Innovative Applications and Development of AI for Emergency Services

Depeng Kong¹, Shangyi Lv¹, Weisi Gu¹, Jiusheng Li¹ and Shaoqing Dai²

1. Research Center of Robot Education, Zhejiang University of Technology, Hangzhou 310023, China; 2. Jiaxing Vocational and Technical College, Jiaxing 314000, China
Email: kdp@zjut.edu.cn

Abstract. With the outbreak of 2019-nCoV (NCP) virus, many AI technologies, equipment and platforms are emerging in the main battlefield of anti-epidemic, such as patrol UVA, 360 disinfection robot, infrared intelligent temperature measuring equipment, throat swab robot, whole lung quantitative analysis technology, medical robot, etc. In the future, AI will continue to play an important role not only in virus type identification, abnormal pathology detection, optimization of treatment methods, prediction of the flow of people, etc., but also in emergency services such as plugging loopholes, making up for shortcomings, strengthening weaknesses. It is suggested to integrate AI into the construction of the emergency system, strengthen the institutional guarantee and make a top-level design, build a coordination platform for AI emergency response, promote the research of key technologies in the field of emergency services and solve the problem of cross-platform coupling in order to build an efficient, scientific and intelligent emergency management system as soon as possible.

1. Introduction
Artificial Intelligence (AI) was proposed by scientists as early as 1956. It is a branch of computer science [1]. It mainly studies how human intelligence is simulated and expanded, and forms a technology science that can explore theories, methods and technologies and put them into application. It covers the fields of language processing, image recognition, robotics and expert systems. After more than 50 years of development, great progress has been made, especially in recent years, the development of AI technology is almost perfect, such as object shape identification, path tracking, semantic intelligent identification, unmanned driving, tracking navigation, Man-machine game, etc. Its function, performance, effect and efficiency are the same as ordinary people, or better than humans. In addition, it also plays an important role in personalized customization, special services, intelligent production, intelligent life and health physiotherapy. On the eve of the Spring Festival in 2020, the new coronavirus epidemic (2019-nCoV, also known as NCP) affects everyone's life. With the virus raging, the advantages of artificial intelligence are demonstrated in various aspects, such as identification of virus species, detection and identification of viral carriers, detection and isolation of disease transmission routes and optimization of treatment methods.

2. Emergency Services of Artificial Intelligence in the Main Battlefield against the Epidemic

2.1. AI Equipment Is at the Forefront of Anti-Epidemic
One of the new diagnostic criteria for NCP is fever. The measurement of body temperature in this battle is the first checkpoint. The means of temperature measurement vary with the different people and environment. For example, mercury thermometer is suitable for residents' self-measurement and mutual measurement of family members. It is not suitable for contact thermometer in places such as...
community entrance, control passageway, hospital guide desk, etc. It is more appropriate to use non-contact electronic gun for temperature measurement. For large traffic situations such as stations, airports, docks, shopping malls, contact and close-range temperature thermometer is also inappropriate. At this time, the AI temperature measurement device has obvious advantages. Because it can not only meet the needs of non-contact, efficient detection and fast traffic, but also has the functions of high temperature intelligent alarm, personnel information collection and path tracking, which relieves the difficulties encountered by transportation enterprises and city managers. For example, in a metro station in Beijing, a remote temperature measurement system with infrared and visible dual sensors is equipped, which has the functions of intelligent temperature recognition and image collection. It can measure the temperature of large-traffic passengers within 5 meters and can accurately identify most of their faces even when they are covered by masks and hats. The temperature error range is less than 0.3 °C, and 15 people can be completed per second. At the same time, according to the face information and the signs of suspected fever, infrared camera can identify high temperature personnel, assist the staff to locate fast moving personnel. A set of systems can monitor 16 gates, one staff can achieve the task of personnel control and temperature measurement of 16 channels, greatly improving the detection efficiency and security of public space, reducing the risk of infection for front-line staff. Incidentally, AI large-flow object temperature detection system launched by Baidu Company. And through face recognition and infrared detection, people don't need to stay and the information of temperature and health conditions is clear. Thermal imaging human temperature measurement system in Shanxi Tiancheng and face recognition infrared video detection system in Beijing Qianfang Technology are also actively arranged in different places. Most of these intelligent temperature measuring assistants make use of modern thermal imaging, face recognition, 5G real-time communication technology. They have fast distribution and control, low cost and high accuracy, and take into account multiple objectives. They are suitable for configuring in stores, group enterprises, schools, bus stations, railway stations, metro entrances and exits, and government security sites.

