Excerpted Translation

The following translation, excerpted from a Chinese government think tank report on China's use of digital health technology to fight COVID-19, describes several examples of how PRC AI companies are using AI technology to improve COVID-19 prevention and treatment. Most of the examples, such as meal delivery robots for hospital staff and technologies that allow doctors to diagnose patients at a distance, are benign. But a number of these AI applications raise troubling questions about privacy and human rights, such as tracking of mobile phones used by suspected infected individuals and video surveillance programs that can identify individuals by posture.

Title
Example Applications of Digital Health Technology for Epidemic Prevention and Control (Third Phase)
数字健康技术疫情防控应用案例集（第三期）

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Source
CAICT website, March 24, 2020. CAICT is a think tank under the PRC Ministry of Industry and Information Industry (MIIT; 工业和信息化部). This excerpt covers all of part III of the report (pp. 51-90).

The Chinese source text is available online at:
http://www.caict.ac.cn/kxyj/qwfb/ztbg/202003/P020200324369446692496.pdf

Translation Date	**Translator**	**Editor**
May 15, 2020	Etcetera Language Group, Inc.	Ben Murphy, CSET Translation Lead

III. Artificial Intelligence (AI) Example Applications

Case 1: The Xiamen COVID-19 Tracing and Monitoring System: Opening a New Front in the Battle Against the Epidemic

Summary: Xiamen's COVID-19 (新冠肺炎) tracing and monitoring system was designed and built in strict adherence to the principle of "externally, defend against the entry of new cases; internally, defend against spreading," focusing closely on the actual needs of collection, case-by-case investigation, reporting, treatment, analysis, and application. Using big data integration and multi-dimensional analysis, an epidemic prevention and control model was constructed, key groups of concern were pinpointed, and sources of infection were blocked. It helped the epidemic prevention and control departments properly manage key areas, groups and situations, and provided strong decision support data for directing epidemic prevention and control at all levels, thereby achieving comprehensive control over epidemic prevention work citywide.

Keywords: big data, AI, digital prevention and control, COVID-19, knowledge graph

Main Text:

Beginning in December 2019, with the growing spread of the novel coronavirus (新型

冠状病毒) infection, the COVID-19 control and prevention situation was becoming increasingly severe. In accordance with the unified arrangements of the Xiamen Novel Coronavirus Infection Control Headquarters, under commission by the Xiamen Municipal Sanitation and Health Commission and focusing on the work objective of "externally, defend against the entry of new cases; internally, defend against spreading," the Xiamen Health and Medical Big Data Center researched and developed the Xiamen COVID-19 Tracing and Monitoring System.

The Xiamen COVID-19 Tracing and Monitoring System focuses closely on the actual needs of collection, case-by-case investigation, reporting, treatment, analysis, and application. Using big data integration and multi-dimensional analysis, an epidemic prevention and control model was constructed, key groups of concern were pinpointed, and sources of infection were blocked. It helped the epidemic prevention and control departments properly manage key areas, groups, and situations, and provided strong decision support data for directing epidemic prevention and control at all levels, thereby achieving comprehensive control over epidemic prevention work city-wide.

Problems addressed in the example:

1. Difficulty of case-by-case investigation and prevention and control for key groups

Grassroots case investigators have limited technical means and power at their disposal, and epidemic-related data and information fed back from various parties is complex. When following-up on close contacts with confirmed cases, for example, there is information from multiple organizations such as the Public Security Bureau, Public Transportation Group, Didi,[1] and others, and analysis and comparison presents considerable difficulty. It is not possible to establish real-time, automatic linking channels for data, and it is labor-intensive. Given the difficulty of data analysis and comparison, it is difficult to track and locate key individuals.

2. Difficulty tracking the process of dealing with hospital fever patient groups

With respect to information on people visiting the fever outpatient departments of the city's hospitals, the relevant regulatory authorities were unable to record the handling and whereabouts of suspected cases of fever, making it impossible for community grid (社区网络) personnel to monitor fever patients that doctors require to be under home observation. This results in problems in terms of being unable to do real-time tracking of case-by-case investigation, testing, observation, and treatment of individuals with fevers.

3. Difficulty tracing close contacts

In traditional infectious disease investigation, information on close contacts is obtained through manual questioning, relying on patients' recollection of possible contacts, places visited, transportation used, etc. The large amount of information, vague memories, and other factors, however, result in the omission of important information, and erroneous information provided by patients may cause the workloads of epidemiological investigators to increase, and compound the difficulty of their work. How to ensure that epidemiological investigators can smoothly carry out infectious disease investigations, quickly locate close contacts, promptly arrange isolation and checking, and stop the spread of epidemics, has become an important question.

[1] Translator's note: Didi (滴滴出行) is a PRC ride-hailing app.

4. Difficulties for leadership analysis and decision-making

Large amounts of disordered epidemic-related information bring a level of difficulty to leadership analysis and decision-making. Due to short time frames and the urgency of the tasks, errors may also appear in data for ordinary, manual statistical analysis. Epidemic-related decision-making involves coordinating information from different government agencies, such as those for health, economy and information technology, communications, transportation, and public security. Doing so manually can result in delays and omissions. Consequently, there is an urgent need for automatic statistical analysis, using systematic, real-time, and effective information sharing, in order to provide decision-making support for leadership.

5. Difficulty of tracking rehabilitation management

COVID-19 patients may, due to the effects of the illness, test positive again after being released from the hospital. Because relevant medical knowledge is lacking, it is easy to overlook related symptoms and fail to carry out relevant therapies for ongoing disease rehabilitation, and it is difficult for specialists/community doctors responsible for rehabilitation to have a good grasp of the situations of patients seeking treatment at other hospitals and departments or recuperating at home. Achieving effective information sharing, so as to better carry out subsequent rehabilitative treatment, has thus become an issue.

6. Difficulty routinely ascertaining the health condition of city residents

Since the outbreak of the COVID-19 epidemic, the question of how to find out people's health information, ensure it is safe to go out, and prevent secondary transmission, has become a top priority. It is also a profound test of cities' governance systems and governance capabilities. Governments urgently need to grasp the health condition of city residents, including real-time acquisition of information on their cold and fever medicine purchases, so as to screen suspicious information and investigate potential risks in a timely fashion, thereby reducing improper government consumption of public emergency response resources, relieving the anxieties of the general public, and helping stores reopen and enterprises get back to work and resume production.

7. Materials management difficulties

Because of the sudden appearance and rapid spread of the epidemic, the lack of therapies, and the high degree of danger, extreme challenges were faced in the allocation of medical facilities, medical supplies, and other emergency response resources. Those included severely inadequate medical materials (protective equipment, disinfectant materials, medical items,) medical service personnel, medical service technology, and information resource sharing. How to promptly and effectively ascertain the resource inventories and requirements of medical institutions, and undertake rational allocation of medical materials, had become a troublesome problem.

The Xiamen COVID-19 Tracing and Monitoring System is divided into six modules: "multi-channel case investigation subsystem," "suspected fever patient management," "close contact group monitoring and management," "key group rehabilitation management," "medical materials management," and "big data-based epidemiological monitoring and analysis." The Xiamen COVID-19 Tracing and Monitoring System allows multi-channel case investigation, creation of a dense big data network, construction of a

city-level digital prevention and control map, and whole-process traceability, to achieve precise prevention and control. Since the Xiamen COVID-19 Tracing and Monitoring System came online, creating a digital prevention and control system for Xiamen, it has allowed informatization to serve the government in accurate epidemic prevention and scientific decision-making. The Xiamen model has thus received thorough recognition from national ministries and domestic industry peers, and it has been extended to other cities.

Link: https://mp.weixin.qq.com/s/PhcWKUzK_ePEv3vVAWjMuQ

Photo:

Case 2: Chinese Hospitals Apply Infervision's AI Technology to Aid COVID-19 Diagnosis

Summary: Zhongnan Hospital of Wuhan University, located at the epicenter of the outbreak of the COVID-19 epidemic, caused by SARS-CoV-2 virus, used software developed by Beijing startup Beijing Infervision Technology Co. Ltd. (Infervision; 北京推想科技有限公司; 推想科技) to look for features associated with COVID-19 in CT scans, helping medical personnel diagnose, isolate, and treat patients faster. Professor Xu Haibo (徐海波), chair of radiology at Zhongnan Hospital, says the software helped overworked medical staff screen patients and prioritize those most likely to have COVID-19 as key screening targets for further examination and testing. Currently, Infervision's COVID-19 software has been deployed in 34 hospitals in China, and has helped screen over 32,000 patients. It is an example of China's application of AI in the medical field. WIRED, North America's top tech-oriented magazine, ran a featured cover story on Infervision's role in the treatment of COVID-19.

