# Emergency responses in smart cities: Driving resilience in the post-pandemic era

# THE ROL OF DATA AND TECHNOLOGY

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DT4CC Episode 17

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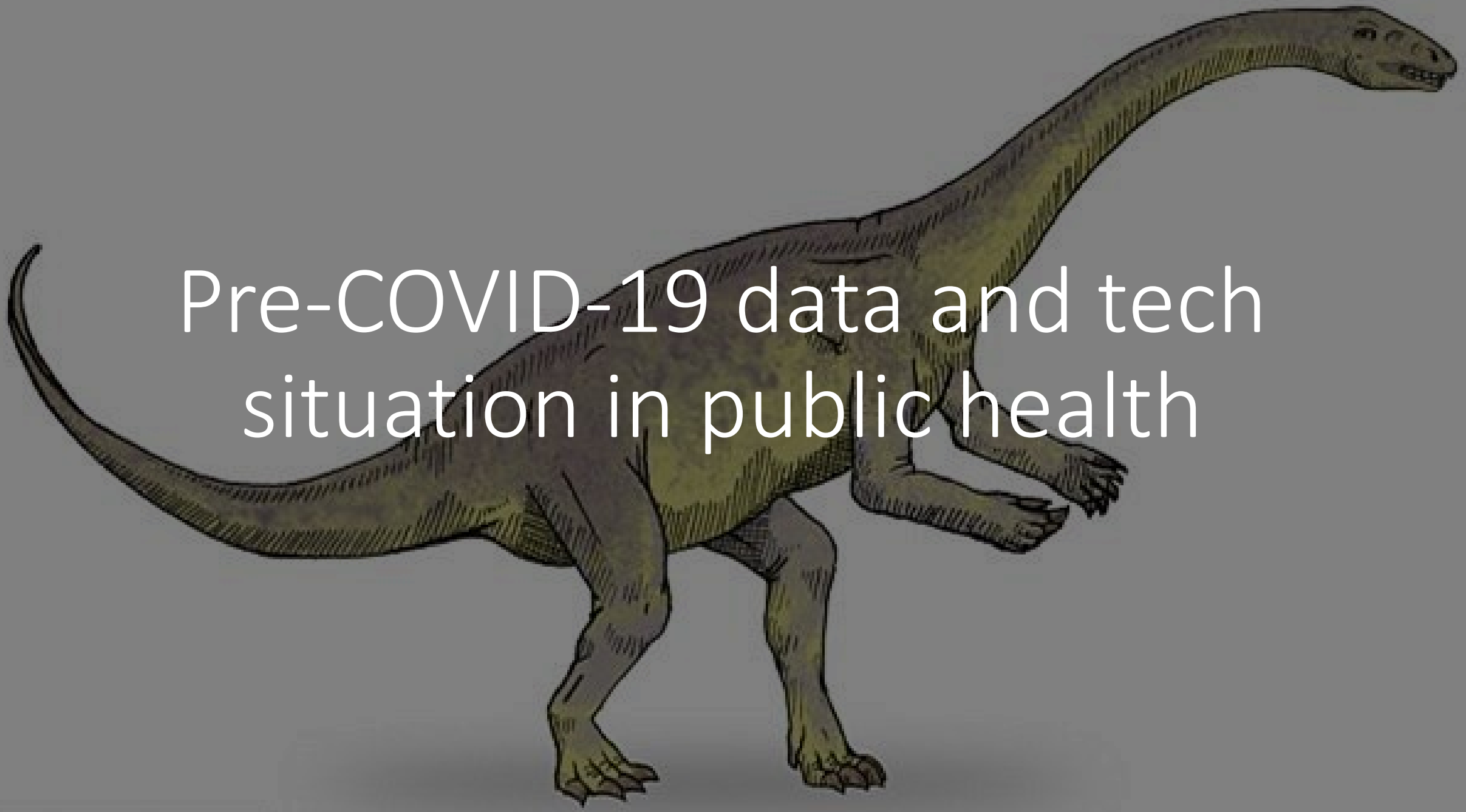


