Knowledge Based System for Immunity Improvement Against Covid-19 Infection

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ABSTRACT
A top-down knowledge-based automaton is presented here for improving immunity against covid-19. The age, gender, body mass index, dietary and life-style habits of people are collected and a direct conditional clauses-based operation flow is performed on them. The output is presented as a set of instructional guidance to be followed to improve resistance against covid-19.

1. INTRODUCTION

Coronavirus disease 19 or COVID 19 is a type of disease which is mainly caused by the severe acute respiratory syndrome 2 or SARS-COV-2. The main reason behind the rapid spread of this virus to other parts of the world is two main reasons such as it is mostly asymptomatic and is highly contagious which is also the main reason for the long incubation of this deadly virus. At this moment there is no such proper or rectified treatment of this worldwide. However, there are various clinical as well as different scientific communities who have jointly assured every effort to overcome the severe effect of the outbreak. [1] Due to the lack of prescribed treatment or vaccine against COVID 19, the primary observation suggests that the immune system is the best defense system as it enables the human body to naturally combat pathogens such as different kinds of fungi, bacteria, viruses, worms as well as protozoan which mainly resist against any kind of infection. Although, there is a low risk of COVID 19 if the immune system in the body functions properly. There are several ways in boosting one's immune system which can be very attractive, unfortunately, the probability to execute that has been proven elusive due to various reasons. [2] However, various factors affect the immune response such as psychological stress, age, exercise, diet, and many more factors that impact human beings as well as animals according to several researchers. In this current situation, there are various methods of healthy living that might be very helpful in improving the immune system which also has other health benefits. This model gives a clear idea how an immune system can be boosted or it gives Knowledge about improvement of an immune system where the body can fight against covid - 19.

2. WORKING

The project presented here is a top-down model of how much a person's immunity increases with respect to their lifestyle practices. The dataset consists of individuals daily habits i.e., smoker/ non-smoker, exercise and the dietary contents. This dataset also contains Covid-19 infection rate of the individual in contrast to their daily habits. First, this dataset is used for top-down approach-based score assigning of a certain numerical value for every positive lifestyle habit corresponding to immunity against covid-19. In this project, two-dimensional Linear Regression is employed. That is, one input parameter and one output parameter is taken and the given dataset is plotted in a 2D graph. The output model of Linear regression is the best fit line, which is the line with 'y = mx + c' equation passing closest to all the given points of the dataset. The model of this machine learning algorithm with just one input and one output parameter can be described with the value of the slope 'm' and the value of the y-intercept 'c'. This algorithm maps the proportionality, be it direct or inverse, between the input and the output parameter. The consumption of ginger-garlic paste in grams is plotted in x axis with respect to percentage of how much it improves immunity against covid-19. The trained linear regression Model is incorporated into the top-down model of the mobile application.
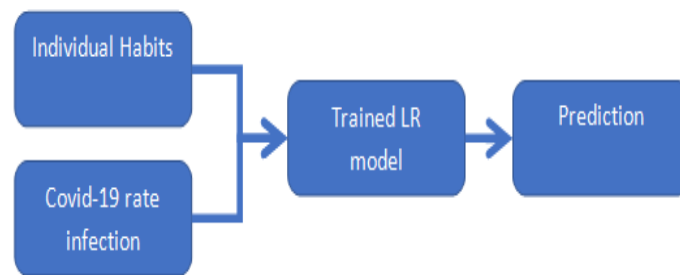
Figure 1. Block Diagram

2.1 Top-down Approach

This type of approach is mainly to learn the high-level step-by-step process as quickly as possible by working through an end-to-end machine learning problem by implementing a dedicated software. with the advancement of various technologies, such as state-of-the-art algorithms as well as setting up validations that are rigorous and also used in statistics hypotheses which are equipped under modern platforms automatically functions within the parameters of tools. [3]

However, we can brief this top-down approach as follows

1. Understand the top-level method of applied machine learning.
2. Practice to use the tools or methods enough so that it can be able to use to solve various problems
3. A lot of practice is required to maintain a large quantity of datasets.
4. Undergoing a change from machine learning to a regular more detail. [3]

