International Journal of Scientific Research in Multidisciplinary Studies
Vol.6, Issue.7, pp.60-63, July (2020)

Survey Paper
E-ISSN: 2454-9312
P-ISSN: 2454-6143

Artificial Intelligence: A Tool for COVID-19 Surface Detection

Mukesh Kumar[1*], Lokesh Rana[2]

[1]Physics Department SSNC, University of Delhi, Delhi, INDIA
[2]Department of Physics & Astrophysics, University of Delhi, Delhi, INDIA

[*]*Corresponding Author: mukeshrana@ss.du.ac.in*

Available online at: www.isroset.org

Received: 30/June/2020, Accepted: 20/July/2020, Online: 31/July/2020

Abstract— This paper provides an alternative to detect microorganisms using Artificial Intelligence (AI). The limitation of the human eye can be equipped with magnifying tools to see microorganisms like viruses. The electromagnetic nature of light also helps in visualizing microorganisms. The advancement of AI made it easy to classify microorganisms class from existing data. The synthesis of magnifying tools and field variation techniques in various fields with AI made it possible to detect all microorganisms.. The main areas where AI can contribute in the current scenario of COVID-19 is varied from public management to detection using CT Scan / X Ray. The COVID-19 symptom - high temperature, automatic detection is a very common application of AI. The technology advancement enables IA to handle millions of microorganisms data at a time. The lack of spontaneous virus detection technology is a major reason for spreading of novel coronavirus worldwide. The human-AI interaction can help in careful balance between microorganism class data and public health services data to overcome any pandemic situation . This work proposed integration of AI with detection techniques to check the presence of anti human microorganism on various surfaces or in the environment. This can also detect contagious diseases including the flu, the common cold, Ebola, Hantavirus etc. Their detection will decrease the possibilities of getting infected, Infected person segregation not only limits its spreading but also protects others. This detective measure is also one of the current strategies to limit the spread of COVID-19. The proposed detector behaves like a superhuman eye to gather extensive microorganism data on the surface and probably also help in human infection detection. All these not only save life but also limit economic damages through better resource management.

Keywords—Covid-19, Public Health, Artificial Intelligence (AI), Detectors

I. INTRODUCTION

When you check out, you will see that this world is loaded up with a wide range of living and non-living objects such as building structures, trees, flying creatures, animals, vehicles etc., the list rundown continues forever. In the night sky you may see enormous and far away objects like the moon, star, constellation and even inaccessible objects. Some of these objects might be a significant of miles away. No wonder what you can see with your eyes ? It's also amazing! that there is a range of objects near you that you can't see ? It's true for objects like germs, microorganisms, residue bugs who are surrounding us and undetectable to the unaided eye despite their enormous number. For these sorts of things one needs a magnifying technology to observer them. Our eyes limitation limits to observer very little objects without external assistance. Certain man made devices, such as magnifying lenses, magnifying instruments like microscopes help to see them. Magnifying apparatus utilize an exceptional focal point or a blend of focal points to twist light at an edge to build the image of the object that is sent to the eye. As the object image sent to the eye by the method of the focal point increases, you see micro objects more effectively, despite the fact that its physical size and shape has not altered. The scientsist accept that the naked eye - a typical eye with ordinary vision and without use of any magnify devices can see objects as little as about 0.1 millimetres [6]. The most minor things an individual can ordinarily observe with the unaided eye are things like human hair and its structure with a magnifying instrument. With the assistance of amazing magnifying instruments, however, people can see unbelievably little objects difficult to see with the unaided eye. Recent discoveries - the "microshpere nanoscope", a combination of a standard microscope with a mind-blowing gadget "transparent microsphere" allow you to see inside a person's cells and explore live viruses in detail for the first time. In the future, Scientists hope that this new tool will open up exciting research opportunities in the future. This will find a way past the theoretical limit that something small will one day be able to see.

Various studies [1,3] observe the seasonal cyclicity a unique feature of acute infectious diseases -Flu outbreaks occur in the cold of winter, chickenpox rises first each spring, typhoid disease usually decreases during the summer. These are carried by small agents of infection, some of them are due to Viruses. The virus is microorganism made up of genetic information carry

material, such as DNA or RNA and protected by a coat of protein / fat. They need living cell machinery to reproduce them. The rate of virus reproduction and population effect the living being health and functionality of information carrying cell. One of most fatal quality is its transmitted to other living being via various mode of transmission. Some bacterial infections are contagious and others are spread by other means, such as the bite of an infected insect. Common examples of infectious viral infections include flu, common cold, HIV, and herpes. Some of them can affect the respiratory system of the living object like running or stuffy nose, coughing or sneezing, The newly determined coronavirus COVID -19 caused a infectious viral disease. It spreads in general through droplets of saliva or discharge from the nose whilst an infected person coughs or sneezes. The great way to save you and sluggish transmission is to better recognize the COVID-19 virus, what causes it, and the way it spreads. Prevention strategies focus on patient segregation and careful contamination control including suitable steps to be taken throughout prognosis and the provision of medical care to an infected affected person.For example, droplets contact, and airway protection mechanisms must be adopted to control its spread. The detection is a prime step in this regards.

