

Conference  
Manual

# ISAIMS 2020

2020 International Symposium on Artificial Intelligence in Medical Sciences

Time: September 12-13, 2020



小张聊科研公众号

**2020 International Symposium on Artificial Intelligence in Medical  
Sciences (ISAIMS 2020)**

**September 12-13, 2020**

**Organizer**

**Automation School, Beijing University of Posts and Telecommunications**

**Co-organizers**

**Key Laboratory of Shanghai Municipal Health Commission for Smart Image and School of Information**

**Technology,**

**School of Information Technology, Henan University of Chinese Medicine,**

**WeChat Public Number (小张聊科研)**

**Atlantis Press**

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# Part I Conference Schedule

## Keynote Speeches: Session I

Chair:

09:00-17:30, Saturday Morning

September 12, 2020

Time	Title	Speaker	Affiliation
09:00-09:10	Welcome & Opening Remark	Organizer	Automation School of Beijing University of Posts and Telecommunications
09:10-09:45	Innovation of AI based Health Services for Aging Society	Prof. Zhiwei Luo	Kobe University, Japan
09:45-10:20	Human-Engaged Computing	Prof. Xiangshi Ren	Kochi University of Technology, Japan
10:20-10:55	Image-based Motion Artifacts Reduction in Magnetic Resonance Imaging Using Deeping Learning Methods	Assoc. Prof. Jie Deng	Rush University Medical Center, USA
10:55-11:30	Application of artificial intelligence in “critical value” warning of regional medical center image	Prof. Gang Huang	Shanghai University of Medicine & Health Sciences, China
11:30-12:05	The basis and significance of remote ECG	Prof. Ying-Min Chen	Jiading District Central Hospital affiliated Shanghai University of Medicine & Health Sciences

## Keynote Speeches: Session II

Chair:

09:00-12:00, Saturday Afternoon

September 12, 2020

Time	Title	Speaker	Affiliation
14:00-14:35	Medical Knowledge Graphs: Technology and Application	Prof. Zhisheng Huang	Free University (VU), The Netherlands
14:35-15:10	The Proactive levelled Intervention for Social Network Users' Emotional Crisis— —based on an Automatic Crisis Balance Analysis Model	Prof. Bingxiang Yang	Wuhan University, China
15:10-15:45	Transforming healthcare with AI	Prof. Xinyuan Zhao	Peking Health Information Technology Association, Beijing, China
15:45-16:20	Artificial Intelligence Technology in Smart Healthcare Systems	Prof. Abdel-Badeeh M. Salem	Ain Shams University, Cairo, Egypt
16:20-16:55	Latent Tree and Constrained Latent Tree Analysis for Researching the Syndrome of Traditional Chinese Medicine	Assoc. Prof. Yulong Xu	Henan University of Chinese Medicine, China
16:55-17:30	Limitation of on Big Data or Nature Language Process Based Algorithm for Clinical Diagnostic Artificial Intelligence	Assoc. Prof. Yifan Zhu	Huaihe Hospital of Henan University

## Technical Session: Oral & Poster Presentation

Chair:

09:00-12:00, Sunday Morning

September 13, 2020

Time	Title	Speaker	Affiliation
09:00-09:30	Tips to Get Published in High Impact Journals	Yanhua Li	Atlantis Press
09:30-09:50	小张聊科研分享		
<b>Oral</b>	AI-based multimodal data management and intelligent analysis system for Parkinson's disease	Kang Ren	GYENNO SCIENCE
<b>Oral</b>	Using BERT-BiLSTM to diagnose and predict alternative medical text	Zongyao Zhao	School of Traditional Chinese Medicine, Beijing University of Chinese Medicine
<b>Oral</b>	Effect of vocal cord polyp on Mandarin tones recognition by native Chinese speakers	Bin Li	Beijing University, China
<b>Oral</b>	Research on Traditional Chinese Medicine Data Mining Model Based on Traditional Chinese Medicine Basic Theories and Knowledge Graphs*	Rui Xiao	College of Information Engineering, Hubei University of Chinese Medicine
<b>Oral</b>	Coronary artery CTA image segmentation and three-dimensional visualization Based on U-Net	Yang Li	Tianjin University of Technology, China
<b>Oral</b>	Calculation system for beam directivity of laser bars based on optimization method	Yunzhe Zhao	Beijing University of Technology
<b>Oral</b>	Design of Knowledge Graph of Traditional Chinese Medicine Prescription and Knowledge Analysis of Implicit Relationship	Yan Chen	Nanjing University of Chinese Medicine
<b>TBD</b>	The Optimal Wavelet Basis for Electroencephalogram Denoising	Liwei Cheng	Beijing University of Posts and Telecommunications

