

# Human Immune Prediction using Machine Learning

Jayant Deshmukh

Department of computer Engineering,  
G H Raisoni college of engineering and  
management  
Pune, India

deshmukh\_jayant.ghrcemcs@raisoni.net

Sanket kasbate

Department of computer Engineering,  
G H Raisoni college of engineering and  
management  
Pune, India

sanket.kasbate.cs@ghrcem.raisoni.net

Umesh Khot

Department of computer Engineering,  
G H Raisoni college of engineering and  
management  
Pune, India

Umesh.khot.cs@raisoni.net

Rajan Saroj

Department of computer Engineering,  
G H Raisoni college of engineering and management  
Pune, India

Rajan.saroj.cs@raisoni.net

Prof. Sunita Nandgave

Department of computer Engineering,  
G H Raisoni college of engineering and management  
Pune, India

sunita.nandgave@raisoni.net

**Abstract**—In health sector immune plays vital role, knowing about our immune is important. Prior detection of low immune can help person to improve immune in order to protect our body from harmful germs and viruses. Data processing is done with the help of factors like RBC counts, WBC counts, HB, MCV, MCH, MCHC, Neutrophils and platelet count. Observing and identifying of immune isn't an easy task to do manually because it takes a lot of time, resources, effort, etc. So it's easier to predict immune with an automated data processing and machine learning system. Different types of data processing and machine learning algorithms are available to create best algorithm like Linear regression and KNN algorithm. Various machine learning algorithm can be used to predict immune system, so that the immune can be predicted easily and clearly because accuracy is important in machine learning algorithm. This paper presents a study of different methods of predicting human immune.

**Keywords**—Immunity, data processing, receptors, immunologists

## I. INTRODUCTION

Immunity is resistance to illness, specifically communicable disease. The system is an assortment of cells, tissues, and molecules that mediate resistance to infections, and therefore the coordinated reaction of those cells associated molecules to infectious microbes contains a response. Immunology is the study of the system in animals, as well as its responses to microorganism pathogens and broken tissues and its role in illness. The importance of the system for health is shown by the frequent observation that people with defective immune responses are at risk of serious, typically grave infections. stimulating immune responses against microbes through vaccination is the simplest methodology for safeguarding people against infections. Due to spread of disease like AIDS people got conscious about their immune. Now because of corona pandemic immunity is the top most priority in the health sector as finding vaccine is difficult till that keeping good immune can help human. The human immune consists of multiple stratified mechanisms of responding to cellular stress, infection, and tissue injury to confirm defense from pathogens, maintenance of tissue physiological condition, and also the integrity of the holobiont. In the body each cell plays a completely different role, however, a couple of dozen, specialized white blood cells are notably necessary for immunity.

Immunology could be a complicated subject to review for many reasons. There are plenty of details, complicated study and generally these details get within the approach of understanding the ideas and its difficult to understand the deep detail convictions. As learning biological things from general background can be difficult task. This is a big issue else immunologists love these exceptions, as a result they work on clues and furnish theme. Our goal is to look at the human immune system, to its best. One more issue is there related to the new studies which are getting out on the regular basis. Some fact which is stated correct today can be claimed false tomorrow which is challenging because of this, continuous updation is required. Something stated correct today can be wrong tomorrow that's why continue updation with perfect knowledge is must.

It is important to predict immune system of the human being for covid 19 cases. In this approach, immune capability of the human being is predicted using machine learning algorithm has been presented. An medical scientist or a hematologists might subdivide this further, there are some essential factors which we can use for classification. In human body proteins are conduit through which cells interchange with each other. Receptors are proteins blind ligands which works as a receptors for the other cells. Cells had different types of receptors on other cells. They carry out work such as transporting glucose into the cells. The receptors related to the system area unit usually are involved with interrogating the atmosphere for proof of danger, infection, abnormal death. within the course of associate in nursing immunologic response, cells follow a method, overall outcome maximizes the probability of living and eliminating the infection. Complications arise once the system doesn't work properly. Some problems arise unit less significant, like spore allergic reaction, whereas others arise unit vital, like genetic disorders that wipe out the presence. This disorder is handled by analyzing the immune and dealing consequently.

