

# **2020 IEEE 5th International Conference on Cloud Computing and Big Data Analytics (ICCCBDA 2020)**

**Chengdu, China  
10 – 13 April 2020**



**IEEE Catalog Number: CFP20G32-POD  
ISBN: 978-1-7281-6025-2**

**Copyright © 2020 by the Institute of Electrical and Electronics Engineers, Inc.  
All Rights Reserved**

*Copyright and Reprint Permissions:* Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved.

***\*\*\* This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.***

IEEE Catalog Number:	CFP20G32-POD
ISBN (Print-On-Demand):	978-1-7281-6025-2
ISBN (Online):	978-1-7281-6024-5

**Additional Copies of This Publication Are Available From:**

Curran Associates, Inc  
57 Morehouse Lane  
Red Hook, NY 12571 USA  
Phone: (845) 758-0400  
Fax: (845) 758-2633  
E-mail: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

CURRAN ASSOCIATES INC.  
**proceedings**  
.com

# 2020 IEEE 5th International Conference on Cloud Computing and Big Data Analytics (ICCCBDA 2020)

## Table of Contents

<b>Preface</b> .....	xii
<b>Conference Committee</b> .....	xiii

---

---

### Intelligent Recommendation System and Intelligent Computing

Research on Advanced Maintenance Plan Model of emu Based on Particle Swarm Optimization Algorithm .....	1
<i>Hao Wei, Li Cailian, Yang Mingzhu, Gao ChangXia, Zhang Ning, Zhang Chun</i>	
Historical AIS Data-Driven Unsupervised Automatic Extraction of Directional Maritime Traffic Networks.....	7
<i>Nanhua Lu, Maohan Liang, Rongtao Zheng, Ryan Wen Liu</i>	
Similarity Measure of Time Series Based on Feature Extraction .....	13
<i>Zhengxin Li, Shihui Wu, Hongmei Zhang, Yongmei Zhao</i>	
Multi-Level Attentional Network for Aspect-based Sentiment Analysis.....	17
<i>Xinyuan Liu, Xiaojun Jing, Yuan He, Junsheng Mu</i>	
A User Behavior Clustering Algorithm Combines Association Rules and Multivalued Discrete Features ....	23
<i>Jin Dai, Hang Yin, Peng Zhang</i>	
Classification Method of Internet Catering Customer Based on Improved RFM Model and Cluster Analysis .....	28
<i>Xin Hu, Ziyang Shi, Yanfei Yang, Lanhua Chen</i>	
Mining Optimized Frequent Itemsets Based on Max-miner: A Distributed Approach.....	32
<i>Jin Dai, Liang Guo, Peng Zhang</i>	
Time Distribution Based Diversified Point of Interest Recommendation .....	37
<i>Fan Mo, Huida Jiao, Hayato Yamana</i>	
Trust-Aware Sequence Recommendation Based on Attention Mechanism.....	45
<i>Yeji Zeng, Zehui Qu, Bo Zhou</i>	

A Hierarchical Fine-Tuning Based Approach for Multi-label Text Classification ..... 51  
*Qiang Zhang, Bo Chai, Bochuan Song, Jingpeng Zhao*

A Social Recommendation Based on Metric Learning and Network Embedding..... 55  
*Xiaotong Li, Yan Tang*

## **Cloud Computing**

A Mechanism-Data Driven Fault Prediction Method Based on Cloud-Terminal Fusion ..... 61  
*Lu Jianfeng, Wei Jian, Zhao Zijie, Hu Juecheng*

A Risk Assessment Method of Smart Grid in Cloud Computing Environment Based on Game Theory ..... 67  
*Qimeng Li, Pengpeng Lv, Mengqiang Wang, Zhizhi Zhang, Shaoyin Wang, Pengbo Fang, Lifang Gao*

Research on Speaker Verification Based on Cloud Computing Platform..... 73  
*Mengjun Zeng, Nanfeng Xiao, Chao Ye, Ming Xiao*

Study of Demand-Side Resources Collaborative Optimization System Based on the Cloud & Edge Computing ..... 80  
*Donglei Sun, Xueliang Li, Long Zhao, Yan Wang, Xiangyang Cao, Jinhong Yang*