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<b>Poster</b>	An End to End Thyroid Nodule Segmentation Model based on Optimized U-Net Convolutional Neural Network	Mengya Liu	Beijing University of Posts and Telecommunications
<b>Poster</b>	Identification of a three-gene chemoresistance-related prognostic signature and risk stratification system in breast cancer	Mingzhou Liu	Department of Pharmacy, Henan Provincial People's Hospital
<b>Poster</b>	Construction and Exploration of Information Interconnection in a Hospital in the Guangdong-Hong Kong-Macao Greater Bay Area	Qunqun Zhang	Information Department The Fifth Affiliated Hospital Sun Yat-sen University
<b>Poster</b>	A Speech-Driven 3-D Lip Synthesis with Realistic Dynamics in Mandarin Chinese	Changwei Liang	Beijing University, China

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## Part II Keynote Speeches

### Invited Speech I: Innovation of AI based Health Services for Aging Society

**Speaker:** Prof. Zhiwei Luo, Kobe University, Japan

**Time:** 09:10-09:45, Saturday Morning, September 12,2020



#### Abstract

Recently, typified by the key words of ICT, Big data, IoT and AI, modern engineering and technologies are rapidly developed in such a direction that towards the realization of the artificial systems more and more intelligent. Conversely, when we look at our modern human societies, the key words are then more and more seriously aging, worldwide infectious disease and dementia related health problems. It is our urging task to promote the innovation of novel science and technologies toward the contribution of the people's health. From this point of view, this talk will introduce our detailed examples of AI based health services which improve not only the level of medical care but also the people's QOL. The talk will also discuss on how to construct a systematic platform for AI based health services as well as how the AI based health services can contribute to the future prediction, prevention and promotion oriented medicine and health.

### Invited Speech 2: Human-Engaged Computing

**Speaker:** Prof. Xiangshi Ren, Kochi University of Technology, Japan

**Time:** 09:45-10:20, Saturday Morning, September 12,2020



#### Abstract

This talk introduces Human-Engaged Computing (HEC) which looks at the future relationship between humans and computers. HEC aims to achieve synergized interactions between human capacities and technological capabilities toward high-level wisdom that can enhance human survival probability and help achieve our progressively unfolding potential as human beings. I will review the history of human-computer interaction and then explain the framework of HEC.

## Invited Speech 3: Image-based Motion Artifacts Reduction in Magnetic Resonance

### Imaging Using Deeping Learning Methods

**Speaker:** Assoc. Prof. Jie Deng, Rush University Medical Center, USA

**Time:** 10:20-10:55, Saturday Morning, September 12,2020



#### Abstract

Magnetic resonance imaging (MRI) is inherently sensitive to motion due to prolonged data acquisition time and the strategies of filling the k-space. Motion artifacts, typically shown as blurring or ghosting across the MR images along the phase encoding direction, degrade image quality and may result in non-diagnostic exams if the motion artifacts are too severe to be corrected. In clinical practice, motion corrupted image series are usually repeated in hope to obtain images with less motion while providing patients with additional instructions or sedation medicine. However, repeated imaging inevitably increases the total examination time, causes patient discomfort, and reduces the throughput of the MRI department. Nonetheless, motion artifacts are sometimes unavoidable in patients with involuntary movement arising from their discomfort, mental status, and existing neurodegenerative conditions. We developed separate deep learning neural networks to reduce motion artifacts in T1 weighted spin echo images of the brain, and in dynamic contrast enhanced images of the liver. The convolutional neural network models are based on a deep residual network with densely connected multi-resolution blocks (DRN-DCMB) and a generative adversarial network (GAN). The models are trained using the image dataset with a variety level of simulated motion artifacts and then applied to testing dataset of images with simulated motion artifacts as well as acquired images corrupted with real motion artifacts. The performance of each model for motion artifact reduction was evaluated using 1) the quantitative measurements of structural similarity index (SSIM) and improvement in signal-to-noise ratio (ISNR), and 2) qualitative assessment of image quality including the overall quality, severity of the motion artifacts, image sharpness, image resolution, and image contrast by a radiologist.

