PREDICTION OF STUNTING AND OVERWEIGHT AMONG CHILDREN IN INDIA BASED ON LINEAR REGRESSION ALGORITHM OF MACHINE LEARNING

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ABSTRACT
Malnutrition is an abnormal physiological condition caused by lacks, excesses or inequities in energy, protein and other nutrients. Insufficient or over food cause malnutrition. Malnutrition includes undernutrition (wasting, stunting, underweight), overnutrition (overweight, obesity) which results in diet-related noncommunicable diseases. Stunting is the condition where the child is too short for age. Child's height is not as per the age. Wasting is the condition where child is too thin for height.Overweight and obesity are the abnormal or extreme fat gathering that may damage the health. In 2020, 149 million children under 5 were estimated to be stunted, 45 million were estimated to be wasted, and 38.9 million were overweight or obese globally. In this paper the prediction of stunting and overweight is calculated by analysis of UNICEF data based on Linear Regression Algorithm of Machine Learning. Nearly half of all deaths in children under 5 are attributable to undernutrition; undernutrition puts children at greater risk of dying from common infections, increases the frequency and severity of such infections, and delays recovery.

KEYWORDS: Malnutrition, Stinting, Overweight, Linear Regression.

I. INTRODUCTION

Micronutrient deficits are a lack of vitamins and minerals which are important for body functions such as producing enzymes, hormones and other substances needed for growth and development of a children.[1]As per the WHO Stunting is defined as low height-for-age. It is the result of continuous or persistent undernutrition, usually associated with shortage, underprivileged maternal health and nutrition, frequent illness and/or inappropriate feeding and care in early life. Stunting prevents children from reaching their physical and cognitive potential [2,4].Malnutrition is divided in two types. Undernutrition and Overnutrition. There are 4 sub types of undernutrition: wasting, stunting, underweight, and deficiencies in vitamins and minerals. Undernutrition makes children much more vulnerable to disease and death. Overnutrition has 2 types: Overweight and obesity. A person is too heavy for his or her height. It can cause excessive fat gathering which impair the health.Body mass index (BMI) is an index of weight-for-height commonly used to classify overweight and obesity.[3] In the present scenario, almost every field is moving into machine-based automation right from fundamentals to high level systems. Machine Learning (ML) is one of the important tools which is most similar to Artificial Intelligence (AI). ML is a subset of AI. There different types of machine learning algorithms available to predict the future estimates based on the present data. Linear Regression is one of the algorithms used to predict a new set of values by taking existing data as a

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reference [7]. Linear regression is one of the easiest Machine Learning algorithms. It is a statistical method that is used for predictive analysis. Linear regression makes predictions for continuous/real or numeric variables. Linear regression algorithm shows a linear relationship between a dependent and one or more independent variables; hence it is called as linear regression. Linear regression finds how the value of the dependent variable is changing according to the value of the independent variable [8].This research paper discusses the objectives of the research in Section II then the summarized literature review is included in section III, methodology of the research is included in section IV. Section V gives the findings of the research and Section VI gives the conclusion and future scope of the research.

II. OBJECTIVES
Objective is to analyse the UNICEF Data of Stunting & Overweight to predict the future estimate.

III. LITERATURE REVIEW
Now a days, a number of machine learning algorithms were active to extract the hidden patterns from nutritional data in the healthcare industry. Machine Learning are important contributors in terms of predicting and analysing the outcomes of malnourished patients [5]. The main objective of these techniques is to provide useful information for decision makers in the healthcare industry, which can help to provide a better determination of malnutrition status in the target population, particularly in children under five years of age group [10,11]. Linear Regression Analysis [12] is a statistical model or statistical approach which establishes a relationship between Dependent Variable and Independent Variable. The slope or characteristics of regression line steeply increasing linearly and can be known as positive regression line and if the regression line tend to have steeply decreased characteristic then it is said to be negative regression line [6]. It is a predictive modelling technique to determine the relationship between two variables like trend forecasting, forecasting an effect, determination of economic growth, price determination of a products, house sales, rain and weather prediction, score predictions, predictions of covid vaccinations etc., The types of linear Regression model are Simple linear regression, multiple linear regressions, polynomial or nonlinear regression. Linear Regression (LR) mainly depends on two factors- which variables acts as predictors for an outcome and how much all the predictions made are accurate [9].The Joint Malnutrition Estimates UNICEF Data is taken for analysis purpose in this research [13].

