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Emerging Technologies in the Age of Coronavirus

The Coronavirus pandemic has created unprecedented challenges for businesses worldwide, including with regard to personnel safety, basic operations, supply and distribution networks and information technology. It has also brought together high-technology and pharmaceutical companies in a shared goal to find effective treatments and a vaccine for COVID-19. Many cutting-edge technologies have become essential in coping with and managing the crisis, including high-bandwidth telecommunications for working remotely,¹ the use of bioinformatics and modeling for research and drug development in the biopharmaceutical industry² and AI-assistants for healthcare providers. Looking forward, the current crisis sheds light on the role that emerging technologies will play in the prevention and management of future pandemics, as well as the private investment, regulatory development and legal frameworks that will guide near-term innovations in these fields.

Artificial Intelligence

Artificial intelligence (AI) technologies are playing a major role in the search for treatment, the diagnosis and the containment of COVID-19. For example, research organizations and drug development companies are using AI to try to predict which drugs or biological products will be effective in treating COVID-19.³ In hospitals, AI is reportedly being used in medical imaging for diagnosis of COVID-19 pneumonia, based on

¹ Ryan Duffy, *Coronavirus Hastens New Technology Trials and Rollouts*, Morning Brew (Mar. 11, 2020), <https://www.morningbrew.com/emerging-tech/stories/2020/03/11/coronavirus-hastens-new-technology-trials-rollouts.amp>.

² Brandi Vincent, *Researchers at Oak Ridge National Lab Tap into Supercomputing to Help Combat Coronavirus*, Nextgov (Mar. 11, 2020), <https://www.nextgov.com/emerging-tech/2020/03/researchers-oak-ridge-national-lab-tap-supercomputing-help-combat-coronavirus/163708/>.

³ Megan Scudellari, *Five Companies Using AI to Fight Coronavirus*, IEEE Spectrum (Mar. 19, 2020) <https://spectrum.ieee.org/the-human-os/artificial-intelligence/medical-ai/companies-ai-coronavirus>.

lung CT scans,⁴ as well as in sensors that can predict which patients are likely to experience complications such as respiratory failure or sepsis.⁵

In the United States, the FDA has already approved for sale a number of AI medical devices that provide clinical and diagnostic decision support for various conditions unrelated to COVID-19.⁶ However, emerging AI products will test the agency as they become more autonomous and assume more decision-making responsibility from human caregivers. Cognizant of that challenge, the FDA is proactively developing more expedited and developer-centric programs to facilitate oversight of sophisticated AI medical devices, without slowing down research and development.⁷

AI is also expected to play a role in preventing future outbreaks, including modeling and tracking data that may help predict where the next pandemic may arise and spread. In addition, the “hands-free” revolution, fueled by AI speech recognition and natural language understanding (NLU) technologies, is likely to see increased demand as people become more sensitive to interacting with public environments. As advances in NLU enable a greater range of speech-activated interfaces, everyday devices like elevator buttons, security touchpads, vending machines and point-of-sale interfaces may increasingly become voice-activated and touchless.

⁴ Baidu, *How Baidu Is Bringing AI to the Fight Against Coronavirus*, MIT Tech. Rev. (Mar. 11, 2020), <https://www.technologyreview.com/s/615342/how-baidu-is-bringing-ai-to-the-fight-against-coronavirus/amp/>. In addition, companies and airports are reportedly beginning to use AI-enabled cameras to scan large crowds for individuals who may have a fever. See Mark Sullivan, *This AI Camera Detects People Who May Have COVID-19*, Fast Company (Mar. 19, 2020), <https://www.fastcompany.com/90479220/this-ai-camera-detects-people-who-may-have-covid-19>.

⁵ Jared Council, *Hospitals Tap AI to Help Manage Coronavirus Crisis*, Wall Street J. (Mar. 20, 2020), <https://www.wsj.com/articles/hospitals-tap-ai-to-help-manage-coronavirus-outbreak-11584696601?ns=prod/accounts-wsj>.

⁶ See FDA, *Clinical Decision Support Software: Draft Guidance for Industry and Food and Drug Administration Staff* (Sept. 27, 2019), <https://www.fda.gov/media/109618/download>.

⁷ FDA, *Proposed Regulatory Framework for Modifications to Artificial Intelligence/Machine Learning (AI/ML)-Based Software as a Medical Device (SaMD)* (Jan. 28, 2020), <https://www.fda.gov/files/medical%20devices/published/US-FDA-Artificial-Intelligence-and-Machine-Learning-Discussion-Paper.pdf>.

Blockchain

Coronavirus has exposed the dependence of our social, political and administrative institutions on in-person interaction. Political debates,⁸ primary elections,⁹ court and governmental functions,¹⁰ and public education¹¹ are being drastically disrupted. The upcoming national election in November, despite being several months away, could similarly be at risk given the necessity for in-person voting.