An effective and automatic motion artifact reduction tool that can be integrated into the day-to-day MRI quality control and quality assurance workflow will be clinically useful to reduce the burden of technologists and radiologists, enhance image quality, and eventually improve the throughput of the MRI department. When motion-corrected image quality is sufficiently diagnostic, it is not necessary to attempt to acquire repeated imaging or to put the patient under sedation or general anesthesia. We expect that deep learning model corrected MR images not only reduce the artifacts, but also provide better details and are easier for the radiologist to read the exam and interpret the lesions. A comprehensive clinical assessment is warranted to confirm the diagnostic performance and workflow improvement by using this tool in clinical practice.

## **Invited Speech 4: Application of artificial intelligence in "critical value" warning of regional medical center image**

**Speaker:** Prof. Gang Huang, Shanghai University of Medicine & Health Sciences, China

**Time:** 10:55-11:30, Saturday Morning, September 12,2020



### **Abstract**

In recent years, the artificial intelligence research made great progress in the field of medical imaging, focused on computer aided detection (CADe), computer aided diagnosis (CADx) and patient's condition monitoring of three direction, but the current study did not highlight the basic characteristics and utilization at the basic level is generally not high, it is difficult to meet the demand of first option at the basic level in the hierarchical diagnostic system. Investigate the reasons, it is that AI products with a single disease are not suitable for primary medical application scene.

With a national strategy guided by a healthy China and graded diagnosis and treatment, strengthening the basic level has become an important direction of the new round of medical reform. Based on artificial intelligence technology, focus on the basic common cerebral hemorrhage, pneumothorax, spine fracture, esophageal trachea, fractured ribs, small joint fracture, diseases such as tuberculosis research, in order to achieve the intelligent diagnosis, quantitative analysis, research and development of intelligent early warning model for the first option at the basic level, meet the needs of emergency patients with precise and rapid diagnosis at the basic level, realize the medical imaging AI from single diseases to the transition of the complex clinical application scene.

This study explores the establishment of basic medical imaging AI application system based on regional medical centers, to promote the healthy and sustainable development of artificial intelligence in regional medical centers and basic medical and health institutions, and to guarantee the safety and diagnostic quality of basic patients under the telemedicine model.

## **Invited Speech 5: The basis and significance of remote ECG**

**Speaker:** Prof. Ying-Min Chen, Jiading District Central Hospital affiliated Shanghai University of Medicine & Health Sciences, China

**Time:** 11:30-12:05, Saturday Morning, September 12,2020



### **Abstract**

Deaths from cardiovascular diseases account for more than 40% of deaths from diseases in the population, ranking first, higher than cancer and other diseases. Since 2004, the annual growth rate of hospitalization expenses of cardiovascular and cerebrovascular diseases has been over 30%, which is much higher than the growth of GDP (over 6%). The risk factors of cardiovascular diseases in China are generally exposed, and the mortality rate of cardiovascular diseases in rural areas is continuously higher than that in urban areas in recent years. The number of cardiovascular diseases will continue to increase rapidly over the next 10 years, especially in rural areas. Hence, urgent demand to prevent and treat cardiovascular diseases due to increasing cardiovascular burden. Remote ECG diagnostic platform is a breakthrough. Remote ECG monitoring system consists 4 components: clinet, internet(4G/5G), cloud server, workstation at administration center. This system have a positive influence on the diagnosis of ECG.

## **Invited Speech 6: Medical Knowledge Grapphs: Technology and Application**

**Speaker:** Prof. Zhisheng Huang, Free University (VU), Amsterdam, The Netherlands

**Time:** 14:00-14:35, Saturday Afternoon, September 12,2020



### **Abstract**

TBD

## **Invited Speech 7: The Proactive levelled Intervention for Social Network Users' Emotional Crisis—based on an Automatic Crisis Balance Analysis**

### **Model**

**Speaker:** Prof. Bingxiang Yang, Wuhan University, China  
**Time:** 14:35-15:10, Saturday Afternoon, September 12,2020



**Abstract**  
TBD

## **Invited Speech 8: Transforming healthcare with AI**

**Speaker:** Prof. Xinyuan Zhao, Peking Health Information Technology Association, Beijing, China  
**Time:** 15:10-15:45, Saturday Afternoon, September 12,2020



### **Abstract**

The healthcare sector in the world is facing challenges. These include increasing demand, rising consumer expectations, and the pressures of an aging population. These factors are straining the health workforce, increasing costs and limiting access to care. Artificial intelligence (AI) is changing the world we live in, and it has the potential to transform struggling healthcare systems with new efficiencies, new therapies, new diagnostics, and new economies. Already, AI is having an impact on healthcare, and new prospects of far greater advances are emerging every day. This presentation sets out how AI can bring new precision to care, with benefits for patients and for whole society.