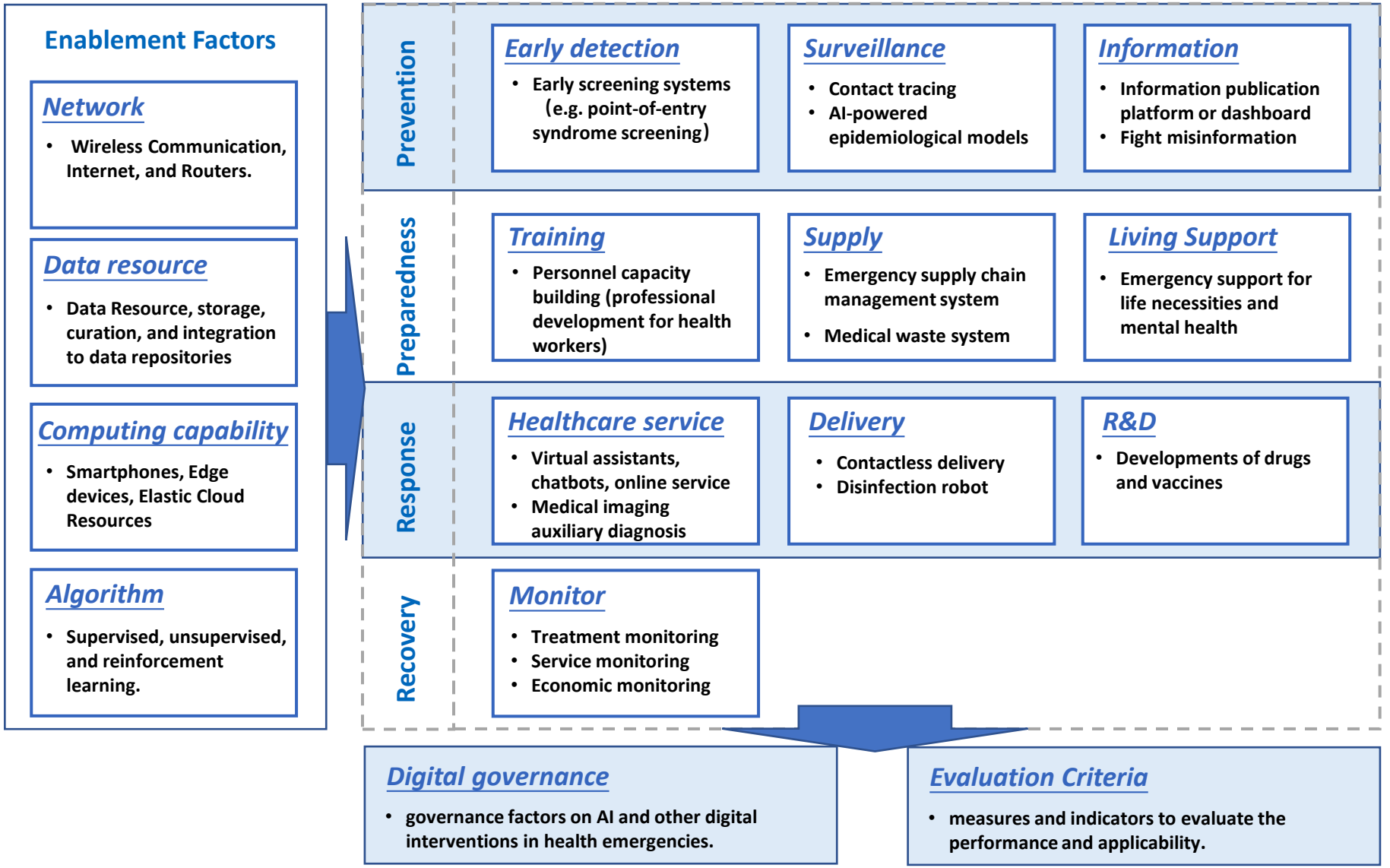
# Pre-COVID-19 data and tech situation in public health