Keywords: COVID-19 screening, aided diagnosis, AI+CT, rapid testing

Main Text:

Zhongnan Hospital of Wuhan University is located in Wuhan, China, the epicenter of

the outbreak of the COVID-19 epidemic, caused by the SARS-CoV-2 virus. The epidemic has forced China, Iran, Italy, South Korea, and other countries to lock down their cities. It has also prompted the hospital to turn itself into a testing base, a testament to how a modern medical center can quickly respond to a new infectious disease epidemic.

One experiment is underway in Zhongnan Hospital's radiology department. Staff are using AI software to detect visual signs of pneumonia associated with COVID-19 on images from lung CT scans. Xu Haibo, professor and chair of radiology at Zhongnan Hospital, says the software can help overworked staff screen patients and prioritize patients most likely to have COVID-19 as the key screening targets for further examination and testing. Detecting pneumonia on a scan doesn't alone confirm a person has the disease, but Xu says doing so helps staff diagnose, isolate and treat patients more quickly.

The software in use at Zhongnan was created by Beijing startup Infervision. The company says its COVID-19 tool has been deployed at 34 hospitals in China and has been used to screen more than 32,000 cases. The startup was founded in 2015 with funding from investors, including early Google backer Sequoia Capital. It is an example of how China is applying AI in the field of medicine. Infervision created its main product—software that flags possible lung problems on CT scans—using hundreds of thousands of lung images collected from major Chinese hospitals. The software is in use at many hospitals in China, primarily to detect potentially cancerous lung nodules, and is being evaluated by clinics in Europe and the United States. The firm began work on its COVID-19 detection tool early in the outbreak after noticing a sudden shift in how existing customers were using its CT imaging analysis software. According to CEO Chen Kuan (陈宽), in mid-January, not long after the U.S. Centers for Disease Control (CDC) advised against travel to Wuhan due to the new disease, hospitals in Hubei Province began employing a previously little used feature of Infervision's software that looks for evidence of pneumonia. "We realized it was coming from the outbreak," he says.

Infervision's staff in Beijing worked through the Lunar New Year holiday to tune their existing pneumonia detection algorithms to look more specifically for COVID-19. The company acquired images of the newly discovered pneumonia from Wuhan's Tongji Hospital. The hospital was one of the first to receive patients with the new disease, and is a longstanding Infervision collaborator. The version of the software in use today was trained with more than 2,000 images from COVID-19 patients, Chen says. Definitively diagnosing COVID-19 requires detecting the virus that causes it, SARS-CoV-2, in patients' bodily fluids. Because testing takes some time, and some laboratories are becoming overloaded, studying clinical signs in lung CT scans has become more important.

Infervision's coronavirus (冠状病毒) research is part of a wave of experimentation in China triggered by the outbreak. Zhongnan recently began operating the hastily constructed 1,600-bed Leishenshan Hospital (雷神山医院). Leishenshan Hospital is one of two hospitals built from scratch in Wuhan to accommodate the surge of patients. It is also using Infervision's new software.

Link:

https://www.newswire.com/news/infervision-in-the-front-lines-against-the-coronavirus-21089029

Photo:

Case 3: Beijing Kunlun Medical Cloud Technology Co., Ltd.'s[2] Smart Pneumonia Diagnostic Assistance System

Summary: The company developed the "COVID-19 Smart Diagnostic Assistance System" in order to better help healthcare workers on the front lines in the fight against the epidemic in achieving prevention and control, and to fully utilize the long-term experience accumulated in intelligent lesion detection, segmentation, classification, and other technical fields. The system was quickly rushed to frontline radiology departments, and was donated to many hospitals in Hubei, Guangdong, Sichuan, Shandong, and other areas for their use.

The Smart Pneumonia Diagnostic Assistance System is software for detecting pneumonia (including common pneumonia and COVID-19) using lung CT scans. The software adopts advanced AI and medical imaging analysis technology and carries out intelligent diagnosis based on patients' CT scans, helping doctors assess the degree of progression of patients' conditions.

Keywords: AI-aided diagnosis, data analysis

Main Text:

During the 2020 Lunar New Year, the novel coronavirus infection that came suddenly from Wuhan began spreading, and the constantly rising number of confirmed cases touched the hearts and minds of the nation.

The "COVID-19 Smart Diagnostic Assistance System" was developed in order to better aid healthcare workers on the front lines in the fight against the epidemic in achieving prevention and control, and to fully utilize the long-term experience accumulated in

[2] Translator's note: The Chinese source text does not explain the relationship, if any, between Beijing Kunlun Medical Cloud Technology Co., Ltd. (北京昆仑医云科技有限公司) and Keya Imaging (科亚医疗), mentioned below.

intelligent lesion detection, segmentation, classification, and other technical fields. The system was quickly rushed to frontline radiology departments, and was donated to many hospitals in Hubei, Guangdong, Sichuan, Shandong, and other areas, for their use.

The software carries out fully automated intelligent analysis using lung CT scans, quickly producing supplemental screening results for COVID-19. While ensuring a certain accuracy rate, it greatly improves COVID-19 diagnostic efficiency. Lung CT abnormalities are the most typical presentation of COVID-19 in imaging. With some patients, lung imaging changes precede clinical symptoms. As a result, CT is currently the primary means of screening for and diagnosing COVID-19. The *Methods for Diagnosis and Treatment of Novel Coronavirus Infection (trial version 5)* issued by the National Health Commission expressly stipulate that CT imaging results are to serve as the judgment criteria for clinical diagnosis of cases in Hubei Province.

However, with the epidemic developing rapidly and the number of patients lining up for CT examination in hospitals surging, the workload of radiologists has increased greatly. Using AI technology to assist CT image examination can help doctors carry out rapid and accurate diagnosis of cases. This boosts the efficiency of diagnosis and treatment, and eases the workload of frontline medical staff, while also shortening the wait times of patients and lowering the risk of cross-infection. The "COVID-19 Smart Diagnostic Assistance System" developed by Keya Imaging (科亚医疗) adopts advanced AI and medical imaging analysis technology and carries out intelligent diagnosis based on patients' CT scans, for early diagnosis of infected patients, and helps doctors assess the degree of progression of patients' conditions.

Keya Imaging's AI product delivers cutting-edge technical support for the early detection, diagnosis, isolation, and treatment of COVID-19. After the product is put into use on the front lines, Keya Imaging quickly carries out iterative feedback based on frontline conditions, fighting together with frontline doctors to prevent and control COVID-19, and safeguarding the health of the public.

Link: https://mp.weixin.qq.com/s/dZC0feUJ0M98hTdjjzdJwg

Photo:

Case 4: News from The Lancet: COVID-19 and Infervision AI: Protecting healthcare workers and curbing the spread of the virus

Summary: In Wuhan, China, the epicenter of this outbreak of the COVID-19 epidemic, hospitals are using AI from Beijing Infervision Technology Co. Ltd. (Infervision) in the containment of the COVID-19 epidemic, and it has played a huge role. At the epicenter, they are using the company's algorithm to spot characteristics of COVID-19, as distinct from other respiratory infections, in lung images. Application of Infervision's AI speeds up the diagnosis and monitoring of COVID-19, thereby minimizing the burden of the diagnosis and monitoring processes. The AI application program speeds up detection of possible coronavirus pneumonia lesions in a lung CT scan, measures their volume, shape, and density, and compares the changes of multiple lung lesions in the image. Finally, the AI application program produces a quantitative report to help doctors make a fast judgment. "While manually reading a CT scan can take up to 15 minutes, AI can finish reading the image within 10 seconds." The Lancet website's news feed reported on the use of AI in the diagnosis and treatment of COVID-19.

Keywords: AI, COVID-19, lung imaging, rapid diagnosis/monitoring

Main Text:[3]

Confirmed cases of COVID-19 have exceeded those of severe acute respiratory syndrome (SARS). Thus far [as of February 20, 2020], there are over 73,435 confirmed cases and over 2,000 deaths globally. By comparison, SARS killed 774 people in 2003. Both

[3] The "main text" portion of Case 4 in the Chinese source text is a Chinese translation of the article "COVID-19 and artificial intelligence: protecting health-care workers and curbing the spread," which was published in The Lancet on February 20, 2020. The “translation” of Case 4 here is cut-and-pasted from The Lancet article. See: https://www.thelancet.com/journals/landig/article/PIIS2589-7500(20)300546/fulltext

COVID-19 and SARS spread across continents, infect animals and humans, and use similar mechanisms to enter and infect cells. On the front lines, the approach for responding to COVID-19 is similar to that of SARS, but with one major difference: In the 17 years since SARS, a powerful new tool has emerged that could potentially be instrumental in keeping this virus within reasonable limits. That tool is artificial intelligence (AI).