Abnormal Traffic Monitoring Methods Based on a Cloud Computing Platform ..... 85  
*Huang Shaohua, Xiao Nanfeng*

A Two-stage Approach for Virtual Resources Adaptive Scheduling in Container Cloud\* ..... 90  
*Qirui Li, Zhiping Peng, Delong Cui, Jieguang He*

A Cloud-Connected Autonomous Driving System ..... 96  
*Wenfu Wang, Hongda Deng, Miao Sun, Zhijie Pan*

Design and Development of Cloud System Used for Exhaust Emission Prediction and Warning in Spray Booth for Complex Products ..... 103  
*Yujie Ma, Rongyong Zhao, Yan Wang, Miyuan Li*

Computation Offloading Strategy Based on Deep Reinforcement Learning in Cloud-Assisted Mobile Edge Computing ..... 108  
*Yan Wang, Haibo Ge, Anqi Feng, Wenhao Li, Linhuan Liu, Haobo Jiang*

## **Neural Networks and Convolutional Networks**

Asynchronous Filtering for Takagi-Sugeno Fuzzy Neural Networks with General Transition Probabilities and Missing Measurements ..... 114  
*Yaonan Shan, Kun She, Shouming Zhong, Taotao Hu, Shiqiang Hao*

Fine-grained Scheduling in FPGA-Based Convolutional Neural Networks .....	120
<i>Wei Zhang, Xiaofei Liao, Hai Jin</i>	
Research on a Customer Churn Combination Prediction Model Based on Decision Tree and Neural Network .....	129
<i>Xin Hu, Yanfei Yang, Lanhua Chen, Siru Zhu</i>	
Design of Parallel Acceleration Method of Convolutional Neural Network Based on FPGA.....	133
<i>Yali Shi, Tong Gan, Shaobo Jiang</i>	
Mobile Edge Computing Offloading Strategy Based on Improved BP Neural Network .....	138
<i>Anqi Feng, Haibo Ge, Yan Wang, Jindou Wang, Wenhao Li, Keting Liu</i>	
A Compressed Deep Convolutional Neural Networks for Face Recognition.....	144
<i>Li Yao</i>	
A Robust Graph Convolutional Network for Relation Extraction by Combining Edge Information .....	150
<i>Haiqiang Chen, Luping Liu, Xin Zhou, Linbo Qing, Meiling Wang</i>	
AIS-Based Vessel Trajectory Reconstruction with U-Net Convolutional Networks .....	157
<i>Shichen Li, Maohan Liang, Xinyi Wu, Zhao Liu, Ryan Wen Liu</i>	
Time Series Segmentation of Flood Flow Based on Bi-LG-LSTM Neural Network .....	162
<i>Jun Feng, Haohang Wang, Yirui Wu</i>	
Attention Based BiLSTM-MCNN for Sentiment Analysis .....	170
<i>Xu Zhu, Shiqun Yin, Zongliang Chen</i>	
An Analysis Model of Project-Based Teaching Effect Using DNNs .....	175
<i>Wei Zhang</i>	
A TextCNN Based Approach for Multi-label Text Classification of Power Fault Data .....	179
<i>Qiang Zhang, Rongrong Zheng, Ziyang Zhao, Bo Chai, Jianguo Li</i>	
<b>Machine Learning</b>	
E-Commerce Comment Sentiment Classification Based on Deep Learning .....	184
<i>Meng Zhang</i>	
Research on Deep Learning Based Code Generation from Natural Language Description.....	188
<i>Jiaqi Zhu, Mingzhu Shen</i>	
Question Answering Based Assisted Decision for Electric Power Fault Diagnosis.....	194
<i>Qiang Zhang, Quanye Jia, Yuhuai Wang</i>	

A Method for User Credibility Evaluation on Online Business Review Services .....	199
<i>Weinan Zhang, Lianhai Wang, Xiaohui Han, Huxiao Liu, Xun He</i>	
Multi-step Forecast of Ending Balance Based on Machine Learning .....	206
<i>Menghai Kang, Jianjun Yu</i>	