# What did COVID-19 pushed towards to in terms of data and tech?

https://www.everydaysight.com/are-blind-people-allowed-to-drive/

- **“Traditional” data:**
  - Ranging epi-genomic information to electronic health records, reflects how **efficient**, **effective**, **representative** and **periodical** a country’s surveillance system is, both for infectious and non-infectious diseases => **quality** of the data.
  - This data that is fed into models that do projections, and in ML and AI algorithms. If it is not representative, it can enhance inequities, push forward several biases and guide us towards unwanted outcomes.
- **“Non-traditional” data:**
  - Ranging from crowd-source insights to real time social media listening.
  - This data can provide a different perspective particularly on social behaviors towards health topics that, when triangulated with traditional data, can provide a fuller picture.

# What have we learnt?




Source: FG AI4H DT4HE Output "Guidance on AI and digital technologies for COVID health emergency

# Case Collection


27 cases in the current stage…

**2 Contact tracing (5)**

| | |
|---|---|
| **Title** | **Itinerary card proves whether one has been to any epidemic-stricken region or country in the past 14 days. Link** |
| Time stamp | Feb 29, 2020 |
| Countries | China |
| Key words | contact tracing, risk assessment, telecommunication |
| Abstract | CAICT, China Telecom, China Unicom, and China Mobile jointly launched an itinerary card based on telecommunication data. The 1.0 version can give a self-check and proof if you have been to any epidemic region in the past 14 days or not. The 2.0 version is based on Bluetooth low energy (BLE) protocol to make close contact reminder possible. It is launched by the State Council to effectively support the social recovery from the epidemic. |
| Providers | CAICT, China Telecom, China Unicom, and China Mobile |
| Users | 1.6 billion mobile-phone users |
| Application | contact tracing |
| Emergency stage | prevention |
| Enabling technologies | big data analysis, AI, smart phone, Bluetooth low energy (BLE) |
| Dependencies | Data resource, ethic and comprehensive usage of the data. |
| More info | • **Is the "itinerary card" accessible to everyone?**<br>If you have a mobile phone, and you are a user of any of the three operators -- China Telecom, China Unicom or China Mobile -- you can use this service. But users who just opened a new account can only use the service after 14 days.<br>• **When can I use an "itinerary card"?**<br>The "itinerary card" is used to help returnees prove what regions they have visited in the past 14 days. Therefore, the employer and the community management department can use it when checking the itinerary of workers.<br>• **Does the "itinerary card" only show the place where you registered your phone number?**<br>Of course not. The "itinerary card" can display information about the countries (regions) and cities (any stays of more than 4 hours) which users have visited in the past 14 days. |
| Image |  |

Source: FG AI4H DT4HE Output "Guidance on AI and digital technologies for COVID health emergency

