

Conference Report

# 2021 IEEE 2nd International Conference on Big Data, Artificial Intelligence and Internet of Things Engineering (ICBAIE 2021)

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**Abstract:** On 27 March 2021, the 2021 IEEE 2nd International Conference on Big Data, Artificial Intelligence and Internet of Things Engineering (ICBAIE 2021) was officially held in Nanchang, China. The Conference invited the IEEE Fellow Professor Guo Yong-xin from the National University of Singapore and the IET Fellow Professor Gao Liang from Huazhong University of Science and Technology of China, as well as other experts, to make the special speeches. The conference focused on the practical application of big data, the development of artificial intelligence and the innovation of Internet of things technology, and the conference provided a platform for academic exchanges among experts and, the experts present reported their own research progress and made prospects for the future development of big data such as application of big data in enterprise decision making, artificial intelligence such as intelligent endoscope in medicine, Internet of Things such as the Internet of Vehicles in urban transport.

**Keywords:** big data; artificial intelligence; Internet of Things; international conference



**Citation:** Yu, H.; Li, S. 2021 IEEE 2nd International Conference on Big Data, Artificial Intelligence and Internet of Things Engineering (ICBAIE 2021). *Proceedings* **2021**, *72*, 2. <https://doi.org/10.3390/proceedings2021072002>

Academic Editor: Mirjana Pejic-Bach

Published: 28 April 2021

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## 1. Introduction

It seems that artificial intelligence is booming around the world, according to the 2018 AI Index, written by scholars from Stanford University.

But in fact, it is not just artificial intelligence, in recent years, big data and the Internet of Things engineering are believed to bring great convenience to mankind in the 21st century and have been increasingly used in various industries, such as business and transportation industry.

The development of Big Data, Artificial Intelligence and Internet of Things engineering is valued by Institute of Electrical and Electronics Engineers (IEEE), therefore, IEEE have held many academic exchange conferences on Big Data, Artificial Intelligence and Internet of Things engineering in recent years, and experts and scholars from all over the world have exchanged their research results and promoted the development of Big Data, Artificial Intelligence and Internet of Things engineering.

### 1.1. IEEE 1st ICBAIE Conference 2020

The 2020 IEEE 1st International Conference on Big Data, Artificial Intelligence and Internet of Things Engineering (ICBAIE 2020) was held in Fuzhou, China, on 12–14 June 2020. The conference mainly focuses on big data, artificial intelligence and Internet of Things engineering and other research areas.

The conference invited experts, scholars, business people and other universities and scientific research institutions over the world to attend the conference, including many well-known experts, for example IEEE Fellow Distinguished Professor Yong-xiang Han from Dongguan University of Technology, IEEE Senior Member Professor Faisal N. Abu-Khzam from American University of Lebanon, IEEE Senior Member Professor Mamoun

Alazab from Charles Darwin University of Australia and IEEE Member Professor Peter Shaw from Massey University.

The conference has attracted a significant number of experts to the conference, and as a result, the conference was particularly successful as experts from all over the world actively exchanged views.

With the precedent for the success of this conference, in order to explore the development direction and application of Artificial Intelligence, Big Data and the Internet of things in the epidemic period and the post-epidemic period, the organizer Institute of Electrical and Electronics Engineers (IEEE) decided to hold a second conference in 2021.

### *1.2. IEEE 2nd ICBAIE Conference 2021*

The 2021 IEEE 2nd International Conference on Big Data, Artificial Intelligence and Internet of Things Engineering (ICBAIE 2021) was held in Nanchang, China on 26–28 March 2021.

There were also many experts all over the world present at the conference, such as IEEE Fellow Professor Guo Yong-xin from the National University of Singapore, IET Fellow Professor Gao Liang from Huazhong University of Science and Technology of China and IEEE Senior Member Professor Liu Kai from Chongqing University.

Due to the impact of the epidemic, most of the experts attending the meeting came from China. Most experts from outside China participated the conference via online live, with 10% of international experts from Eastern Europe, South Africa and Southeast Asia.

As well, the second conference was also successfully held.

### *1.3. The Need for Such Conferences*

The purpose of such conferences is to provide experts and scholars engaged in Big Data, Artificial Intelligence and Internet of Things Engineering research, engineering and technical personnel, technology research and development personnel to share scientific research results and cutting-edge technology, understand the trend of academic development, broaden research ideas, strengthen academic research and discussion, and promote the platform of industrialization cooperation of academic achievements.

