Robots and Artificial intelligence can be helpful in future Covid Research

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Abstract

The world for over almost one and half year now has faced the pandemic of Corona, a disease by the Flu virus, diagnosed both by certain clinical and lab imaging tests. [(5)]

The most important issue which is a hindrance of treatment types and vaccine discovery is mutation. During replication, a virus often undergoes genetic mutations that may create what are called variants**.** To understand the concept of the article one has to first understand basics of Mutation. Artificial intelligence has helped robots to identify the types of mutations and hence in demographic and geographical distinctions. We have observed, being inspired by the notable discovery of the famous mathematician, Alan Turing, that only a machine can decipher the encoded signals used during German bombings, an invention of the modern computer, which cut short the second world war by at least three years saving millions of lives. Hence it is a feeling that a Robot instilled with AI can identify mutations in the Corona virus before it occurs.

Key words: New concept with Artificial intelligence and Robot in future Covid research.

Article

To understand the concept of this article one must first understand the concepts behind mutation and artificial intelligence and then if at all there is any scope of instilling AI in robots in future to develop prevention of Covid.

As it is expected that Covid, like other Flues will in future be a part of our life and keep changing its nature thereby giving a scope to accordingly change an existing vaccine instead of investing hugely creating one after another.

Mutation

Mutation causes the DNA in the virus to send altered signals to its RNA and finally the RNA produces such proteins which after binding to the specific (ACE-2 receptor in humans) receptor enter the body and can create new kinds of damage to various organ systems. Some mutations however may weaken the virus too fortunately. Others may yield some advantage that **enables the variant to proliferate**. [8]

Variants with distinctly different physical characteristics may be co-termed a strain. [7]

The variant that **emerged in England** in September, B.1.1.7, contributed to a surge in cases that sent the U.K. back into lockdown in January. In *southern Africa*, hospitals faced pressure from a resurgence driven by another variant, 501Y.V2. (**South African strain**).**The Brazilian strain**, so-called P.1 variant spotted in Manaus, Amazonas state, in December may have driven a surge in cases that strained the health system and led to oxygen shortages.

At present in India that what is being thought to be a 2nd Covid-19 wave is actually mixed with a new mutant strain –B.1.167 which is affecting young people, not responding to standard regimens, responding with great difficulty to monoclonal antibodies(costly), killing, in days normal apparently absolutely healthy individuals in 18-45 years' age group, the bread earners and the country's future.

How quickly have the strains spread?

- Rapidly, aided by year-end holidays traditionally associated with increased family and social mixing.

Broadly, they pose different concerns of varying degrees. These relate to their:

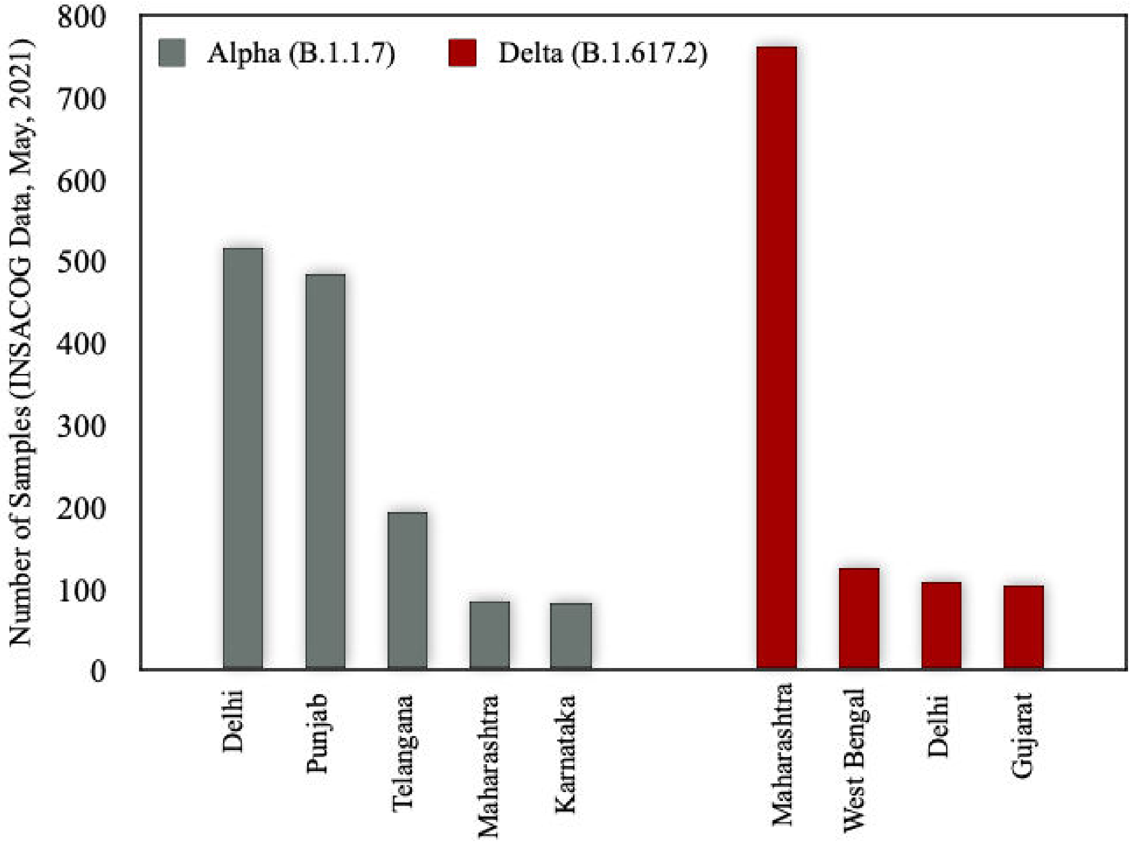
- Transmissibility, or propensity to spread
- The severity of illness they cause

