



# **The 10th International Conference on Frontier Computing**

*~ Theory, Technologies, and Applications ~*

**Co-located Conferences  
International Conference for Convergency Information Technology &  
Applications (ICIA 2020)**

**The 4th International Conference on Advanced Information  
Technology with Sensor or Sensor Network (ADINTECH 2020)**

## **FC 2020**

Singapore  
September 7-9, 2020  
Alternative Presentation September 7-9,2020

**Organized by**

**Frontier Computing Conference Group**

## Sponsors

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OF SCIENCE AND TECHNOLOGY

## Message from Organizing Committees

The International Conference on Frontier Computing – Theory, Technologies, and Applications (FC) was first proposed in early 2010 on an IET executive meeting. This conference series aims at providing an open forum to reach a comprehensive understanding to the recent advances and emergence in information technology, science, and engineering, with the themes in the scope of Communication Technology and Applications, Business Intelligence and Knowledge Management, Artificial Intelligence, and any related fields that prompt the development of information technology. This will be the ninth event of the series, in which fruitful results can be found in the digital library or conference proceedings of FC 2010 (Taichung, Taiwan), FC 2012 (Xining, China), FC 2013 (Gwangju, Korea), FC2015 (Bangkok, Thailand), FC2016 (Tokyo, Japan), and FC2017 (Osaka, Japan), FC2018 (Kuala Lumpur, Malaysia), FC ABH2019 (Taichung, Taiwan), FC2019 (Kitakyushu Japan). Each event brings together the researchers worldwide to have excited and fruitful discussions as well as the future collaborations.

This year FC2020 is the 10th-anniversary event of FC conference series, it was planned to be hold in Singapore, however, due to the CODIV-19 pandemic, our conference has to change to the online form and each presentation is planned as a video stream in the website. The papers accepted for inclusion in the conference proceeding primarily cover the topics of current frontier computing areas. The FC2020 is organized together with International Conference for Convergency Information Technology & Applications (ICIA 2020), The 4th International Conference on Advanced Information Technology with Sensor or Sensor Network (ADINTECH 2020), and Fi Award Competition 2020, and there are server workshops and special sessions that are cooperated with FC2020. These events present the current developments of frontier computing.

We send our sincere appreciations to the authors for their valuable contributions and the other participants of this conference. The conference would not have been possible without their support. Appreciates are also due to the many experts who contributed to making the event a success. We hope we can have a next FC event, FC2021, in onsite form, and it is the next milestone of FC conference toward to the next future ten years.

FC 2020 Organizing Committees  
FC Conference Group  
September 2020

## Organizing Committees

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## Schedule

<b>Day 1</b>		
<b>September 7, 2020 (Monday)</b>		
	<b>Room 1</b>	<b>Room 2</b>
<b>10:00~12:00</b>	<b>Session 1-1</b>	<b>Session 1-2</b> ICIA 2020 -1
<b>12:00~13:00</b>	<b>Lunch</b>	
<b>13:00~14:00</b>	<b>Keynote Speech</b>	
<b>14:00~16:00</b>	<b>Session 2-1</b>	<b>Session 2-2</b> ICIA 2020 -2

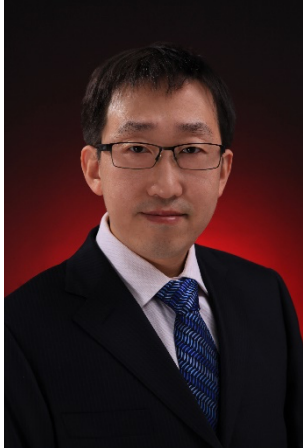
<b>Day 2</b>		
<b>September 8, 2020 (Tuesday)</b>		
	<b>Room 1</b>	<b>Room 2</b>
<b>10:00~12:00</b>	<b>Session 3-1</b> ADINTECH 2020 MITE	<b>Session 3-2</b> ICIA 2020 -3 DLHC
<b>12:00~14:00</b>	<b>Lunch</b>	
<b>14:00~15:00</b>	<b>Session 4-1</b> ABCat	<b>Session 4-3</b> MLFSP
<b>15:00~16:00</b>	<b>Session 4-2</b> Fi-Award Competition	

