

# Lecture Notes of the Institute for Computer Sciences, Social Informatics and Telecommunications Engineering

350

## Editorial Board Members

Ozgur Akan

*Middle East Technical University, Ankara, Turkey*

Paolo Bellavista

*University of Bologna, Bologna, Italy*

Jiannong Cao

*Hong Kong Polytechnic University, Hong Kong, China*

Geoffrey Coulson

*Lancaster University, Lancaster, UK*

Falko Dressler

*University of Erlangen, Erlangen, Germany*

Domenico Ferrari

*Università Cattolica Piacenza, Piacenza, Italy*

Mario Gerla

*UCLA, Los Angeles, USA*

Hisashi Kobayashi

*Princeton University, Princeton, USA*

Sergio Palazzo

*University of Catania, Catania, Italy*

Sartaj Sahni

*University of Florida, Gainesville, USA*

Xuemin (Sherman) Shen 

*University of Waterloo, Waterloo, Canada*

Mircea Stan

*University of Virginia, Charlottesville, USA*

Xiaohua Jia

*City University of Hong Kong, Kowloon, Hong Kong*

Albert Y. Zomaya

*University of Sydney, Sydney, Australia*

More information about this series at <http://www.springer.com/series/8197>

Honghao Gao · Xinheng Wang ·  
Muddesar Iqbal · Yuyu Yin ·  
Jianwei Yin · Ning Gu (Eds.)

# Collaborative Computing: Networking, Applications and Worksharing

16th EAI International Conference, CollaborateCom 2020  
Shanghai, China, October 16–18, 2020  
Proceedings, Part II

*Editors*

Honghao Gao  
Shanghai University  
Shanghai, China

Muddesar Iqbal  
London South Bank University  
London, UK

Jianwei Yin  
Zhejiang University  
Hangzhou, China

Xinheng Wang  
Xi'an Jiaotong-Liverpool University  
Suzhou, China

Yuyu Yin  
Hangzhou Dianzi University  
Hangzhou, China

Ning Gu  
Fudan University  
Shanghai, China

ISSN 1867-8211

ISSN 1867-822X (electronic)

Lecture Notes of the Institute for Computer Sciences, Social Informatics  
and Telecommunications Engineering

ISBN 978-3-030-67539-4

ISBN 978-3-030-67540-0 (eBook)

<https://doi.org/10.1007/978-3-030-67540-0>

© ICST Institute for Computer Sciences, Social Informatics and Telecommunications Engineering 2021

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, expressed or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

This Springer imprint is published by the registered company Springer Nature Switzerland AG  
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

# Preface

We are delighted to introduce the proceedings of the 16th European Alliance for Innovation (EAI) International Conference on Collaborative Computing: Networking, Applications and Worksharing (CollaborateCom 2020). This conference brought together researchers, developers and practitioners around the world who are interested in fully realizing the promise of electronic collaboration with special attention to the aspects of networking, technology and systems, user interfaces and interaction paradigms, and interoperation with application-specific components and tools.

The technical program of CollaborateCom 2020 selected 77 papers from 211 paper submissions, comprising 61 full papers, 13 short papers and 3 workshop papers in oral presentation sessions in the main conference tracks. The conference sessions were: Collaborative Applications for Network and E-Commerce; Optimization for Collaborative Systems; Cloud and Edge Computing; Artificial Intelligence; AI Application and Optimization; Edge Computing and CollaborateNet; Classification and Recommendation; Internet of Things; Collaborative Robotics and Autonomous Systems; Resource Management; Smart Transportation; Resource Management in Artificial Intelligence; Short paper Track and Workshop Track. Apart from high-quality technical paper presentations, the technical program also featured two keynote speeches and two technical workshops. The two keynote speeches were delivered by Dr Fumiyuki Adachi from Tohoku University and Dr. Deke Guo from National University of Defense Technology. The two workshops organized were Securing IoT Networks (SITN) and Collaborative Networking Technologies towards Future Networks (CollaborateNet). The SITN workshop aims to bring together expertise from academia and industry to build secure IoT infrastructures for smart society. The CollaborateNet workshop aims to facilitate all efforts to advance current networks towards content-centric future networks using collaborative networking technologies.

Coordination with the steering chair, Imrich Chlamtac, was essential for the success of the conference. We sincerely appreciate his constant support and guidance. It was also a great pleasure to work with such an excellent organizing committee team for their hard work in organizing and supporting the conference, in particular, the Technical Program Committee, led by our General Chairs and TPC Co-Chairs, Dr. Ning Gu, Dr. Jianwei Yin, Dr. Xinheng Wang, Dr. Honghao Gao, Dr. Yuyu Yin and Dr. Muddesar Iqbal, who completed the peer-review process of the technical papers and made a high-quality technical program. We are also grateful to the Conference Manager, Karolina Marcínova, for her support and to all the authors who submitted their papers to the CollaborateCom 2020 conference and workshops.