## Literature Survey

Lot of research are going on regarding immune system. Now as of corona pandemic it is important to understand our immune and work according to that. There are some factors through which we can predict immune. We can use those factors and form machine

learning module which can perfectly predict immune system of human being. . By studying the different research paper we get some information about - three types of immune diseases: (a) allergies, (b) autoimmune diseases, and (c) infectious diseases. We compared the representative machine learning algorithms respectively from three different categories, namely decision tree learning, instance-based learning, and maximum margin learning machine learning techniques to construct accurate classification models for three types of immune diseases, allergy, autoimmune disease and infectious disease, caused by different protein antigens[1]. ORTALLER is an online allergen classifier based on allergen family featured peptide (AFFP) dataset and normalized BLAST E-values, which establish the featured vectors for support vector machine (SVM)[2].After lot of research we can state that algorithms are specified in different papers but there is need of actual implementation then only we will be able to use the application.

II. METHODOLOGIES TO RECOGNIZE IMMUNE PREDICTION.

The generalized block diagram of Immune prediction as shown in Fig.1.

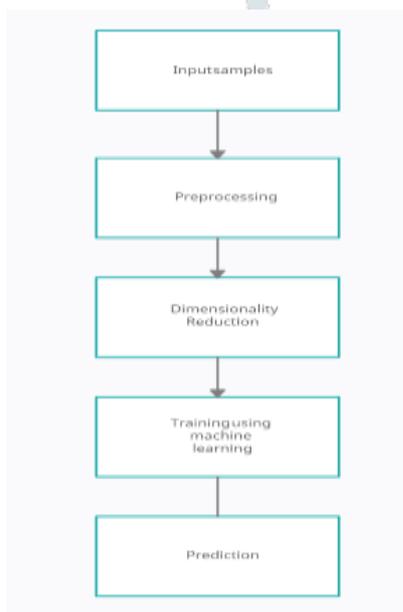


Fig. 1. Framework of immune recognition algorithm

The detailed explanation of each block is explained below.

A. Input data

Immune prediction datasets are also available. The Immune Detection Dataset(IDD) is the only public dataset to the best of our knowledge. The data set consist of RBC,WBC, HB,MCV,MCH . As for machine learning algorithm 75% of data from dataset is used for training purpose and rest of 25% of data is used for testing purpose.

Fig. 2. Samples of diseased and healthy leaf of PlantVillage Dataset

B. Preprocessing

Data preprocessing is one of the necessary steps in Machine learning therefore the helpful information that may be derived from it directly affects the flexibility of our model to find out, we must tend to preprocess our knowledge before feeding it into our model. Preprocessing includes Handling Null Values, standardization, Handling

construct variables, and multiple regression. universe dataset forever consists of some null values. It doesn't very matter whether or not it's regression, classification, or the other reasonably drawback, no model will handle these null values on its own thus we'd like to intervene.

Standardization is another integral preprocessing step. In standardization, we tend to rework our values such as average ought to be zero, and deviation ought to be one.

Handling construct variables are an integral side of machine learning. construct variables are primarily the variables that are separate and not continuous. construct variables are more divided into 2 varieties of ordinal construct variables and nominal construct variables.

C.Machine learning algorithm

An extensive survey compared sickness detection and classification methods in machine learning. we tend to learned Support Vector Machine (SVM) Classification Technique, Artificial Neural Network (ANN) Classification Technique, K- Nearest Neighbor Classification Technique, Fuzzy C-Means Classifier, and Convolutional Neural Network Classification strategies utilized in prediction of immune and effectiveness.

Classification is both supervised classification and unsupervised classification. In the supervised classification, the set of graded groups is known in advance but is not known in the unsupervised learning set and Classifiers for classification purposes[19]. Classification techniques are:- artificial neural network[6][19], decision tree[19], support vector(SVM)[19],[20], Fuzzy measure etc.[21],[22].

