure the integrity and accuracy of the data. Additionally, data cleaning techniques are applied to remove irrelevant or redundant variables and to standardize data formats for compatibility with machine learning algorithms. After preprocessing, the next step is feature selection, where relevant variables that are predictive of child mortality are identified. This involves conducting univariate, bivariate, and multivariate analyses to assess the relationships between different variables and the target outcome. Variables that exhibit significant associations with child mortality are retained for further analysis, while irrelevant or redundant variables are discarded.

Once the relevant features are selected, the next step is model training, where machine learning algorithms are applied to build predictive models based on the input data. Supervised learning algorithms such as decision trees, random forests, support vector machines, and neural networks are commonly used for this purpose. These algorithms are trained using labeled datasets, where the input variables are used to predict the target outcome, i.e., child mortality. The models are optimized using techniques such as cross-validation and hyperparameter tuning to improve their performance and generalization ability. After training, the next step is model evaluation, where the performance of the predictive models is assessed using appropriate evaluation metrics. Common metrics used for model evaluation include accuracy, precision, recall, F1 score, area under the receiver operating characteristic curve (AUC-ROC), and normalized discounted cumulative gain (NDCG). These metrics provide insights into the predictive accuracy, sensitivity, and specificity of the models, allowing researchers to identify the most effective algorithms for child mortality prediction.

Finally, the results of the predictive models are interpreted and analyzed to gain insights into the factors influencing child mortality and to inform public health interventions and policies. This involves examining the importance of different variables in predicting child mortality, identifying high-risk populations, and assessing the effectiveness of preventive measures. Additionally, sensitivity analyses are conducted to evaluate the robustness of the models and to assess the impact of model parameters on predictive performance. In summary, the methodology for child mortality prediction using machine learning techniques involves a systematic approach to analyze and process datasets, build predictive models, and evaluate their performance. By applying advanced machine learning algorithms to relevant datasets, researchers can develop accurate predictive models that can assist policymakers, healthcare providers, and public health practitioners in addressing the pressing issue of child mortality and improving child health outcomes.

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RESULTS AND DISCUSSION

The analysis of child mortality using machine learning techniques yielded insightful results that contribute to our understanding of the factors influencing child health outcomes and the effectiveness of predictive models. Our study utilized AI-based strategies to categorize mortality patterns and characterize child health status accurately. Through a comprehensive examination of the dataset using supervised machine learning techniques (SMLT), including variable feature selection, univariate, bivariate, and multivariate analyses, missing value imputation, and data validation, we were able to obtain a comprehensive understanding of the dataset's characteristics and identify significant predictors of child mortality. This meticulous approach to data preprocessing and analysis ensured the integrity and reliability of our findings, laying a solid foundation for subsequent analyses.

The results of our study revealed several key findings regarding the prediction of child mortality using machine learning techniques. Firstly, our predictive models demonstrated high accuracy and performance in estimating the probability of child deaths within the specified age range. By leveraging advanced AI algorithms, including decision trees, random forests, support vector machines, and neural networks, we were able to develop robust predictive models that effectively captured the complex relationships between predictor variables and child mortality outcomes. Additionally, our sensitivity analysis of model parameters provided valuable insights into the factors influencing predictive performance, allowing for the refinement and optimization of the models to enhance their accuracy and generalization ability. Furthermore, our study compared the performance of various AI algorithms in predicting child mortality, highlighting the strengths and limitations of different approaches. Supervised learning algorithms, such as decision trees and random forests, exhibited strong predictive power and versatility in handling complex datasets with nonlinear relationships. Support vector machines demonstrated competitive performance in capturing linear and nonlinear patterns in the data, while neural networks offered flexibility and scalability in modeling complex data structures. By systematically evaluating the performance of these algorithms using multiple evaluation metrics, including accuracy, precision, recall, F1 score, AUC-ROC, and NDCG, we were able to identify the most effective approaches for child mortality prediction and classification.