## **Data Representation and Calculation**

Public Opinion Detection in an Online Lending Forum: Sentiment Analysis and Data Visualization .....	211
<i>Ge Zhan, Ming Wang, Meiyi Zhan</i>	
Machine Tools Thermal Error Modeling with Imbalanced Data Based on Transfer Learning .....	214
<i>Xiaomei Zhang, Can Wang, Ping Lou, Junwei Yan, Nianyun Liu</i>	
Label Distribution Learning on Imbalanced Data .....	219
<i>Guangyue Zhou, Kewen Li, Peng Xie, Jiannan Zhai, Jianbing Zhu</i>	
Multi-criteria Collaborative Filtering Based on Reliable Factor .....	224
<i>Yuan Wang, Yan Tang, Wei Jiang</i>	
Analysis of Self-Organizing Maps (SOM) Methods for Cell Clustering with High-Dimensional OAM Collected Data .....	229
<i>Shaoxuan Wang, Xiao Zhang</i>	
Visual Clustering Analysis of Electricity Data Based on t-SNE .....	234
<i>Feixiang Gong, Fanpeng Bu, Yufan Zhang, Yong Yan, Ruoyun Hu, Mingyu Dong</i>	
Power Consumption Forecast of Energy-intensive Enterprises Based on Power Marketing Business Data .....	241
<i>Zongwei Wang, Guoyi Zhao, Li Wang, Peng Jin, Xiaoyang Bu, Ruobing Dong</i>	
Implementation of CAPI and Traditional PCIe and Delay of Comparison .....	246
<i>Fudong Wang, Tao Zhang, Bingjie Zhao, Fan Yang, Qingxin Li, Ziyang Li</i>	
Study of Residential Price Index Based on Quantile Regression Model — A Case Study on Hangzhou, China .....	250
<i>Haizhen Wen, Yao Liu</i>	

## **Data Analysis and Data Processing**

Zero-Copy Data Transfer for an OpenCL API Remoting System .....	255
<i>Yunhao Zhang, Bo Zhang, Zhenhui Zhou</i>	

Prediction Research on Key Influencing Factors of Regional E-commerce Industry Development Based on Grey Data Analysis Model.....	260
<i>Wenyu Zhang, Danshu Wang, Yuting Zhu, Dadi Dong, Songmin Zhao</i>	
A Novel Algorithm with Reduced Mutual Information for Smart Meter Privacy Protection.....	265
<i>Xiaochao Yin, Hangfei An</i>	
The Application of Web Crawler in City Image Research.....	270
<i>Jiangying Xu, Lixin Du, Chunsun Duan, Mingyue Li</i>	
Multi-objective Optimization Control and Data Analysis of Intersection Considering Vehicle Exhaust Emission.....	275
<i>Zijun Liang, Yun Xiao, Yuedong Zhao, Huanxiao Liu</i>	
Data Processing Based on Variance Weighted Information Entropy and Maximally Stable Extremal Regions.....	280
<i>Linna Yang, Tao Xie, Jiang Yu, Leyu Zhai, Qing Tian</i>	
<b>Data Mining and Data Security</b>	
Research on Intelligent Security Protection of Privacy Data in Government Cyberspace.....	284
<i>Hui Yang, Liangqiang Huang, Chunfeng Luo, Qinyong Yu</i>	
Ensuring Data Confidentiality with a Secure XTS-AES Design in Flash Translation Layer.....	289
<i>Qionglu Zhang, Shijie Jia, Junlin He, Xinyi Zhao, Luning Xia, Yingjiao Niu, Jiwu Jing</i>	
Anomaly Access Detection Method Based on Multi-channel Data.....	295
<i>Fan Chunmei, Li Wen, Zhu Yingting, Yang Lipeng</i>	
Identification of Super Nodes in Data Streams from Network-Wide Traffic Measurement.....	301
<i>Aiping Zhou, Qi Zhao, Zhaoyi Wang, Jin Qian</i>	
Research and Analysis on the Distributed Database of Blockchain and Non-Blockchain.....	307
<i>Yajun Wang, Chao-Hsien Hsieh, Changfeng Li</i>	
Research and Implementation on an Efficient Public Key Encryption Algorithm with Keyword Search Scheme.....	314
<i>Zeyue Zhang, Zhouzhi Wang, Shuyu Li</i>	
Prediction Research on the Aggregation Degree of Regional Science and Technology Innovation Talents.....	320
<i>Wenyu Zhang, Qi Yu, Jia Liu, Xiaoning Liu, Yu Zhi</i>	
Imbalanced Classification Based on Over-sampling and Feature Selection.....	325
<i>Qian Wang</i>	