Machine-learning ways have two huge drawbacks. First, they're extremely smitten by variables trends and therefore the options to be extracted. Second, classifiers should be trained many times before applying them to real-world applications. NNs square measures the foremost promising knowledge analysis ways[23]. NNs' operate is predicated on the human systema nervosum[23]. NNs square measure helpful for pattern recognition despite any specific recognition rules[23].stated that NNs would like less formal statistics to model advanced nonlinear relationships.

D.Evaluation Metrics

The classifiers will produce the percentage of the immune type. The routine assessment of the result is dependent on accuracy values.

Accuracy: It is the ratio of observation predicted correctly to the total number of observations. It is calculated as,

$$Accuracy = \frac{Currently\ predicted\ observations}{Total\ number\ of\ observations} \tag{1}$$

Immune percentage is determined using equation (2). This will give disease severity. This knowledge will help people to predict there immune.

$$Percentage\ of\ immune = \frac{Pixel\ in\ immune\ portion}{Total\ pixel\ in\ immune} \tag{2}$$

## III. CONCLUSION

In this paper, the different methods for Immune prediction has been reviewed. It is observed that only one dataset i.e. Immune Detection Dataset is available publicly for research. Hence there is a need of development of immune dataset. The most of the existing systems were implemented using machine learning algorithms. Mostly implementation work is remaining. Recently, it is observed that deep learning algorithms are used which are more accurate.

In future, there is a scope for development of dataset for immune detection for Indians as well as foreign people. Also, there is need of implementation of highly accurate classifiers which can be invariant in term of predicting perfect immune.

## REFERENCES

- 
- [1] Kuan-Hui Lin, Yuh-Jyh Hu, "Application of Machine Learning to Immune Disease Prediction", *International Journal of Engineering and Innovative Technology (IJEIT)* Volume 7, Issue 11, May 2018
  - [2] Lida Zhang, Yuyi Huang, Zehong Zou, Ying He, Ximo Chen, Ailin Tao, "SORTALLER: predicting allergens using substantially optimized algorithm on allergen family featured peptides", *Bioinformatics*, Volume 28, Issue 16, 15 August 2012, Pages 2178–2179. Barbedo, J. G. A., & Godoy, C. V. (2015). Automatic classification of soybean diseases based on digital images of leaf symptoms. In *Embrapa Soja-Artigo em anais de congresso (ALICE)*. In: CONGRESSO BRASILEIRO
  - [3] Xu, J., Jo, J. Immunological Recognition by Artificial Neural Networks. *J. Korean Phys. Soc.* **73**, 1908–1917 (2018). Muhammad Thaqif bin Mohamad Azmi and Naimah Mat Isa, "Orchid disease detection using image processing and fuzzy logic," *International Conference on Electrical, Electronics and System Engineering, IEEE*, 2013.
  - [4] H Ai JShen JWang, "An Improved Artificial Immune System-Based Network Intrusion Detection by Using Rough Set", *conference of Communications And Network Published Online*, February 2012.
  - [5] M Middlemiss, "Framework for Intrusion Detection Inspired by the ImmuneSystem", 2005,
  - [6] J Chen, D Yang and M Naofumi, "A Study of Detector Generation Algorithms Based on Artificial Immune in Intrusion Detection System", *WSEAS TRANSACTIONS on BIOLOGY*, vol. 4, no. 3, pp. 1109-9518, March 2007.
  - [7] L. N. De Castro and F. J. Von Zuben, *Artificial immune systems: Part I basic theory and applications*, 1999
  - [8] D. Dasgupta and F. González (Gonzalez), "An immunity-based technique to characterize intrusions in computer networks",
  - [9] J. Y. Le Boudec and S. Sarafijanovic, *An artificial immune system approach to misbehavior detection in mobile ad hoc networks*, Sep. 2003.
  - [10] Learning Ensembles of Neural Networks by Means of a Bayesian Artificial Immune System Pablo A. Dalbem Castro; Fernando José Von Zuben