We strongly believe that the CollaborateCom conference provides a good forum for all researchers, developers and practitioners to discuss all scientific and technical

aspects that are relevant to collaborative computing. We also expect that the future CollaborateCom conferences will be as successful and stimulating, as indicated by the contributions presented in this volume.

December 2020

Honghao Gao  
Xinheng Wang

# Conference Organization

## Steering Committee

### Chair

Imrich Chlamtac

Bruno Kessler Professor, University of Trento

### Members

Song Guo

The University of Aizu, Japan

Bo Li

The Hong Kong University of Science and Technology

Xiaofei Liao

Huazhong University of Science and Technology

Xinheng Wang

Xi'an Jiaotong-Liverpool University

Honghao Gao

Shanghai University

## Organizing Committee

### International Advisory Committee

Velimir Srića

University of Zagreb, Croatia

Mauro Pezze

Università di Milano-Bicocca, Italy

Yew-Soon Ong

Nanyang Technological University, Singapore

### General Chairs

Ning Gu

Fudan University

Jianwei Yin

Zhejiang University

Xinheng Wang

Xi'an Jiaotong-Liverpool University

### TPC Chair and Co-chairs

Honghao Gao

Shanghai University

Yuyu Yin

Hangzhou Dianzi University

Muddesar Iqbal

London South Bank University

### Local Chairs

Zhongqin Bi

Shanghai University of Electric Power

Yihai Chen

Shanghai University

### Workshops Chairs

Yusheng Xu

Xidian University

Tasos Dagiklas

London South Bank University

Shahid Mumtaz

Instituto de Telecomunicações

### **Publicity and Social Media Chairs**

Li Kuang	Central South University
Anwer Al-Dulaimi	EXFO Inc
Andrei Tchernykh	CICESE Research Center
Ananda Kumar	Christ College of Engineering and Technology

### **Publications Chairs**

Youhuizi Li	Hangzhou Dianzi University
Azah Kamilah Binti Draman	Universiti Teknikal Malaysia Melaka

### **Web Chair**

Xiaoxian Yang	Shanghai Polytechnic University
---------------	---------------------------------

## **Technical Program Committee**

### **CollaborateNet Workshop**

Amando P. Singun, Jr.	Higher College of Technology
BalaAnand Muthu	V.R.S. College of Engineering & Technology
Boubakr Nour	Beijing Institute of Technology
Chaker Abdelaziz Kerrache	Huazhong University of Science and Technology
Chen Wang	Huazhong University of Science and Technology
Chi-Hua Chen	Fuzhou University
Fadi Al-Turjman	Near East University
Muhammad Atif Ur Rehman	Hongik University
Rui Cruz	Universidade de Lisboa/INESC-ID
Suresh Limkar	AISSMS Institute of Information Technology

### **Collaborative Robotics and Autonomous Systems**

Craig West	Bristol Robotics Lab
Inmo Jang	The University of Manchester
Keir Groves	The University of Manchester
Ognjen Marjanovic	The University of Manchester
Pengzhi Li	The University of Manchester
Wei Cheah	The University of Manchester

### **Internet of Things**

Chang Yan	Chengdu University of Information Technology
Fuhu Deng	University of Electronic Science and Technology of China
Haixia Peng	University of Waterloo
Jianfei Sun	University of Electronic Science and Technology of China



Kai Zhou	Sichuan University
Mushu Li	University of Waterloo
Ning Zhang	Texas A&M University-Corpus Christi
Qiang Gao	University of Electronic Science and Technology of China
Qixu Wang	Sichuan University
Ruijin Wang	University of Electronic Science and Technology of China
Shengke Zeng	Xihua University
Wang Dachen	Chengdu University of Information Technology
Wei Jiang	Sichuan Changhong Electric Co., Ltd
Wen Wu	University of Waterloo
Wen Xiang	Texas A&M University-Corpus Christi
Wu Xuangou	Anhui University of Technology
Xiaojie Fang	Harbin Institute of Technology
Xuangou Wu	Anhui University of Technology
Yaohua Luo	Chengdu University of Technology
Zhen Qin	University of Electronic Science and Technology of China
Zhou Jie	Xihua University