## **2. The Conference Report of IEEE 2nd ICBAIE Conference 2021**

### *2.1. Opening Ceremony*

At 8:00 a.m. on 27 March 2021, all the experts went to the Space Lecture Hall of Nanchang Institute of Technology in China to prepare for the upcoming conference. At 08:30, the conference officially began after Academician Chen Zhi-ning from China have finished the opening speech.

At the beginning of the conference, the moderator Professor Yu Yin-quan from East China Jiaotong University introduced the special invited guests of the conference, and then the speeches of the special invited guests started.

### *2.2. Special Invited Guest: The IEEE Fellow Professor Guo Yong-xin*

#### *2.2.1. A Brief Introduction of Professor Guo Yong-xin*

Professor Guo Yong-xin is from the National University of Singapore, famous for his research of artificial intelligence, especially in medical artificial intelligence. Meanwhile, Professor Guo Yong-xin is also the reviewer and editor of several journals from the IEEE Publisher. Owing to his many achievements in the fields of artificial intelligence and the big data, here attached his Scopus Website [1] for the detailed information.

#### *2.2.2. The Speech of Professor Guo Yong-xin*

The speech title of Professor Guo Yong-xin is Smart Wireless Sensing of Life Activities for Smart Hospitals in IoT. In terms of the feedback of experts present, his speech was undoubtedly interesting and instructive.

Professor Guo Yong-xin divided his speech into three parts:

In the first part, he stressed the importance of sensors.

At the beginning, Professor Guo Yong-xin introduced the concept of the intelligent and smart from three aspects: medical intelligent, vehicle intelligent and industrial intelligent. He further described the medical intelligent, focusing on the application of sensors in human health testing.

As an extension, Professor Guo Yong-xin also described the course of sensors development, that is, sensors developed from wearable to embedded, from wired to wireless, from visible to the skin-like. Besides, Professor Guo Yong-xin proposed that due to the development of the sensors, the concept of the brain computer could be realized, so he used the relevant literature to introduce brain computers: In 2010, G. Schalk and J. Mellinger [2] put the concept of brain computer into practice, and around 2014, the wearable [3,4] brain computer was successfully born. After 2015, brain computers [5–8] are beginning to be used in hospital treatment and diagnosis. Specially, Professor Guo Yong-xin revealed, by early 2021, his team had almost developed the Wireless-Sensing brain computer, and the research results are expected to be published within 2021. In addition, in this part, he specifically raised his own expectations for intelligent monitoring of viruses in pandemic environments. Professor Guo Yong-xin suggested that if artificial intelligence could be used to monitor the coronavirus, the epidemic would soon disappear.

In the second part, he reported some recent research progress mainly about the medical Intelligent on his team.

Firstly, Professor Guo Yong-xin revealed that they had developed many sensor platforms, for example, temperature sensor platform and video sensor platform for endoscopes. The aim of their research, he said, is to lighten the burden on doctors identified as high-risk occupations mostly because of their busy work. It will actually drive the development and progress of medical research and hospital services if the pressure on doctors to work is reduced by artificial intelligence technology. Therefore, in addition to developing sensor platforms, they were also working on AI endoscopes now.

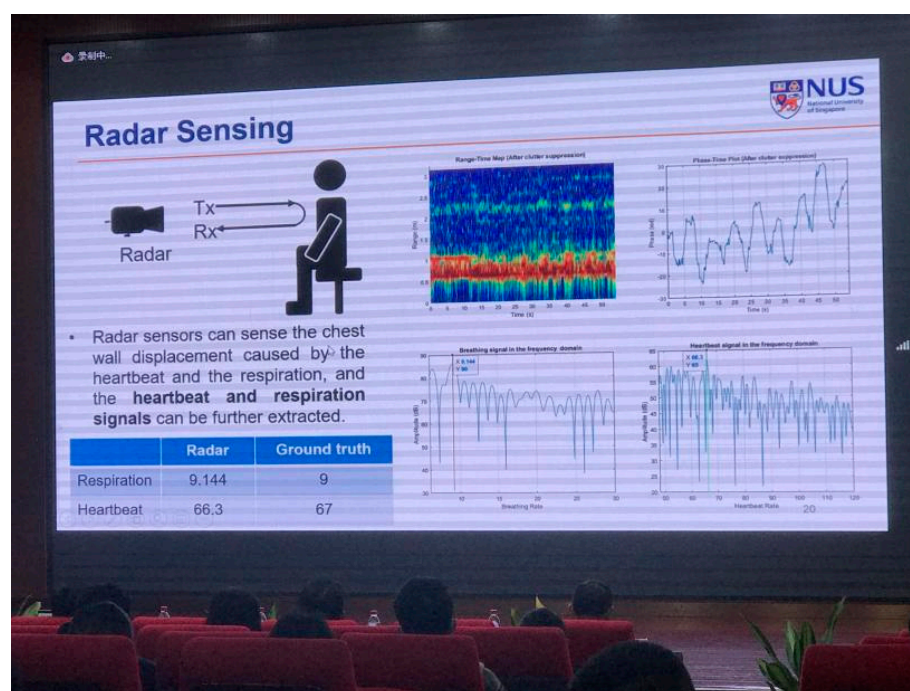
Secondly, Professor Guo Yong-xin announced the project they were working on, that is, Fall Sensors for the old. As more and more unnatural deaths occurred, falls made up a large proportion of them, so his team has now completed a new study of Fall Sensor LKCNN-1. In terms of experimental data, the sensor performed better than other existing fall sensors.