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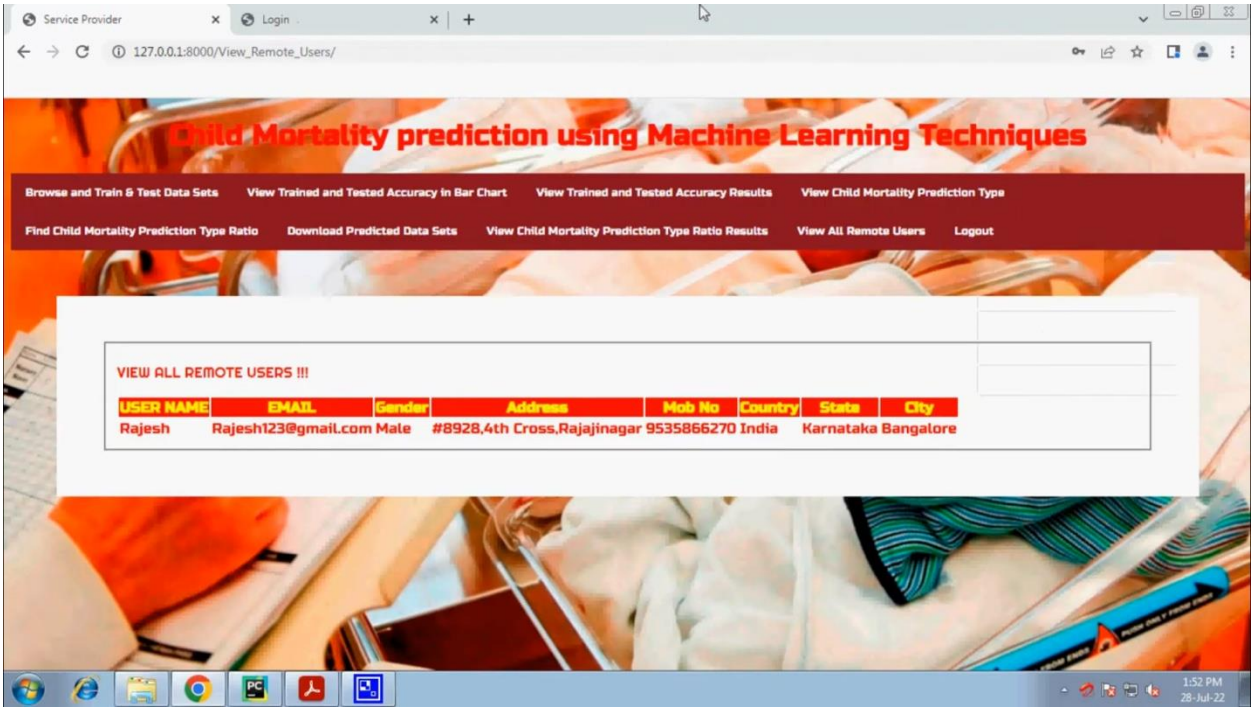