2.2. *AI Algorithms Make Their Best Efforts to Combat the "Epidemic"*

The throat swab kit is one of the most important methods to determine the diagnosis of patients with NCP. When a doctor or nurse takes a sample, the patient may cough which contains a large amount of gas and droplets. And each medical staff must take samples and test thousands of patients every day. In such an environment, there is a high probability of infection. Later, experts verified that the virus will also extinct in the patient's breath. It spreads in sols, so health care workers face the risk of infection every moment. To this end, Xinsong Robot has introduced a throat swab detection robot which can accurately perform a throat swab according to a preset control program. This method can achieve unmanned operation, eliminating the need for medical workers to take the risk of sampling face to face. Another method to identify patients with NCP is to identify the characteristics of imaging. The characteristic of diagnosis is pneumonia or acute distress syndrome. It is not diagnosed through quantitative indicators and it is not as directional as the blood test. Therefore, it is necessary to use artificial methods for comparison and quantitative evaluation. Usually, a case needs to spend nearly 5 hours for comparison, which is very inefficient and difficult for clinical promotion. Comparing with artificial methods, AI has been trying and improving in the processing of medical images. For example, Alibaba cloud ET is engaged in lung nodule research, and has focused on optimizing the detection method, greatly improving the accuracy. So mature AI technology can perform local lesions and diffuse lesions research on CT images of patients, and base on the severity of various pneumonia diseases. It can complete accurate quantitative analysis in 2-3 seconds, and automatically identify suspected cases, which can not only help doctors to treat patients accurately, but also reduce cross infection between patients with different diseases. Meantime, the development of corresponding therapeutic drugs is the top priority. Recently, small-molecule drugs have shown potential curative effects in related research and have received widespread attention. Because small-molecule drugs are prone to drug resistance, it is necessary to obtain the law of variation of the virus in order to find a better strategy. Gene analysis and pharmacological analysis must be performed quickly, but this requires a large amount of AI computing power. Therefore, in order to help new drug development, protein screening and gene sequencing, Ali provided free computing power to global public scientific
research institutions. And Baidu Research Institute also opened an RNA structure prediction website and a Linear platform for free. Shenzhen Supercomputing, Shanghai Supercomputing combined with the Suzhou Computing Center, Kunshan Computing Center, Jiangxi Computing Center and Gansu Computing Center provide computing power for the treatment and research of new coronaviruses [2].

2.3. AI Data Helps Track and Block Epidemic Situation
The focus of prevention and control of the epidemic situation is in the community. The goal of community prevention and control is "anti-input, anti-spread, anti-export". But the number of grassroots workers is limited. On the one hand, the staff of the primary medical institutions and all the workers in the community are mobilized to give full play to the advantages of group prevention and control. The tasks are implemented to the households and the responsibilities are clearly defined. The grid management and carpet tracking are carried out. On the other hand, the use of remote sensing methods, data analysis and mining technology [3] improves the efficiency of epidemic prevention, and alleviates the serious shortage of manpower. For example, through the rapid use of remote sensing data, we can know the situation of the floating population and vehicle track, to achieve the comparison and verification of the reported information and the real information. With the help of AI mobile data collection and analysis technology, it is possible to obtain information about the movement of certain personnel within a local area at the first time, which is conducive to on-site investigation, accurate community management. Of course, for the home observation of suspected cases, the traditional method is to use dedicated staff, which consumes a lot of manpower for each household. As a result, some communities have temporarily installed image monitoring equipment. Some communities use electronic bracelets for quarantined people. For example, on February 3, Hong Kong residents who had visited the place where the epidemic occurred within 14 days were prohibited from leaving their designated residences and wearing electronic bracelets. The number of wristbands increased from 500 to 1,000 at the beginning. These bracelets can simultaneously monitor the wearer and have warning functions to avoid the spread of epidemic situations. In addition to the above measures, the AI data computing model is docked with the local communication operation platform. The first time to grasp the travel rules of citizens and tourists has provided great help to the epidemic prevention and control. For example, measures such as the "New NCP Prevention and Control System" and "NCP Map" established in Hangzhou can more accurately obtain the travel trajectory of infected persons.