3. ARTIFICIAL INTELLIGENCE

The algorithmic flow presented in this paper falls under the field of Artificial Intelligence and Machine Learning. Presented below is an outline of those technologies.
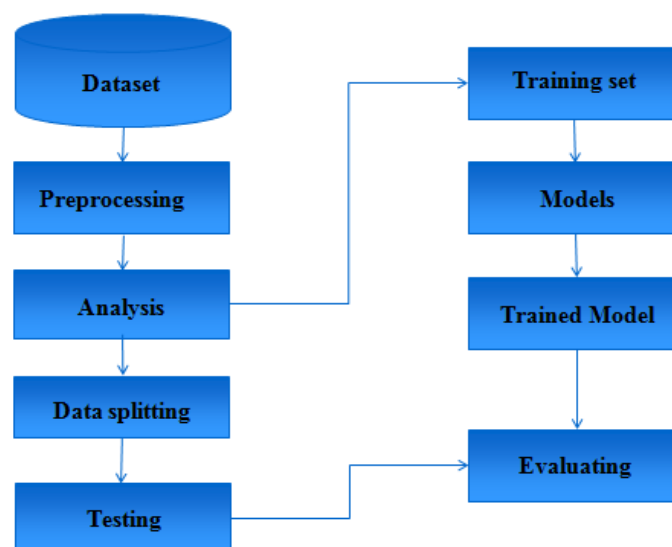
Figure 2. Flow Chart

Artificial Intelligence or AI can be termed as a type of intelligence presented by any machine, which is unlike any intelligence shown by any human beings as well as animals presenting both consciousness as well as emotions. However, the comparison between both the categories such as the former as well as the later has always been exposed by the acronym selected. The most powerful Artificial Intelligence is often presented as Artificial General Intelligence or AGI while on the other side, there are attempts to imitate various natural intelligences which are termed as Artificial Biological Intelligence or ABI. There are renowned books on Artificial Intelligence describes this sphere of study of intelligent carriers: any such device that understands its environment as ell takes necessary steps to enhance its capacity in order to

achieve its goal. However, it is clear that machines which mirror the cognitive functions which humans often relies with their human brain, for example, learning as well as problem solving. [4]

As time passes, machines have become more and more capable and reliable and as a result those tasks which can be considered to use intelligence are frequently bypassed as the definition of Artificial Intelligence and this activity is often known as the AI effect. As based on Tessler's Theorem it is believed that Artificial intelligence are those things that are not performed yet. if we consider a simple situation where the optical character recognition is frequently separated from those which are considered as Artificial Intelligence and have become a regular technology. The capabilities of modern are often classified as Artificial intelligence that consists of a phenomenal knowledge of human speech, almost competing at the top level the most important game system, for example chess as well as go, and on the other hand managing those games which are not perfect in information such as self-driving cars, pokers, simulations for military as well as the process of intelligent routing in networks for delivering a content. [4]

During the year 1955, Artificial intelligence had been prescribed as an academic discipline, as well as various waves of optimism, which are then leading to disappointment and reduction in finance which are then often called the Artificial Intelligence winter. Then later there were new approaches, leading towards success as well as renewed funding. Artificial Intelligence gained widespread popularity and global attention when a gaming platform called AlphaGo successfully defeated a Go player in the year 2005. In major areas, AI research has been separated into various sub-fields which frequently fail to communicate with one another. Various subfields are mainly focused on such considerations which are technical for example, machine learning as well as robotics, use of certain tools and many more. These are also based on certain social factors. [4]

The main vision of any AI research consists mainly of reasoning, representation of knowledge, planning and many more. Among these areas, AGI is one of the major long-term objectives. These researchers include various statistical practices, electronic intelligence as well as AI for traditional symbols. Tools such as mathematical optimization, artificial neural network as well as various steps on statistics, economics and many more. This field has various implications such as computer science, mathematics, engineering, psychology, linguistics and many more. [4]

Artificial Intelligence was founded on the basis of simulating human intelligence by a machine. It highlights a philosophical approach that an artificial being can be as similar as a human being. However, these factors have been followed by myth, fiction and many more at the earliest. It has also been considered that AI is a risk to society while others fear that it might create huge unemployment. [4]

This twenty-first century has been an era of the emergence of Artificial Intelligence which has been witnessing huge advancements such as increase in computer power, large databases as well as theoretical understanding. Artificial Intelligence has become a phenomenal part of technology which helps to solve many challenges. [4]