Some believe that AI is causing a paradigm shift in health care, and there is value in the application of AI to the current COVID-19 epidemic, such as in predicting the location of the next outbreak. This application is effectively what the Canadian company, Blue Dot, has attempted to do, and it was widely reported as the first organization to reveal news of the outbreak in late December. Various other applications of AI have emerged in response to this new epidemic. BenevolentAI and Imperial College London report that a drug approved for rheumatoid arthritis, baricitinib, might be effective against the virus, while Hong Kong-based Insilico Medicine recently announced that its AI algorithms had designed six new molecules that could halt viral replication.

But to what extent is AI really at the point where it can deliver effective insights and solutions in a timely, wide-scale fashion to help halt the current epidemic?

As Executive Director of the Communicable Diseases Cluster, WHO, David Heymann led the international response to SARS. He says that, with or without AI, several key factors are required for a successful public health response to an outbreak of a new infection. These factors include: understanding its transmissibility and at-risk populations; establishing the natural history of infection, including incubation period and mortality rate; identifying and characterizing the causative organism; and (in some circumstances,) epidemiological modeling to suggest effective prevention and control measures. This information can be collected from those working at outbreak sites that are linked with the WHO. This strategy worked for SARS and is, again, a major source of information for COVID-19, he stresses.

This data can be used to train and prime an AI application so it can perform various dedicated tasks. Heymann stresses: "We can't replace the human brain at this point, nor the epidemiologist or virologist with anything that can analyze and rapidly do what is necessary at the onset of an outbreak. We still need to prime that AI with information from studying the evidence and link this to events in the outbreak."

Taking a balanced view of AI's position in the current arsenal for tackling COVID-19, Heymann adds: "By monitoring social media, news feeds, or airline ticketing systems, for example, we can tell if there's something wrong that requires further exploration. All these things together are very important." However, Heymann points out that the source of the data needed to inform AI in this outbreak, "won't necessarily come from China, because it hasn't been able to get hold of the data it needs due to the disorder and panic. This virus has spread to 24 other countries, and these countries have set up good systems of contact-tracing and patient isolation. This is where our information will come from."

Peter Hotez (Baylor College of Medicine, Houston, TX) says that AI can make a major contribution to the current outbreak, and can be used to predict how the COVID-19 epidemic might be affected by seasonality. “Historically, upper respiratory coronaviruses in the Northern Hemisphere peak in the winter months and then decline. AI can help predict what beneficial effect warmer weather in April and May might have on stopping the spread of the epidemic." He says that this kind of AI application could really help stabilize Asia's current financial markets. “People think the apocalypse is coming, but a report indicates that the number of cases is going to diminish substantially as we move into spring. That

would provide us some reassurance, and AI can play an important role here."

Echoing Heymann's view, Hotez also notes that effective AI needs high quality input data, and says in no uncertain terms that "it's a case of garbage in, garbage out." He mentioned his own previous work collating disease-related data in sub-Saharan Africa, and pointed out that there is a "doughnut hole" phenomenon: There is little or no data, not due to an absence of disease, but because there is no surveillance. The same applies to COVID-19. "Flights are going into Africa all the time (for example, into Ethiopia)," he notes. "Who knows what's happening there?" WHO Director-General Tedros Adhanom Ghebreyesus has declared the situation a public health emergency of international concern, and expressed concerns on the impact in less developed countries. "... We don't know what type of damage the virus could do if it were to spread to a country with a weaker health system." Moritz Kraemer, a spatial epidemiologist (University of Oxford) is involved in tracking the spread of COVID-19 on the web-based platform, Healthmap. The platform visually represents global disease outbreaks according to location, time and infectious disease agent. "In sub-Saharan Africa, our model predicted that the main entry points would be in South Africa, Ethiopia and Nigeria, which are high population centers. But it is dependent on where the outbreak is focused in China, because the number of flights to parts of Africa varies by Chinese city," Kraemer points out.

While China is the epicenter of the outbreak, it is also playing a large role in using AI to curb the COVID-19 epidemic. Infervision is a Beijing-based AI company. The company uses its algorithm to look for COVID-19 features, in lung CT imaging, that are distinct from those of other respiratory infections.

Velislava Petrova is a virologist (University of Cambridge). She highlights that Infervision's AI application expedites the diagnosis and monitoring of COVID-19, thereby minimizing the burden of these processes. "As more and more scans are done, the algorithm learns and improves the accuracy of virus monitoring."

Speaking at a time when the infection of healthcare professionals is an issue of great concern, Infervision founder Chen Kuan points out that his company's AI application can be very good at helping to protect medical staff. On February 7, medical doctor Li Wenliang (李文亮) raised a warning about the virus,[4] but was reprimanded by the Chinese government. His death highlighted the plight of frontline clinicians. Chen adds that in Wuhan, there are far too many cases to test, and polymerase chain reaction (PCR)-based diagnosis takes too long (sometimes over a week.) CT imaging with AI could serve as a substitute for doctors when fast judgment is needed. "Doctors no longer need to engage in the lengthy process of manually reading images one by one to identify high-risk cases, while coronavirus-probable patients wait around the hospital posing a severe risk of infecting other patients and hospital staff."

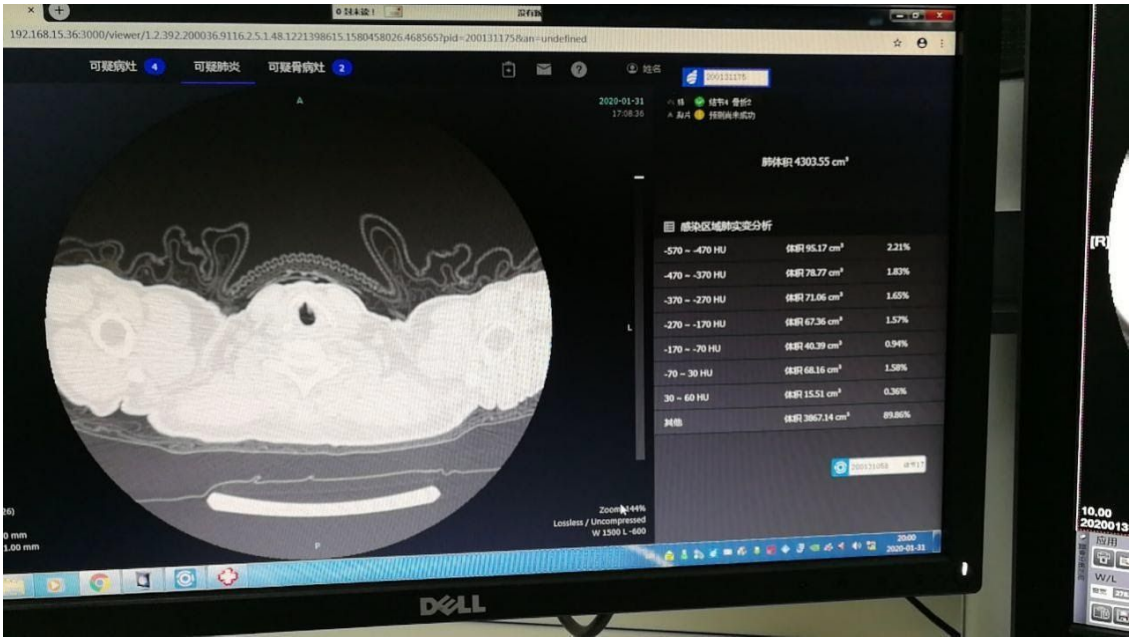
It is still too early to tell if—and to what extent—AI will have an impact on the COVID-19 epidemic. The numbers of confirmed cases and deaths rise daily, and therefore so does the available data. Moritz believes one thing is certain: "AI is relevant to this outbreak and in the future it will become even more so." Heymann's view is more conservative: "AI is one part of the final understanding." In any case, time will tell.