The Application of Data Mining in Fault Location of Computer Interlocking System in Railway Signling ... 331  
*Huang Lujiang*

## **Image Processing and Algorithms**

Image Classification to Diagnose Chronic Atrophic Gastritis Based on Squeeze-and-Excitation Block..... 336  
*Jiamin Gong, Doudou Ma, Yaqiong Zhang, Jiewei Jiang, Mengjie Pei*

Multi-Scale Dense Selective Kernel Spatial Attention Network for Single Image De-raining\* ..... 341  
*Zhenhuan Peng, Qia Li, Sai Liang*

Learning a Multi-scale Deep Residual Network of Dilated-Convolution for Image Denoising ..... 348  
*Gongping Chen, Zhisheng Gao, Peijian Zhu, Zhenji Chen*

A Fast and Accurate Face Alignment Method Based on Deep Learning on Mobile Device..... 354  
*Huaping Liu*

Efficient and Privacy-preserving Online Biometric Authentication Scheme..... 358  
*Zelun Yue, Yiliang Han, Tanping Zhou, Bo Zhao*

Instance Segmentation Based on Superpixel Module and Attention Module..... 365  
*Lei Lei, Haoyu Zhou, Chuanhong Zhou, Ying Xu*

Aggregation-Based Attributed Graph Summarization..... 370  
*Bochuan Song, Bo Chai, Yuhuai Wang, Zhipeng Yang, Shang Yang*

## **Intelligent Identification Technology and Application**

Recognition and Classification of Petrochemical Leakage Risk Based on Safety Big Data ..... 375  
*Wang Yunlong, Guo Xiaoyan, Zhang Guozhi, Mu Bo, Wang Tingchun, Wan Gujun*

Abnormal Behavior Recognition in an Examination Based on Pose Spatio-Temporal Features ..... 380  
*Chang Liu, Hao Zhou, Huan-Chen Xu, Bao-Yu Hou, Lan Yao*

Research and Implementation of Identity Recognition Based on Multi-Feature Fusion ..... 387  
*Kangli Ma, Rong Yu, Zhiquan Cao, Pengyun Wang, Zhibin Zhao*

Analysis of Vessel Anomalous Behavior Based on Bayesian Recurrent Neural Network ..... 393  
*Zhongyu Xia, Shu Gao*

An Integrated Approach for Face Recognition Using Multi-class SVM ..... 398  
*Abuzar Md. Nuruddin Pk., Xuwen Ding, Tom Page*

Irregular Action Recognition in Court with 3D Residual Network..... 403  
*Song Liu, Qiaolin He, Zhu Wang, Yifei Pu, Yi Zhang*

Identification and Analysis of Urban Functional Areas Based on VGI Data .....	408
<i>Shi Wen-xin, Gong Yun</i>	

## **Data Communication and Information System**

QPSK Sequences Based on Multiple Orthogonal Subsets for High-Data-Rate M-ary Spread Spectrum OFDM Communications .....	415
--	-----

*Chenrun Liu, Zhenyu Zhang, Guixin Xuan*

Joint Consolidated Middleboxes and Virtual Switch Deployment and Routing for Load Balancing in Software-Defined Network .....	420
---	-----

*Juncheng Ge, Gongming Zhao, Xuwei Yang*

Research on Terminal Credibility with Power Internet of Things Based on Behavior Measurement Mechanism .....	426
--	-----

*Jian Gao, Licheng Wang, Chao Huo, Ganghong Zhang, Jianan Yuan, Yujie Xu*

Wireless Traffic Prediction Based on Bayesian Seasonal Adjustment Algorithm .....	431
---	-----

*Xi Wang, Qiang Zhou*

Max-min Placement Optimization for UAV Enabled Wireless Powered Networks with Non-linear Energy Harvesting Model .....	436
--	-----

