**Interpretable Machine Learning in Healthcare through Generalized Additive Model with Pairwise Interactions (GA2M): Predicting Severe Retinopathy of Prematurity**

We have investigated the risk factors that lead to severe retinopathy of prematurity using statistical analysis and logistic regression as a form of generalized additive model (GAM) with pairwise interaction terms (GA2M). In this process, we discuss the trade-off between accuracy and interpretability of these machine learning techniques on clinical data. We also confirm the intuition of expert neonatologists on a few risk factors, such as gender, that were previously deemed as clinically not significant in RoP prediction. Retinopathy of prematurity (ROP), a vasoproliferative disorder of the immature retina in premature infants, is a significant cause of blindness in many middle-income countries. The prevalence of ROP is lower in high-income countries, where risk factors such as oxygen administration and blood oxygen saturation are strictly monitored.1 Severe ROP is typically found in infants with a very low gestational age (GA) at birth in developed countries. Heavier and more mature babies can also develop ROP in developing countries, because there is insufficient awareness of the risk factors of the disease process, a shortage of skilled professionals and/or a shortage of essential equipment to care for infants.

**EXISTING SYSTEM:**

In the existing studies have reported that the prevalence of ROP was higher in Small for gestational age (SGA) infants compared with appropriate for Gestational Age (GA) preterm, while SGA was not found to be a risk factor for ROP in other reports. Factors that are considered an increased risk for severe ROP in SGA babies include chronic uterine hypoxia, abnormal growth factor levels, nutrient restriction and antioxidant deficiency. However, in this study, SGA was surprisingly associated with a decreased incidence of severe ROP in very low birth weight VLBW infants. There was a relationship between poor postnatal weight gain and an increased risk for ROP. Poor postnatal weight gain was also found as an independent risk factor for severe ROP in infants with low weight in existing study

**DISADVANTAGES OF EXISTING SYSTEM:**

* The strength of the TR-ROP(Turkey) study was that it was a large multicentre cohort study that allowed us to prospectively obtain data via a special network.
* Accuracy analysis of these predictions is not available for the TR-ROP model.
* TR-RoP study as it was not focusing for an ML audience.

**Algorithm**: TR-RoP study.

**PROPOSED SYSTEM:**

The material of our study starts with retinopathy of premature (RoP) data collected from clinical data centers or maternity homes. Among some newborns with birthweights below 2000g, few cases diagnosed with severe RoP were investigated. However, it must be noted that the important task is to predict those who might develop severe ROP from among those who have already been diagnosed with any type of RoP. Thus, our sample size was reduced to n numbers count. Out of total patients diagnosed with any type of RoP, we tried to build a model that would predict the patients diagnosed with severe RoP.

**ADVANTAGES OF PROPOSED SYSTEM:**

* We run univariate and multivariate logistic regression machine learning algorithms, starting with generalized additive model (GAM) to predict severe RoP based on the same risk factors as in TR-ROP study.
* We include accuracy analysis of these predictions, which was missing in the TR-RoP study.
* We only focused on the multivariate logistic regression analysis Ability to identify outliers or anomalies. It is easy to understand

**Algorithm**: Logistic Regression (LR)

**SYSTEM REQUIREMENTS:**

**HARDWARE REQUIREMENTS:**

* System : Intel Core i3.
* Hard Disk : 1 TB.
* Monitor : 15’’ LED
* Input Devices : Keyboard, Mouse
* Ram : 8 GB.

**SOFTWARE REQUIREMENTS:**

* Operating system : Windows 10.
* Coding Language : Python
* Tool : PyCharm, Visual Studio Code
* Database : SQLite

**REFERENCE:**

Tamer Karatekin, Selim Sancak, Gokhan Celik , Sevilay Topcuoglu, Guner Karatekin, Pinar Kirci, Ali Okatan, University of Health Sciences, Zeynep Kamil Maternity and Children's Training and Research Hospital Turkey " **Interpretable Machine Learning in Healthcare through Generalized Additive Model with Pairwise Interactions (GA2M): Predicting Severe Retinopathy of Prematurity** " International Conference on Deep Learning and Machine Learning in Emerging Applications (Deep-ML). Date Added to IEEE Xplore: 21 October 2019 INSPEC Accession Number: 19080532 DOI: 10.1109/Deep-ML.2019.00020