Link:

[4] Translator's note: February 7, 2020 was actually the date of Li Wenliang's death. He raised the warning on December 30, 2019.

https://www.thelancet.com/journals/landig/article/PIIS2589-7500(20)30054-6/fulltext

Photo:



Case 5: 4Paradigm's AI Is Helping to Bolster Epidemic Prevention and Control: Precision prevention and control, epidemiological deduction, and virus source-tracing

Summary: Domestic AI company 4Paradigm (第四范式) has developed an AI technology-based solution for precision prevention and control, epidemiological deduction, and virus source-tracing, enriching the existing rule-based models for prevention and control screening. The solution further improves population coverage, screening accuracy, and recall rates, deduces epidemiological development, and implements precision control, as well as helping to find and cut off sources of outbreaks.

Keywords: AI, machine learning, precision control, virus source-tracing

Main Text:

COVID-19 outbreaks occur suddenly. The key to prevention and control work is to promptly discover the high-risk groups and super-spreaders, accurately grasp epidemiological developments, preview and judge the impact of different policies on the epidemic, trace viral transmission paths more rapidly, and improve the efficiency of government agencies' prevention and control efforts. Domestic AI firm 4Paradigm, together with Nanjing University and Northern Jiangsu People's Hospital (苏北人民医院) clinical experts, has developed an AI-based precision prevention and control, epidemiological deduction, and virus source-tracing solution, which is currently being put into the front lines of the fight against the epidemic.

4Paradigm is a leading domestic AI company. It already has over ten thousand AI applications in place in the financial, retail, healthcare, energy, internet, and other industries. Based on its practical experience with AI in different industries, 4Paradigm already had the ability to find the best solution in vast quantities of data rapidly and efficiently, so in the current epidemic it was able to join with clinical research experts in

formulating a solution right away. By means of multidimensional data analysis and simulation, the solution has further increased the accurate screening rate, deduced epidemiological developments, and implemented precision prevention and control, as well as helping to find and cut off sources of outbreaks.

High-dimensional machine learning prevention and control and screening model for accurate screening of high-risk susceptible groups

In epidemic prevention and control, accurate screening of high-risk susceptible groups is very important. By identifying these groups and taking timely discovery, notification, and isolation measures, the spread of the epidemic can be prevented effectively. Traditional rule-based screening systems work by determining the presence of people in the same area and at the same time as a confirmed or suspected infected person. The rules are simple and operation is easy, but obtaining data sources for judgment and analysis is difficult, and the accuracy of screening results based on limited data leaves a great deal of room for improvement.

4Paradigm uses AI to enrich existing rule-based models for prevention and control screening, further improving population coverage, as well as screening accuracy and recall rates. It reduces the difficulty and cost of control, especially under emergency conditions, and can help competent authorities put limited resources into the most critical areas. In addition, to address viral variability and the complexity of population dynamics, 4Paradigm also constructed a data-and-system closed loop based on AI's self-learning capability, with continuous iteration. It thereby ensures efficient and accurate judgment support, in a very limited time frame, based on a dynamically changing environment, helping various relevant authorities formulate workable policies and action plans.

Learning-enabled provincial- and county-level digital twin system for real-time preview and analysis of epidemiological development

In epidemiological deduction, because it is difficult to take into account composite factors such as population dynamics and control measures when using traditional models such as susceptible, exposed, infected and resistant (SEIR), Gaussian process regression, and SARS propagation models, their support for prevention and control decision-making in combating epidemics is inadequate. They are thus unable to provide decision-makers effective solutions for formulating policies and affecting the development of epidemics.

4Paradigm adopted high-dimensional machine learning technology and multidimensional data to construct a provincial- and county-level digital twin system that is both more granular and closer to reality. The system fully takes into consideration the effects on epidemic development of various suddenly arising factors (traffic controls, resumption of work, drugs becoming available, etc.). Most importantly, the system has a simulation function, so simulation-based prediction can be performed on the effects that key decisions will have once they are implemented, providing an important basis for formulating practical and effective epidemic control policies.

AI-based epidemic source-tracing system built to quickly trace transmission paths

Viral transmission source-tracing is extremely important, both early on in prevention and control and after it is completed. Before, viral transmission source-tracing was mainly done by manually analyzing patient information to look for correlations, and then verifying the deduced sites. This approach presents many challenges, however, such as the slow response to new information and limited ability to handle complex scenarios. Also, it is very

difficult to actually observe the occurrence of transmission events, which makes it extraordinarily hard to infer the path and direction of transmission.

In order to achieve accurate and efficient source-tracing, 4Paradigm teamed up with Nanjing University and clinical research experts at Northern Jiangsu People's Hospital. The team used machine learning technology to build a data-driven novel coronavirus transmission digital twin (数字孪生) system, and constructed a potential infection relationship network, which was combined with patient information. Possible transmission sources and potential super-spreaders are then found in the relationship network. 4Paradigm also constructed a learning-enabled event playback simulator to promptly discover potential transmission paths, helping disease prevention departments quickly cut off sources spreading the epidemic.

The system has now been put to use on the front lines of epidemic prevention. Going forward, 4Paradigm will cooperate with the relevant authorities to improve epidemic prevention and control work. At the same time, 4Paradigm has announced that it will open its intelligent epidemic prevention and control system to the society, hoping to provide AI technology help and support to more epidemic prevention departments, institutions, and other organizations, to fight the epidemic together with them, and do its part to end this "war without smoke."

Link:

1. https://mp.weixin.qq.com/s/7WLYil1sHpIl_gKsJiiWsw

Photo:

Case 6: Wuzhu Technology's Intelligent Voice Robot System for Epidemic Prevention and Control Helps the Grassroots Level Make Large-Scale Improvements in the Efficiency of Epidemic Prevention, Case-by-Case Investigation, and Follow-up Visits

Summary: Given the broad scope, large number of people, and high risk of cross-infection involved in manual epidemic case investigation, manpower is severely inadequate, and data is incomplete and not timely. Wuzhu Technology's (五竹科技) emergency response utilizes self-learning AI technology. Leveraging the strength of its own robotic process automation technology, it is using epidemic robots (疫情机器人) to help grassroots organizations make large-scale improvements in epidemic prevention and control work, interpreting "scientific governance, overcoming difficulties together" with practical actions, and doing its all to help win the epidemic prevention and control battle.

Keywords: AI, intelligent outcall (智能外呼), intelligent speech, intelligent epidemic

Main Text:

In the current epidemic, Wuzhu Technology's emergency response utilizes self-learning AI technology. Leveraging the strength of its own robotic process automation technology, it is using epidemic robots to help grassroots organizations make large-scale improvements in epidemic prevention and control work. This helps solve the following problems: ① policy announcements to entire populations; ② case-by-case investigation for entire populations; ③ regular closed-loop tracking of patient groups; ④ social sampling surveys; and ⑤ automated data collection and analysis for medical institutions.

Specific cases include:

(1) Epidemic prevention and control surveys are carried out jointly with local health commissions.

Taking the Langfang City Health Commission as an example, the 12320 health hotline number was used as the instrument to carry out a thorough case-by-case investigation,

asking survey subjects whether they had physical discomfort, whether they had left the Langfang area, whether they had been to seriously affected areas, whether they had had contact with suspected patients, etc., while also communicating epidemic-related policies. On the basis of the robotic case investigation results, secondary follow-up is conducted for those in sensitive data groups. The project has served nearly 40,000 people since coming online.

(2) With the cooperation of local operators, big data is incorporated and precise case-by-case investigation is carried out.

Taking the Guangzhou branch of China Unicom for example, telephone call-back using big data-based intelligent voice was rolled out at health commissions and sub-district offices in Baiyun and Conghua districts. Call-back users first perform screening with the big data capability provided by the operator, such as on whether the caller had been to Hubei or Wenzhou, and whether they had been in contact with suspected cases. Based on the screening results, telephone call-back is carried out by means of intelligent voice robots, and secondary confirmation of the results is carried out, thereby achieving efficient and accurate epidemiological case investigation.

Link:

https://ie.bjd.com.cn/5b165687a010550e5ddc0e6a/contentApp/5b1a1310e4b03aa54d764015/AP5e4aae66e4b0c4aab142c4d8?isshare=1&app=8ED108F8-A848-43A8-B32F-83FD7330B638&from=timeline

Photo:

Case 6: Wuzhu Technology's Voice Robot System for Epidemic Prevention and Control Helps the Grassroots Level Make Large-Scale Improvements in the Efficiency of Epidemic Prevention, Case-by-Case Investigation, and Follow-up Visits

Application by grassroots epidemic prevention and control organizations

Case 7: Futong Dongfang's Intelligent Guidance (2020 Standard Version) AI Helps Hospitals Screen Patients for Pre-Diagnosis Triage

Summary: Futong Dongfang's (富通东方) Intelligent Guidance product is an AI engine that helps medical institutions by applying accurate and intelligent medical consultation guidance services to the patient care process, thereby increasing the efficiency of healthcare services and improving the patient experience. It has independent intellectual property rights and patented advanced technology for medical text semantic understanding and labeling. It uses big data and AI to solve the problem of matching medical resources to medical needs; allows patients to find precisely the right doctor by means of intelligent human-machine dialogue; and lets doctors screen for patients who match their specialization, working at the source to make healthcare service delivery more accurate and efficient.

