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COVID-19 and Artificial Intelligence: the pandemic pacifier

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Background

COVID-19 remains a threat to the entire world [1, 2]. In an attempt to curb its spread and facilitate its treatment, the technological tool that is Artificial Intelligence (AI) is being researched as a potential alternative to conventional methods.

Profound social phenomena, i.e., globalism in combination with urban sprawl, population expansion and demographic changes, have profoundly altered the planet. Industrial Revolution 4.0 marks the dawn to the combination of digital, physical and biological systems, by application of digital skills such as Blockchain, Internet of things, Artificial Intelligence and Big data [3, 4]. This marks an empowering and inspiring era for medicine and science, where these technologies can automate interconnected ecosystems to enhance the experience of caregiving systems. This enabling us to analyze real-time data, model risk associations and predict future trends [5]. The application of this technology in numerous healthcare and medical fields acting as a decision assistance tool will provide aid from diagnosis to prognosis [6]. For example, detecting a myocardial infarction using a six lead ECG with a validated deep learning bases AI algorithm [7].

The application of these technologies is to minimize the loss caused by this pandemic. [8,9]. The outbreak of COVID19 was detected by the AI technology through a Toronto based startup, named Blue Dot. By using a surveillance programme supported by AI, they were able to unmask this outbreak prior to the Chinese Authorities and International Agencies. Another monumental example of modern-day technologies is the breakthrough in the treatment of Rheumatoid Arthritis by discovering a biologic named Baricitinib which is used in combination with Remdesivir [10].

For instance, AI tools in SARS-COV-2 pandemic are highly competitive to human performance, such as rapid screening and diagnosis of the disease, surveilling the efficacy of the treatment, keeping record and depicting active cases and mortality, inventions of medications and vaccines, relieving the workload of healthcare workers and extinguishing the spread of the disease. [11]. Contact tracing platforms like Aarogya Setu App [12], implemented by the Government of India, Australian

Government's COVID Safe app [13], Trace Together- a Bluetooth-based contact tracing app developed in Singapore [14]; based on syndromic mapping/surveillance technology [15] Such a transition represents a futuristic breakthrough, as it imminently optimizes advanced, open-access platforms to unlock their capacity to assist researchers in designing a diagnostic test for pathogens. Deployment of international and national responses to any outbreak are far more rapid and efficient [16].

The unprecedented situation caused by COVID-19 has made the implementation of telemedicine-based services a pivotal manner to uphold the treatment of patients [17]. It is vital for the amalgamation of technology and knowledge to be better prepared for the next pandemic [18].

Clinical applications in COVID-19

Artificial intelligence aided screening for COVID-19 vs conventional methods

The first suggested application of AI in this current pandemic is the early detection, screening and diagnosis of the disease [11]. Massachusetts Institute of Technology (MIT) designed an Open Voice Medicine model architecture, which makes use of forced-cough and other biomarkers, namely muscular degeneration and alterations in vocal cords to diagnose COVID19 [19]. Furthermore, it has been suggested to be a far better means of screening as compared to thermometers, which are not reliable in asymptomatic afebrile COVID19 positive patients. This proposed technology, with an accuracy of 98.5%, reaches 100% diagnosis of both symptomatic and asymptomatic COVID19 patients [19].

Large scale application technologies

Digital services such as hotlines and online questionnaires have been extensively used [20]. These methods have their shortcomings in terms of hotlines being inundated. AI has allowed for the creation of symptom-to-disease search engines, one of which is named Symptoma [20]. The latter precisely identifies positive cases of COVID19 from a database of 20,000 other possible causes. Its accuracy is 96.32%. Moreover, its availability in 36 different languages lends itself to extensive use. Another symptom analyzer known as Isabel Healthcare, provides only 6000 differential diagnoses [20]. Similarly, the clinical use of AI guided chatbots has been established to ease out communication with the public [5, 21].

RT-PCR and artificial intelligence combination

Owing to its increased availability, RT-PCR is the gold standard in diagnosis. CT scans have diagnosed patients in RT-PCR negative cases [22]. An AI based CT diagnosis, which demonstrates an accuracy level 95%, proves to have a promising role in the diagnosis of the disease. On a gross spectrum the accuracy was 90.8%, which is superior to RT-PCR with a sensitivity of 60-70% [22]. This study highlights the need for a combination of RT-PCR and CT scans in the detection of COVID19. [23].