4.   MACHINE LEARNING

It is the study of algorithms which through experience as well as use of data improves automatically and is also a part of Artificial Intelligence. ML algorithms are used in a variety of applications such as medicines, email filtering, speech recognition and many more. [5]
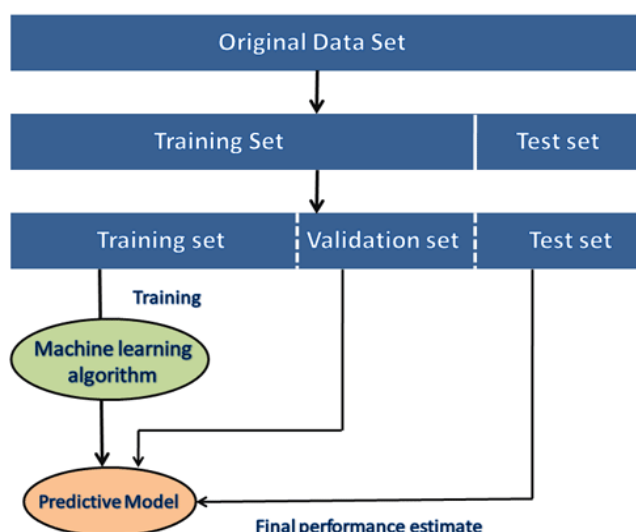

Figure 3. Machine learning Dataset

Machine learning or a subset of it is related to computational statistics for making future predictions. Acquiring knowledge on mathematical optimization delivers processes, theory as well as various applications that domain in machine learning. It is also considered as a process of predictive analysis. [5]

5. INDUSTRY 4.0

According to Wikipedia, industry 4.0, The Fourth Industrial Revolution reveals the progress of automations in various industries. Wide spread of machine-to-machine interaction is installed. Systematic communication, self-monitoring and production as well as application of smarter machines that can perform huge amounts of tasks without any human interventions. [6]

Automation under Industry 4.0 has a particular schema or pattern at its outset. Presented below is how automation in the mass production industry as well as consumer level products are built in today's technological era.

The schema presented in Figure 4 has a lot of other components involved but the generic outline of it stands justifiable for all kinds of automation today.

The software automaton of the conventional automation model, which is the status quo, was built by a human expert or a team of human experts till now. With the advent of machine learning technology, the software automaton was not fully directly designed by human experts. The human experts build the machine learning software and give the real-world data set as training information. The machine learning software identifies the pattern between the input and the output parameters of the dataset in the form of a mathematical model. This mathematical model can be downloaded as a working software module to other electronic computing devices. This mathematical model is referred to as the 'trained machine learning module'. The software automaton of all the current digital embedded devices is a mathematical model that gives a numerical output for a numerical input based on arithmetic and logical conditions. This software automaton, as explained above can be either directly developed by a set of human experts by means of setting the boundary conditions themselves based on observation and requirement or can be downloaded as an executable module from machine learning training systems that are trained with relevant dataset. In whatever way the software automaton is developed, it can be loaded onto the relevant embedded computing module that can be used for either sensor based closed loop automation or open loop automation.

The technological components of Industry 4.0 include IoT, augmented reality, virtual reality, cloud computing, 3D printing, big data analytics, networking, data security, human-machine interaction and others. IoT is a very effective way to collect real world data. Sensors integrated with data acquisition and transmission systems can be placed anywhere and the collected data can be pre-processed if required and used as datasets to train machine learning models.

Cloud computing is employed for optimized utilization of computing resources. There are many third-party vendors like Google and Amazon which are very reliable in terms of data security and speed of computation. These services offer companies and organizations a cheap and reliable way to harness the power of artificial intelligence and machine learning.
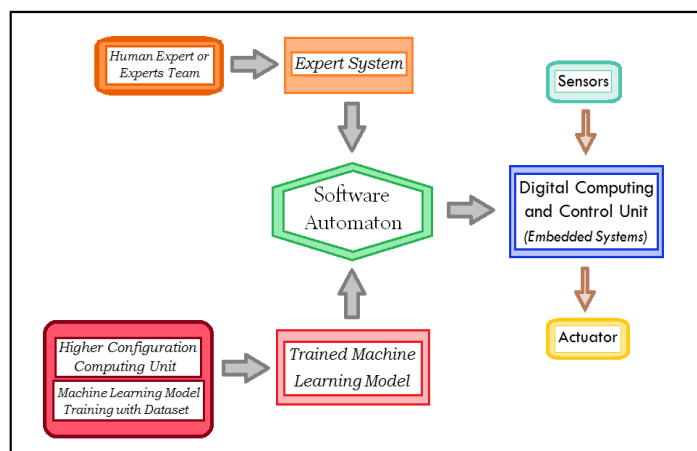

Figure 4. Schema of Automation

Big data analytics is the set of technological components involved with collecting, collating and managing large quantities of data for analytics and decision making. When so much data is involved, especially with third party service providers, data security plays an important role.