Keywords: intelligent healthcare, AI, knowledge map, microservices

Main Text:

Futong has been developing corporate-level applications for over 20 years. It is dedicated to integrating cloud computing, big data, AI, mobile internet, and other technologies into industry solutions, helping customers fully exploit the power of digital technology, and assisting customers in "inside-out" digital transformation and upgrading. In recent years, the company has leveraged its industry, academic, and research strengths to build up a wealth of products and solutions in healthcare, retail, transportation, and other industries. In 2017, it began gradually expanding its ability to apply AI technologies like machine learning and neural networks in healthcare fields, rolling out intelligent medical consultation guidance products aimed at serving the entire outpatient visit process—before, during, and after consultation. In order to make positive contributions to help win the fight to control the epidemic, Futong Dongfang Technology has responded vigorously to the nation's call since the beginning of the COVID-19 outbreak. During the epidemic, it has comprehensively upgraded its product capabilities to address routine epidemic management needs, such as for out-of-hospital patient self-assessment, triage of in-hospital guided consultation, data collection and sharing, etc.

Futong Dongfang's Intelligent Guidance product is an AI engine that helps medical institutions by applying accurate and intelligent medical consultation guidance services to the patient care process, thereby increasing the efficiency of healthcare services and improving the patient experience. It has independent intellectual property rights and patented advanced technology for medical text semantic understanding and annotation. It uses big data and AI to solve the problem of matching medical resources to medical needs; allows patients to find precisely the right doctor by means of intelligent human-machine dialogue; and lets doctors screen for patients who match their specialization, working at the source to make healthcare service delivery more accurate and efficient. Its key technologies are: natural language processing + cognitive computing + application microservices architecture.

At the same time, the intelligent medical consultation guidance product conforms to intelligent services standards, and provides integrated intelligent outpatient consultation solutions, with the goal of facilitating patients' entire outpatient visit process—before, during, and after consultation—and improving the medical visit experience. As prevention and control of the COVID-19 epidemic was entering a critical phase, Futong Dongfang

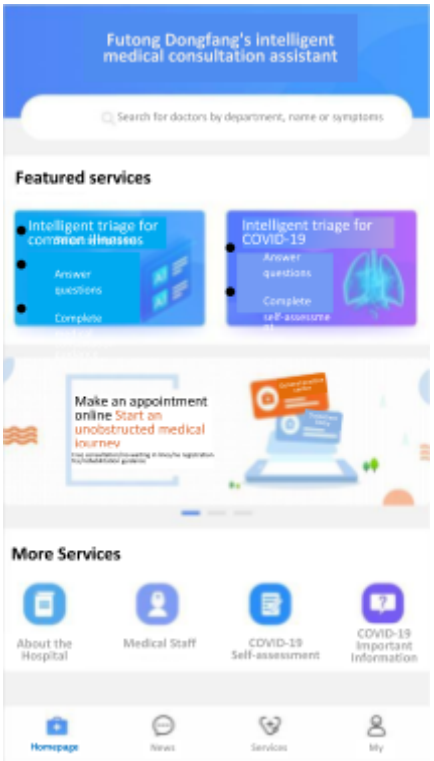
launched, in real time, the 2020 Standard Version of its application, and made its products and technical services available to medical institutions free of charge for the duration of the epidemic. It is also helping medical institutions quickly boost their pre-hospital service and prevention and control capacity, so as to lighten the work burdens of medical staff and reduce cross-infection risk.

Since the beginning of the COVID-19 epidemic, Futong Dongfang has responded vigorously to the nation's call, taken into account the actual needs and current realities of hospitals, and formally released the 2020 Standard Version. It comprehensively upgraded its product capabilities to address routine epidemic management needs, such as for out-of-hospital patient self-assessment, triage of in-hospital guided consultation, and data collection and sharing, during the epidemic. In order to enable large-scale population screening and in-hospital consultation triage work, priority was given to pilot projects in level 3A (三甲) hospitals and large hospitals, with gradual improvement in practice. Among those projects was a Beijing Municipal Natural Science Foundation research project on intelligent healthcare and intelligent outpatient service, completed at Beijing Tiantan Hospital, Capital Medical University. The project was primarily tasked with the design, construction, testing, and evaluation of an AI-based triage training model, as well as data pre-processing based on a trial corpus and labeling of the results.

Futong Dongfang is dedicated to improving the quality and management level of healthcare services, and innovating hospital service models, based on AI. At the same time, improving the data collection system for hospital user information and hospital admissions, and standardizing the sharing, analysis, and reporting processes for epidemiological investigation information and other data, has an important catalytic role to play in promoting progress in healthcare informatization (信息化).

Link: http://www.futong.com.cn/intell-medical-product.html

Photo:



Case 8: Airdoc Helps Jiangsu Sunshine Group: AI-based risk review for thousands returning to work

Summary: As a company that supports frontline medical staff, Jiangsu Sunshine Group (江苏阳光集团) is well aware of how important case-by-case risk review is for returning to work, so it joined hands with Airdoc to carry out such risk review of its employees. The system uses intelligent devices to analyze employees' vascular condition and body temperature, heart rate, breathing, and other data, combined with data on employees' recent behavior, to quickly review the risks of employees returning to work, and indeed ensured that employees could safely return to work at their jobs.

Keywords: Safe work resumption solution, scientific prevention and control, AI black technology (AI黑科技) , corporate customization, level 5 prevention and control, intelligent analysis

Main Text:

On February 26, news feeds carried reports about a company called Sunshine Group. Ever mindful of their mission, they are working around the clock to produce personal protective equipment (PPE; 防护服) for frontline medical staff. How did Sunshine Group manage it? Production lines had to be adjusted, but even more important was ensuring that several thousand employees could safely return to work. Their good approach to solving this problem was an AI "secret weapon," one few people are likely to have ever seen. Jiangsu Sunshine Group teamed up with Airdoc to carry out case-by-case risk review of employees for resumption of work. Retinal scans combined with AI sensor analysis were used to comprehensively investigate and identify the work resumption risks of employees. This "secret weapon" is easy to use, and the review efficiency is high, so risk reviews for over 2,000 people were achieved on the first day.

Sunshine Group is a State Key Enterprise group (国家重点企业集团) and ranks as a

leader of key industries supported by the state (国家重点扶持). It is engaged in the woolen textile, garment, biotech and pharmaceuticals, medical devices, ecological agriculture and forestry, real estate, metal product, and other industries. In 2007, the International Standardization Organization / Technical Committee on Textiles (ISO/TC38) set up its International Secretariat in Sunshine Group, making it the first domestic enterprise to undertake the work of the ISO/TC38 International Secretariat. During the epidemic, Sunshine Group has never looked back when it comes to shouldering its responsibility to support frontline medical staff. It transformed its plants and added dedicated production lines for protective clothing, and it has currently provided over 200,000 pieces of medical-use protective clothing to Hubei and other places.

As a company that supports frontline medical staff, Jiangsu Sunshine Group is well aware of how important case-by-case risk review is for returning to work, so it linked up with Airdoc to carry out such case-by-case risk review of its employees. The system uses intelligent devices to analyze employees' vascular condition and body temperature, heart rate, breathing, and other data, combined with data on employees' recent behavior, to quickly review the risks of employees returning to work, and has indeed ensured that employees could safely return to work at their jobs. At the same time, Airdoc's professional technicians also visited Sunshine Group in person to answer employees' questions, and to ensure that return-to-work inspections were being conducted in a safe and orderly environment. A female employee, Mrs. Wu, said, "Airdoc's technicians work really hard, arriving at the site a little after 7 a.m. and patiently instructing each one of us on how to use the intelligent instruments. My family didn't support my returning to work at first, but now that there's risk review for returning employees, my family has been reassured, and we are also working on a sounder footing." During the return-to-work risk review process, Airdoc fully experienced the great importance Sunshine group attaches to employee health. May the lives of all company employees returning to work be filled with sunshine!