The section I contains the introduction of limitation of eye and need for microorganism detection, Section II discuss light and electron microscope detection limit and how artificial intelligence play a role in this regard. Section III contains COVID-19 detection methodology, and Section IV formulates some AI integrated model for surface and airborne COVID-19 detection. In the last we proposed some future directions in this regards.

II. DETECTION TECHNOLOGY

Light behaves like a wave and its distortion helps in seeing things. Even with a standard microscope, it is very difficult to detect anything below the wavelength of light that is only about half a micrometre - about 2000 millimetres. There are ways to do things in the light that means you can get a little less than that, using funny things called metamaterials, but they are rare. For much more magnification, one needs to use something with a much smaller wavelength, a common one to use waves associated with a moving electron, much shorter and therefore you can see much much smaller things.

Other forms use scanning tunneling electron microscopes, where one needs to measure the electric current between a measurement error and your object - in this case, measurement up to large atoms size is possible.In 2008 Researchers at the University of California, Berkeley [4] identified hydrogen atoms, as the smallest atomic level in the Universe. They used a graphene sheet, a single layered, one carbon atom thick, and scanned this sheet using the electron microscope to detect hydrogen atoms. This also helps to actually see this zig-zag canal of hydrocarbons. with a large molecule like butane, It is absolutely amazing!

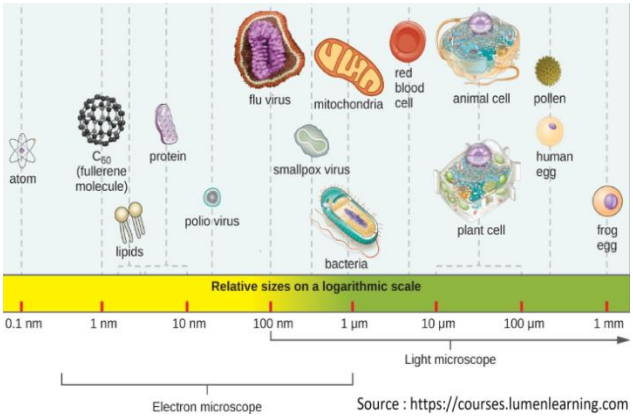

Fig. 1

Artificial intelligence (AI) is similar to Machine learning that teaches machine like computer to think in the same way that humans do: to learn and to improve on the past [2]. Artificial Intelligence is the one of the most important and most useful scientific advances ever made, helping humans the most pressing challenges, from climate change to improved health delivery. It works by examining the data, identifying patterns, and including minimal human intervention. Machine learning employs two basic strategies: supervised learning and unsupervised learning. Supervised learning that works in the same way as learning people and unemployed readers who try to learn different data structures in unlabeled examples. The supervised AI tasks are performed by currently written data points called a training set, whereas unsupervised learning helps to detect all kinds of unknown patterns in the data. The use of AI to detect COVID-19 was performed by various investigators [8,9]. For AI to meet this promise, we realize that technology should be constructed in a human way and that we have to look at all of the demanding situations and risks.Many AI models rely on historical data to make predictions for future behavior. Reducing the variety of variables in a statistics set by way of grouping the same or related attributes for better translation and good model training.

III. COVID-19 AND AI DETECTION

COVID-19 virus is generally spherical with 120-160 nm diameter and decorated with large (~20 nm) petal-shaped surface projection [6-8]. COVID-19 has been widely spread worldwide since the first case reported in 2019. This invisible virus COVID-19 has taken many lives. Rapid and undetectable viral spread is one of the major problems in regards, creating havoc. Early diagnosis is essential for the treatment and isolation of patients to prevent the spread of the virus. The Temperature screening is one of the tool in this regards. The latest learning model called COVID-19 to obtain a neural network (COVNet), developed to capture the precise

findings of COVID-19 and to distinguish between the findings of pneumonia and other lung diseases, AI models based on existing data can help covid interests make better use of scarce health care resources, offer personalized patient management programs, inform policy, and speed up clinical trials.