One of the paramount concerns about Industry 4.0 is the unemployment it can create due to powerful automations. The field of human-machine interactions and co-working has been a very developing field now to mitigate the above-mentioned problem.

6. RESULTS AND DISCUSSION

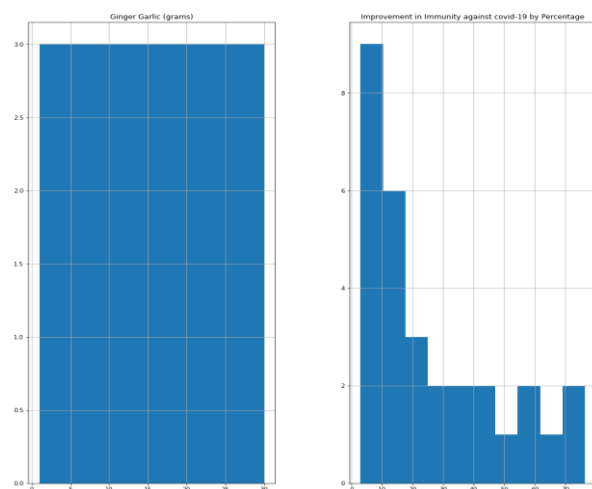| Ginger Garlic (grams)	Improvement in Immunity against covid-19 by Percentage
1	3
2	3.5
4	4.2
5	4.9
6	5.3
9	9.4
7	6.1
8	7.4
11	12.3
14	16.1
12	13.4
13	14.4
15	17.3
19	27.1
17	22.3
18	24.6
21	33.4
24	45.9
20	30.2
16	19.7
3	4
10	11.1
23	42.3
22	37.1
30	76.5
25	50.2
29	71.5
27	60.7
26	55.3
28	65.9

Figure 5. Input Sample Dataset
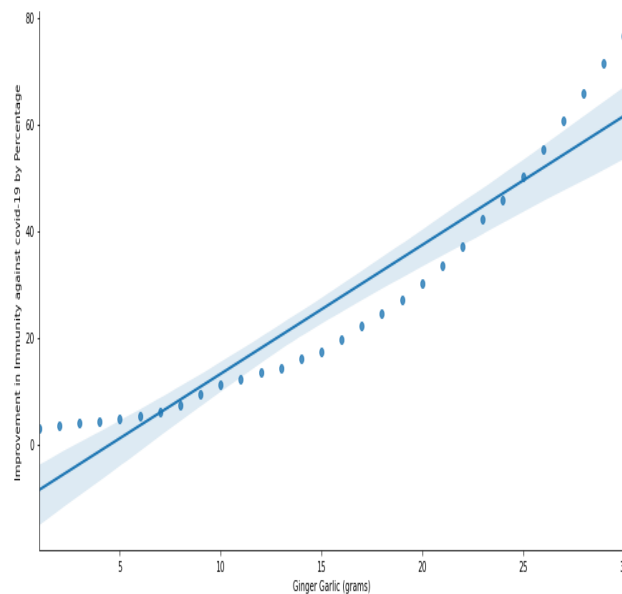

Figure 6. Output graph 1

Figure 7. Output graph 2

This top down approach presented here is an algorithmic flow that generates the output based on a logical series of conditional statements. Most of the infrastructure systems still use an expert designed top-down approach. Since the infrastructure solutions are all very well defined, the top-down approach is still the status quo method for developing software. In this particular project, an effective mobile application for suggesting simple lifestyle steps to improve immunity against covid-19 infection is presented. Multiple conditional clauses can be incorporated with strong domain knowledge to create powerful top-down software automata.

Figure 8. Mobile App – Input Data

Figure 9. Status Output

7. CONCLUSION AND FUTURE WORK

In combating Covid-19 the best is to prevent by increasing our immunity towards it. The Support Vector Machine based our predictive model with our given data debriefing an individual's daily habit can clearly show one's increased immunity by various day today activities can drastically increase effective combating against Covid-19. The future is based on an android app that acts as a wellness tracker tracking one's day today activity and revert the necessary changes to improve one's immunity.

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