Rapidity of Artificial intelligence in diagnosis

As per Petrova V, a virologist from the University of Cambridge, United Kingdom, the value of AI in the diagnosis of COVID19 can be gauged from its ability to relieve the burden of clinicians during this pandemic. Applications such as Infervision's AI can read the scan in 10 seconds as compared to a CT scan manual which takes up 15 mins of reading time [24]. Chest imaging (X-ray) can also be employed for the detection of COVID19 as performed in Beijing Hospital [5]. This approach has been put to practice in Zhongshan Ophthalmic Eye Center, China [5].

Contact tracing of individuals and minimizing the spread of COVID19 has been made possible by AI. In China, machine learning models were created from data, collected through mobile payment applications, migration maps and social media, the aim of which was to gather real-time information about the movement of people, who had been to Wuhan market. These models were then used to predict the transmission dynamics of COVID-19 and hence curb its spread [25]. Lastly AI has contributed extensively in new drug design and drug repurposing for COVID19 [26, 27].

Current status of Artificial intelligence

The principle and core basis of artificial intelligence is the analyses of historical data [28]. A pitfall of this heavy reliance on historical data suggests that a wide spectrum grassroot implementation across all sectors will face many challenges as in many cases new system development cycles will need to be procured and initiated, thus retarding the process. In juxtaposition to this the pre-existing intrinsic technological and digital base lends itself to be retrofitted to support further artificial intelligent modifications to curb the spread of the virus via the formation of an integrated digital ecosystem [29, 30].

Future scope of Artificial intelligence:

The future endorsement and wide scope application of artificial intelligence has never been so clear cut and supported [31]. The development of software and technology to improve screening, mapping, data collection and future predictions of outbreaks is well underway and various models are currently being implemented and tested in across the globe [32]. It is evident that raw data collection from pre-existing social media applications and or newly designed platforms will be key for the real-time assessment of the situation. The use of one's mobile cellular device as a continuous data feed and point of input will thereby allow projections of outbreaks and epicenters to be more accurate and thus will form the basis of future models. The future use of this artificial intelligent data driven model is the donnée to all current research being undertaken and will form

the foundation of the worlds future preparations to combat pandemics to the likes of COVID19 in future [5].

Conclusion

Artificial intelligence will become a mainstay in both the diagnosis and treatment of COVID-19 as well as similar pandemics in future. The application and system development will be challenging; the accuracy and rapidity of its use far outweigh this drawback. The current global technological leaders have proven that the retro modification of current data systems and applications have been indispensable in the war on COVID-19, thus permanently securing their development and application in future.

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Competing interests

There is no conflict of interest for any author of this manuscript.

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References

1. Banerjee I, Robinson J, Kashyap A, Mohabeer P, Shukla A, Leclézio A. The changing pattern of COVID-19 in Nepal: A Global concern- A Narrative Review. Nepal J Epidemiol. 2020 Jun 30;10(2):845-855.
https://doi:10.3126/nje.v10i2.29769
PMid: 32874698; PMCid: PMC7423402

2. Banerjee I, Mohabeer P, Shukla A, Kashyap A, Robinson J. COVID-19: Recent advances in epidemiology, virology, etiopathogenesis, clinical trials and vaccine development. J Biomed Sci, 2020; 7(1), 18-27.
https://doi.org/10.3126/jbs.v7i1.2984

3. Kashyap A. Artificial Intelligence & Medical Diagnosis. Sch. J. App. Med. Sci. Dec, 2018; 6(12): 4982-4985.
https://doi:10.21276/sjams.2018.6.12.61

4. Cheng GJ, Liu LT, Qiang XJ, Liu Y. Industry 4. 0 development and application of intelligent manufacturing. In IEEE; p. 407-410.