The proposed and current uses of AI in health care are myriad. Whether it's being used to discover links between genetic codes, to power surgical robots or even to maximize hospital efficiency, AI has been a boon to the healthcare industry.

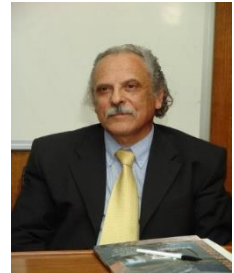
In fact, artificial intelligence simplifies the lives of patients, doctors and hospital administrators by performing tasks that are typically done by humans, but in less time and at a fraction of the cost.

This presentation focuses on how AI transforms healthcare and the applications or examples of AI that may impact the healthcare domain, which include using AI to efficiently diagnose and reduce error, developing new medicines with AI, streamlining patient experience with AI, mining and managing medical data with AI, and AI robot-assisted surgery.

## Invited Speech 9: Artificial Intelligence Technology in Smart Healthcare Systems

**Speaker:** Prof. Abdel-Badeeh M. Salem, Ain Shams University, Cairo, Egypt

**Time:** 15:45-16:20, Saturday Afternoon, September 12,2020



### Abstract

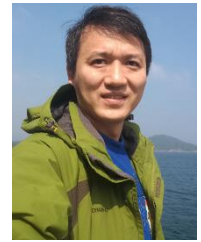
Artificial Intelligence (AI) is devoted to create intelligent computer software and hardware that imitates the human mind. The main goal of AI technology is to make computers smarter by creating software that will allow a computer to mimic some of the functions of the human brain in selected applications. Advances in AI paradigms and smart healthcare systems (SHS) domains highlight the need for ICT systems that aim not only in the improvement of human's quality of life but at their safety too. SHS are intelligent systems and based on the concepts, methodologies and theories of many sciences, e.g. artificial intelligence, data science, social science, information science, computer science, cognitive sciences, behavioral science, life sciences and healthcare. The well-known smart healthcare paradigms are; Real-time monitoring devices, Computer-aided surgery devices, Telemedicine devices, Population-based care devices, Personalized medicine from a machine learning perspective, Ubiquities intelligent computing, Expert decision support systems, and Health 2.0 .and Internet of Things (IoT).

On the other side, AI can support many tasks and domians ,e.g. law, education, healthcare, economy, bussines, life sciences, environment, energy and military applications. All of these applications employ knowledge base and inferencing techniques to solve problems or help make decisions in specific domains. This talk discusses the potential role of the AI paradigms, computational intelligence and machine learning techniques which are used in developing the SHS. The talks focus on the AI techniques, algorithms and methodologies and their potential usage in recent trends in developing the smart healthcare and bio-medical systems. The following three paradigms are presented: (a) ontological engineering, (b) case-based reasoning, and (c) data mining and knowledge discovery. Moreover, the talk presents, the research results of the author and his colleagues that have been carried out in recent years@AIKE-Labs at Ain Shams University.

## **Invited Speech 10: Latent Tree and Constrained Latent Tree Analysis for Researching the Syndrome of Traditional Chinese Medicine**

**Speaker:** Assoc. Prof. Yulong Xu, Henan University of Chinese Medicine, China

**Time:** 16:20-16:55, Saturday Afternoon, September 12,2020



### **Abstract**

Latent Tree Analysis is an unsupervised machine learning algorithm, which is designed by Hong Kong University of Science and Technology for researching the syndrome diagnosis of Traditional Chinese Medicine. Based on explicit variable probabilistic co-occurrence to construct the latent tree model (as known as latent structure model), this method can simulate the reasoning process of syndrome diagnosis in the traditional Chinese doctor. The relevant research results show that this method is suitable for the study of TCM syndrome, and has been recognized by peers and achieved many positive results.