<b>Day 3</b>	
<b>September 9, 2020 (Wednesday)</b>	
<b>10:30~12:00</b>	<b>Steering Committee Meeting</b>
<b>13:30~16:00</b>	<b>Organizing Committee Meeting</b>

## Keynote Speaker

### Prof. Chong Fu, Northeastern University, China

**Title: Image Encryption Technique Based on Chaos**



#### **Abstract**

Recent years have seen a fantastic amount of images transmitted over the Internet, raising lots of privacy concerns. Block ciphers (e.g., DES, AES and IDEA), the most commonly used symmetric ciphers, provide a high level of security but can hardly satisfy the growing demand for real-time communications when dealing with image data characterized by large volume. To meet this challenge, a variety of image encryption techniques have been suggested. Among them, the chaos-based technique has been proven to be the most successful. Since 1990s, many researchers have noticed that there exists a close relationship between chaos and cryptography. The intrinsic properties of chaotic dynamical systems such as extreme sensitivity to initial conditions and system parameters, ergodicity and mixing property naturally satisfy the essential design principles of a cryptosystem such as avalanche, confusion and diffusion. The iterative permutation-substitution operations, suggested by Shannon for secure ciphers constructions, are widely adopted in chaos-based image ciphers. In the permutation stage, the pixel positions are scrambled in a secret way, which leads to a great reduction in the correlation among neighboring pixels. In the substitution stage, the pixel values are altered sequentially, and the influence of each pixel is diffused to all its succeeding ones during the modification process. With such a structure, a minor change in one pixel of the plain-image may result in a totally different cipher-image with several overall rounds of encryption. Area-preserving chaotic maps, including the cat map, the baker map, and the standard map, have been widely used in image scrambling. The substitution algorithm consists of three major procedures: 1) generation of a pseudorandom sequence by iterating a chaotic system; 2) extraction of a keystream from the chaotic sequence; 3) mixing plain pixels with the keystream and diffusing the influence of a pixel to its succeeding ones. Theoretical analysis and experimental results have indicated that well-designed chaos-based image encryption algorithms have a high security level, which can effectively resist all common attacks, such as brute force attack, statistical attack and differential attack. In conclusion, the chaos-based image encryption technique has shown to be a promising way for online secure image communication applications.

#### **Biography**

Chong Fu received the M.S. degree in telecommunication and information systems and the Ph.D. degree in computer software and theory from Northeastern University, Shenyang, China, in 2001 and 2006, respectively. He joined Northeastern University in 2001, where he is currently a Professor and serves as associate dean at the School of Computer Science and Engineering. In 2010, he spent three months as a Visiting Researcher with the Department of Electronics Information Engineering, The Hong Kong Polytechnic University. His research interests include multimedia security and computer vision.