The visible light between 400 and 700 nm and infrared, microwave and radio waves have long wavelengths for interactions with virus-like COVID-19. It is too small to interact with these light wavelengths, not absorbing or reflecting that light, do not interact at all. But the short end of the ultraviolet spectrum (10–400 nm) certainly interacts with the virus. It is sensitive to ultraviolet light and helps in detecting COVID-19. This technology is developed by Amos Danielli of the Alexander Kofkin Faculty of Engineering at Bar-Ilan University - the saliva test [1] may be analyzed within 15 minutes. The proven technology to reduce the time of prognosis of the Zika virus is currently being used at the Israeli Ministry of Health's predominant virology label at Tel Hashomer Hospital.The technology developed in Daniel's lab enables the critical detection of direct RNA sequencing by virtue of the viral RNA to fluorescent light molecules when illuminated by a laser beam.The two main goals aimed at building this technology are to simplify the diagnostic process and make it more accurate.

The viruses are taken into consideration life, on the one hand, they comprise the key elements that make up all dwelling things: nucleic acids, DNA or RNA (any virus can have only one or more) and however it do no longer have the capacity to study and act independently of the statistics contained in those nucleic acids. These nucleic acids are electronically charged, which is a charged particle that affects the magnetic field of a similar sequence. Since electric and magnetic fields are on one side of the same coin, this also affects a similar electric field. Similar technology is available in the form of Nuclear Magnetic Resonance and Magnetic Resonance Imaging. Many structural biologists use some heavy atoms, with nonspecific magnetic field effects for specific detection. Recent advances in nanoscience, techniques for magnetic field analysis of nanoparticles are available. Such a technique is also used for the study of target viral infections of single cells or small groups of cells that are optically accessible in any tissue. [6]. The other physics principle wave-particle can also provide a wave probe for the virus. The best result is also obtained with electron microscopes with certain energy. By doing so, one can create a three-dimensional map of COVID-19 or any small particle that actually appears in its shape. Electron microscopes also provide the best resolution imaging of this small size of cells to an individual virus.

The virus does not multiply itself, but requires a host for multiplication.The COVID-19 virus is stable for several hours to days in aerosols and on surfaces, according to a study from various reputed organizations [7-9]. Viruses in aerosols can last up to three hours, four hours on copper, 24 hours on cardboard, and two to three days on plastic and stainless steel. The important information about the stability of the virus that causes the disease indicates that people can get the virus through air and after contact with contaminated objects. Artificial intelligence can make this detection smart,safer and fast. The detection of viruses on vital usable places like aerosols, cardboard, stainless steel etc. also helps in COVID-19 prevention and transmission.

IV. SMART EYE TECHNOLOGY

The X-ray lens, de broglie matter wave, optical pattern, and very low magnetic variation are properties which help to detect microorganism. The size of observation increases drastically, as one approaches lower level. These millions of observations makes the analysis level very high. The artificial intelligence learning model does the same task in an effective manner. Like an eye lens can increase the visibility to a few micrometres from naked eye by a few millimeters capacity, it is the size of microorganisms which decides the type of detection technique. The AI models rely on historical data to make predictions from external observation. The integration of optical phenomena and magnetic variation can increase the detection upto micron level to detect flu virus, smallpox virus and various bacterias. The use of laser light can increase this level too. The most important role is played by AI algorithms. First expected results like variation in optical pattern or magnetic field from different surfaces for a given object used for training purposes. Then AI learns by means of trial and error to achieve a complicated goal. This removes the need for the human to specify a goal for the algorithm in advance. This is an critical step because getting the intention even a piece incorrect could lead to undesirable or even dangerous behavior. Reducing the number of variables in a dataset like detection of a specific microorganism leads to more accuracy of prediction.

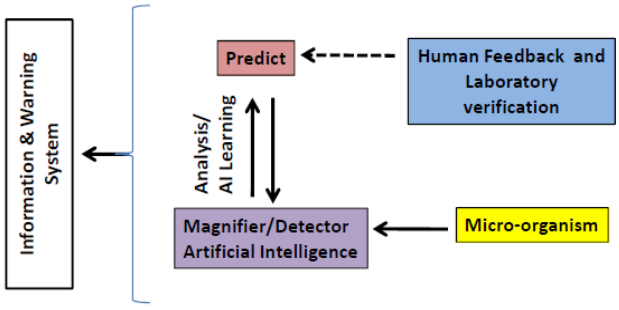

Fig. 2 AI detector learning model

One such example is effective use of AI thermal imaging for the detection of temperature symptoms due to COVID-19. This has helped the government in separating doubtful cases and saving the lives of many.

Similarly we have proposed some more design [Figure 2] for the purpose of detecting microorganisms like covid-19 on different surfaces. The trained AI equipe glass lens (model a) or amount of optical pattern variation of UV laser light model b and c) or magnetic variation (model d) can help in differentiate and detect COVID-19 virus. a combination of such techniques may make prediction better.