III. RESEARCH METHODOLOGY
Mainly, we adopted Linear Regression Algorithm, some considerations that this is the simplest and easiest prediction algorithm. The Joint Malnutrition Estimates UNICEF Data is taken for analysis purpose in this research [13].
The linear regression model provides a sloped straight line representing the relationship between the variables. Consider the below image [8].
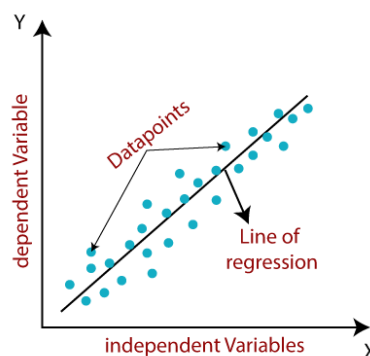
Linear Regression in Machine Learning

we can represent a linear regression as:

y= a0+a1x+ ε   …..Where

Y= Dependent Variable (Target Variable)

X=Independent Variable (predictor Variable)

a0= intercept of the line (Gives an additional degree of freedom)

a1 = Linear regression coefficient (scale factor to each input value).

ε = random error

The values for x and y variables are training datasets for Linear Regression model representation.

A linear line shows the relationship between the dependent and independent variables is called a regression line. A regression line is of two types

Positive Linear Relationship:

If the dependent variable increases on the Y-axis and independent variable increases on X-axis, then such a relationship is termed as a Positive linear relationship.
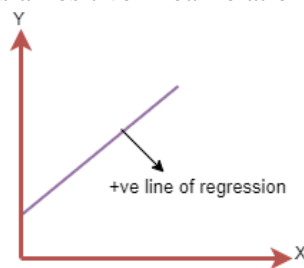
The line equation will be: $Y = a_0 + a_1 x$

Negative Linear Relationship:

If the dependent variable decreases on the Y-axis and independent variable increases on the X-axis, then such a relationship is called a negative linear relationship.
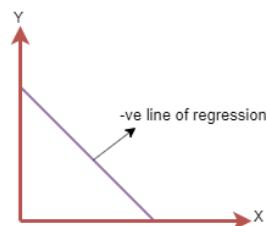
The line of equation will be: $Y = -a_0 + a_1 x$

By applying Linear Regression Algorithm on the UNICEF Data for Stunting:

Data Source: UNICEF/WHO/World Bank Joint Child Malnutrition Estimates, 2021 Edition
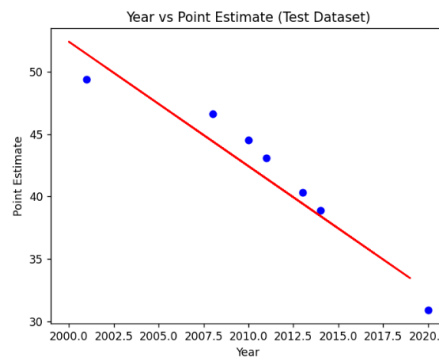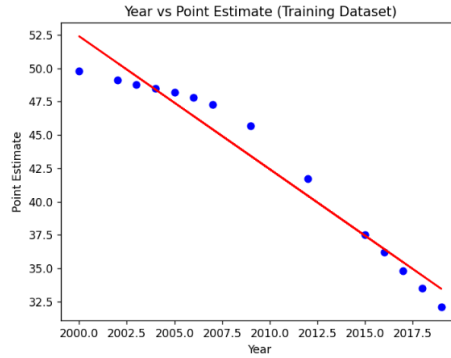
From the above result it is clear that Stunting has declined steadily since 2000 – 2020 and same will continue in future.

By applying Linear Regression Algorithm on the UNICEF Data for Overweight:
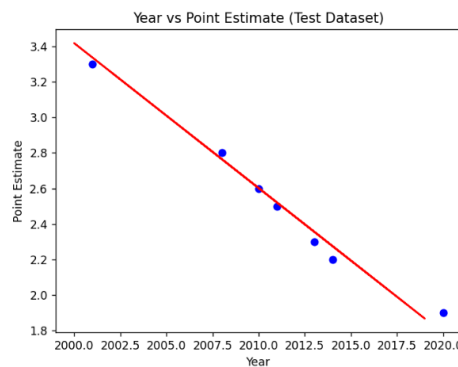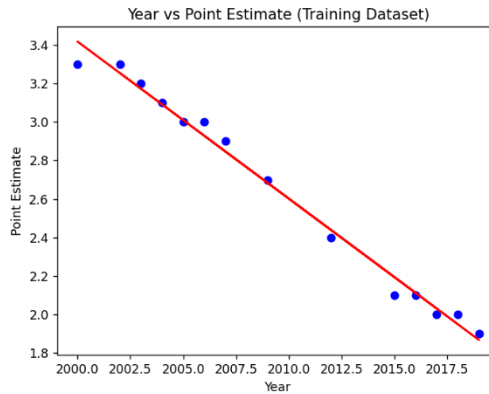
From the above result it is clear that overweight has declined steadily since 2000 – 2020 and same will continue in future.

IV. FINDINGS AND CONCLUSION

By applying linear regression on time series data, we can easily predict the future estimate of stunting and overweight. By the study it is found that the stunting and overweight has declined steadily from 2000 to 2020. If the same is continue in future year then we can achieve the target of 2030.

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