This report summarizes the application of latent tree analysis for syndrome diagnosis in Traditional Chinese Medicine. And then, to consider the semantics of major-minor symptoms, we extend a new method named Constrained Latent Tree analysis. The Constrained Latent Tree analysis can turn qualitative standards in the form major-minor symptoms into quantitative diagnosis rules. Compared with the classic Latent Tree Analysis, the result shows that the BIC information criterion score of the Constrained Latent tree model is lower than that of the classic Latent Tree model. However, considering the size of syndromes and the reasonable degree of rules reflect the characteristics of major-minor syndromes, the Constrained Latent Tree has more practical rules than the classic Latent Tree analysis.

## **Invited Speech 11: Limitation of on Big Data or Nature Language Process Based Algorithm for Clinical Diagnostic Artificial Intelligence**

**Speaker:** Assoc. Prof. Yifan Zhu, Huaihe Hospital of Henan University, China

**Time:** 16:55-17:30, Saturday Afternoon, September 12,2020



### **Abstract**

TBD

## Part III Presented Papers

**Title:** AI-based multimodal data management and intelligent analysis system for Parkinson's disease

**Authors:** Kang Ren, Yun Ling, Fan Liu, Haimei Zhuang

**Affiliation:** GYENNO SCIENCE

### Abstract

The PD CIS is an AI-based (machine learning, deep learning, intelligent reasoning, etc.) multimodal data (clinical data and real-world data ) management and intelligent analysis system for Parkinson's disease (PD). It mainly solves the problems in traditional diagnosis of PD such as lack of objective evaluation data, lack of reproducible diagnosis system, and lack of closed-loop treatment tracking. It is a multimodal data platform which realizes data standardization, evaluation objectification, and diagnosis standardization.

The big data set of The PD CIS is mainly composed of the following three parts:

1. Traditional clinical data: Complete data required by clinical and scientific research of PD ,including personal information of patients (basic information, current medical history, medication history, past medical history, family history, etc.), diagnostic data (disease conditions, treatment methods, medical scales, inspections, experimental tasks), etc.
2. Clinical quantitative data: Contains all quantitative evaluation and diagnostic data detected and generated by GYENNO's evaluation and diagnostic equipment.
3. Real-world data: Contains all the quantitative data of daily life which collected by GYENNO's innovative medical devices in the real-world conditions.

For different data sources, diversified data formats, and complex data logical relationships, The PD CIS provides traditional relational databases (MySQL), memory databases (Redis), NoSQL databases (MongoDB), distributed file storage systems (FastDFS) and other dedicated storage service technologies, which provide a guarantee for the efficient storage and effective management of data, and provide unified data storage and management tools for data with different storage methods and different logical structures.

At the same time, in order to guarantee the security of medical data and privacy protection, The PD CIS complies with the relevant requirements of the HIPPA law for security and privacy protection, and keeps the patient's name, identity card number, mobile phone number, home address, personal photos, etc. in the electronic medical record through MD5-based symmetric encryption processing, which not only realizes the anonymization of private data, but also retains the ability to backtrack the data. At the same time, according to the ethical norms and information security grade protection norms of the medical industry, only minimum medical data set required by the business is provided, and access audits are performed at the same time. Based on RBAC permission control technology, the permissions are configured for users with different permissions, and each data permission has different data browsing and retrieval permissions, and a complete approval process for data export is implemented and archived. So far, The PD CIS has covered more than 100 TOP hospitals in PD diagnosis in China. Furthermore, The PD CIS has established an electronic medical record artificial intelligence system and then has achieved professionalism and efficiency by establishing an intelligent follow-up system and formulating standard follow-up rules after diagnosis, thus realizes the linkage of follow-up data and clinical data. The above data will then be sorted and summarized to the PD specialists, so as to achieve the goal of assisting the PD specialists to make better treatment plans and promote the development of precision medicine of PD. In terms of hierarchical diagnosis and treatment of PD, The PD CIS provides a variety of organizational forms such as alliances, medical consortia, projects and expert teams, and also inventively proposes and



establishes the concept of multimodal exclusive data sets, which provides scientific basis with optimizing configuration of medical resources , decision-making and evaluation of graded diagnosis and treatment work, and the further improvement of graded diagnosis and treatment policies.