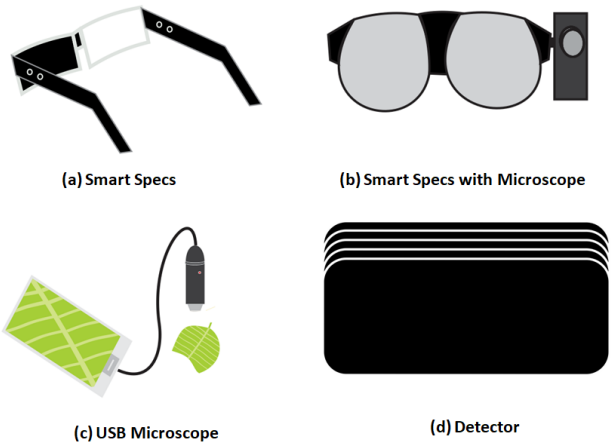

Fig. 3 Smart Artificial Detector

Such designs also help in various other diseases like dengue. This allows humans with no technical experience to detect the exact location of the necessary remedial actions. The detection of their presence also helps to limit its spreading, This detective measure is one of the current strategies to limit the spread of cases.

V. CONCLUSION AND FUTURE SCOPE

The best way to prevent and slow down COVID-19 transmission is prevention strategies in the current scenario because of nonexistence of its medical drug . The prevention involved patient segregation,social distancing, use of masks etc. The COVID-19 virus detection is also one of the major prevention strategies to break transmission chains. It ranges from surface detection to inner body detection. The physical principle such as optical magnification, variation in electric and magnetic fields due to the presence of any object can help in detections. The AI integrated with such technologies will prove to be very beneficial in controlling communicable diseases. Various AI based technologies such as thermal scanner, resources management, clinical management, GIS based locator etc are proved to be very useful today. The proposed smart eye technology is also an AI based detection device which will be well informed about the COVID-19 virus on various surfaces, those who can spread viruses like bomb detectors. Surely, in future this technology will be available in smart eye glasses , this will detect viruses on surfaces or in humans mouth in just a look. It may work for many communicable diseases and airborne microorganisms. This will help control management agencies for causes and it spreads control. This will prove a better tool for communicable disease prevention and protection. mechanisms must be adopted to control its spread.

The main conclusions of the study may be presented in a short Conclusion Section. In this section, the author(s) should also briefly discuss the limitations of the research and paintFuture Scope for improvement.

REFERENCES

[1] Bar-Ilan, New Technology Developed by Dr. Amos Danielli May Significantly Reduce Diagnostic Time of Coronavirus Date: 2020 Feb, https://www1.biu.ac.il/indexE.php?id=33&pt=20&pid=4&level=1&cPath=4&type=1&news=3422

[2] K. Abhishek, A. Ganvir, A. Rouf, A. Das, K. Rama Krishna, Open Access ArticleExploring the Possibility of Big Data and Machine Learning in Steel Melting Shop Logistics Planning, Vol.**5** , Issue.**5** , pp.**1-5**, May-**2019**

[3] Kampf Günter, Potential role of inanimate surfaces for the spread of coronaviruses and their inactivation with disinfectant agents,Infection Prevention in Practice, Volume **2**, Issue **2**, 100044 June, **2020**.

[4] Meyer JC1, Girit CO, Crommie MF, Zettl A., Imaging and dynamics of light atoms and molecules on graphene, Nature. **17**;**454** (7202):319-22, Jul, **2008.**

[5] Micaela Elvira Martinez * - The calendar of epidemics : Seasonal cycles of infectious diseases, **2018** Nov; **14**(**11**): e1007327.

[6] Ray, Sidney F. (2002). Applied Photographic Optics: Lenses and Optical Systems for Photography, Film, Video, Electronic and Digital Imaging. Focal Press. p. 40. ISBN 0-240-51540-4.

[7] Schubert, R., Herzog, S., Trenholm, S. *et al.* Magnetically guided virus stamping for the targeted infection of single cells or groups of cells. *Nat Protoc* 14, 3205–3219 (2019). https://doi.org/10.1038/s41596-019-0221-z

[8] Ward, P et al. (2020), 'COVID-19/SARS-CoV-2 Pandemic', Faculty of Pharmaceutical Medicine blog, 6 April

[9] WHO : Various reports on COVID 10

AUTHORS PROFILE

Dr. Mukesh Kumar, awarded Ph.D. by University of Delhi in 2005. He was awarded JRF and SRF fellowship by CSIR. In his more than 15 years of teaching career at Swami Shraddhanand College, University of Delhi, he has taught various courses to undergraduate students. He is actively involved in research in the fields of popular science, Energy and classical mechanics. He has published many papers and organized conferences.

Dr. Lokesh Rana , awarded Ph.D. by University of Delhi in 2019. He was awarded JRF and SRF fellowship by CSIR. His expertise includes fabrication of Surface acoustic wave based sensors. He has also experience in fabrication of PDMS based micro channels. He has published several papers on SAW based gas and biosensors.