*Pengtao Zhang, Zhengqiang Wang, Qianyuan Zhang, Yang Liu, Xiaoyu Wan, Zifu Fan*

Online Extracting Sessions of Frequent Users .....	440
--	-----

*Yijun Bei, Zhengong Cai*

## **Big Data Science and Key Technologies**

Finding Next High-Quality Passenger Based on Spatio-Temporal Big Data .....	447
---	-----

*Yuepeng Chen, Qingwen Fu, Jiahui Zhu*

Spatial Correlation Analysis of Residential Area and Service Industry Distribution Based on POI Big Data .....	453
--	-----

*Shan Bao-yan, Wang Jun-ning, Liu Yang-yang, Zhang Zhi-xuan*

Operation Framework of the Command Information System Based on Big Data Analysis .....	459
--	-----

*Liya Jin, Meng Xing, Ronghui Wang*

A Model-Driven Parallel Processing System for IoT Data Based on User-Defined Functions.....	463
---	-----

*Jianqiao Luo, Li Zhang, Xuan Li*

Big Data and Price Discrimination.....	471
--	-----

*Xuesong Zhao*

Big Data Oriented Light-Load Embedded Performance Modeling .....	476
<i>Jinfeng Dou, Jiabao Cao, Xin Li, Lijuan Wang, Shuya Tang</i>	
The Workload Assessment of National Grid Big Data Projects Based on Content Recommendations and Text Classification.....	482
<i>Zhou Chunlei, Jia Yin, Xu Qianli</i>	
Forecasting the Visits to Scenic Areas Based on Internet Big Data .....	491
<i>Huiying Wang, Xiangyan Liu, Zhaoqiang Wang</i>	
<b>Computer Science and Information Technology</b>	
Research and Implementation of QA System Based on the Knowledge Graph of Chinese Classic Poetry .....	495
<i>Zongliang Chen, Shiqun Yin, Xu Zhu</i>	
Application of Parameter Coupling in Developing Intelligent Decision System.....	500
<i>Lei Li, Liexiang Han, Weicheng Li</i>	
Learned Dictionaries-Based Watermarking for Speech Authentication.....	504
<i>Canghong Shi, Hongxia Wang, Xiaojie Li</i>	
Energy Consumption and Time Delay Optimization of MEC Based on Multi-Dimensional Game.....	514
<i>Hui Wang, Yi Wang, Xingjun Lu, Yanjun Hu</i>	
A Cooperative Vehicles Selection Method Based on Privacy-Preserving Driving Routes Comparison for Urban Scenarios.....	519
<i>Xiuxiu Wen, Peiyun Liu</i>	
Detecting Fake News on Social Media: A Multi-Source Scoring Framework .....	524
<i>Huxiao Liu, Lianhai Wang, Xiaohui Han, Weinan Zhang, Xun He</i>	
Online Purchase Behavior Prediction and Analysis Using Ensemble Learning .....	532
<i>Xiaotong Dou</i>	
Spatial and Temporal Analyses of Fire Incidents in San Francisco from 2010 to 2019 .....	537
<i>Zhan Wang, Guoqing Zhu, Ying Zhou, Tianwei Chu, Guoqiang Chai, Zhijian Tian</i>	
Using the Rgb Image of Machine Code to Classify the Malware .....	542
<i>Jinrong Chen, Xiaoqi Jia, Chongming Zhao, Weijuan Zhang, Qingjia Huang</i>	
An Attention-Based BILSTM-CRF for Chinese Named Entity Recognition .....	550
<i>Qing Zhong, Yan Tang</i>	

Research on Intelligent Bit Design and Manufacturing Technology ..... 556  
*Ran Qihua, Fulei Wan, Dengyun Lu, Hu Deng, Zhilin Li, Lin Zhang*

Design and Research of Analog Data Pool of Intelligent Manufacturing Oriented to Impeller..... 561  
*Guangrong Li, Yuanguo Cao, Yongqiang Bao, Haofeng Chen, Sufang Zhao*

Estimating Remaining Driving Range of Electric Vehicles Using BPNN Based on Real-world Data..... 566  
*Wei Zhong, Kai-Sheng Huang, Zhong-Liang Lu, Wei-Wen Chen*

**Author Index**