ATSE

Australian Academy of
Technology & Engineering

FACT SHEET

Using technology to get through the pandemic

In early 2020, the World Health Organisation (WHO) officially categorised the novel coronavirus outbreak (COVID-19) as a global health crisis, and subsequently a pandemic (global outbreak of an infectious disease). Technology has played, and will continue to play, a critical role in supporting efforts to track, identify and combat this virus; and in keeping connections, business, homes and education functioning while travel and face-to-face meetings are constrained.

IDENTIFYING OUTBREAKS, TRACKING THE DISEASE & MINIMISING TRANSMISSION

- Using an automated infectious disease surveillance system, an artificial intelligence (AI) epidemiology company sent its first warnings to customers about the new form of coronavirus in December 2019, days before official notices were issued.
- AI and machine learning techniques are also being used in surveillance, and tracking online activity for signs of symptoms. For example HealthMap, a Harvard Medical School-developed AI technology, is being used to monitor COVID-19 cases across the globe in partnership with the World Health Organisation (WHO) and Centres for Disease Control and Prevention. The system updates in real-time as it collects and processes data from the web.
- AI is being used in diagnosis, with AI-enabled software scanning images of patients' lungs to looks for signs of COVID-19.
- In China, drones are being deployed to check peoples' temperatures (using a thermal camera), disseminate announcements to the public (via loudspeakers), and disinfect public spaces (using an autonomous precision spraying tool). Facial recognition-enabled cameras and drones are helping to find people who might be sick or are not wearing masks.
- Robots are being used to disinfect rooms, communicate with isolated people, take vital information, and deliver medications and other goods.

GETTING THE FACTS STRAIGHT

- The Center for Systems Science and Engineering at Johns Hopkins University has created a visualisation of global COVID-19 cases, tracking its progress around the world, including infection, death, and recovery rates.
- Technology has also been used to address the spread of false information on Facebook, Twitter and TikTok. For example, Twitter is launching a prompt when users search for coronavirus encouraging them to use official channels for information, and a large banner saying "Know the facts" appears (see left).

CREATING A VACCINE

- Genomic sequencing technologies and data are playing an important role in building an understanding of the virus. A task force of Chinese researchers were the first to sequence the virus in January 2020, which revealed the pathogen causing the disease.

- Numerous teams have since sequenced the genome, which has informed the development of diagnostic tests and the identification of treatment options for the virus. A number of biotechnology companies are working on producing new, portable and faster electronic devices for DNA sequencing and diagnostics.
- A team of scientists from the Peter Doherty Institute for Infection and Immunity in Australia were the first laboratory outside China to grow COVID-19 from a patient sample. This sample has helped to accelerate virus diagnosis and vaccine development.
- Multiple labs around the world are working on producing a vaccine. Some are using machine learning techniques to create new drug candidates or to predict if existing drugs might work as a vaccine for COVID-19.
- The University of Queensland (UQ) has created a candidate vaccine for COVID-19 and is working quickly towards pre-clinical testing. The lab's 'molecular clamp' technology can engineer a vaccine that could be more readily recognised by the immune system, triggering a protective immune response.

SUPPORTING BUSINESSES TO FUNCTION

- Communication is being enabled by video-conferencing, and Zoom video conferencing has been one of the few stock market winners during the outbreak.
- Messaging services, online webinar and conference portals, and video chat platforms are supporting education, meetings, and conferences. Events can be live-streamed or recorded and made available to thousands of people. This may prompt more investment in developing technologies like virtual reality meeting rooms and holographic telepresence at virtual 'face-to-face' meetings.
- People are being supported to work remotely using cloud-based software for file sharing, project management and collaboration, among others.
- Remote working can be aided by use of virtual team building to avoid loneliness and disengagement. Atlassian provides virtual team building advice for building connection and team spirit while working remotely.
- Self-driving robots are delivering medical supplies to workers in Wuhan, ensuring employees of the logistics company supplying hospitals are protected.
- Touch-free biometrics systems such as facial recognition are coming into their own as a safe alternative to using a key or a fingerprint to enter a building or room, limiting the spread of infection through human-to-surface contact.