Thirdly, Professor Guo Yong-xin proposed the artificial intelligence-based vital signs monitoring technology in order to promote the medical industry, and he thought radar sensing should be used to monitor heart rate and vital signs of respiratory lights. There is no doubt that if this technique can be used in vital signs monitoring, it will benefit patients and the hospitals.

Figure 1 showed the details of the Fall Detection and Figure 2 showed the Radar Sensing using in Health monitoring.



Figure 1. The speech of Professor Guo Yong-xin: Fall Detection using Radar Sensors for the old.



**Figure 2.** The speech of Professor Guo Yong-xin: Radar Sensing in Health monitoring.

In the final part, he put forward the prospect of future sensing technology.

Professor Guo Yong-xin believed that the trend of sensor development would develop in the direction of wireless sensing, whether in the field of medical artificial intelligence sensing or industry sensing. He hoped medical conditions will be better in the future.

### 2.3. Special Invited Guest: The IEEE Senior Member Professor Goh Hui Hwang

#### 2.3.1. Brief Introduction of Professor Goh Hui Hwang

Professor Goh Hui Hwang is a senior member of the IEEE, and from Guangxi University in China. His research direction is the application of big data in renewable energy and energy efficiency. Meanwhile, he is excellent in education and scientific research, please access his Scopus Website for more information about him [9].

#### 2.3.2. The Speech of Professor Goh Hui Hwang

The speech title of Professor Goh Hui Hwang is AI and Big Data Analytics and Insight in Power System: State Predictive Transformation. Given that other experts present may not understand the research of power and energy very well, his speech was brief and easy to understand for the present experts. Figure 3 showed the concept of Big Data in Power System.

Professor Goh Hui Hwang divided his speech into two parts:

In the first part, he made his own understanding of the advantages of big data.

First of all, Professor Goh Hui Hwang believed that the analysis of the big data could play a great role in decision-making, especially some enterprises often need to analyze the situation through the big data when making decisions.

Secondly, Professor Goh Hui Hwang thought that the big data analysis would play an important role in process optimization. He analyzed the advantages of big data and suggested that big data is beneficial to the high level of management and the direction of talent training.

Finally, in this part, Professor Goh Hui Hwang put forward the advantages of the big data for wind power prediction model of his research, that is, good data induction and integration.



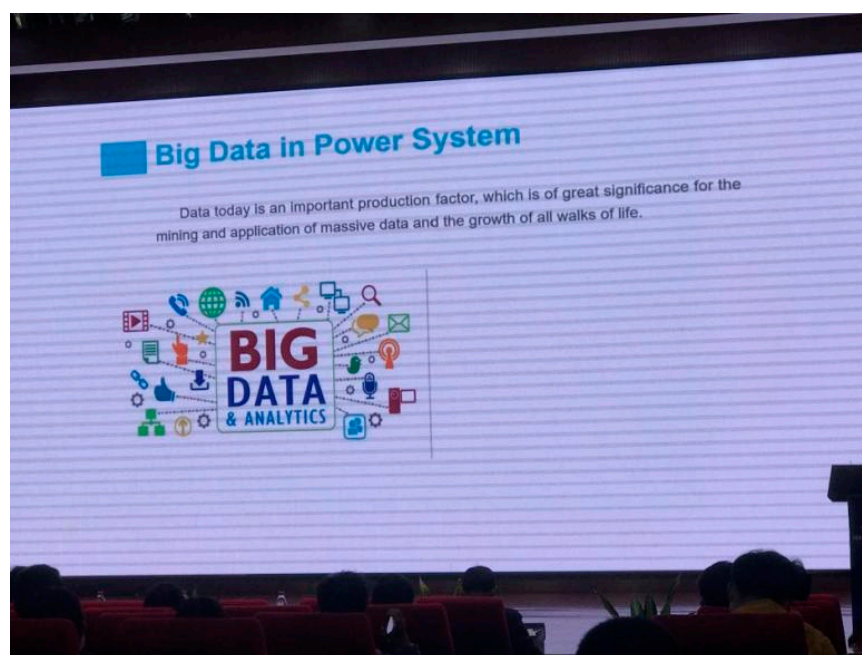


Figure 3. The speech of Professor Goh Hui Hwang: Big Data in Power System.

