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A Novel Approach Low Birth Weight Prediction Using Machine Learning Techniques

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ABSTRACT

In new-born babies, low birth weight (LBW) serves as a sign of illness. Infant mortality and a number of other health problems later in life are both strongly correlated with LBW. Numerous studies have found a significant link between maternal health during pregnancy and birth weight. This manuscript makes use of machine learning approaches to gather pertinent data from pregnancy-related health indicators for the early identification of prospective LBW cases. In order to use supervised machine learning for LBW detection as a binary machine classification problem, the forecasting problem has been framed as a classification problem between the LBW and NOT-LBW classes. The proposed model, as expected, had improved accuracy. To create decision criteria that may be applied to predictive health care in smart cities, Indian health care data was utilised. A screening tool based on the decision model is developed to assist health care professionals in Obstetrics and Gynecology (OBG).

Keywords - Low Birth weight (LBW), Smart health informatics, Predictive analytics, Machine Learning (ML).

I. INTRODUCTION

World Health Organization Maternal Health and Safe Motherhood Programme-1992, Low Birth Weight. It is expected to rise at the rate of 12% every year. Nearly 39% of power is used for cooling 45% for running the Information Technology (IT), infrastructure and 13% for lights. This level of consumption costs heavily to the businesses. LBW and prematurity remain a serious public health burden worldwide. Neonatal deaths account for a major fraction of deaths of children under the age of five, globally Children with LBW are at significantly higher risks of early childhood morbidity and mortality when compared with their counterparts with normal birth weights.

Low birth weight is the term used to refer to babies born with a weight less than 2500gm Low birth weight (LBW) has been identified as a major public health problem around the world. LBW includes both pre-term babies as well as fully grown babies who are very small in size as a consequence of intra uterine

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growth retardation. Birth weight is closely associated with neonatal and infant mortality, mortality rates being significantly higher in LBW babies when compared to the normal birth weight (NBW) babies. This phenomenon is now of global concern in the view of serious short term and long-term problems such as development disorders, neurosensory outcomes, health outcomes including Type 2 diabetes, cerebral stroke, hypertension and various other disorders that LBW babies are prone to. Studies in 2013 showed that out of the 22 million new-borns about 16 percent were low birth weight cases globally. This is a major problem in developing countries, especially in India which contributes to about 30 percent of the global LBW cases.

Innumerable studies around the world indicate strong between maternal health and impact on birth weight of babies. Popular assumptions claim that LBW can be considerably reduced, with dedicated medical care during pregnancy. In our approach, the risk factors in pregnant women that can be easily assessed with basic methods are carefully examined throughout the gestation period and form the basis for predictions. Early detection can help in preventing the chances of LBW and also to put forward some recommendations under some intervention mechanisms.

II. RELATED WORKS

[1]. Kramer MS. Determinants of low birth weight: methodological assessment and meta-analysis. Bull World Health Organ. 1987; 65(5):663-737. PMID: 3322602; PMCID: PMC2491072.

The existence and magnitude of a causal effect on birth weight, gestational age, and prematurity and intrauterine growth retardation were determined by a set of methodological standards. In developed countries, the most important factor was cigarette smoking, followed by nutrition and pre-pregnancy weight. In developing countries the major determinants were racial origin, nutrition, low pre-pregnancy weight, short maternal stature, and malaria. Pre-pregnancy weight, prior premature birth or miscarriage, diethylstilbestrol exposure and smoking were major determinants of gestational duration, but the majority of prematurity was unexplained in both developed and developing countries.

[2]. Vega J, Sáez G, Smith M, Agurto M, Morris NM. Factores de riesgo para bajo peso al nacer y retardo de crecimiento intrauterino en Santiago de Chile [Risk factors for low birth weight and intrauterine growth retardation in Santiago, Chile]. Rev Med Chil. 1993 Oct; 121(10):1210-9. Spanish. PMID: 8191127.

An epidemiologic case-control study to ascertain the determinants of low birth weight was carried out in Santiago, Chile, from January to December 1989. The cases were defined as live births < 2500 g. The controls were live births > or = 2500 g of birth weight. All cases and a random sample (1:1) of controls were selected among 8,254 singleton births occurring at the El Salvador Hospital in the Eastern area of Santiago. These deliveries represented 50% of institutional deliveries in the area. Home deliveries (2%) and private hospital deliveries were not included in the study. Information was obtained from hospital medical records by six trained medical students. Some information could not be obtained from the hospital medical records. Thus the second step in data collection was the tracking of all the selected subjects to their referring neighbourhood health centres.

[3]. Mavalankar DV, Trivedi CC, Gray RH. Maternal weight, height and risk of poor pregnancy outcome in Ahmedabad, India. Indian Pediatr. 1994 Oct; 31(10):1205-12. PMID: 7875780.

This paper explores the relationships between maternal weight, height and poor pregnancy outcome using a data set from a case-control study of low birth weight (LBW) and perinatal mortality in Ahmedabad, India. Maternal height and weights were compared between mothers of 611 perinatal deaths, 644 preterm-LBW, and 1465 normal birth weight controls as well as 617 small-for-gestational age (SGA) and

1851 appropriate-for-gestational-age (AGA) births. Weight and height were much lower in this population compared to western standards. Low weight and height were associated with increased risk of perinatal death, prematurity and SGA. After adjusting for confounders, maternal weight remained significantly associated with poor pregnancy outcomes, whereas height was only weakly associated. Attributable risk estimates show that low weight is a much more important contributor to poor outcome than low height. Improvement in maternal nutritional status could lead to substantial improvement in birth outcome in this population

[4]. Bosetti C, Nieuwenhuijsen MJ, Gallus S, Cipriani S, La Vecchia C, Parazzini F. Ambient particulate matter and preterm birth or birth weight: a review of the literature. Arch Toxicol. 2010 Jun;84(6):447-60. doi: 10.1007/s00204-010-0514-z. Epub 2010 Feb 6. PMID: 20140425.