2.4. The AI Platform Makes Overall Efforts to Ensure People's Livelihood
The prevention of the epidemic follows the principles of “early detection, early reporting, early isolation, and early diagnosis”. But for places where medical resources are scarce, “early diagnosis” also encounters difficulties. Before that, some fever clinics in some hospitals have serious queuing situation, so that some patients who have only common cold face the risk of being infected with NCP. Can we get medical information consultation and scientific guidance without leaving home, or can patients be preliminarily diagnosed at home? Now, the answer is yes. The Internet hospital platform built by the People's Hospital of Kaifeng City, Henan Province, has played a great role. It conducts 24-hour free online consultations to help patients distinguish between common cold and NCP. It recommend that cold people take their own medicine to observe and do not need to gather up and occupy the medical resources. It not only reduce the pressure of hospital outpatients, but also reduce the risk of cross-infection when waiting in line to go to the hospital. At present, the whole country is in the critical stage of fighting against the epidemic. And in order to prevent the epidemic, we should make full use of scientific and technological means to ensure the basic life of the masses. For example, at present, big data and automation technology are used to realize remote supervision and remote dispatching, so that medical equipment, protective products, pharmaceutical and other manufacturers can resume production. Using smart city systems for precise policy and scientific management can guide people to work at home, promote online teaching and learning, and reduce people mobility and outings. Through the Traceability Technology of the Internet of things, we ensure that food, vegetables, meat, eggs, grains and oils is on the online and platforms have reliable sources, smooth circulation, transparent transactions, and fast delivery. Therefore, the use of science and technology is conducive to the fight against NCP, so that society can return to normal situations as soon as possible.
With the popularization of 5G technology in cities and the construction of industrial Internet platforms, AI will play a greater role in protecting people's livelihood.

3. Countermeasures and Suggestions of AI in Emergency Service

3.1. Increase Investment on Top-Level Design and Incorporate AI into Emergency Management System

AI has played an important role in the anti NCP, but many of the methods and means lack of normative constraints and system design, many of which are a kind of attempt by researchers or a creative combination of technology lovers. This is not conducive to give full play to the advantages of AI, nor to the effectiveness of emergency services. At present, we should not only make scientific strategies to win this epidemic war, but also look into the future, find out problems and deficiencies, timely plug loopholes, and make up for weaknesses and strengths. Therefore, it is suggested to do a good job in top-level design and incorporate the technology and application of AI into the national emergency system. First, financial support improves the scientific means of community emergency response. Community is the basic unit of social organism. Increasing financial investment is related to the allocation of equipment for residents' travel. It can improve information means in data collection, information comparison, intelligent monitoring, grid computing, intelligent security, information diversion and traffic guidance. Accelerating the improvement of the information level of the street and community personnel can ensure that the grass-roots team has the ability of OA office, information consultation, technology identification and map identification. Second, through policy guidance, smart devices will be attracted to integrate into the smart medical system. Through the implementation of intelligent medical projects, new robot technology, AI algorithm, social computing power can be connected with community service system or platform in the form of standard configuration. We will promote the construction of Internet hospitals and online medical systems for infectious diseases. The national network consultation will be implemented to maximize the resources and drive the development of regional economic belt and intelligent medical industry. Third, the system guarantee configures the mature AI into the emergency system. For example, home robots, nursing robots, medical robots, disinfection robots, information collection robots, Internet hospitals, online diagnosis and treatment systems, medical sensing equipment, people-friendly e-commerce systems, commodity traceability systems, medical big data platforms, online and offline product supply platforms, etc., are integrated into the prevention and control system in a scientific and orderly manner.

3.2. Construct An AI Collaboration Platform to Ensure Smooth Operation of the Emergency Mechanism

AI equipment, computing power, platforms, etc. are integrated into the emergency response system. From design to application, we should ensure that the entire process is smooth and it is necessary to build an AI collaboration platform to complete the following tasks. First, scientifically design and uniformly deploy the emergency management system. According to the national, provincial, city and county emergency requirements, products, equipment, and technical strategies of AI are seamlessly integrated into the emergency management system. And they should play their due roles in an orderly manner [4]. The second is to formulate coordination mechanisms and operating methods. Emergency services require the participation of government, universities, enterprises and personnel from all parties. It is necessary to formulate and improve operational methods to ensure that the main boundaries of provinces, cities, counties, streets, and community units are clear, and that government regulations are smooth. The third is to build a strong technical team. Using intelligent thinking to design and integrate emergency systems requires a disciplinary service team including blockchain, Internet of Things, cloud computing, big data to ensure that scientific solutions can be proposed during system design and integration and integration can be performed. The fourth is to carry out standard formulation and technical iteration and upgrading. In system integration, it involves different departments, different systems and different platforms. In order to integrate robot system, computing platform, management system and decision center through information
superhighway, we need to speed up the development of unified technical standards such as data protocol, hardware interface and sharing mode.