Blockchain technologies have the potential to enable secure and confidential online participation in political processes and administrative functions. Although the concept is still developing and is subject to debate, some observers believe that permanent and verifiable blockchain-based identities can enable participation in a variety of governmental functions. These technologies have been tested in small-scale elections,¹² and they may now gain increased adoption. Some jurisdictions are also experimenting with blockchain-based personal records that would facilitate remote engagement with governmental institutions, such as state DMVs, the Social Security Administration, and passport offices, which traditionally require human-to-human interaction.¹³ Although widespread use of these technologies will require amendments to current laws and regulations, as well as public investment in new digital infrastructure, there may now be greater political impetus to implement such initiatives.

⁸ Alex Seitz-Wald, Sanitizer. *Skip the Handshake. No Audience. An Unusual Debate, Thanks to Coronavirus*, NBC News (Mar. 15, 2020), <https://www.nbcnews.com/politics/2020-election/sanitizer-skip-handshake-no-audience-unusual-debate-thanks-coronavirus-n1160016>.

⁹ Kelly Mena & Dianne Gallagher, *Georgia Postpones Presidential Primary Due to Coronavirus*, CNN (Mar. 14, 2020), <https://www.cnn.com/2020/03/14/politics/georgia-presidential-primary-coronavirus/index.html>.

¹⁰ Kara Scannell & Erica Orden, *In Hardest-Hit States, Coronavirus Is Grinding Justice to a Halt*, CNN (Mar. 13, 2020), <https://www.cnn.com/2020/03/12/politics/legal-system-weight-of-coronavirus/index.html>.

¹¹ Douglas Belkin, *Coronavirus Closes School for Nearly 30 Million Children in U.S.*, Wall Street J. (Mar. 16, 2020), <https://www.wsj.com/articles/coronavirus-closes-school-for-nearly-30-million-children-in-u-s-11584356400>.

¹² Danny Palmer, *Blockchain Elections: How Bitcoin Tech Could Secure Your Vote - and Save Democracy*, ZD Net (Feb. 4, 2020), <https://www.zdnet.com/article/blockchain-elections-how-bitcoin-technology-could-secure-your-vote-and-save-democracy/>.

¹³ Jon Martindale, *From the Doctor to the DMV, Blockchain Can Make Governments Swift and Secure*, Digital Trends (Apr. 16, 2018), <https://www.digitaltrends.com/computing/can-governments-benefit-from-implementing-blockchain-technology/>.

Analytics

Large-scale data mining and analytics have become the norm in many industries,¹⁴ but some sectors still lag behind. The widespread economic impact of the COVID-19 crisis could prompt increased investment in technologies that can forecast, model, and quantify the impact of future adverse events. Industries that have historically relied on relatively predictable returns, such as travel and tourism, energy and transportation, will have increased demand for so-called “Black Swan”¹⁵ prediction technologies, and investors in these sectors will increasingly scrutinize the long-term preparedness strategies of companies when deciding where to place capital.

Analytics can also enable early detection of potential crises from small sample data. Some firms reported the COVID-19 outbreak before it became widespread, using social media and other data from the Wuhan Province in China.¹⁶ Refining these technologies, and coupling them with sophisticated epidemiological models of disease contagion and spread, could help governments and business leaders react more quickly to emerging events in the future.

Analytics and new computational technologies have also been instrumental in researching potential vaccines that may be effective against Coronavirus. One example is the COVID-19 High Performance Computing Consortium—a partnership that includes IBM, the Energy Department National Laboratories, Alphabet Inc.’s Google Cloud, Amazon.com Inc.’s Amazon Web Services, Microsoft Corp. and others—which makes available to researchers high-performance computing systems (supercomputers) that permit very large numbers of calculations in epidemiology, bioinformatics, and molecular modeling. These experiments would take months or even years to complete on slower, traditional computing platforms.¹⁷ And looking forward, as quantum computing becomes viable for industrial applications,¹⁸ the pace of new drug discovery could further increase substantially.

Importantly, many of these new technologies rely on vast datasets of personal healthcare information, which can raise patient privacy concerns and HIPAA requirements. Initiatives to use technology platforms

¹⁴ See, e.g., Daniel Willis, *Elanco Urges Utilization of Data to Help Tackle AMR*, Animal Pharm: AgriBusiness (Mar. 16, 2020), <https://animalpharm.agribusinessintelligence.informa.com/AP017047/Elanco-urges-utilization-of-data-to-help-tackle-AMR>.

¹⁵ Jacopo Credi, Axyon AI, *Spotting the Black Swan: How One-off Events Can Be Predicted*, Fin. Director (June 19, 2019), <https://www.financialdirector.co.uk/2019/06/19/spotting-the-black-swan-how-one-off-events-can-be-predicted/>.