To review epidemiologic evidence on maternal exposure to particulate matter and adverse pregnancy outcomes, we performed a MEDLINE search of the literature up to June 2009. We considered all original studies published in English including information on total suspended particles (TSP), reparable (PM(10)) or fine (PM(2.5)) particles and the risk of preterm birth, low birth weight (LBW) or very low birth weight (VLBW) and small for gestational age (SGA). We identified a total of 30 papers, including 13 with information on preterm birth, 17 on LBW or VLBW, and 4 on SGA. Eight studies on preterm birth, 11 studies on LBW/VLBW and two studies on SGA reported some increased risk (by about 10-20%) in relation to exposure to PM; no meaningful associations was found in the remaining studies. However, even in studies reporting some excess risk, this was inconsistent across exposure levels and pregnancy periods. Epidemiologic studies on maternal exposure to PM during pregnancy thus do not provide convincing evidence of an association with the risk of preterm birth and LBW/VLBW and SGA. The excess risks, if any, are small, and it is unclear whether they are causal, due to misclassification of the exposure or some sources of bias/residual confounding.

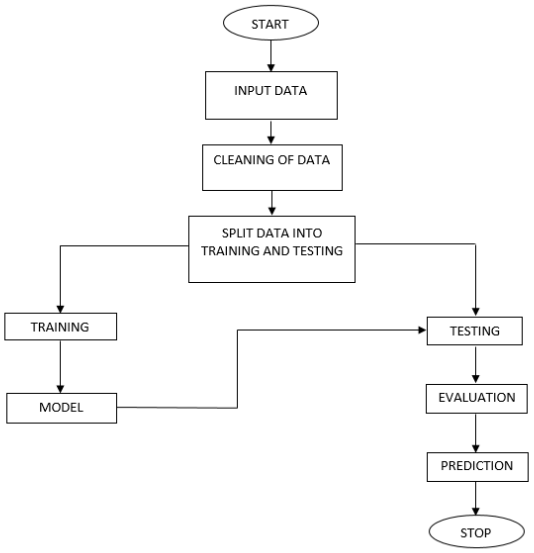
III. EXISTING METHOD

In existing system, model used is Logistic Regression to estimate whether the baby belongs to the Low Birth Weight or not belongs to the Low Birth. This model employs low accuracy and inaccurate results.

IV. PROPOSED SYSTEM

In proposed system, we implement supervised machine learning algorithms like XGBoost Classifier, Random Forest Classifier and Support Vector Classifier and Decision Tree Classifier for prediction of low-Birth-Weight babies.

Block Diagram:



Block diagram of proposed method

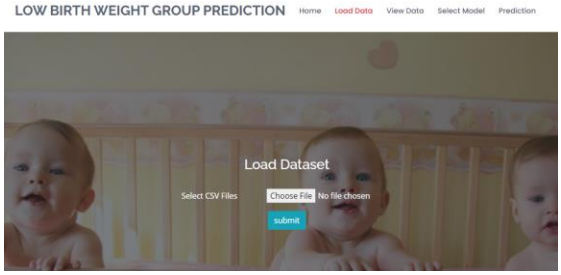
V. Results

In our project, we use machine learning model to predict if the infant is a low birth weight baby or not.

HOME PAGE:

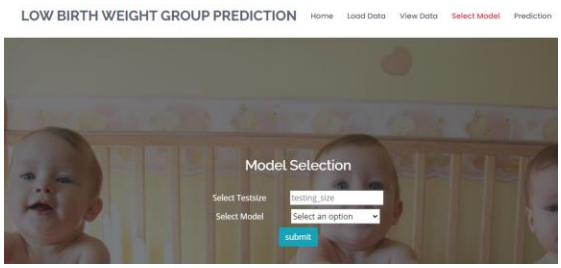

LOW BIRTH WEIGHT GROUP PREDICTION
Home
Load Data
View Data
Select Model
Prediction

DATA LOADING PAGE:

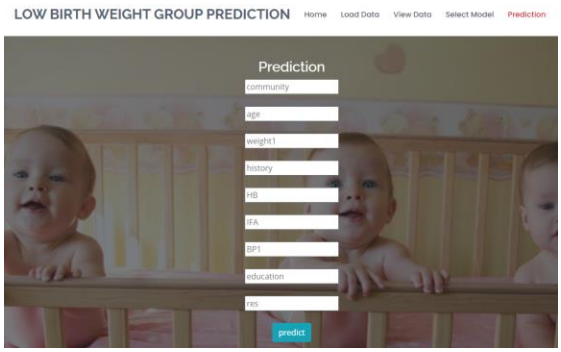


DATA VIEW PAGE:

MODEL SELECTION PAGE:



PREDICTION PAGE:



VI. CONCLUSION

In this application, we have successfully developed a machine learning model to predict if the infant is a low birth weight baby or not. This was created in a user-friendly setting utilizing Python programming and Flask. We found that the Decision Tree Classifier XGBoost Classifier, Random Forest Classifier, and Support Vector Classifier in terms of accuracy Decision Tree Classifier performs well with better accuracy.

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