5. Ting DSW, Carin L, Dzau V, Wong TY. Digital technology and COVID-19. Nat Med. 2020;26(4):459-61.
https://doi.org/10.1038/s41591-020-0824-5
PMid:32284618 PMCid: PMC7100489

6. Van Teijlingen A, Tuttle T, Bouchachia H, Sathian B, Van Teijlingen E. Artificial Intelligence and health in Nepal. Nepal J Epidemiol. 2020;10(3):915-8.
https://doi.org/10.3126/nje.v10i3.31649
PMid:33042595 PMCid:PMC7538016

7. Cho Y, Kwon J-M, Kim K-H, Medina-Inojosa JR, Jeon K-H, Cho S, et al. Artificial intelligence algorithm for detecting myocardial infarction using six-lead electrocardiography. Sci Rep [Internet]. 2020;10(1).
https://doi.org/10.1038/s41598-020-77599-6
PMid:33235279 PMCid:PMC7686480

8. Mas-Coma S, Jones MK, Marty AM. COVID-19 and globalization. One Health. 2020;9(100132):100132.
https://doi.org/10.1016/j.onehlt.2020.100132
PMid:32368611 PMCid:PMC7184197

9. Adly AS, Adly AS, Adly MS. Approaches based on artificial intelligence and the Internet of Intelligent Things to prevent the spread of COVID-19: Scoping review. J Med Internet Res. 2020;22(8):e19104.
https://doi.org/10.2196/19104
PMid:32584780 PMCid:PMC7423390

10. Bragazzi NL, Dai H, Damiani G, Behzadifar M, Martini M, Wu J. How Big Data and artificial intelligence can help better manage the COVID-19 pandemic. Int J Environ Res Public Health. 2020;17(9):3176.
https://doi.org/10.3390/ijerph17093176
PMid:32370204 PMCid:PMC7246824

11. Vaishya R, Javaid M, Khan IH, Haleem A. Artificial Intelligence (AI) applications for COVID-19 pandemic. Diabetes Metab Syndr. 2020;14(4):337-9.
https://doi.org/10.1016/j.dsx.2020.04.012
PMid:32305024 PMCid:PMC7195043

12. Kodali PB, Hense S, Kopparty S, Kalapala GR, Haloi B. How Indians responded to the Arogya Setu app? Indian J Public Health. 2020;64(Supplement):S228-30.
https://doi.org/10.4103/ijph.IJPH_499_20
PMid:32496261

13. Thomas R, Michaleff ZA, Greenwood H, Abukmail E, Glasziou P. Concerns and Misconceptions About the Australian Government's COVIDSafe App: Cross-Sectional Survey Study. JMIR Public Health Surveill. 2020 Nov 4;6(4):e23081.
https://doi.org/10.2196/23081
PMid:33048826 PMCid:PMC7644267

14. Lai SHS, Tang CQY, Kurup A, Thevendran G. The experience of contact tracing in Singapore in the control of COVID-19: highlighting the use of digital technology. Int Orthop. 2020 Nov 14:1-5.
https://doi:10.1007/s00264-020-04646-2
PMiD: 33188602; PMCiD: PMC7666400.

15. Mandl KD, Overhage JM, Wagner MM, Lober WB, Sebastiani P, Mostashari F, et al. Implementing syndromic surveillance: a practical guide informed by the early experience. J Am Med Inform Assoc. 2004;11(2):141-50.
https://doi.org/10.1197/jamia.M1356
PMid:14633933 PMCid:PMC353021

16. Sreepadmanabh M, Sahu AK, Chande A. COVID-19: Advances in diagnostic tools, treatment strategies, and vaccine development. J Biosci. 2020;45(1).
https://doi.org/10.1007/s12038-020-00114-6
PMCid:PMC7683586

17. Stawicki SP, Jeanmonod R, Miller AC, Paladino L, Gaieski DF, Yaffee AQ, et al. The 2019-2020 novel Coronavirus (severe

