**Abstract-**

Worldwide, maternal health during pregnancy is a major concern, especially in rural areas where risks are increased by a lack of medical experts and poor infrastructure. The lack of effective methods for predicting maternal health risks poses a significant challenge in maternal healthcare. Traditional approaches often fall short in accurately identifying and managing complications during pregnancy, leading to adverse outcomes. To close this gap, new methods must be developed that can reliably analyse medical data to predict risks to maternal health. This research focuses on investigating the utility of machine learning algorithms in predicting maternal health risks based on various medical parameters. The objective of this research is to increase the efficiency and accuracy of maternal risk prediction by analysing and comparing various machine learning algorithms. These algorithms are chosen for their ability to handle complex datasets and make accurate predictions based on maternal health parameters. By comparing the performance of these algorithms, this paper aims to identify the most effective approach for predicting maternal health risks. To train and test the predictive models, a carefully curated dataset consisting of medical parameters relevant to maternal health has been considered. This dataset is pre-processed using advanced data cleaning and feature engineering techniques to ensure the quality and reliability of the input data. With the use of this extensive dataset, this research aims to find the most effective predictive model capable of accurately identifying maternal health risks, thereby reducing adverse outcomes during pregnancy and facilitating timely interventions when needed.

**Intro-**

Pregnancy, a transformative phase in a woman's life, is often accompanied by a myriad of physiological changes and potential health risks. According to recent statistics, globally, approximately 295,000 women died due to pregnancy-related complications in 2017, with a significant portion of these deaths being preventable [1]. The World Health Organization estimates that 810 women die every day from pregnancy- and childbirth-related preventable causes, with low- and middle-income countries accounting for 94% of these deaths. Teenagers and young adults under the age of twenty-one are particularly at risk [2]. Recognising the critical need for proactive management of maternal health, predictive modelling emerges as a promising approach to anticipate and mitigate pregnancy risks.

Individuals encounter considerable difficulties and incur preventable outcomes in the absence of risk prediction pregnancy models. When these models are lacking, possible problems are not recognized early enough, which causes medical intervention to be insufficient or delayed [3]. This delay can exacerbate health issues for both the mother and the fetus, leading to adverse outcomes such as preterm birth, preeclampsia, and gestational diabetes [4]. Moreover, without predictive models, healthcare resources may not be allocated optimally, leading to inefficiencies and disparities in healthcare access [5]. Overall, the lack of risk prediction pregnancy models raises the rates of maternal death while also causing unnecessary pain and health issues for expectant mothers around the globe.

This research explores several cutting-edge machine learning techniques, including Random Forest with hyperparameter optimization, XGBoost, Support Vector Classification (SVC), Decision Tree, and Logistic Multiclass models. The primary objective of this study is :

1. To determine the most accurate and reliable Machine Learning methodology for predicting pregnancy risks, via rigorous comparison and analysis.
2. The evaluation of multiple parameters, such as age, blood glucose levels, heart rate, risk level, systolic and diastolic blood pressure, and heart rate, in order to carry out a thorough comparison.

By integrating various variables into our predictive models, we aim to enhance the precision and sensitivity of risk assessment during pregnancy, thus enabling timely intervention and personalized care.

This paper's Section 2 compares the machine learning techniques and methodology employed here with those in previous works. The logical process for assessing the data gathered is presented in Section 3; the results are then given and discussed in Section 4; followed by discussion in Section 5; and lastly, recommendations and conclusions are presented in Section 6.

Sources-

[1] Maternal mortality – WHO

[2] World Health Organization. Maternal Mortality. Available online: https://www.who.int/en/news-room/fact-sheets/detail/ maternal-mortality

[3] A Semi-Supervised Machine Learning Approach in Predicting High-Risk Pregnancies in the Philippine

[4] Improving preeclampsia risk prediction by modeling pregnancy trajectories from routinely collected electronic medical record data- <https://www.nature.com/articles/s41746-022-00612-x>

[5]https://www.publichealth.columbia.edu/research/population-health-methods/risk-prediction