¹⁶ Cory Stieg, *How This Canadian Start-up Spotted Coronavirus Before Everyone Else Knew About It*, CNBC (Mar. 3, 2020), <https://www.cnn.com/2020/03/03/bluedot-used-artificial-intelligence-to-predict-coronavirus-spread.html>.

¹⁷ Sara Castellanos, *In Bid for Coronavirus Vaccine, U.S. Eases Access to Supercomputers*, Wall Street J. (Mar. 22, 2020), <https://www.wsj.com/articles/in-bid-for-coronavirus-vaccine-u-s-eases-access-to-supercomputers-11584915152>.

¹⁸ Sara Castellanos, *Honeywell to Roll out Quantum Computer*, Wall Street J. (Mar. 3, 2020), <https://www.wsj.com/articles/honeywell-to-roll-out-quantum-computer-11583229600>.

to trace individuals' movements in an attempt to contain the Coronavirus pandemic have similarly raised privacy concerns.¹⁹ As technology advances in this space, the existing legal frameworks and privacy norms are increasingly being tested by emerging forms of healthcare data analytics.²⁰

Virtualization

The Coronavirus pandemic has also highlighted the value of virtual meeting and other remote interaction technologies. However, the full scale of virtualization technologies has yet to truly emerge, and limitations remain. Large conferences and events have mostly been cancelled in the wake of the outbreak, although a few have managed to “go virtual.”²¹ The public sector lags even farther behind at enabling virtual interaction. Courts, government offices, and administrative buildings are currently ill-equipped to enable virtual engagement, and coherent legal standards for virtual participation in these forums do not exist. In the corporate sector, adoption is increasing. Virtual shareholder meetings, which were criticized when first adopted by some companies a few years ago as not allowing the intangible benefits of an in-person meeting, will undoubtedly become more prevalent—with the Coronavirus pandemic turning attention from “why” to have a virtual meeting to “how” to improve the virtual meeting experience.

The next generation of virtualization technologies are likely to enable multi-sensory, multi-participant, immersive experiences that allow a range of interactions beyond current capabilities. Many of the core technologies, such as 5G networks, augmented and virtual reality interfaces, and haptic feedback devices, are rapidly nearing commercial readiness. Sophisticated virtualization technologies will also increasingly rely on real-world counterparts to enable truly remote engagement in a full spectrum of business and social activities. Drone and autonomous-vehicle delivery services are a leading example of such counterpart technologies. However, to enable full adoption, regulatory updates will be needed to streamline the growing

¹⁹ See, e.g., Tony Romm, *Senate Democrats Raise Privacy Concerns with Google About Coronavirus Screening Service*, Wash. Post (Mar. 18, 2020), <https://www.washingtonpost.com/technology/2020/03/18/testing-verily-google-coronavirus-white-house-letter/>.

²⁰ See, e.g., Will Knight, *The Value and Ethics of Using Phone Data to Monitor Covid-19*, Wired (Mar. 18, 2020), <https://www.wired.com/story/value-ethics-using-phone-data-monitor-covid-19/>; David Blumenthal, *Why Google's Move into Patient Information Is a Big Deal*, Harv. Bus. Rev. (Nov. 26, 2019), <https://hbr.org/2019/11/why-googles-move-into-patient-information-is-a-big-deal>.

²¹ *Virtual Conference Hosted by MIT Technology Review*, MIT Tech. Rev.: EmTech Digital, <https://emtech.technologyreview.com/emtech-digital-2020/> (last visited Mar. 25, 2020).

patchwork of federal, state and local regulations of autonomous vehicles,²² and to untangle the often overlapping regulation of aerial drones by states, municipalities and the Federal Aviation Administration.²³

Conclusion

AI, blockchain, analytics and virtualization offer examples of emerging technologies that are uniquely situated to combat the far-reaching impacts of the Coronavirus pandemic. Advances in these fields may also mitigate the effects of future outbreaks, as well as potentially even anticipate and help prevent them. Yet, in many cases, full adoption of these technologies will require not only private capital, it will also depend on government initiatives and regulatory innovation to modernize the public sector.

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This memorandum is not intended to provide legal advice, and no legal or business decision should be based on its content. Questions concerning issues addressed in this memorandum should be directed to:

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²² See, e.g., Austin Brown et al., UC Davis Inst. of Transp. Studies & Policy Inst. for Energy, Env't, & the Econ., *Federal, State, and Local Governance of Automated Vehicles* (Dec. 2018), https://policyinstitute.ucdavis.edu/wp-content/uploads/AV-Governance_IssuePaper_1218.pdf.

²³ See, e.g., Case Comment, *Singer v. City of Newton: Massachusetts District Court Finds Portion of Local Drone Ordinance Preempted by FAA Regulation*, 131 Harv. L. Rev. 2057 (2018).