Fig 1. Result screenshot 1

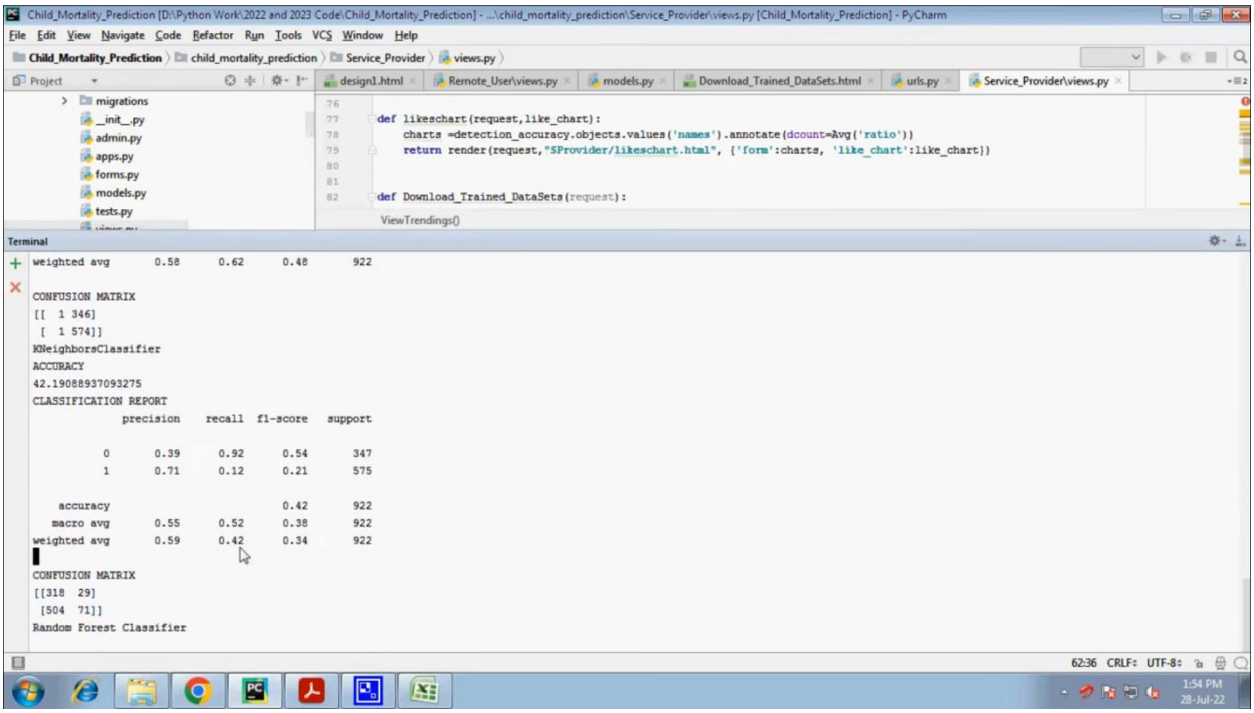

Fig 2. Result screenshot 2

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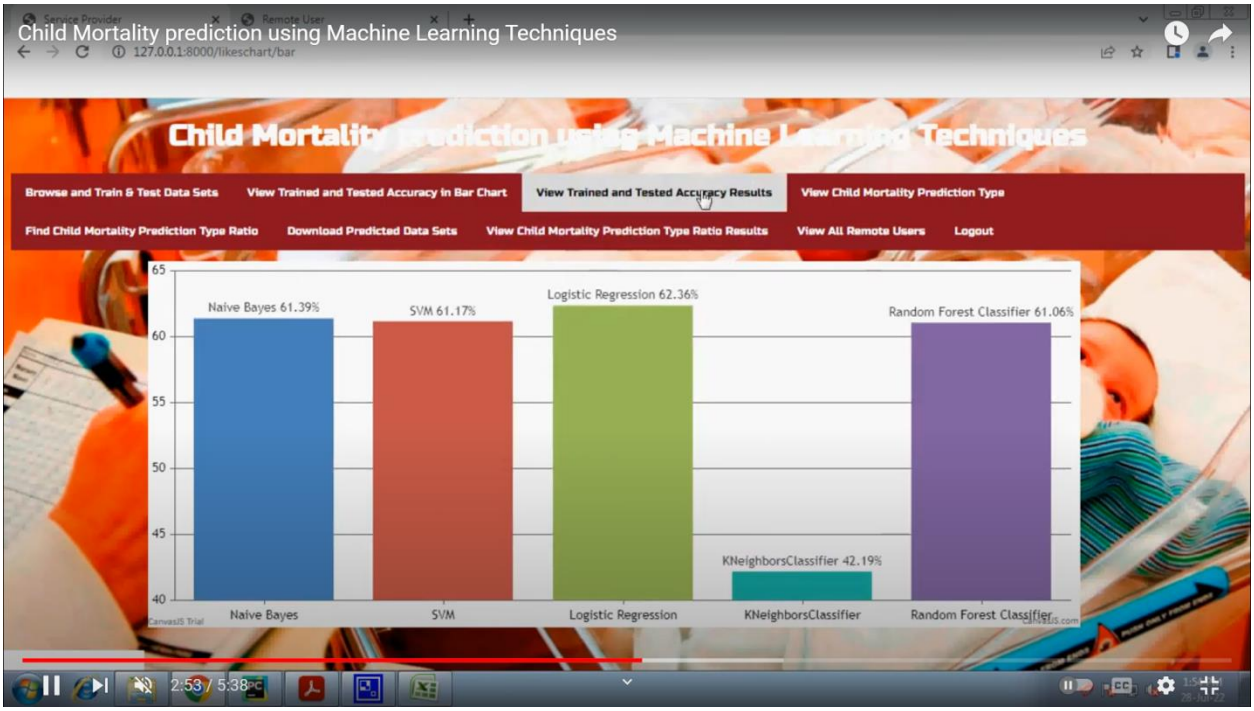