In the second part, Professor Goh Hui Hwang briefly introduced the function of the big data by reporting his research progress of the wind power prediction model.

First of all, Professor Goh Hui Hwang believed that data preprocessing is a very important function for the big data, which can exclude many miscellaneous. By preprocessing the data and decomposing the data, the whole process of prediction model execution could be optimized.

Then Professor Goh Hui Hwang proposed to combine the big data with artificial intelligence neural networks to achieve deep learning of the data.

Finally, Professor Goh Hui Hwang showed the experts the results of the preprocessing of the data, he said it was what his team was working on and experts all applauded for him. Figure 4 showed Preprocessing and the Result of the Wind Power Prediction Model.

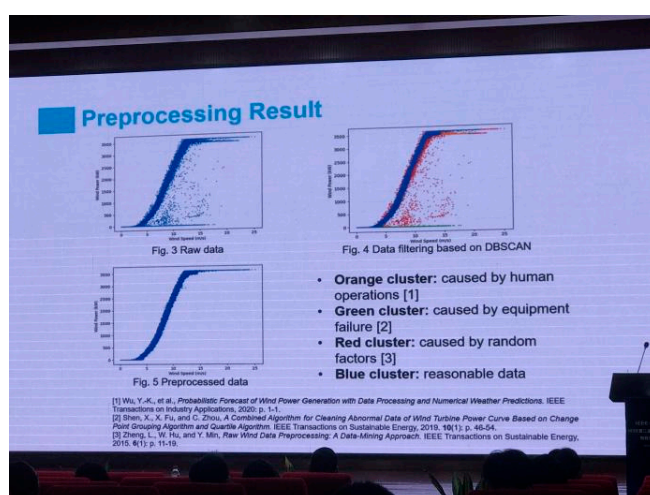
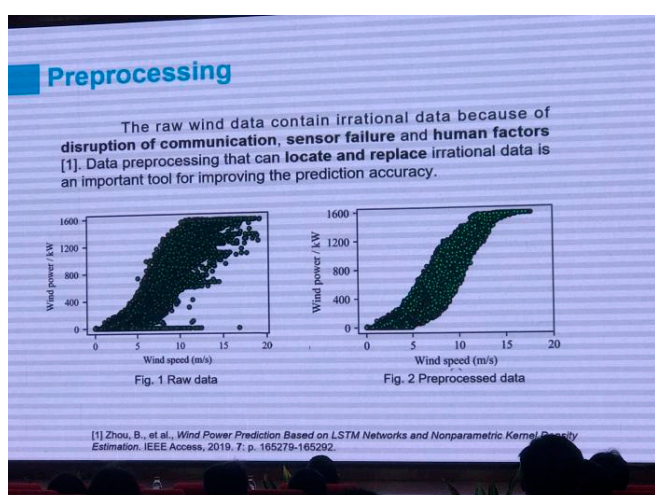


Figure 4. The speech of Professor Goh Hui Hwang: Preprocessing and the Result of the Wind Power Prediction Model.

All in all, although the report of Professor Goh Hui Hwang was short and not purely scientific, it was so interesting for the experts present.

## 2.4. Special Invited Guest: The IET Fellow Professor Gao Liang

### 2.4.1. Brief Introduction of Professor Gao Liang

Professor Gao Liang is from Huazhong University of Science and Technology in China engaged in intelligent optimization and the application of machine learning methods in design and manufacture. The details of his information are as shown in the Scopus Website attached [10].