Link:

http://jiangsu.china.com.cn/html/finance/zh/10708533_1.html

Photo:

Case 9: Potevio's (中国普天) AI Boosts Epidemic Prevention and Control

Summary: The "AI Close Contact Catcher" (“AI密接捕手”) adopts a convolutional neural network (CNN) distributed computing/advanced deep learning algorithm approach. By means of "cross-camera pedestrian re-identification technology" (“行人夸镜头重识别技术”) it is able to search huge amounts of video, and relying just on a single photo of a pedestrian target, it can efficiently and accurately retrieve and identify the target individual from the vast amount of video surveillance images, then depict trajectories in space and time. There is no need to keep an eye on multiple surveillance screens for long periods of time, or rely on face information, so "human wave" tactics are not required. It substitutes computers for manpower to achieve truly real-time "finding the needle in the haystack" and to carry out screening analysis of close contacts.

Keywords: AI, close contact investigation, epidemiological survey area investigation, automatic detection for isolation and warning

Main Text:

The current positive trend in the nationwide epidemic prevention and control situation is expanding, and socioeconomic development is recovering rapidly, but the epidemiological situation in Hubei Province and Wuhan in particular remains complex and serious. The risk of a resurgence of the epidemic in other regions also cannot be ignored. As General Secretary Xi Jinping has stressed, there can be no letting up in the effort to strengthen epidemic prevention and control, and at the same time, various economic and social development tasks must not be delayed. Based on the seriousness of the current phase in epidemic prevention and control, and the urgency of restoring work at enterprises nationwide, Potevio Information Engineering Design Service Co., Ltd. (普天信息工程设计服务有限公司) is using AI technology to fill in technological gaps in epidemic prevention and control. It fast-tracked industrial production and application services, and urgently developed the "AI Close Contact Catcher" for retracing the activities of suspected cases and investigating close contacts. The system is based on surveillance video network data. The core algorithm is used to derive an activity trajectory of a target individual within the range of surveillance, and to quickly identify close contacts, thereby achieving rapid location and timely investigation for promptly controlling the spread of the epidemic.

One of the difficulties in controlling the COVID-19 epidemic is that rapid transmission to contacts is possible during its asymptomatic incubation period. In consequence, the focus of epidemic prevention and control is on the timely detection of, and disruption of transmission by, confirmed and suspected cases and their close contacts, so as to prevent infection from spreading further. The AI Close Contact Catcher developed by Potevio Information Engineering Design Service Co., Ltd. uses pedestrian detection and position redetermination technology, without relying on facial features. Based on the features of people's postures from any angle, it can carry out intelligent detection, intelligent identification, and intelligent position determination in the video network within the range of surveillance. It can provide infection source tracing and contact tracing for confirmed cases, epidemiological survey area examination, warning of intentional transmission and quarantine irregularities, and other functions.

The incubation period of the novel coronavirus may be as long as 24 days, and it is also contagious in those who test positive but are asymptomatic, so transmission source tracing is extremely difficult. The only way to effectively control the spread of the virus and the

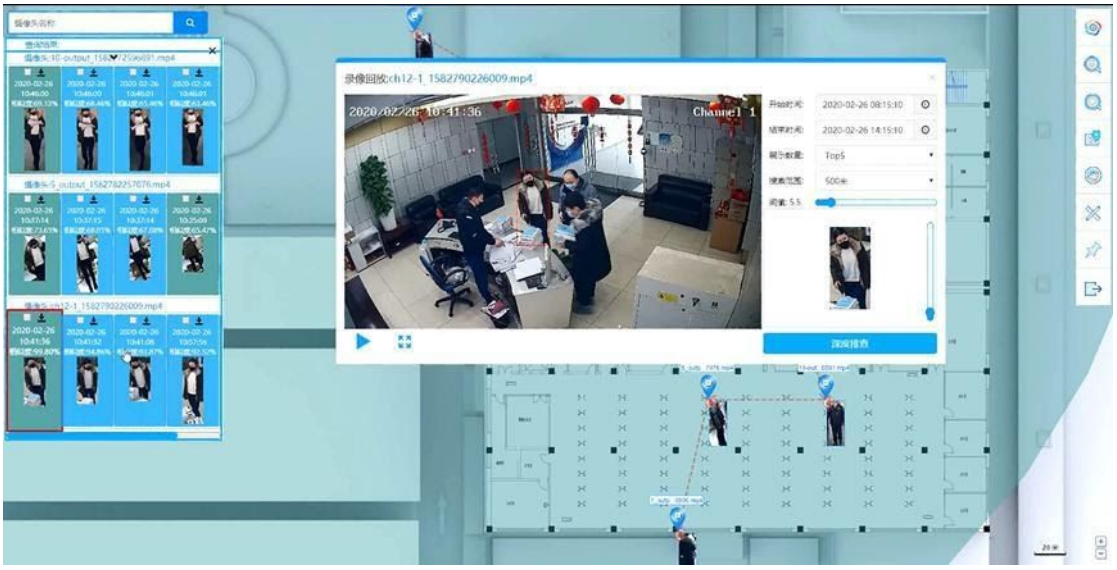
development of the epidemic is to fully understand the activity trajectories of relevant patients and close contacts, trace each back to the source, investigate potential close contacts case by case, and impose strict prevention and control measures. The AI Close Contacts Catcher can perform real-time tracking and historical retracing of the activity trajectories of confirmed cases and suspected cases for several days within a range of surveillance, recovering their historical trajectories and activity areas. With multi-branch observation of the infection paths that may exist, it narrows the range of possible close contacts for confirmed cases, and tracks down close contacts at risk of infection, achieving precise prevention and control, and reducing the chances of the virus spreading further.

After conducting epidemiological investigations of confirmed cases, the AI Close Contact Catcher can verify the areas accessed and routes taken by confirmed cases in the survey results, and investigate case-by-case whether there were omitted areas, improving the accuracy of survey results. This serves to increase the vigilance of people in those areas and reduce unnecessary contacts, thus controlling the spread of the virus.

Based on people's body characteristics, the AI Close Contact Catcher's real-time deployment and control function can confirm different quarantine targets (without interference from factors such as obscuring of faces, distance to the target, etc.), and quickly and accurately identify their activity trajectories. It can discover unauthorized abnormal behaviors on the part of quarantined individuals (such as intentional transmission by a confirmed case, violation of quarantine provisions by suspected cases and close contacts, etc.), and carry out real-time warning. It thus achieves effective monitoring, precise isolation, and real-time warning.

General Secretary Xi Jinping has stressed that properly doing epidemic prevention and control work relates directly to the safety of people's lives and physical health. It is directly related to the big picture of economic and social stability, and also concerns China's opening up to the outside world. Under the strong leadership of the Communist Party of China (CPC) Central Committee and the State Council, all sectors of society are taking positive actions to contribute to the fight against the epidemic. What epidemic prevention and control urgently require are mobilization orders and rallying cries. As a central government enterprise (央企) with a long history, China Potevio has made the most of AI's empowering effect, organized its scientific research and productive forces, and actively prioritized the accelerated research and application of relevant products that effectively support epidemic prevention and control. It has consolidated resources, pooled efforts, and contributed its own strengths to epidemic detection, early warning, prevention, and control!

Photo:



Case 10: In the Collective Fight against the Epidemic, an Internet Business Security Line of Defense is Erected for Zhejiang's Healthcare Industry

Summary: Recently, with the COVID-19 epidemic continuing, announcements on epidemic-related trends and government policies have touched people's hearts nationwide, and as the internet is the transmission channel for epidemic information, its security is both evident and important. During the epidemic, especially, in the face of problems such as major business pressures, manpower constraints, and impeded logistics, ensuring the stable operation of internet business systems has taken on paramount importance. This case addresses the importance of internet-based healthcare business, as well as problems with staffing shortages, during the epidemic. The overall solution adopts a software as a service (SaaS) solution approach based on the idea of full-lifecycle protection—before, during, and after events occur.

Keywords: cloud computing, big data, AI, SaaS, threat intelligence

Main Text:

The COVID-19 epidemic broke out nationwide during the 2020 Lunar New Year Festival. The epidemic's relentless menace brought numerous inconveniences for the lives and work of people across the country, and as the epidemic spread, pressures on healthcare businesses multiplied. On one hand, they faced enormous amounts of outpatient healthcare business; on the other hand, it was necessary to prevent hackers from tampering with their internet business systems. Zhejiang Province is a key region in the epidemic, and Zhejiang's healthcare industry has also faced those huge pressures.