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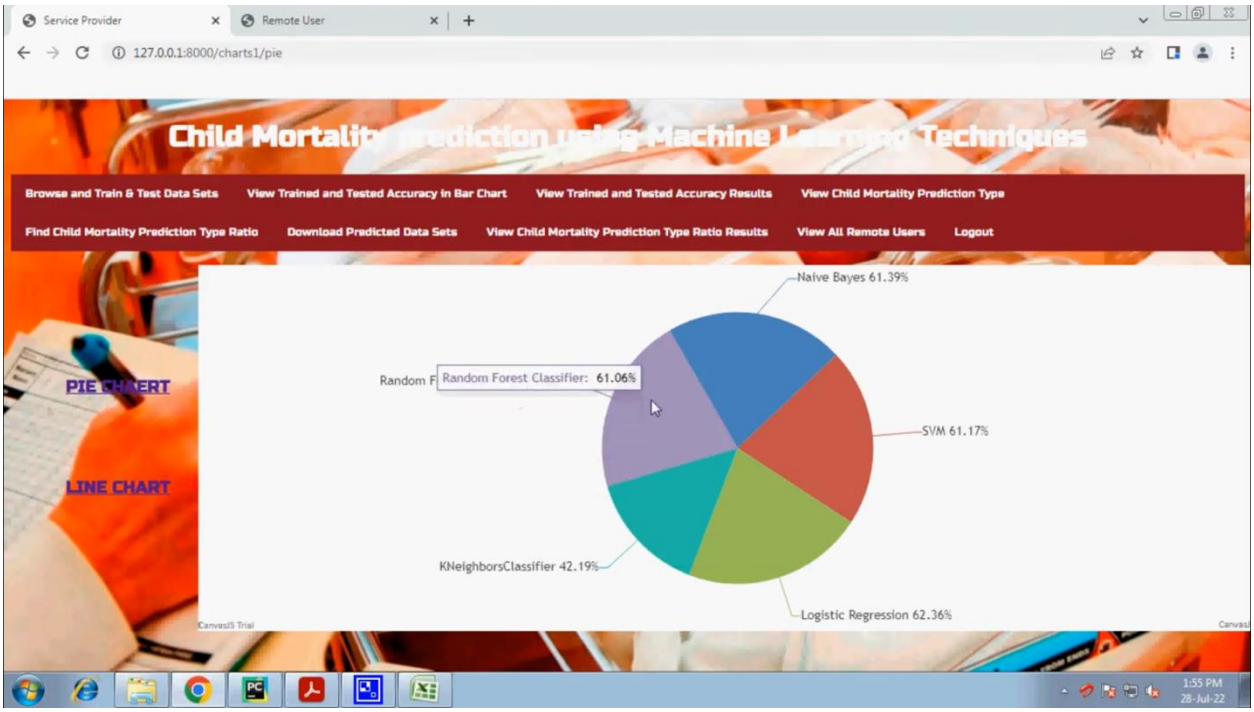