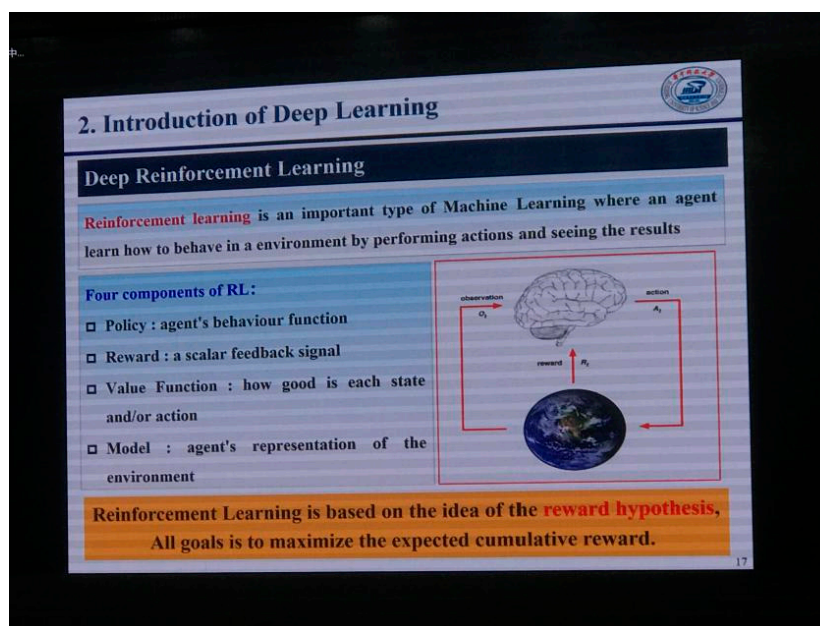
### 2.4.2. The Speech of Professor Gao Liang

The speech title of Professor Gao Liang is Data-driven & Learning Enabled Fault Diagnosis. Instead of revealing the research and progress of his team, his speech briefly summarized the development and trends of the big data worldwide.

Professor Gao Liang divided his speech into four parts, the first two parts briefly introduced the background and importance of big data and deep-learning, and in the third part, he showed the experts some latest research progress of the big data and deep-learning through the literature review and stressed the importance of the deep-learning:

Around 2019, C. Vitari and E. Raguseo [11] analyzed company performance and employee performance through big data fault diagnosis. Professor Gao Liang thought the application of big data fault analysis method in business highlighted the superior analytical ability of big data. Professor Gao Liang put forward that big data has not only made a significant difference in business, but also in medicine and public health. H. Congjiao et al. [12] used big data analysis to treat oral diseases while more and more scholars [13–15] applied big data to prevent and control the epidemic during the pandemic period.

Figure 5 showed the introduction of Deep Learning.



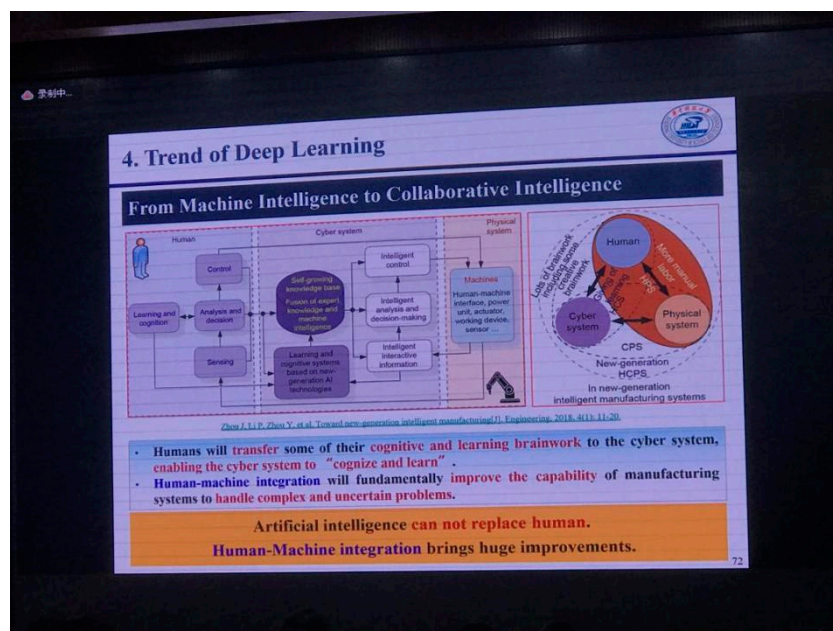
**Figure 5.** The speech of Professor Gao Liang: Introduction of Deep Learning.

At the same time, Professor Gao Liang stressed the need to combine big data with deep learning, that is, to bring greater value to society. Recently, D. Sharma, V. Agrawal and S. K. Yadav [16] combined big data analysis with deep-learning to solve process optimization and resource optimization. N. Balakrishnan, D. Pelusi and S. Ganesan [17] applied big data analysis and deep-learning in business and R. Balakrishnan, Valdés Hernández, Maria del C and A. J. Farrall [18] applied big data analysis and deep-learning in medicine.

In the fourth part, Professor Gao Liang put forward his own views on the future development of deep-learning, he believed that deep-learning, as a branch of machine-learning that is becoming more and more popular, and it will continue to develop and be

applied to more and more industries and fields, and he thought deep-learning algorithm need to be more efficient.

And Figure 6 showed the development Trend of Deep Learning.