Against this background, the Zhejiang Health Commission sought to implement national epidemic control policies and to effectively ensure the stable and safe operation of Zhejiang's healthcare-related internet businesses. Using DBAPPSecurity's (安恒信息) Xuanwu Shield Cloud Defense (玄武盾云防护) platform as the foundation, real-time protection and control was put in place for over 40 websites of Zhejiang Health Commission and others within its jurisdiction. Cyberattacks by lawbreakers are cut off effectively by means of unified access to the Cloud Defense platform for important information systems. By analyzing network attack behavior, clues of attacks are discovered, and targeted management and technical protection measures are taken, thus promoting improvements

in security levels and security control capabilities, preventing and reducing the occurrence of significant information incidents, and effectively ensuring the information security of information systems.

During the epidemic, monitoring by the DBAPPSecurity Storm Center (风暴中心) has discovered that, in a little over 1,500 healthcare network systems, there were over 750 network security vulnerabilities. Of that number, high-risk vulnerabilities accounted for 67.94%, followed by low-risk vulnerabilities, accounting for 31.30%, while medium-risk vulnerabilities accounted for 0.76%. In the 1,500-plus healthcare networks/systems, there had been 105 high-risk security incidents. Further analysis revealed that the networks/systems had 2,828 hidden links, 152 bad links, 112 instances of sensitive content, and 6 external links. From this, it was evident that the current network security situation was severe.

DBAPPSecurity provided healthcare institutions under the Zhejiang Health Commission's jurisdiction an entire package of Internet business hosting services. The package provided one-stop security hosting services, with pre-incident monitoring and check-ups, security protection and monitoring during incidents, and ex post security operations maintenance and response. The entire solution adopts the SaaS approach, requiring no deployment, operation, or maintenance, and access can be completed in just 10 minutes.

Dynamic protection: Real-time updating of the monitoring and protection a priori algorithm is carried out by the back-end support team based on an empowering trinity of (a) research by security researchers on mainstream attack methods, (b) correlation analysis of Xuanwu Shield's monitoring and protection data, and (c) threat intelligence on the latest attack postures.

Active defense: In the past, we put too much effort into real-time defense, but did not completely block threats. Today, we can use threat intelligence to make predictions about attacks. At the core of all this, however, is mastering vast quantities of data and having strong data analysis capability. Threat intelligence is oriented toward new forms of threats, and is the natural result of the evolution of defensive thinking from the vulnerability-centered approach of the past to a threat intelligence-centered approach. Threat intelligence, along with big data analysis and ideas such as kill-chain-based defense in depth, are forming the cornerstone of a new generation of defense systems. The addition of threat intelligence to the solution will bring about a major change in our defense systems, turning passive defense into active defense.

Rapid response mechanism: By means of a cloud monitoring + cloud protection approach, big data and AI technology are used for timely alerts, giving users timely reminders of security risks.

Sound emergency response mechanisms: When a network security incident occurs, a "one-key shutdown" function can be used to shut down a webpage in seconds. An "always online" function can also be used to switch user traffic over to mirror sites, protecting business against interruption.

Through no-contact deployment and no-contact operations maintenance methods, and drawing on its performance advantage with 50 monitoring and protection nodes nationwide able to protect against up to 2.5T distributed denial-of-service (DDoS) attacks, it provides Zhejiang Province's healthcare industry 24/7 professional remote service, ensuring

comprehensive security protection and assurance before, during, and after incidents, and helping Zhejiang Province win the epidemic prevention and control battle.

Since the Zhejiang Health Commission and the healthcare institutions within its jurisdiction gained access to Xuanwu Shield, not one security incident has occurred. During this protected period, 620,100 site visits were logged, along with 26,300 intercepted attacks. Visits and attacks can be seen simultaneously on a single screen, giving a full view of the security situation.

Photo:

Case 11: Shanghai Uses AI to Analyze Lung CT Images

Published: March 16

Summary: A press conference was held in Shanghai at 2:00 p.m. on March 16, at which the following were invited to present the situation in Shanghai with regard to COVID-19 prevention and control work: Zhang Quan (张全), director of the Municipal Science and Technology Commission, Zheng Jin (郑锦), spokesperson of the Municipal Health Commission, Yi Chengdong (衣承东), deputy director of the Municipal Health Commission, Wen Daxiang (闻大翔), director of the Municipal Medical Products Administration (药品监管局), and Wu Fan (吴凡), member of the expert committee of the Municipal Science and Technology Hard Problems Group (科技攻关组).

The press conference was presided over by Xu Wei (徐威), director of the Shanghai Government Information Office and spokesman of the Shanghai Municipal Government.

Main Text:

Since the onset of the epidemic, Shanghai's higher education institutions, S&T enterprises, and frontline medical institutions have collaborated closely, and a host of jointly developed new technologies and new products have seen pioneering applications on the front lines of epidemic prevention and control. In the area of smart devices, for example, United Imaging (联影医疗) has provided an integrated solution for epidemic prevention and control that incorporates high-performance medical equipment, remote medicine, and AI. Intelligent robots developed by TMiRob (钛米科技) and CloudMinds (达闼机器人), among

others, provide services such as mobile disinfection, materials distribution and recycling, initial fever screening, and isolation ward services, which are effective in decreasing cross-infection among staff and increasing the level of isolation management and control in hospital wards. Infrared temperature measurement and monitoring systems developed by Magnity Electronics (巨哥电子), DeepBlue Technology (深蓝科技), and others have achieved application at scale in airports, high-speed rail, subways and buildings.

In terms of AI technology applications, application of an "Intelligent Evaluation System for COVID-19" developed by YITU Technology (依图科技) has been launched at the Shanghai Public Health Clinical Center (上海市公共卫生临床中心). For COVID-19 lesions in chest CT images, it can perform quantitative analysis, efficacy evaluation, and prognosis, providing clinical physicians a basis for decision-making. Fudan University and Shanghai Public Health Clinical Center jointly developed an AI-assisted diagnosis and prognosis system that can shorten the time it takes to read patients' CT scans from around 10 minutes to a few seconds. Since coming online on February 21, it has served 93% of the confirmed COVID-19 patients in Shanghai.

In the areas of big data and 5G, Wonders Information (万达信息), Wangsu Technology (网宿科技), UCloud (优刻得), and other companies have provided support for epidemic prevention and control through the free release of data resources and cloud services. For example, Wonders Information leveraged its strengths in big data-supported governance and community-based prevention and control to provide 41 cities nationwide with toolkits with "suishen codes,"[5] infected region returnee updates, health declarations, COVID-19 early diagnosis, face mask ordering, etc. Having served over 100 million people and activated over 10 million health codes, it has eased the work pressures of grassroots personnel on the front lines of epidemic prevention and control. Qianxun Spatial Intelligence (千寻位置) and Nokia Shanghai Bell have provided the Huoshenshan and Leishenshan hospital construction sites high-precision measurement and 5G communications.

Link:

https://news.sina.cn/2020-03-16/detail-iimxxstf9431433.d.html

Case 12: "China's Silicon Valley" Zhongguancun: Achievements in AI technology help in the fight against the epidemic

Published: March 17

Summary: A slew of new technology products developed by high-tech firms—rapid temperature measurement and early warning systems, voice-controlled elevators, contact-free meal delivery robots, and disinfection robots—are playing important roles during this epidemic prevention and control effort.

Main Text:

On March 16, when this reporter stepped into the first-floor lobby of Zhongguancun Advanced Technology Innovation Center, the temperatures of everyone entering the building were seen instantly displayed in the thermal imaging area of a screen. This is THOR, the latest intelligent temperature measurement and early warning system developed by

[5] Translator's note: "Suishen codes" (随申码) are personal COVID-19 risk QR codes that people are required to show at entrances and other checkpoints.

Zhongguancun tech company Beijing SEEMMO Technology (北京深晶科技).

This system employs high-precision body temperature cameras, together with intelligent facial detection, target tracking, and facial recognition algorithms, to automatically take and record the temperatures of people at all access monitoring points, without contact or sensation. As soon as someone is found to have an abnormally high temperature, sound and light alarms are instantly triggered. It is accurate to ± 0.3°C.

As explained by SEEMMO CEO Chen Ruijun (陈瑞军), the system can rapidly take the temperatures of 100 people per minute, and is already in use in communities, parks, campuses, subways, bus stations, airports, and other crowded areas in public places.

Dubbed "China's Silicon Valley," Zhongguancun is China's largest concentration of high-grade, precision, and advanced technology enterprises, and is deeply rooted in S&T. In recent years, Zhongguancun has been mining and screening cutting-edge technology projects with a global orientation, focusing on cutting-edge fields such as AI, smart manufacturing, new materials, and healthcare, in order to hasten the incubation of innovative enterprises that have a global orientation.