# Case collection (lit. review)

| Classification | Category | Title | Date | Author(s) | Keywords | User Scope | Technologies | Link | DOI |
|---|---|---|---|---|---|---|---|---|---|
| prevention | COVID Screening | AI-Enhanced ECG Shows Potential for COVID-19 | 17-Jun-21 | | AI-enhanced ECG, rapid screening | hospital emergency department | mobile technology enabled AI-ECGs | https://www.tctmd.com/news/ai-enhanced-ecg-shows-potential-covid-19-screening | |
| | | New AI technology screens for COVID faster than lateral flow tests | Nov-21<br>1-Sep-21 | Soltan et al. | screening test, validation, operational evaluation, diagnosis, electronic health records, emergency | medical professionals | machine learning, big data | https://www.mobihealthnews.com/news/emea/new-ai-technology-screens-covid-faster-lateral-flow-tests | 10.1101/2021.08.24.21262376v2 |
| | | Orbita Launches COVID-19 Virtual Assistant to Help Healthcare Providers Screen for Coronavirus | 18-Mar-20 | | conversational AI, interactive chatbot, virtual assistant | public and medical professionals, healthcare and life science organizations | NLP, big data, SMS | https://venturebeat.ai/2020/03/18/orbita-launches-covid-19-virtual-assistant-to-help-healthcare-providers-screen-for-coronavirus/ | |
| | | Wipro pioneers advanced AI technology to listen for COVID-19 | | | rapid antigen detection, non-intrusive patient screening, cough signatures | hospitals, public health departments | machine learning, NLP, big data | https://www.wipro.com/innovation/wipro-pioneers-advanced-ai-technology-to-listen-for-covid-19/ | |
| | | Vibrent Health Leverages AI-Based Technology to Build a Tool Improving COVID Response | 16-Nov-21 | | digital infrastructure, symptom screening application, contact tracing | health care, government, business, and public health clients | AI-based screening algorithm, mobile technology | https://www.healthcaredive.com/prnews-releases/20211115-vibrent-health-leverages-ai-based-technology-to-build-a-tool-improving-covid-19 | |
| | Contact Tracing | How can I prove that I have not been to any epidemic-stricken region or country in the past 14 days? | Mar-20 | | contact tracing, risk assessment, telecommunication | 1.6 billion mobile-phone users | big data analysis, smart phone, Bluetooth low energy (BLE) | http://www.chinadaily.com.cn/a/202003/12/WS5e69ad45a3101282472727e822.html | |
| | | Apps Gone Rogue: Maintaining Personal Privacy in an | Mar-20 | Raskar et al. | personal privacy, contact tracing, mass surveillance | researchers | | https://arxiv.org/abs/2003.08567 | |
| | | Google, Apple announce Contact Tracing technology to track Coronavirus | ###### | | Bluetooth, API, scalable, interoperability | Android and iOS users | big data analysis, smart phone, Bluetooth low energy (BLE) | https://www.xda-developers.com/google-apple-contact-tracing-coronavirus/ | |
| | | Machine learning spots language disparities to improve COVID-19 tracing | 29-Oct-21 | | language barriers, contact tracing, Latino communities | | machine learning algorithm, big data, NLP | https://fcw.com/emerging-tech/2021/10/machine-learning-create-language-disparities-improve-covid-19-tracing/256447/ | |
| | | Safe Paths | | | contact tracing, privacy, PrivateKit | health care, government, business, and public health clients | mobile technology, GPS, Bluetooth | https://www.media.mit.edu/projects/safepaths/overview/ | |
| | | Quantifying SARS-CoV-2 transmission suggests epidemic control with digital contact tracing | Mar-20 | Ferretti et al. | contact tracing, epidemic spread | contact tracing application developers, public health officials, researchers | simulation, machine learning | | 10.1126/science.abb6936 |
| | | S.Korea to test AI-powered facial recognition to track COVID-19 cases | 13-Dec-21 | | contact tracing, facial recognition, CCTV cameras | South Korean government | facial recognition, machine learning | https://www.reuters.com/world/asia-pacific/skorea-test-ai-powered-facial-recognition-track-covid-19-cases-2021-12-13/ | |
| | | How does the Aarogya Setu app work? | 8-May-20 | | contact tracing, privacy concerns, India official | People of India | mobile technology, GPS, Bluetooth | https://www.livemint.com/news/india/how-does-the-aarogya-setu-app-work/article2-1532072.ece | |