**Figure 6.** The speech of Professor Gao Liang: Development Trend of Deep Learning.

## 2.5. Special Invited Guest: The IEEE Senior Member Professor Liu Kai

### 2.5.1. Brief Introduction of Professor Liu Kai

Professor Liu Kai is a senior member of the IEEE, and from Chongqing University in China. His main research interests include Internet of Vehicles, mobile computing, pervasive computing, big data and the Internet of Things, here attach his Scopus website [19].

### 2.5.2. The Speech of Professor Liu Kai

The speech title of Professor Liu Kai is Towards Collaborative Intelligence in Internet of Vehicles, and the importance of sensing was also highlighted in his speech.

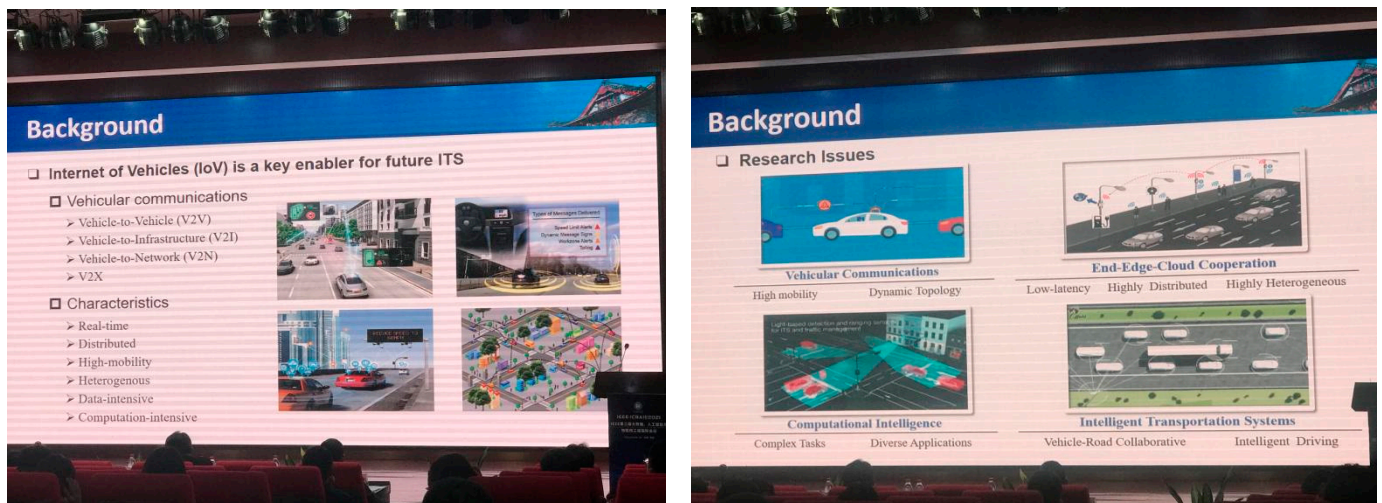
Professor Liu Kai divided his speech into four parts:

In the first part, Professor Liu Kai raised the importance of Internet of Vehicles for the future urban transport systems, particularly the promotion of driver-less technology. Meanwhile, in this section, Professor Liu Kai pointed out the four most important research focuses of vehicle networking at this stage, that is, interconnection between vehicles, security system, remote information transmission and intelligent transportation system.

In the second part, Professor Liu Kai stressed the importance of sensing, especially in intelligent control, distance guidance and information updating, he used Amap's GPS location function as an example, which can monitor the speed of each section of the vehicle, complete the route planning and guidance of the distance, and update the information in time. As well, Professor Liu Kai also raised the importance of sensing through the literature review: J. Wang et al. [20] they collect and transmit some auxiliary information about the vehicle through the sensing, H. Yao, R. Qin and X. Chen [21] used sensing to test driver-less technology, P. Hu et al. [22] optimized the vehicle sensing system to realize the Location Privacy Protection.