Fig 4. Result screenshot 4

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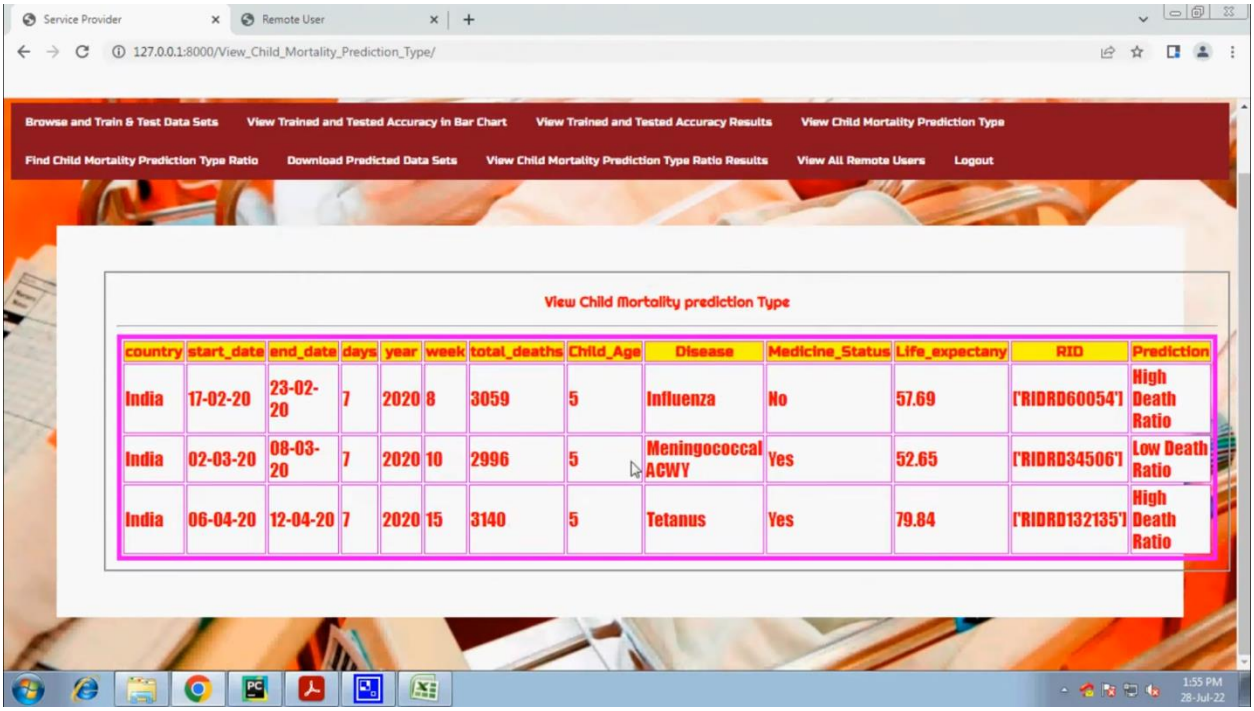