acute respiratory syndrome Coronavirus 2) pandemic: A joint American college of academic international medicine-world academic council of emergency medicine multidisciplinary COVID-19 working group consensus paper. J Glob Infect Dis. 2020;12(2):47-93.
https://doi.org/10.4103/jgid.jgid_86_20
PMid:32773996 PMCid:PMC7384689
18. Uddin M, Mustafa F, Rizvi TA, Loney T, Suwaidi HA, Al-Marzouqi AHH, et al. SARS-CoV-2/COVID-19: Viral genomics, epidemiology, vaccines, and therapeutic interventions. Viruses. 2020;12(5):526.
https://doi.org/10.3390/v12050526
PMid:32397688 PMCid:PMC7290442
19. Laguarta J, Hueto F, Subirana B. COVID-19 Artificial Intelligence Diagnosis using only Cough Recordings. IEEE Open Journal of Engineering in Medicine and Biology. 2020;:1-1.
https://doi.org/10.1109/OJEMB.2020.3026928
20. Martin A, Nateqi J, Gruarin S, Munsch N, Abdarahmane I, Zobel M et al. An artificial intelligence-based first-line defence against COVID-19: digitally screening citizens for risks via a chatbot. Scientific Reports. 2020;10(1).
https://doi.org/10.1038/s41598-020-75912-x
PMid:33149198 PMCid:PMC7643065
21. Ahuja A, Reddy V, Marques O. Artificial intelligence and COVID-19: A multidisciplinary approach. Integrative Medicine Research. 2020;9(3):100434.
https://doi.org/10.1016/j.imr.2020.100434
PMid:32632356 PMCid:PMC7255319
22. Harmon S, Sanford T, Xu S, Turkbey E, Roth H, Xu Z et al. Artificial intelligence for the detection of COVID-19 pneumonia on chest CT using multinational datasets. Nature Communications. 2020;11(1).
https://doi.org/10.1038/s41467-020-17971-2
PMid:32796848 PMCid:PMC7429815
23. Bachtiger P, Peters N, Walsh S. Machine learning for COVID-19-asking the right questions. The Lancet Digital Health. 2020;2(8):e391-e392.
https://doi.org/10.1016/S2589-7500(20)30162-X
24. McCall B. COVID-19 and artificial intelligence: protecting health-care workers and curbing the spread. The Lancet Digital Health. 2020;2(4):e166-e167.
https://doi.org/10.1016/S2589-7500(20)30054-6
25. Whitelaw S, Mamas M, Topol E, Van Spall H. Applications of digital technology in COVID-19 pandemic planning and response. The Lancet Digital Health. 2020;2(8):e435-e440.
https://doi.org/10.1016/S2589-7500(20)30142-4
26. Hessler G, Baringhaus K. Artificial Intelligence in Drug Design. Molecules. 2018;23(10):2520.
https://doi.org/10.3390/molecules23102520
PMid:30279331 PMCid:PMC6222615
27. Zhou Y, Wang F, Tang J, Nussinov R, Cheng F. Artificial intelligence in COVID-19 drug repurposing. The Lancet Digital Health. 2020;2(12):e667-e676.
https://doi.org/10.1016/S2589-7500(20)30192-8
28. Amisha, Malik P, Pathania M, Rathaur VK. Overview of artificial intelligence in medicine. J Family Med Prim Care. 2019 Jul;8(7):2328-2331.
https://doi.org/10.4103/jfmpc.jfmpc_440_19
PMid:31463251 PMCid:PMC6691444
29. Scott BK, Miller GT, Fonda SJ, Yeaw RE, Gaudaen JC, Pavliscsak HH et al. Advanced Digital Health Technologies for COVID-19 and Future Emergencies. Telemed J E Health. 2020 Oct;26(10):1226-1233.
https://doi.org/10.1089/tmj.2020.0140
PMid:32456560
30. Lee SM, Trimi S. Convergence innovation in the digital age and in the COVID-19 pandemic crisis. J Bus Res. 2021 Feb;123:14-22.
https://doi.org/10.1016/j.jbusres.2020.09.041
PMid:33012897 PMCid:PMC7518178
31. Browning L, Colling R, Rakha E, Rajpoot N, Rittscher J, James JA 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 Jul 3:jclinpath-2020-206854.
https://doi.org/10.1136/jclinpath-2020-206854
PMid:32620678
32. Mei X, Lee HC, Diao KY, Huang M, Lin B, Liu C et al. Artificial intelligence-enabled rapid diagnosis of patients with COVID-19. Nat Med. 2020 Aug;26(8):1224-1228.
https://doi:10.1038/s41591-020-0931-3
PMiD: 32427924; PMCiD: PMC7446729.