**Keyword:** Parkinson's disease (PD), Multimodal, Intelligent analysis system, Quantitative evaluation and diagnostic data set

**Title:** Using BERT-BiLSTM to diagnose and predict alternative medical text

**Author:** Zongyao Zhao

**Affiliation:** School of Traditional Chinese Medicine, Beijing University of Chinese Medicine

### **Abstract**

Diagnostic standardization based on text classification is an important research content in the modernization and objectification process of complementary alternative medicine. Since the text data of complementary and alternative medicine usually contain many personalized symptom descriptions and herbs, how to effectively obtain this information is an interesting question. We used the authoritative data of traditional Chinese medicine (TCM) as the source of textual data for complementary and alternative medicine and constructed a new model. This model is mainly composed of a two-way LSTM model and a BERT model, which can effectively obtain professional vocabulary in the text and make up for the shortcomings of BERT's insufficient expression of words in special fields and the lack of retraining. The experiment is implemented on a real Chinese medical data set. Experimental results show that our model achieves state-of-the-art performance.

**Title:** Effect of vocal cord polyp on Mandarin tones recognition by native Chinese speakers

**Author:** Bin Li

**Affiliation:** Beijing University, China

### **Abstract**

Intelligent Diagnosis for pathological voice contains two parts, one is intelligent detection, and the other is intelligent comprehension. Before the application of intelligent comprehension, it is important for us to know how human perceive pathological voice. This paper first investigates acoustically a patient who had vocal cord polyp read Chinese characters in Mandarin tones before and after the surgeries. Second, identification test was used to find out the effect of vocal cord polyp on Mandarin tones recognition. The results show that first, the effect of vocal cord polyp on Tone 1 and Tone 3 in F0 contour are statistically significant, but not Tone 2 and Tone 4. Second, vocal cord polyp does not affect identification of Mandarin tone types. Third, vocal cord polyp affects Tone 1 and Tone 2 in identification rate significantly, but not Tone 3 and Tone 4. It is concluded that vocal cord polyp has little influence on the intelligibility of Mandarin tone types. And our research results are referential to intelligent diagnosis for pathological voice.

**Title:** Research on Traditional Chinese Medicine Data Mining Model Based on Traditional Chinese Medicine Basic Theories and Knowledge Graphs\*

**Author:** Rui Xiao

**Affiliation:** College of Information Engineering, Hubei University of Chinese Medicine

### **Abstract**

In recent years, great progress has been made in the study of knowledge graph in various fields, and it has become a hot topic in Traditional Chinese Medicine (TCM) related fields. This paper utilizes a Chinese Herbal Medicine collection, which includes 537 medicines, retrieved from a hospital affiliated with a TCM university, as data source; referenced the Chinese Pharmacopoeia for building the knowledge graph founded on the basic TCM theory. Via associating the prescription with drug properties, taste and meridian tropism of Chinese medicine and visualizing the complex network of Chinese medicine prescription from a novel perspective, the rules in the prescription can be mined in a deeper level, which has a strong practical reference value for developing new clinical medicine and studying the prescription data mining.

**Title:** Coronary artery CTA image segmentation and three-dimensional visualization Based on U-Net

**Author:** Yang Li

**Affiliation:** Tianjin University of Technology, China

### **Abstract**

Coronary atherosclerotic heart disease (CAD) refers to a heart disease caused by myocardial ischemia, hypoxia or necrosis due to narrowing or obstruction of the blood vessel cavity, which seriously endangers the life and health of people around the world. The precise extraction of coronary arteries has received extensive attention. The main work of this article is as follows: Image enhancement processing is performed by a multi-scale enhancement filter based on Hessian matrix to improve the contrast of the coronary artery area in the CTA image. By using the fast training of U-Net network and the accurate feature recognition method, the region of coronary artery of interest in CTA image of human body is located and roughly segmented, which solves the problem that the location and shape of coronary artery in CTA image are different, which easily leads to segmentation error. By designing a variety of conditionally constrained level set algorithms for contour evolution, the accurate segmentation and extraction of coronary arteries is finally achieved. A three-dimensional visualization system of coronary arteries is designed by moving cube algorithm. Compared with other typical algorithms, the segmentation algorithm designed in this paper can increase the average overlap rate by up to 12.41%.