| | Data Sourcing / Reporting | Artificial intelligence systems aim to sniff out signs of COVID-19 outbreaks | ###### | | data-mining, social media, public health monitoring, data visualization | health care, government, business, and public health clients | machine learning, NLP, big data | https://www.science.org/content/article/artificial-intelligence-systems-aim-sniff-out-signs-covid-19-outbreaks | |
| | | COVID-19 Maps | | | | providers, public health authorities, researchers, and the general public | mobile internet, machine learning | https://covid.cs.cmu.edu/<br>https://coronavirus.jhu.edu/map.html | |
| | | How AI Spotted and Tracked the Coronavirus Outbreak | 6-Feb-20 | | reliable, worldwide, data visualization early warning, AI-driven algorithm, possible outbreaks' prediction | health care, government, business, and public health clients | machine learning, NLP, big data | https://covid19.eng.cam.ac.uk/<br>https://www.wsj.com/articles/how-ai-spotted-and-tracked-the-coronavirus-outbreak-11580985001 | |
| | | To Track Coronavirus, Israel Moves to Tap Secret | 16-Mar-20 | | cellphone data, data trove, contact tracing | Israeli government | big data analysis, smart phone | https://www.nytimes.com/2020/03/16/world/middleeast/israel-coronavirus-cellphone-tracking.html | |
| preparedness | Supply Chain | Artificial intelligence for supply chain resilience: | Jan-21 | Modgil et al. | supply chain resilience, dynamic capabilities | supply chain providers | | | 10.1108/IJLM-02-2021-0094 |
| | | The Saudi supermarket Danube Online is using AI to minimize delivery time during quarantine | Apr-20 | | AI-powered, supermarket chain, minimize delivery time, real-time task manager | Shoppers in Saudi Arabia | "aisle-mapping" technology | https://www.cnbc.com/2020/04/16/countries-in-the-middle-east-are-using-ai-to-fight-coronavirus.html | |
| response | Public Health | NHS workers use 'XR' tech for training during COVID-19 pandemic | ###### | | virtual, augmented and mixed reality (XR), interactive training, remote education, NHS employees | NHS employees in UK | data-driven XR | https://www.med-technews.com/news/nhs-workers-use-xr-tech-for-training-during-covid-19-pandemic/ | |
| | | CSAIL device lets doctors monitor COVID-19 patients from a distance | 14-Apr-20 | | remote monitoring, wireless signals | hospitals, medical professionals, high-risk patients | wireless technology, machine learning | https://www.csail.mit.edu/news/csail-device-lets-doctors-monitor-covid-19-patients-distance | |
| | | China fights coronavirus with delivery drones | 6-Mar-20 | | unmanned aerial vehicles, drone, automatic operation, contactless | hospitals, public health departments | data processing, terrain filtering algorithms, drone, 4G LTE communication, | https://www.asmworld.com/china-fights-coronavirus-with-delivery-drones/ | |
| | | How AI Played a Role in Pfizer's Covid-19 Vaccine Rollout | 1-Apr-21 | | vaccine rollout, real-time predictive models, medical dashboard | Pfizer, pharmaceutical companies | data processing, big data, simulation | https://www.wsj.com/articles/how-ai-played-a-role-in-pfizers-covid-19-vaccine-rollout-11617213124 | |
| | Medical Imaging | Automated detection of COVID-19 cases using deep neural networks with X-ray images | Jun-20 | Ozturk et al. | deep learning, chest X-ray images, radiology images, COVIDX-Net model | radiologists, medical professionals | convolutional neural networks, deep learning | | 10.1016/j.compbiomed.2020.103792 |
| | | Researchers at Facebook, NYU Langone Develop AI to Help Predict Covid-19 Patient Conditions | 15-Jan-21 | | X-ray images, prediction | hospitals | self-supervised learning, machine learning | https://www.wsj.com/articles/researchers-at-facebook-nyu-langone-develop-ai-to-help-predict-covid-19-patient-conditions-11610720002 | |
| | | Common pitfalls and recommendations for using machine learning to detect and prognosticate for COVID-19 using chest radiographs and CT scans | Mar-21 | Roberts et al. | | | | | 10.1038/s42256-021-00307-0 |
| | | Review of Artificial Intelligence Techniques in Imaging Data Acquisition, Segmentation, and Diagnosis for | Apr-20 | Shi et al. | | | | | 10.1109/RBME.2020.2987975 |
| | | Review on Diagnosis of COVID-19 from Chest CT Images Using Artificial Intelligence | Sep-20 | Ozsahin et al. | AI-assisted segmentation, CT images | medical professionals, imaging researchers | | | 10.1155/2020/9756518 |