- Neutralization capacity, or the likelihood they will infect people who have recovered from a previous bout of Covid-19
- Potential impact on vaccination through their ability to evade the protection that immunizations are designed to generate
- That another surge could occur even as states are flinging open vaccine eligibility criteria, trying to get shots in arms as quickly as possible.

How many mutations are there?

- Many thousands of mutations and distinct lineages have arisen in the SARS-CoV-2 genome since the virus emerged in late 2019. **A variant with a so-called D614G mutation emerged in early 2020. By June, it had replaced the initial strain identified in China to become the dominant form of the virus circulating globally**.
- Months later, a novel variant linked to farmed mink was identified in a dozen patients in North Jutland, Denmark, but doesn't appear to have spread widely.
- As SARS-CoV-2 continues to circulate, more mutations will arise, potentially leading to more variants. [(9)]

Distribution of Variants in sequenced samples



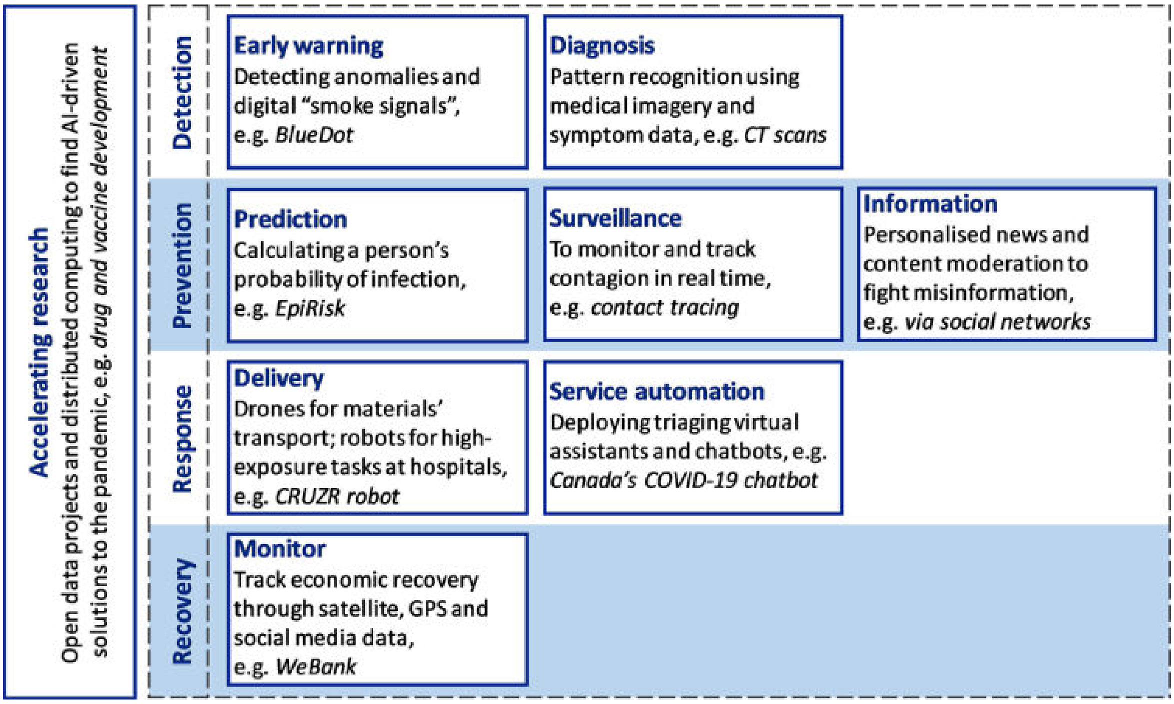
State	B.1.1.7 (VOC)			B.1.351 (VOC)			P1 (VOC)			B.1.617 (VUI)			Total VOC/VUI
	Tr&Co	Community	Total	Tr&Co	Community	Total	Tr&Co	Community	Total	Tr&Co	Community	Total	
ANDHRA PRADESH	28	32	**60**	3	3	**6**					143	**143**	**209**
BIHAR	4	5	**9**			**0**					5	**5**	**14**
CHANDIGARH		51	**51**			**0**						**0**	**51**
CHATTISGARH	1	19	**20**			**0**					75	**75**	**95**
DELHI	91	391	**482**	4	19	**23**				1	106	**107**	**612**
GOA	4	2	**6**			**0**					1	**1**	**7**
GUJARAT	18	42	**60**	2		**2**					102	**102**	**164**
HARYANA	6	14	**20**			**0**					1	**1**	**21**
HIMACHAL PRADESH		34	**34**			**0**					2	**2**	**36**
JAMMU & KASHMIR		25	**25**			**0**				1	13	**14**	**39**
JHARKHAND		14	**14**								61	**61**	**75**
KARNATAKA	40	42	**82**	6	0	**6**				15	131	**146**	**234**
KERALA	15	3	**18**			**0**						**0**	**18**
LADAKH	1	5	**6**			**0**					1	**1**	**7**
MADHYA PRADESH	4	51	**55**			**0**					53	**53**	**108**
MAHARASHTRA	35	53	**88**	5	1	**6**	1		1		870	**870**	**965**
ODISHA	3	28	**31**			**0**					39	**39**	**70**
PUDUCHERRY	23		**23**	1		**1**					23	**23**	**47**
PUNJAB	8	508	**516**	1	1	**2**					1	**1**	**519**
RAJASTHAN	5	18	**23**			**0**						**0**	**23**
SIKKIM		0	**0**			**0**					0	**0**	**0**
TAMIL NADU	14	1	**15**	2		**2**						**0**	**17**
TELANGANA	148	53	**201**	62	7	**69**	0			1	76	**77**	**347**
TRIPURA		0	**0**		0	**0**					0	**0**	**0**
UTTAR PRADESH	17		**17**	1		**1**						**0**	**18**
UTTARAKHAND	1	25	**26**			**0**					5	**5**	**31**
WEST BENGAL	14	26	**40**	6	3	**9**					124	**124**	**173**
Total	**480**	**1442**	**1922**	**93**	**34**	**127**	**1**	**0**	**1**	**18**	**1832**	**1850**	**3900**