# Day 1

## September 7, 2020

### Session 1-1

Chair: Dr. Jianqiang Li

- 1. Recognition and Diagnosis of Computed Tomography Images Using Reconstructive Techniques**  
Pengzhi Li, Jianqiang Li, Haihua Xie, Yan Pei and Hui Feng
- 2. Comprehensive Economic Evaluation of Strategic Emerging Industries in China Based on the model of entropy TOPSIS**  
Wei Cai
- 3. Boundary U-Net: A Segmentation Method to Improve Salt Bodies Identification Accuracy**  
Yelong Zhao, Bo Liu, Jianqiang Li and Guangzhi Qu
- 4. Identity Authentication Protocols for Greenhouse Environmental Monitoring System Based on Internet of Things**  
Shujie Lu, Xiao Zhang and Ling Li
- 5. Design of anatomy multimedia E-learning platform**  
Mengjiao Liu, Liheng Gong and Xiao Zhang
- 6. A Study on Learning Effectiveness and Satisfaction by Integrating Social Network Analysis into Cooperative Learning -A Case Study of Junior High School Physics and Chemistry in New Taipei City**  
Wen-Chih Chang and Jing-Jing Chang
- 7. Study of the Medical Image Sharing System Based on a RBAC Expansion Model**  
Liheng Gong, Mengjiao Liu and Xiao Zhang
- 8. Quality traceability system for multi-station SMT Manufacturing Process**  
Cheng-Hui Chen, De-Wei Hsieh, Ci-Hua Wu, Ci-Yi Lai and Chi-Chin Hsieh

### Session 1-2 –ICIA -1

Chair: Dr. Seung Gyun Yoo

- 1. An Image Similarity Estimation Approach Based on Weighted Features**  
Seok-Woo Jang
- 2. An Empirical Study on Success Factors of Asian Chinese Companies**  
Seung Gyun Yoo
- 3. Efficient Covering of a Target Object Using a Prediction Technique**  
Byeongtae Ahn and Seok-Woo Jang



4. **An Empirical Study on Success Factors of Game Industry**  
Seung Gyun Yoo
5. **Impact of Corruption on Economic Growth: Focusing on Asia of emerging developing countries**  
Woo-Sung Cho and Seung Gyun Yoo
6. **Keyword Network Analysis on North Korean Children's Rights and Welfare**  
Byung-Man Kim
7. **Topic Modeling of News articles for Low Birth Patterns in South Korea**  
Yoojin Shon and Bosoon Seo
8. **Development of Evaluation Scale of Creativity and Personality for College Students Using Delphi Survey Method\_ Change the title of a paper**  
Byung-Man Kim, Jeong-Jin Youn and Jeong Su-Jeong

## **Session 2-1**

Chair: Dr. Fujiao Ju

1. **Automatic Pollen Detection Based on Feature Fusion and Self-attention Mechanism**  
Quanzeng Wang, Juan Li, Fujiao Ju, Jianqiang Li, Baokai Zu and Caihua Ye
2. **A Malicious Web Request Detection Technology Based on Gate Recurrent Unit**  
Zhibin Liu, Wenqiang Zhang, Yuanyuan Huang and Qingguo Zhou
3. **Using the XGBoost model to predict Santander Customer Trading**  
Wen-Chih Chang, Yi-Hong Guo, Ya-Ling Yang, Ming-Chien Hsu, Yi-Hsuan Chu, Ting-Yi Chu and Long-Cheng Meng
4. **Fluid Simulation with a Dense Space-time Deformation via L0 Gradient Minimization**  
Kun Li, Na Qi and Qing Zhu
5. **A Deep Learning Framework for Character Gait Motion Control with Physical Model**  
Qing Zhu and Chuanhua Liu
6. **A Visualization Analysis of the Paper of Chinese Computational Thinking of China in the Recent Decade**  
Haomin Song, Yu Liu, Lihua Ding and Xinghua Sun
7. **Painter eMarketplace Platform**  
Chatchai Suthapakti, Taminee Shinasharkey and Santithorn Bunchua
8. **Acoustic Emission Signal Analysis for Stamping Machine Condition Monitoring and Fault Diagnosis**  
Hsiao-Yu Wang, Yu-Hung Chiang, Chih-Yuan Chen and Yu-Shiang Hon