After the COVID-19 epidemic broke out, Zhongguancun companies made full use of their strengths in technology innovation to make positive contributions in the fight against the epidemic. According to incomplete statistics, over 200 Zhongguancun firms have participated directly in efforts to battle and control this epidemic.

At Zhongguancun Cutting-Edge Technology Innovation Center—Zhongguancun's new landmark for cutting-edge S&T—the focus is on cutting edge S&T innovation, and the companies in residence have major disruptive and original core technologies, as well as high-level talent teams.

Each of these cutting-edge technology companies has its own unique "skill set." With the contact-free voice-controlled elevators developed by Yunji Technology (云迹科技公司),[6] passengers just need to scan a QR code and open an app to be able to summon an elevator by voice on their phones, then select a floor.

According to the head of the company, the contact-free control elevator app mainly uses IoT technology and voice interaction technology to achieve voice-based elevator calling. Floor buttons are also turned on by calling, and the passenger is sent to the desired floor.

A robot shuttles up and down the hallways emitting "steam," drawing many people's attention. It turns out that this robot is silently disinfecting the building, and the "steam" it emits is diluted disinfectant.

This disinfection robot developed by Yunji Technology can autonomously take the elevator, plan its routes, and avoid obstacles. It makes its scheduled rounds disinfecting the building following planned routes, working continuously for up to 8 hours.

As a leading domestic company specializing in robotic product applications and R&D, Yunji Technology has developed delivery robots, disinfection robots, and meal delivery robots that have served over 1,300 large hotels and other buildings in China, and it exports

[6] Translator's note: According to China.org.cn (http://www.china.org.cn/china/2020-03/19/content_75835111.htm), there are six elevators, one voice-controlled with technology developed by SoundAI, the other five controlled with a QR code-accessed app from Yunji Technology.

to South Korea, Japan, Thailand, etc.

Using IoT technology, the "meal delivery robot" links meal delivery service to cafeteria ordering devices, elevators, building doors, cargo containers, etc., allowing the robot to move about the building unimpeded and deliver piping hot meals to those who order them, quickly and accurately. After it arrives at the designated location, the robot autonomously calls the person who ordered to collect their food, avoiding person-to-person contact that spreads viruses.

During the epidemic, new technologies and new products developed by Zhongguancun's cutting-edge tech companies have been applied in locations nationwide. For instance, Unisound's (云知声) intelligent voice-based electronic case (病例) system has been put to use at COVID-19-designated hospitals in Xiamen, Guangxi, Beijing, and other places; and remote microbe source detection robots from AUBO Robotics (遨博智能) can detect viruses in laboratories using remote control operation. AI S&T accomplishments have made important contributions to help fight the epidemic.

Link:

http://ai.people.com.cn/n1/2020/0317/c422228-31635605.html

Case 13: Under this epidemic, AI Is "Not Backing Down"

Published: February 26

Summary: "For patients who do not have particular discomfort today, continue giving traditional Chinese medicine (TCM) treatment, and wait until later to carry out CT review and nucleic acid review." These words were spoken by a clinical physician dressed head-to-toe in airtight PPE, sitting before a computer and speaking into a microphone inside the Wuhan Keting temporary hospital (武汉客厅方舱医院) in Wuhan. The above spoken words were accurately recorded and automatically converted to text on the computer's screen. This is a common scene in the course of medical records work at the Wuhan Keting temporary hospital. Keyboard entry is very difficult when wearing two layers of gloves. This (making medical records orally) has greatly eased the workload on doctors, allowing them more time to see and communicate with patients.

Main Text:

Wuhan Keting temporary hospital's "e-chart" (电子病历) intelligent voice entry technology comes from iFlytek (科大讯飞). Based on AI technology such as speech recognition and semantic understanding, the voice robot helps doctors make medical case records orally, reducing labor intensity for them. It is a typical application of AI in anti-epidemic scenarios. According to reports, since the beginning of the epidemic, the Shanghai Economic and Information Technology Commission (上海市经信委) has relied on the Shanghai AI Development Alliance (上海人工智能发展联盟) to marshal the city's AI industry forces. The Alliance organized and coordinated a group of AI enterprises from Shanghai to introduce a range of new AI technologies to aid the joint epidemic prevention and control effort. It also took the Shanghai Public Health Clinical Center and Shanghai East Hospital (assisting Wuhan medical teams) as the first sites for developing key AI applications for COVID-19 prevention and control.

After the COVID-19 epidemic emerged, Shanghai Public Health Clinical Center joined forces with the YITU Technology to develop and launch an "Intelligent Evaluation System of Chest CT for Coronaviral Pneumonia (新型冠状病毒性肺炎)." The system, which is the

industry's first AI-based imaging product for the intelligent assessment of coronaviral pneumonia, helps doctors achieve assisted diagnosis throughout the entire process—before, during, and after. It has been put into operation at Wuhan Union Hospital, Zhongnan Hospital of Wuhan University, Renmin Hospital of Wuhan University, and First People's Hospital of Jingzhou, where it is taking on the extremely heavy and vital task of rescuing critically ill patients. CT images are an important examination tool on the clinical front lines of COVID-19. Targeting makeshift hospitals, Shanghai-based AI company United Imaging rolled out a rapid, flexible, and intelligent full-process radiology department solution—the United Imaging Temporary Hospital CT "emergency radiology department." In the past, doctors had to go into the scanning room and do positioning next to the patient, increasing the infection risk for medical staff. The Temporary Hospital CT, on the other hand, can achieve contact-free, next-room filming, greatly reducing infection risk. Use of this "contactless CT" solution was first launched at the Jianghan temporary hospital, where it completed scanning for nearly 200 patients on the first day. Apart from Wuhan International Conference and Exhibition Center [where Jianghan temporary hospital is located], installation of "emergency radiology departments" has been completed recently at other temporary hospitals such as Hongshan Stadium, Hanyang International Expo Center, and Tazihu Sports Center, and they will soon be put into use.

Person-to-person contact has become an important factor in the spread of the epidemic. In order to subdue the epidemic faster, a cadre of "iron nurses" made up of AI robots is working on the front lines, reducing the chances of spreading the virus. In the disinfection field, TMiRob has already introduced nearly 60 disinfection robots into hospitals in Hubei and other places nationwide. With applications in disinfecting isolation wards, ICUs, operating rooms, fever clinics, etc., they are helping greatly reduce risks to medical staff and prevent cross-infection, while also increasing disinfection efficiency. They have received high recognition from the hospitals using them, including Wuhan Central Hospital, Wuhan Union Hospital, and Zhongnan Hospital.

In the meal delivery area, Keenon Robotics (擎朗智能) meal delivery robots have already taken up residence at key hospitals such as Wuhan's Shipailing temporary hospital and the Hubei Provincial Party School temporary hospital. As of February 20, Keenon Robotics had put over 100 meal delivery robots into service, rushing to the rescue in over 10 provinces and municipalities nationwide, including Hubei, Shanghai, Beijing, and Chongqing, and involving close to 50 hospitals and isolation sites. CloudMind partnered with China Mobile to donate two 5G Cloud Robots to Wuhan Union Hospital and Tongji Tianyou Hospital, helping medical staff perform tasks such as giving medical guidance consultation, disinfecting, cleaning, and delivering medicine. This has helped to reduce the chances of infection for personnel and improved the level of isolation and control in hospital wards.

In the materials management and distribution area, Noah Robot (智慧林医疗) has deployed dozens of its Noah logistics robots (诺亚物流机器人) in the fight against the epidemic in Wuhan. For example, as one of the fourth batch of hospitals designated for COVID-19 treatment, Wuhan Asia General Hospital introduced 9 Noah robots, divided between operating rooms, the pharmacy, the central supply room, and the anesthesiology department, for their use. Two other designated COVID-19 treatment hospitals—Tongji Hospital and Wuhan Central Hospital—have also used Noahs to ensure intelligent distribution in the hospital and prevent the risk of infection.

In addition, intelligent products from companies like Ferly Digital Technology (方立数

码), Gaussian Robotics (高仙机器人) and YOGO Robot (有个机器人) have also seen applications in actual epidemic prevention work in key locations. These efforts to build key AI application scenarios both focus on the urgent needs of current work and serve long-term development requirements. Making the most of the "testing ground" and "racetrack" roles that innovative applications play, they will promote the demonstration of new AI technologies and products. In actual applications, they will continuously amass data, forming replicable and extendable experiences, and they will explore the formation of operating norms, usage processes, and technical standards for related products and technologies.

Link: https://www.fromgeek.com/ai/301560.html