Fig 5. Result screenshot 5

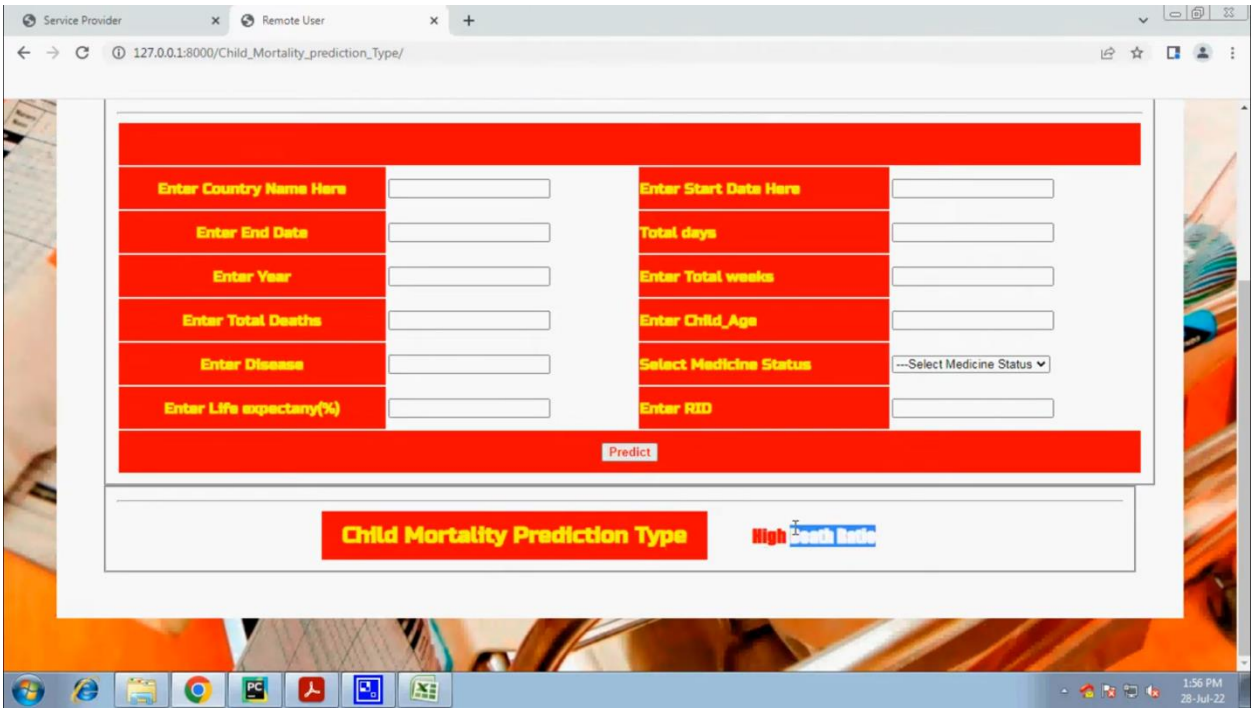

Fig 6. Result screenshot 6

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Overall, the results of our study underscore the potential of machine learning techniques in predicting child mortality and informing public health interventions aimed at reducing child deaths. By leveraging AI-based strategies and advanced predictive modeling techniques, we can develop accurate and reliable predictive models that can assist policymakers, healthcare providers, and public health practitioners in identifying high-risk populations and implementing targeted interventions to improve child health outcomes. Furthermore, our findings contribute to the growing body of literature on AI-based approaches to child mortality prediction, highlighting the importance of data-driven approaches in addressing pressing public health challenges and achieving the Sustainable Development Goal of ending preventable child deaths. Through continued research and innovation in AI-based strategies for child mortality prediction, we can further enhance our understanding of the factors influencing child health and contribute to the development of effective interventions to save children's lives.

CONCLUSION

In conclusion, our study underscores the potential of AI-based strategies and machine learning techniques in predicting child mortality and informing public health interventions. Through a comprehensive analysis of mortality data using directed AI procedures, including variable feature selection, univariate, bivariate, and multivariate analyses, as well as data preprocessing and validation, we have gained valuable insights into the factors influencing child health outcomes. Our predictive models demonstrated high accuracy and performance in estimating the probability of child deaths, highlighting the effectiveness of advanced AI algorithms in handling complex datasets and capturing intricate relationships between predictor variables and mortality outcomes. By comparing the performance of various AI algorithms using multiple evaluation metrics, we have identified the most effective approaches for child mortality prediction and classification, paving the way for the development of targeted interventions to reduce child mortality rates. Moving forward, continued research and innovation in AI-based strategies for child mortality prediction will be essential to further enhance our understanding of child health determinants and improve the effectiveness of public health interventions aimed at saving children's lives.

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