## **Session 2-2 -- ICIA -2**

Chair: Dr. Byeongtae Ahn

- 1. Depth Image Based Rendering System by Kinect Sensor**  
Beom-Seok Oh, Eungyeol Song and Sunjin Yu
- 2. LAD Analysis of Policy Reports for Low Birth Patterns**  
Mi-Jin Kim and Byung-Man Kim
- 3. A Semantic Network Analysis of Research Trends on Media Education of Elementary School Students**  
Su Jeong Jeong
- 4. Implementaion for Used Trading Management System Based BlockChain(Case: Used Car)**  
Byeongtae Ahn
- 5. Design of Real Estate Contract Management System based Blockchain**  
Byeongtae Ahn
- 6. A Study for Analysis of Stock Price Information through Extraction of News Articles**  
Seok-Woo Jang and Byeongtae Ahn
- 7. Solid particle dynamics by using Moving Particle semi-implicit Method**  
Kyung Sung Kim

## Day 2 September 8, 2020

### Session 3-1 --- ADINTECH, MITE

Chair: Dr. Jia-Wei Chang

- 1. Research on Remote Control of Self-propelled Lawn Mower**  
Wan Rong Chen, Tung-Shou Chen, Jeanne Chen, Fang Rong Hsu and Yu-Hsun Kuo
- 2. Application model research of visual focus on exhibition item in museum**  
Min-Feng, Lee
- 3. Determinants of Competitiveness in Immersive Technologies with Sensor Networks**  
Jeongeun Byun and Jae-pyo Hong
- 4. Impacting of integrating the CDIO model into computational thinking on the STEM attitudes-an example of a STEM course**  
Hua-Xu Zhong, Chi Fang Chang, Chin-Feng Lai and Po-Sheng Chiu
- 5. The Design and Implementation of a Cloud Resource Search System**  
Po-Sheng Chiu and Ying-Hong Pu
- 6. Authentic Learning Evaluation Method Applied to Information Security Education**  
Chyun-Chyi Chen
- 7. Using Computer-based Feedback Help Student Nurses Improving Accuracy of Performing Clinical Operations**  
Ying Geng and Po-Sen Huang
- 8. Exploring the Effectiveness of Deep Neural Networks with Technical Analysis Applied to Stock Market Prediction**  
Ming-Che Lee, Jia-Wei Chang, Jason C. Hung and Bae-Ling Chen
- 9. Semantic-aware Voice Assistant for IoT Environments with Hybrid Cloud Services**  
Jia-Wei Chang, Yu-Ting Haiso and Jason C. Hung

### Session 3-2 ---ICIA-3 DLHC

Chair: Dr. Seung Gyun Yoo

- 1. A Study of 2D multi-person Pose Estimation Distance Scaling on Images**  
Boney Labinghisa and Dong Myung Lee
- 2. A Study of Zero-Knowledge Circuit-based for Reduce Transaction Storage Cost**

Soonhyeong Jeong and Byeongtae Ahnbt

3. **A Study on the Factors of Performance Improvement in Manufacturing SMEs on Overseas Market**  
Seung Gyun Yoo
4. **Interactive Device for Rhythm Training Assistance**  
Yu-Xiang Zhao and Chia-Hsuan Wu
5. **Multijoint Robot Hand Design for Puppet Operation**  
Chien-Hsing Chou
6. **PTM: A Novel Approach for Visualizing Spatio-temporal Data**  
Juo-Yu Yang, Shih-Syun Lin, Yi-Zeng Hsieh, Chun-Chieh Wang
7. **Underwater ROV broken fishing net of detection system based on YOLO**  
Yi-Zeng Hsieh, Yu-Ting Chen, Po-Yen Lee