| | | Speeding Up CT Scans to Detect COVID-19 | 1-Apr-20 | | CT images, cloud intelligence, Covid-19 screening | hospitals, Covid-19 screening centers | Standard DICOM protocol | https://www.alibabacloud.com/blog/speeding-up-ct-scans-to-detect-covid-19_596124 | |
| | | Ping An's COVID-19 Smart Image Reading System speeds up diagnoses and treatment | 9-Mar-20 | | CT images, intelligent reading, intelligent imaging, AI, remote | medical institutions, especially at the primary level in China | cloud based image analysis, public or private cloud | https://www.mobihealthnews.com/news/asia/ping-an-covid-19-smart-image-reading-system-speeds-diagnoses-and-treatment | |
| | Drug Discovery | AI method reveals 17 existing drugs that may fight against COVID-19 | 24-Aug-21 | | image analysis, remdesivir | | AI-powered image analysis, machine learning | https://www.drugtargetreview.com/news/96015/ai-method-reveals-17-existing-drugs-that-may-fight-against-covid-19/ | |
| | | Artificial Intelligence for COVID-19 Drug Discovery and Vaccine Development | Aug-20 | | molecule prediction, CoronaDB-AI | | deep learning, dataset construction | | 10.2289/ifrai.2020.00065 |
| | | Researchers Use AI To Find New Uses for Existing | 21-Jan-21 | | drug repurposing | | AI-enabled drug repurposing | https://www.verywellhealth.com/researchers-use-ai-repurposing-medications-5096087 | |
| | | Intelligent Repurposing: An AI-identified drug enters clinical trials for COVID-19 | 7-Mar-20 | | drug development, AI, autonomous, clinical trials | researchers, medical professionals, pharmaceutical companies | machine learning, big data | https://theme-discovery.com/discovery-development/intelligent-repurposing | |
| | | AI invents new 'recipes' for potential COVID-19 drugs | 7-Aug-20 | | AI-recipes, drug development | | machine learning, drug synthesis | https://www.science.org/content/article/ai-invents-new-recipes-potential-covid-19-drugs | |
| | Social Networks and Misinformation | AI researchers take aim at COVID-19 "infodemic" | 28-Oct-21 | | COVID-19 misinformation, infodemic, "stance detection" algorithm | public health officials | NLP, big data | https://www.eurekalert.org/news-releases/933107 | |
| | | New AI tool tracks evolution of COVID-19 conspiracy theories on social media | 19-Apr-21 | | COVID-19 conspiracy theories, misinformation, | public health officials | random forest machine-learning, NLP, big data | https://www.nsuworks.com/coronavirus/news-ai-tool-tracks-evolution-of-covid-19-conspiracy-theories-on-social-media | |
| | | Understanding Public Perceptions of COVID-19 Contact Tracing Apps: Artificial Intelligence–Enabled Social | May-21 | Cresswell et al. | sentiment analysis, social media, Facebook, Twitter | researchers | ensemble model, deep learning, NLP | | 10.2196/26618 |
| | | What social media can reveal about a community's well- | 27-Apr-20 | | mental health monitoring, Twitter | researchers | machine learning, big data | https://hai.stanford.edu/2020/04/27/social-media-can-reveal-communitys-well/ | |
| recovery | Monitoring | Satellites and AI Monitor Chinese Economy's Reaction to Coronavirus | 10-Mar-20 | | economy monitoring, satellite, GPS, social networking | economy researchers | deep learning, NLP, big data, GPS | https://spectrum.ieee.org/satellites-and-ai-monitor-chinese-economys-reaction-to-coronavirus | |
| | | AI Can Identify Unseen Sufferers of COVID-19 & Enable Proactive Care | ###### | | healthcare analytics, risk assessment, proactive healthcare | Americans who don't have COVID-19, but have needs for acute, chronic, and preventive healthcare | machine learning, big data | https://hitconsultant.net/2020/05/21/ai-can-identify-unseen-sufferers-of-covid-19-enable-proactive-care/#.YaOH95HtLOo | |



44 referenced articles where DT4ER with AI focus have been identified and classified within the PPRR framework

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# Way forward towards resilience

- **Technical Enablement:** identify minimum set of requirements for the technical enablement components such as network, data resource, computing capacities, etc.
- **Digital governance**: considers governance factors on AI and other digital interventions on COVID-19 and other health emergencies.
- **Outcome Evaluation:** Contains measures and indicators to evaluate the outcome and applicability of different AI and digital interventions.

# Thank you