**Title:** Calculation system for beam directivity of laser bars based on optimization method

**Author:** Yunzhe Zhao

**Affiliation:** Beijing University of Technology

### **Abstract**

Semiconductor lasers have the advantages of compact structure, high electro-optical conversion efficiency, long life, high brightness, etc., and are extremely widely used in scientific research and engineering. Due to the continuous increase in the power requirements of lasers in practical engineering, multi-bar beam combination is required to obtain high power output. In the fiber coupling experiment, the research team found that the deviation of the collimated beam directivity of the 19 luminous points of the bar has a significant impact on the beam combination and fiber coupling efficiency. The research team measured the collimated beams of several sample bars of semiconductor lasers used in scientific research projects, using CDD and slits to obtain the far-

field spot of the collimated beam of each bar, and the far-field spot of the collimated beam of the single luminous point. Test data such as directivity, found that there are significant differences in the directivity of the sample laser beam, and it needs to be screened before it can be used in scientific research projects.

This subject mainly studies the measurement method and calculation of the beam directivity deviation of the semiconductor laser array. This subject uses numerical analysis and calculation methods, based on the theory of semiconductor laser light field distribution, combined with experimental testing and modeling calculations, to develop an efficient method for calculating beam directivity deviation, and use Python language to develop a software for efficiently calculating beam directivity deviation. Among them, establishing the light field distribution model of the semiconductor laser includes: establishing the light field distribution model of the semiconductor laser light-emitting unit, and establishing the light field distribution model of the bars. The experimental platform used for image acquisition includes: detection object, attenuation system, image acquisition system, and image analysis system. The calculation process of the directivity deviation parameter includes: calculating the initial value of the directivity deviation parameter and optimizing the parameters. The calculation process of the directivity deviation parameter includes: calculating the initial value of the directivity deviation parameter and optimizing the parameters. Figure 1 is a flow chart of the beam directivity test and calculation system of the laser bar, and Figure 2 is a schematic diagram of the experimental platform for collecting image data

**Title:** Design of Knowledge Graph of Traditional Chinese Medicine Prescription and Knowledge Analysis of Implicit Relationship

**Author:** Yan Chen

**Affiliation:** Nanjing University of Chinese Medicine

### **Abstract**

Purpose-As of March 2020, this paper collected 41 prescriptions for Covid-19 in official reports, and used machine learning and knowledge graph technology to discover the rules of common prescription medication for Covid-19 and the Chinese medicinal herb groups applicable to different groups of people to help the TCM prescriptions for the clinical treatment of Covid-19. Methods-The FP-Growth algorithm was used to analyze the properties, tastes, and meridian tropism of Chinese medicinal herb groups in prescription data, constructing a knowledge graph for Covid-19 description and mining the prescription medication rules. Results-In the 41 pieces of prescription, patients in medical observation period were treated with Chinese medicinal herbs that can relieve exterior syndromes and stop vomiting, such as Radix Saposhnikoviae, Semen Sojæ Preparatum, etc. Those with mild common syndromes were treated with heat-clearing and detoxicating Chinese medicinal herbs, such as Rhizoma Coptidis, Radix Scutellariae, etc. Infected patients were treated with Chinese medicinal herbs such as Radix Glycyrrhizae, Herba Asari, etc., which can dissolve phlegm, relieve cough and invigorate the spleen, relieve pain, expel wind syndromes, relieve exterior symptoms and help digesting. Conclusion-Combining machine learning and knowledge graph technology to analyze the data characteristics of common prescriptions used by different populations can help analyze the core medication mechanism of TCM (Traditional Chinese Medicine) treatment of different populations with the same disease.

**Title:** The Optimal Wavelet Basis for Electroencephalogram Denoising

**Author:** Liwei Cheng

**Affiliation:** Beijing University of Posts and Telecommunications

**Abstract**

To solve the problem of optimal wavelet basis selection in motor imagery electroencephalogram (MI-EEG) denoising by wavelet transform, based on the analysis of wavelet basis parameters and characteristics, combined with the characteristics of MI-EEG, we summarized the characteristics of wavelet basis suitable for MI-EEG denoising. Signal to noise ratio (SNR) and root mean squared error (RMSE) are introduced as evaluation criteria of signal denoising effect, it is concluded that the bior and rbio wavelet basis functions are better at denoising MI-EEG among the 7 types of wavelet clusters. Among them, the rbio2.2 wavelet basis is the most suitable for MI-EEG denoising. The comparison of simulation results verifies the correctness of the conclusions.