Tr&Co= Travelers and contacts

State-wise Variants of Interest and Variants of Concern in India as of 05.05.2021

Data from INSACOG, May 2021

Algorithm of Artificial intelligence:



Concept of Artificial intelligence(AI)

AI-powered **early warning systems** can help detect epidemiological patterns by mining mainstream news, online content and other information channels in multiple languages to provide early warnings, which can complement syndromic surveillance and other healthcare networks and data flows.

AI tools can help **identify virus transmission chains and monitor broader economic impacts**. In several cases, AI technologies have demonstrated their potential to infer epidemiological data more rapidly than traditional reporting of health data. Institutions such as Johns Hopkins University and the OECD (oecd.ai) have also made available interactive dashboards that track the virus' spread through live news and real-time data on confirmed coronavirus cases, recoveries, and deaths.[2]

Rapid diagnosis is the key to limit contagion and understand the disease spread. Applied to images and symptom data, AI could help to rapidly diagnose COVID-19 cases. Attention must be given to collecting data representative of the whole population to ensure scalability and accuracy. Limiting contagion is a priority in all countries and AI applications are helping prevent the virus' spread.

Role of Robots or Drones:

Semi-autonomous **robots and drones** are being deployed to respond to immediate needs in hospitals such as delivering food and medications, cleaning and sterilisation, aiding doctors and nurses, and performing deliveries of equipment.

AI can assist the response to the crisis, and the recovery to follow

Conversational and interactive AI systems help respond to the health crisis through personalised information, advice and treatment, and learning.

To fight **misinformation** – the COVID-19 "infodemic" – social networks and search engines are using personalised AI information and tools and relying on algorithms to find and remove problematic material on their platforms.

Identifying, finding and contacting **vulnerable, high-risk, individuals**. For example, Medical Home Network, a Chicago-based non-profit, has implemented an AI platform to identify Medicaid patients most at risk from COVID-19 based on risk of respiratory complications and social isolation.

AI may eventually play a role in accelerating training and education of healthcare personnel.