## **Session 4-1 ---ABcat**

Chair: Dr. Jason C. Hung

1. **The Design and Implementation of Blockchain-based Supply Chain System with Traceability**  
Chien-Ying Chen, Yu-Wei Chan, Chih-Hung Chang, Tsan-Ching Kang, Chun-Hong Huang and Yin-Te Tsai
2. **WiFi Location-based 3D Map for Device Connections**  
Chao-Tung Yang, Chen-Kun Tsung, Wei-Chen Chen, Jia-Hao Zhang, Shih-Kuang Chang and Ming-Shang Hsu
3. **Using Spark Distributed Deep Learning to Analyze NetFlow in Data Lake System**  
Cheng-Tian Jiang, Chao-Tung Yang, Yu-Wei Chan, Endah Kristiani and Jung-Chun Liu
4. **Using Long Short-Term Memory Deep Learning for Short-Term PM2.5 Prediction in Taiwan**  
Hao Lin, Wen-Yen Lin, Chao-Tung Yang and Jwu-Rong Lin
5. **A Container-Based of Edge Device Monitoring on Kubernetes**  
Halim Fathoni, Hao-Yi Yen, Chao-Tung Yang, Chin-Yin Huang and Endah Kristiani
6. **Flame Recognition System Using YoLo**  
Chao-Tung Yang, Wen-Yen Lin, Yi-Chun Chen and Zheng-Yao Wang
7. **Comparison of Influenza Disease Prediction Using ARIMA and LSTM models for Central Taiwan**  
Kieu Lan Phuong Nguyen, Ho-Wen Chen, Chao-Tung Yang and Endah Kristiani
8. **The Design and Implementation of Dynamic Costume Projection System**  
Chuan-Feng Chiu, Han-Yun Hsieh, Wei-Chuan Chung and Shwu-Huey Yen

## Session 4-2 --- Fi-Award

Chair: Dr. Neil Yen

### Fi-Award Competition

- **Design and Development of Photography VR Game**  
Advisor: Po-Sheng Chiu  
Students: Fu-Jie Liung, Shi-Jun Zeng, Yu-Shan Li, and Tzu-Ling Wang
- **Development of a Wearable Guide Device based on Convolutional Neural Network for Blind or Visually Impaired Persons**  
Advisor: Yi-Zeng Hsieh  
Students: Yen-Hsun Meng, Fu-Xiong Xu, and Kang-Hong Peng
- **SONAR Assisted Learning System**  
Advisor: Jia-Wei Chang and Jason C. Hung  
Students: Shih-Chuan Lin, Jia-Hsiang Chang, Yen-Yang Lin, and Jia-Wei Huan

## Session 4-3 --- NLFSP

Chair: Dr. Wei-Chen Wu

1. **Unidentified PII detection with a k-Nearest Neighbors Approach**  
Tzu-Yin Liao, Yu-Chih Wei, Wei-Chen Wu
2. **Artificial Intelligence Identification Model for Chronic Kidney Disease**  
Ya-Fang Cheng, Hsiu-An Lee, Chien-Yeh Hsu
3. **Using AI algorithm to Establish the CVD Risk Assessment Model**  
Yin-Chen Chen, Hsiu-An Lee, Chien-Yeh Hsu
4. **An Architecture of Real-World Data Database for Real-World Evidence Research**  
Hsiu-An Lee, Chien-Yeh Hsu
5. **An Innovation Study on Applying Deep Learning to Recognize Gesture in Sign Language**  
Chen-Hu Chou, Yu-Yu Yen, Yu-Chen Su, Horng-Twu Liaw, Wei-Chen Wu
6. **Research on Medical Information Exchange Mechanism of Blockchain Combined with Health Passbook**  
Ying-Che Huang, Yu-Yu Yen, Jui-Hung Kao, Horng-Twu Liaw, Wei-Chen Wu
7. **Using RoBERTa and Linguistic Features to Detect Fake News**  
Jhu-Jyun Huang, Yen-Heng Tsao, Zi-Ying Chen, You-Chuan Yang
8. **Developing an Accessibility Assessment System for Mobile Devices**  
Ting-Fang Wu, Chi-Nung Chu, Hui-Shan Lo

**9. A Mobile Module Design of Rhythm in Music Based on Practicing Strategy**  
Yu Ting Huang, Chi Nung Chu

**Day 3**  
**September 9, 2020**

**AM: Steering Committee Meeting**

**PM: Organizing Committee Meeting**