STAYING SOCIAL

- Smartphone apps, social networking, and other software are helping people to stay connected, take exercise classes and other group activities, and even go on virtual dates.
- Delivery services – including those using drones – are helping people to source food and essentials while in self-isolation
- Ride-share services like Uber have seen a rise in business as people avoid public transport
- Hundreds of the world's most famous museums have virtual tours you can take from the comfort of your couch.

LESSONS FOR THE FUTURE

Vaccines are one of the most effective ways to protect people against pandemics, but an effective and rapid response to pandemic diseases can only be achieved through coordinated surveillance, early warning systems, and responses by all levels of government across the world.

Data generated through the tracking, surveillance and analysis of population health will increase our capability to monitor trends in health and wellbeing, and to make predictions about the future of global health. The digitisation of health must underpin this transition. By rapidly processing vast amounts of health information, AI technologies can supplement healthcare professionals' efforts to make decisions in rapidly changing situations.

Traditional tracking often depends on time-consuming manual investigation, but CSIRO's Data61 has developed a tool that tracks the spread of infectious disease using statistical machine learning techniques. This tool rapidly processes multiple sources of information on

people movement to understand how diseases spread. This will provide an opportunity to predict when and where an outbreak is likely to occur, allowing hospitals and biosecurity agencies to be as prepared as possible.

Telehealth and mobile health are also key technologies to enable and support surveillance, monitoring, and containment. Telehealth is the use of advanced telecommunication technologies to exchange health information and provide healthcare across geographic, social and cultural barriers, improving access and enabling the provision of care to individuals who cannot physically attend consultations. Telehealth is already being deployed by the Australian government to provide access to essential health services to people in self-isolation or quarantine, and reduce the risk of exposure to COVID-19 for vulnerable people. US medical authorities are calling the outbreak a 'turning point' for health, in demonstrating how telehealth can be used in a public health crisis.

Mobile phone apps can be used for disease surveillance and monitoring, outbreak tracking and to educate consumers about preventative healthcare. South Korea is even using a smartphone app to monitor its citizens during a mandatory home quarantine. The app, developed by the Ministry of the Interior and Safety, allows those who have been ordered not to leave home to stay in contact with case workers and report on their progress. It will also use GPS to keep track of their location to make sure they are not breaking their quarantine.

Another emerging technology that can be deployed in the surveillance and understanding of infectious diseases is genomics. Infectious disease genome data – produced from near-real-time, high-throughput screening – is already providing valuable insights into how infectious diseases are started, spread and evolved. This data can further provide targeted approaches to infectious disease control at both the individual and population level.

IS THE HEALTH SECTOR TECHNOLOGY READY?

ATSE has spent the past year examining new and emerging technology in Australia's health sector, and our readiness to develop, adapt or adopt this technology to meet the challenges the sector will face in the coming decade, including emerging diseases and digitisation. We have spoken to industry, government and research about the potential solutions, which include digital and data technologies, precision medicine and integrated care through technology. We have a long way to go before our vision of a technology-supported, patient-centred, prevention-focused healthcare system becomes a reality, but ATSE's analysis shows that it is achievable by 2030. Work is already underway in all the critical areas, but in some – such as infrastructure and skills – we will need to do more, or make faster progress. When the report is launched on 7 April 2020, ATSE will recommend support for rapid digitisation of health data, increased equity and access through telehealth, workforce development and targeted support for technology commercialisation.

FURTHER READING

- ATSE Health sector technology readiness report (launching 7 April 2020)
- ATSE position statement: Advanced technological solutions for a healthy Australia
- ATSE and AAS report: Preparing for Australia's Digital Future
- ATSE position statement: Embracing Australia's Digital Futures
- ATSE action statement: Positioning Australia as a leading digital nation
- ACOLA report: The Future of Precision Medicine in Australia
- ACOLA report: The effective and ethical development of artificial intelligence

FURTHER INFORMATION
T. 03 9864 0900
info@atse.org.au