3.3. Accelerate the Coupling Research of AI Technology and Solve the Bottleneck Problems in System Integration

Although the AI technology has been very mature and the application effect is quite obvious, the real construction of efficient cooperation and intelligent integrated emergency service system still needs to strengthen the research in the system integration and solve the bottleneck problem of different system and platform. So the key research work starts from the following aspects. The first is accelerate the research on special equipment. The original intention of UAV development and design is not to be used for street shouting and food transportation, so the simple assembling of devices is bound to have management and security risks. Therefore, we can try to develop special training patrol monitoring and convenient commodity transportation vehicles, develop community service and network management robots, temperature intelligent detection robots, medical disinfection robots and throat swab robots. Of course, the technical standards, product testing standards, user manuals, after-sales service methods need to be matched with it. The second is the research of equipment cooperation platform, such as the analysis of community fixed monitor, the control of ground moving cargo robot, air vehicle security protocol, cloud control means of collaborative platform, scheduling mechanism of decision center, etc. The third is promoting the application and development of fine technology. For example, the medical care robot and the home care robot have tried to enter the family and the medical place. But when they are really applied and popularized in an all-round way, there are still some disadvantages, such as the lack of humanization, the low accuracy of technology, and the lack of flexibility in operation. Therefore, whether the advanced intelligent equipment with high efficiency and flexibility can be designed and developed is an important factor in determining the future application prospects. The fourth is the research on the design of convenience and humanity. The big data reference of travel and life information has unconsciously entered people's life. Therefore, the humanization of human-computer interaction interface, the convenience of information push, and the friendliness of policy interpretation need to be redefined and considered. At the same time, the study of the intelligent platform for information identification, security measures, information association, decision-making methods, coordination mechanism and the underlying dynamic model also need to be strengthened [5]. The fifth is the exploration of innovative application field. Internet hospitals have begun to operate online, but how to access the Internet for diagnosis and reference needs to be studied. Most of blank areas need to be studied, such as the information submission mechanism of remote diagnosis, the information sharing strategy of pathological cases, the accessibility query and information prompt method of personnel flow, the unmanned ambulance control technology and scheduling system, and the operation mechanism of self-driving public vehicles.

3.4. Clarify Market Demand and Industrial Development Prospects, and Strive to Build Industrial Chains

Based on the advantages of AI, more market segments in the future are expected to integrate the development of AI and emergency prevention, especially in disinfection robots, medical care robots, internet hospitals, smart communities, big data, etc. Considering the current situation in China, we will allow cities with conditions to expedite the resumption of production of medical equipment, mask and disinfectant. In the later period, we should vigorously support innovative research in medical protection and new drug manufacturing. At the same time, according to the local industrial economic foundation and future planning, we should create conditions for enterprises and attract domestic and foreign funds to actively participate in the creation of economic zones and industrial clusters. Take Zhejiang as an example. The province has characteristic small towns of AI, robotics, the Internet of Things, blockchain, cloud manufacturing, and has rich experience in economic system management and feature creation. We should comprehensively conduct market research, actively carry out top-level design, and implement cross-regional collaboration mechanisms, integrate AI and many other unique features and advantages. 5G communication technology, the Internet of Things platform and big data are deeply combined to give play to regional economic advantages, actively build distinctive industrial
bases and economic belts, and form industrial chains as soon as possible [6]. In this anti epidemic battle, Zhejiang Province has shown a high level of political acumen and rapid emergency decision-making ability. In the early stage of the epidemic, Zhejiang Province was the first province in China to launch provincial level response and make good deployment. First of all, Zhejiang Province is at the forefront of the country in terms of personnel isolation, household investigation, etc. Then the Zhejiang government, together with Alibaba, built a "epidemic information collection system", which enables a mobile phone to check the epidemic situation and report clues without leaving home. Zhejiang virus research laboratory was the first one to successfully isolate the virus strain in the national provincial CDC. Then, in order to treat and explore the cases, Zhejiang Province combined with big data analysis technology, which can quickly learn the flow and direction of personnel. Recently, Zhejiang took the lead in launching health code, which brings great convenience to community management. At the time of struggling to fight the epidemic, Zhejiang donated money and materials for Wuhan, and successively sent five medical teams to help Wuhan and other cities in Hubei Province. Zhejiang's economy is at the forefront of the whole country, which is inseparable from its spirit. The province's fight against the epidemic is not nearly over.

4. Conclusion
Since the outbreak of the epidemic, AI has great advantages in the epidemic diagnosis, blocking, tracking and treatment. However, at present, the technical equipment and data platform put into application are mostly single innovative cases, lacking systematic design and planning. In the future, from the perspective of the emergency management system, AI will be of great use in supplementing medical resources, improving medical methods, facilitating and intelligentizing community services. Therefore, we need to do more in the planning and construction of the emergency system, the formulation and improvement of the system, the operation and guarantee of the mechanism, so as to achieve clear positioning, detailed objectives, strong guarantee, coordination and order. We need to make more efforts in developing new technology, new equipment coupling and new mode application, overall design and overall planning, building the industry chain as soon as possible, so that AI can play its due function in daily life, learning, work and even emergency avoidance, and continuously bring benefits to the people.

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