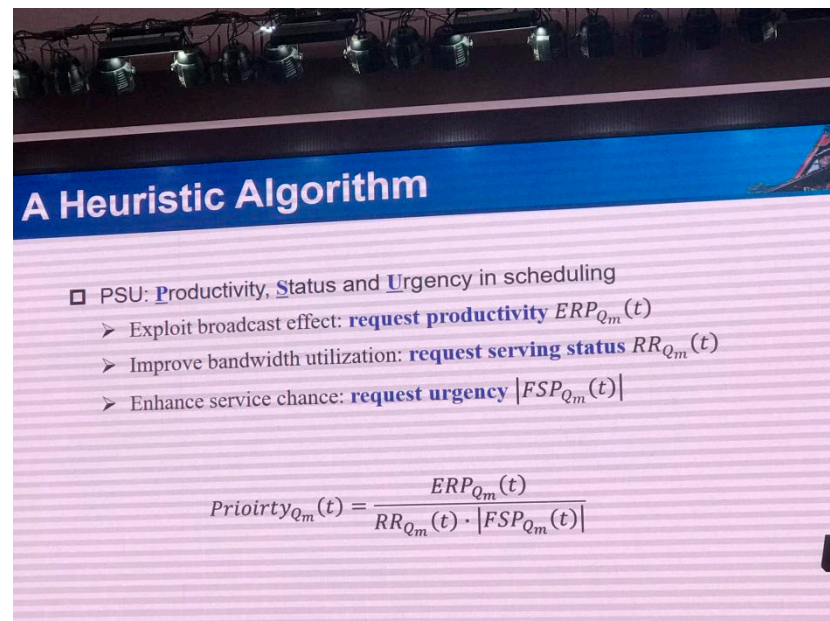
Figure 7 showed the Background of the Internet of Vehicles (IOV).





**Figure 7.** The speech of Professor Liu Kai: The Background of the Internet of Vehicles (IOV).

In the third part, Professor Liu Kai revealed just a little bit of their focus of the research, that is, proposing a new heuristic algorithm for vehicle scheduling, as shown below Figure 8.



**Figure 8.** The speech of Professor Liu Kai: A Heuristic Algorithm for Vehicle Scheduling.

In the final part, Professor Liu Kai had high expectations of future vehicle network technology and driver-less vehicle technology, and believed that if all this could be achieved, smart cities would also emerge as soon as possible.

## 2.6. Special Invited Guest: Associate Professor Sun Xu-dong

### 2.6.1. Brief Introduction of Associate Professor Sun Xu-dong

Associate Professor Sun Xu-dong is from East China Jiaotong University, engaged in non-destructive testing of agricultural products technology and equipment research.

### 2.6.2. The Speech of Associate Professor Sun Xu-dong

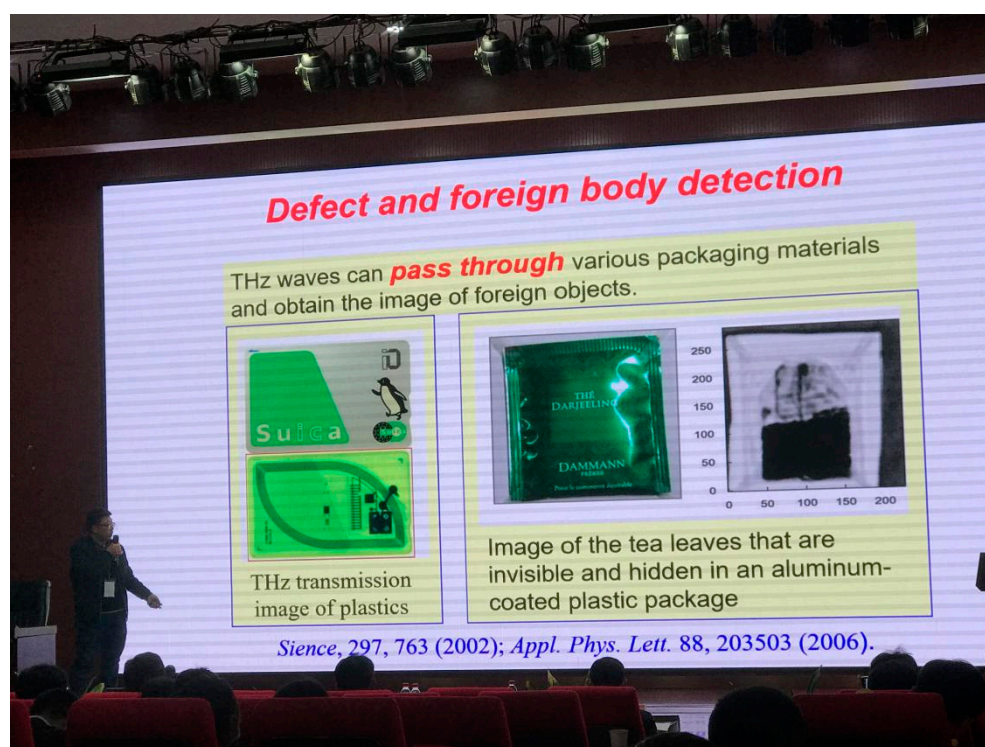
The speech title of Associate Professor Sun Xu-dong is THz spectral imaging an emerging technology for food quality assessment.