**Title:** An End to End Thyroid Nodule Segmentation Model based on Optimized U-Net Convolutional Neural Network

**Author:** Mengya Liu

**Affiliation:** Beijing University of Posts and Telecommunications

**Abstract**

For current clinical diagnosis of thyroid nodules, thyroid ultrasound is one of the most valuable imaging examinations to evaluate thyroid diseases. There are many improved ultrasound equipment whose imaging mechanism will cause large imaging noise, blurred borders, complicated background, which certainly bring great challenges to the nodule segmentation. As a consequence, there will be disadvantages of poor segmentation accuracy or high model complexity when using the ordinary image segmentation methods. This paper proposes an Optimized U-Net convolutional neural network model of thyroid nodule segmentation method whose structure is mainly based on U-Net model and combines the advantages of residual network. The segmentation method is also combined with the TTA (test time segmentation) method, that is, the output is the weighted average of all prediction results of the input image after enhancement. The network model trained on 544 thyroid nodule images not only achieves the end-to-end segmentation output, but also can achieve a dice coefficient of 89.50% in the final verification set.

**Title:** Identification of a three-gene chemoresistance-related prognostic signature and risk stratification system in breast cancer

**Author:** Mingzhou Liu

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**Abstract**

Breast cancer (BC) is the most commonly diagnosed cancer and the leading cause of cancer death in females worldwide. Chemoresistance has been a major reason for the drug therapy failure. Better understanding of chemoresistance may enable a more informed selection of chemotherapeutic agents and improve patient outcomes. Therefore, detailed mechanisms and predictive markers are urgently needed. The aim of this study was to identify a robust prognostic gene signature help clinicians to develop an individualized course of treatment for chemoresistant breast cancer.

**Title:** Construction and Exploration of Information Interconnection in a Hospital in the Guangdong-Hong Kong-Macao Greater Bay Area

**Author:** Qunqun Zhang

**Affiliation:** Information Department, The Fifth Affiliated Hospital Sun Yat-sen University

### **Abstract**

The interconnection of hospital information systems is a technology that must be overcome in the development of my country's health informatization. The "Outline of Development Plan for the Guangdong-Hong Kong-Macao Greater Bay Area" has played a positive role in promoting the development of the Greater Bay Area. Comprehensive interconnection and information sharing can promote the improvement of medical services and the innovation of medical technology. The Fifth Affiliated Hospital of Sun Yat-sen University adheres to the goal of facing the frontiers of medicine, facing the strategy of healthy China and local economic and social needs, and facing the goal of a national regional medical center in the Guangdong-Hong Kong-Macao Greater Bay Area. This article introduces the basic situation and information construction process of the five hospitals' medical institutions, and introduces the construction of data resource standardization, interconnection standardization and infrastructure construction. On the basis of the above innovations, the application effects of interconnection are introduced, and the highlights of our hospital and the exploration of technological innovation are described.

**Title:** A Speech-Driven 3-D Lip Synthesis with Realistic Dynamics in Mandarin Chinese

**Author:** Changwei Liang

**Affiliation:** Beijing University, China

### **Abstract**

In this paper, a new speech-driven lip synchronization method is developed, predicting the 3-D geometric shape of the lip without using speech recognition model in the visualization procedure, and can be trained and evaluated with realistic dynamics. Videos of Mandarin Chinese words are used. Speech signals are calculated into MFCC as audio features. 68-points facial landmarks are annotated from the corresponding videos through the prediction algorithm from the Dlib Library. Eos, a 3-D Morphable Face Model, is applied, using the facial landmarks, to predict the 3-D shape, where we can acquire 3-D landmarks. A machine-learning sequence-tagging model, averaged Structured Perceptron using Viterbi algorithm, is applied for modelling the direct prediction of labial parameters from the acoustic MFCC parameters. The 3-D labial area shape from the 'eos' prediction of a frame is morphed according to the predicted 3-D labial landmarks, forming the 3-D lip sequence, which can be plotted synchronically with the acoustic signal. In this 3-D lip synthesis, acoustic features and realistic lip shapes are directly mapped, where lip units and speech recognition are not applied, preserving more realistic articulatory or personality details; and the predicted geometric shapes are comparable with realistic dynamics, with the comparison indicating that this synthesis is of good effect.

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