### Main Track

Bin Cao	Zhejiang University of Technology
Ding Xu	Hefei University of Technology
Fan Guisheng	East China University of Science and Technology
Haiyan Wang	Nanjing University of Posts & Telecommunications
Honghao Gao	Shanghai University
Jing Qiu	Guangzhou University
Jiwei Huang	China University of Petroleum
Jun Zeng	Chongqing University
Lizhen Cui	Shandong University
Rong Jiang	Yunnan University of Finance and Economics
Shizhan Chen	Tianjin University
Tong Liu	Shanghai University
Wei He	Shandong University
Wei Du	University of Science and Technology Beijing
Xiong Luo	University of Science and Technology Beijing
Yu Weng	Minzu University of China
Yucong Duan	Hainan University
Zijian Zhang	University of Auckland, New Zealand

### SITN Workshop

A. S. M. Sanwar Hosen	Jeonbuk National University
Aniello Castiglione	Parthenope University of Naples
Aruna Jamdagni	Western Sydney University

Chunhua Sun	The University of Aizu, Japan
Deepak Puthal	Newcastle University
Jinguang Han	Queen's University Belfast
Julio Hernandez-Castro	University of Kent
Kashif Saleem	King Saud University
Md Zakirul Alam Bhuiyan	Fordham University
Mian Jan	University of Technology Sydney
Mohiuddin Ahmed	Canberra Institute of Technology
Nikolaos Pitropakis	Edinburgh Napier University
Qingchen Zhang	St. Francis Xavier University
Qingru Li	Hebei Normal University
Saurabh Singh	Dongguk University
Shancang Li	UWE Bristol
Syed Bilal Hussain Shah	Dalian University of Technology
Weizhi Meng	Technical University of Denmark
Yang Xu	Hunan University
Yongjun Zhao	Nanyang Technological University
Zhihong Tian	Guangzhou University

## Contents – Part II

### Collaborative Robotics and Autonomous Systems

Self-organised Flocking with Simulated Homogeneous Robotic Swarm . . . . .	3
<i>Zhe Ban, Craig West, Barry Lennox, and Farshad Arvin</i>	
Investigation of Cue-Based Aggregation Behaviour in Complex Environments . . . . .	18
<i>Shiyi Wang, Ali E. Turgut, Thomas Schmickl, Barry Lennox, and Farshad Arvin</i>	
Towards Efficient and Privacy-Preserving Service QoS Prediction with Federated Learning. . . . .	37
<i>Yilei Zhang, Xiao Zhang, and Xinyuan Li</i>	
A Reinforcement Learning Based Approach to Identify Resource Bottlenecks for Multiple Services Interactions in Cloud Computing Environments . . . . .	58
<i>Lingxiao Xu, Minxian Xu, Richard Semmes, Hui Li, Hong Mu, Shuangquan Gui, Wenhong Tian, Kui Wu, and Rajkumar Buyya</i>	
Differentially Private Location Preservation with Staircase Mechanism Under Temporal Correlations . . . . .	75
<i>Rong Fang, Jianmin Han, Juan Yu, Xin Yao, Hao Peng, and Jianfeng Lu</i>	

### Resource Management

Mobile Edge Server Placement Based on Bionic Swarm Intelligent Optimization Algorithm . . . . .	95
<i>Feiyan Guo, Bing Tang, Linyao Kang, and Li Zhang</i>	
A MOEAD-Based Approach to Solving the Staff Scheduling Problem. . . . .	112
<i>Feng Hong, Hao Chen, Bin Cao, and Jing Fan</i>	
A Deep Reinforcement Learning Based Resource Autonomic Provisioning Approach for Cloud Services . . . . .	132
<i>Qing Zong, Xiangwei Zheng, Yi Wei, and Hongfeng Sun</i>	
End-to-End QoS Aggregation and Container Allocation for Complex Microservice Flows . . . . .	154
<i>Min Zhou, Yingbo Wu, and Jie Wu</i>	