Finally, AI tools can help monitor the economic crisis and the recovery – for example, via satellite, social networking and other data (e.g. Google's Community Mobility Reports) – and can learn from the crisis and build early warning for future outbreaks.[4]

AI in Detection of COVID-19 Variants

Artificial Intelligence (AI) has been applied in the field of medical applications extensively in order to improve the effectiveness, productivity and consistency of health care. It has also tasted success in basic research. Protein sequences and genetic codes can be modelled using Natural Language Processing (NLP) techniques and to detect mutations. A study by Berger et al. highlights the idea of a viral immune escape through mutation and how NLP can be instrumental in detecting this. Viral samples from patients may take weeks to get sequenced in a lab and then the mutations need to be re-created and studied to understand variations. AI based models can speed this up and predict potential mutations immediately. [6]

Grammar and semantics have been used to identify a virus - a successful virus is grammatically correct while an unsuccessful one is not. For viruses, the embedding of the genetic sequences grouped viruses according to how similar their mutations were. The system looks for similar grammatical structures but very different meanings, and it flags mutations for review if their meanings have changed the most. The top mutations detected by the NLP algorithm were checked against real viruses in a lab to see how many were escape mutations. The accuracy scores ranged from 0.69 for HIV to 0.85 for coronavirus.

The ability for viruses to mutate and evade the human immune system, a term called viral escape, is an obstacle vaccine development, Hence understanding the complex rules of this escape, using machine models, could design therapeutic design .

Such designs preserve viral infectivity but cause the virus to look different to the immune system.

This approach language models of Influenza hemagglutinin, HIV-Envelope protein and presently, SAARS CoV2 spike proteins can accurately predict structural escape patterns which be a promising conceptual bridge between natural language and viral evolution.

Using these tools accelerates the process of detecting virus behaviour - and time is of essence in this ongoing battle against COVID19. [10]

Will this concept be able to change the idea of investing on development of vaccines of combining them?

This might be true if this concept o f AI can be used in robots to detect mutations, by using AI in them vaccination picture will also change in future.

Data are emerging, and no clinical studies have directly compared different vaccine types and their ability to protect against the new strains. Overall, 10 vaccines have proved effective in clinical trials at preventing severe disease and death from Covid-19. The studies suggest, however, that some may not be as good at stopping less severe illness in countries where particular variants predominate.

The impact, (Vaccine combination) though, isn't likely to be significant, according to the WHO but still is an interesting area of research. That further intensifies the idea that development of one after other vaccine or combining them may actually change once Robots instilled wit AI can detect the exact anticipated mutation.

SUMMARY

Thus if AI can be of help in such rapid detection of Covid in demography, there can be a scope to research on further. [5]

Likely this means that instilling in Robots can in future help them to identify the DNA coding change in virus, before it occurs, the main idea behind anticipating a new mutant of Corona virus before its outbreak. [10]

This new concept of using AI in robots hence can targetise vaccine development in future instead of investing hugely in one vaccine after another and trialling them, with no definite pattern of benefit, though 10 of many, have proved beneficial but not without side effects.

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References

1. Browning L., Colling R., Rakha E., et al Digital pathology and artificial intelligence will be key to supporting clinical and academic cellular pathology through covid-19 and future crises: the pathlake consortium perspective. *J Clin Pathol.* 2020
2. Chamola V., Hassija V., Gupta V., Guizani M. A comprehensive review of the covid-19 pandemic and the role of IoT, drones, ai, blockchain, and 5g in managing its impact. *IEEE Access.* 2020; 8:90225–90265.
3. Mohamadou Y., Halidou A., Kapen P.T. A review of mathematical modeling, artificial intelligence and datasets used in the study, prediction and management of covid-19. *Applied Intelligence.* 2020:1–13.

4. Chen J., Li K., Zhang Z., Li K., Yu P.S. A survey on applications of artificial intelligence in fighting against covid-19. 2020b. arXiv:2007.02202.
5. Ilyas M., Rehman H., Nait-ali A. Detection of covid-19 from chest x-ray images using artificial intelligence: An early review. 2020. arXiv:2004.05436.

6. TsikalaVafea M., Atalla E., Georgakas J., Shehadeh F., Mylona E., Kalligeros M. Emerging technologies for use in the study, diagnosis, and treatment of patients with covid-19. *Cell Mol Bioeng.* 2020

7. Lu R, Zhao X, Li J, Niu P, Yang B, Wu H, et al 2020. Genomic characterization and epidemiology of 2019 novel coronavirus: implications for virus origins and receptor binding. Lancet 395:565–574. doi:10.1016/S0140-6736(20)30251-8.

8. Chen Y, Liu Q, Guo D. 2020. Emerging coronaviruses: genome structure, replication, and pathogenesis. J Med Virol 92:418–423. doi:10.1002/jmv.25681

9. Nakagawa K, Lokugamage KG, Makino S. 2016. Viral and cellular mRNA translation in coronavirus-infected cells. Adv Virus Res 96:165–192. doi:

10. Brian Hie, Ellen D.Zhonng, B.Berger et al,Learning the language of viral evolution and escape *Science* 15 Jan 2021:Vol. 371, Issue 6526, pp. 284-288