Associate Professor Sun Xu-dong briefly reported that he used near-infrared technology to test the quality of food in previous years, but many scholars [23,24] have recently proposed using Terahertz spectroscopy technology to check the quality of food, especially the fruits.

In the early 2021, M. D. Fabrizio et al. [25] thought Terahertz spectroscopy technology is a new field of imaging science, which still has a few short-comings, Associate Professor Sun Xu-dong thought so, and he proposed if this technology can be developed rapidly in recent years, it can be applied well not only in the field of food detection, but also in many other fields.

From the speech of Associate Professor Sun Xu-dong, experts present said they had acquired interesting and meaningful knowledge. After his speech, it was time to have lunch. Figure 9 showed the Application of the THz Waves.



**Figure 9.** The speech of Associate Professor Sun Xu-dong: The Application of the THz Waves.

### 3. Oral Reports of Other Experts

After all the presentations by the special invited guests, all the experts were arranged to have lunch in the restaurant. After the meal, the experts went to each venue for oral reports. This section lists the three most excellent oral reports of the experts.

#### 3.1. Expert Josbert from the Chongqing University of Posts and Telecommunications

The topic of Josbert is Solution for Industrial Networks: Resilience-based SDN Technology.

In five minutes, he first introduced their team's optimization process of traditional wide area networks, which became more intelligent and flexible, based on SDN technology. After that, he briefly introduced the principle and development of SDN technology, and described their specific work in industrial network optimization. Finally, he also pointed to the shortcomings of the research, which is that the number of stream tables supported by chips on network devices is limited, but he was full of confidence in further research and practice in the future.

### 3.2. Expert Gai Rong-li from the University of Dalian

The topic of Gai Rong-li [26] is A review of 5G applications and key technologies.

She communicated with the other experts through the report on the literature review, and she thought the factor limiting the wide application of the 5G is the problem of the antenna, which needs to be improved. Recently, A. Desai et al. [27], W. Ali et al. [28] and C. H. Le Thi et al. [29] have been focusing on the improvements and designs of antenna aimed at optimizing 5G technology. Ge Rong-li proposed that the reason 5G technology is so difficult to be widely used is that the spectrum of 5G is too high, therefore, she was hoping that the next generation 5G technology will further optimize antenna and RF.

### 3.3. Experts Haoxuan Yu and Shuai Li from the Central South University

The topic of Haoxuan Yu and Shuai Li [30] is Intelligent Monitoring and Control System for underground mine rail transportation based on communication-based train control (CBTC) system and AI computing [31].

They combined CBTC systems with Internet of Things technology and AI computing to solve problems in real mining projects: A. Safety Problem: The rear-end collision problem. B. Efficiency Problem: The transport efficiency problem. C. Monitoring and Control: The real-time monitoring problem.

They have established the analysis of the fault events based on the Dynamic Fault Tree analysis method proposed by P. Gao et al. [32] to solve the Safety problems especially the rear-end collision. They used the AI computing with the ATP (Automatic Train Control) System to calculate and control the speed of each transport vehicles to make the efficiency of the whole underground mine maximum. Specially, they realized the real-time monitoring of each transport vehicles based on the ATS (Automatic Train Supervision) System and the Sensors [33].

Finally, they claimed their report served just only as a guide to the “Tossing out a brick to get a jade gem” and hope more scholars will be interested in this direction.

## 4. Closing Ceremony

At 8 a.m. on 28 March 2021, the closing ceremony of 2021 IEEE 2nd International Conference on Big Data, Artificial Intelligence and Internet of Things Engineering began at the Space Lecture Hall of Nanchang Institute of Technology.

At the end of this conference, Professor Yu Yin-quan of East China Jiaotong University delivered his closing speech, he said how rare it was for so many experts to come together for academic exchanges during the epidemic period, and he thanked the experts for attendance on behalf of the IEEE.

Finally, he wished the bright future of the development of artificial intelligence and big data, and hoped that more experts will make more contributions to this field.

At 12 a.m. on 28 March 2021, the IEEE—ICBAIE International Conference was successfully concluded.

**Author Contributions:** H.Y.—attending conference/writing—original draft/writing—review and editing. S.L.—supervision/validation. All authors have read and agreed to the published version of the manuscript.

**Funding:** The authors thank the financial supports from the National Natural Science Foundation of China (51804337).

**Acknowledgments:** Special thanks to MDPI and the editors for long-term guidance to authors. Thanks to the Institute of Electrical and Electronics Engineers. Thanks to the Central South University. Thanks to the financial supports from the National Natural Science Foundation of China (51804337).

**Conflicts of Interest:** The authors declare no conflict of interest.

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