A DQN-Based Approach for Online Service Placement in Mobile Edge Computing . . . . .	169
<i>Xiaogan Jie, Tong Liu, Honghao Gao, Chenhong Cao, Peng Wang, and Weiqin Tong</i>	
A Hybrid Collaborative Virtual Environment with Heterogeneous Representations for Architectural Planning . . . . .	184
<i>Krishna Bharadwaj and Andrew E. Johnson</i>	
<b>Smart Transportation</b>	
T2I-CycleGAN: A CycleGAN for Maritime Road Network Extraction from Crowdsourcing Spatio-Temporal AIS Trajectory Data . . . . .	203
<i>Xuankai Yang, Guiling Wang, Jiahao Yan, and Jing Gao</i>	
Where Is the Next Path? A Deep Learning Approach to Path Prediction Without Prior Road Networks. . . . .	219
<i>Guiling Wang, Mengmeng Zhang, Jing Gao, and Yanbo Han</i>	
HMM-Based Traffic State Prediction and Adaptive Routing Method in VANETs . . . . .	236
<i>Kaihan Gao, Xu Ding, Juan Xu, Fan Yang, and Chong Zhao</i>	
A Hybrid Deep Learning Approach for Traffic Flow Prediction in Highway Domain . . . . .	253
<i>Zhe Wang, Weilong Ding, and Hui Wang</i>	
HomoNet: Unified License Plate Detection and Recognition in Complex Scenes . . . . .	268
<i>Yuxin Yang, Wei Xi, Chenkai Zhu, and Yihan Zhao</i>	
<b>Resource Management in Artificial Intelligence</b>	
Reactive Workflow Scheduling in Fluctuant Infrastructure-as-a-Service Clouds Using Deep Reinforcement Learning . . . . .	285
<i>Qinglan Peng, Wanbo Zheng, Yunni Xia, Chunrong Wu, Yin Li, Mei Long, and Xiaobo Li</i>	
BPA: The Optimal Placement of Interdependent VNFs in Many-Core System . . . . .	305
<i>Youbing Zhong, Zhou Zhou, Xuan Liu, Da Li, Meijun Guo, Shuai Zhang, Qingyun Liu, and Li Guo</i>	
Cooperative Source Seeking in Scalar Field: A Virtual Structure-Based Spatial-Temporal Method. . . . .	320
<i>Cheng Xu, Yulin Chen, Shihong Duan, Hang Wu, and Yue Qi</i>	

BiC-DDPG: Bidirectionally-Coordinated Nets for Deep Multi-agent Reinforcement Learning . . . . .	337
<i>Gongju Wang, Dianxi Shi, Chao Xue, Hao Jiang, and Yajie Wang</i>	
FocAnnot: Patch-Wise Active Learning for Intensive Cell Image Segmentation . . . . .	355
<i>Bo Lin, Shuiguang Deng, Jianwei Yin, Jindi Zhang, Ying Li, and Honghao Gao</i>	
<b>Short Paper Track</b>	
EFMLP: A Novel Model for Web Service QoS Prediction . . . . .	375
<i>Kailing Ye, Huiqun Yu, Guisheng Fan, and Liqiong Chen</i>	
Automated Detection of Standard Image Planes in 3D Echocardiographic Images . . . . .	386
<i>Wei Peng, XiaoPing Liu, and Lanping Wu</i>	
Distributed Color-Based Particle Filter for Target Tracking in Camera Network . . . . .	396
<i>Yueqing Jing and Yanming Chen</i>	
Towards a Trusted Collaborative Medical Decision-Making Platform. . . . .	407
<i>Hamza Sellak, Mohan Baruwal Chhetri, and Marthie Grobler</i>	
Code Prediction Based on Graph Embedding Model . . . . .	419
<i>Kang Yang, Huiqun Yu, Guisheng Fan, Xingguang Yang, and Liqiong Chen</i>	
Technical Implementation Framework of AI Governance Policies for Cross-Modal Privacy Protection . . . . .	431
<i>Yuxiao Lei, Yucong Duan, and Mengmeng Song</i>	
Toward Sliding Time Window of Low Watermark to Detect Delayed Stream Arrival . . . . .	444
<i>Xiaoqian Zhang and Kun Ma</i>	
A Novel Approach for Seizure Classification Using Patient Specific Triggers: Pilot Study . . . . .	455
<i>Jamie Pordoy, Ying Zhang, and Nasser Matoorian</i>	
Cooperative Pollution Source Exploration and Cleanup with a Bio-inspired Swarm Robot Aggregation . . . . .	469
<i>Arash Sadeghi Amjadi, Mohsen Raoufi, Ali Emre Turgut, George Broughton, Tomáš Krajník, and Farshad Arvin</i>	

A Tamper-Resistant and Decentralized Service for Cloud Storage Based on Layered Blockchain . . . . .	482
<i>Fuxiao Zhou, Haopeng Chen, and Zhijian Jiang</i>	
Multi-UAV Adaptive Path Planning in Complex Environment Based on Behavior Tree . . . . .	494
<i>Wendi Wu, Jinghua Li, Yunlong Wu, Xiaoguang Ren, and Yuhua Tang</i>	
Budget Constraint Task Allocation for Mobile Crowd Sensing with Hybrid Participant . . . . .	506
<i>Xin Wang, Peng Li, and Junlei Xiao</i>	
A Unified Bayesian Model of Community Detection in Attribute Networks with Power-Law Degree Distribution . . . . .	518
<i>Shichong Zhang, Yinghui Wang, Wenjun Wang, Pengfei Jiao, and Lin Pan</i>	
<b>Workshop Track</b>	
A New Collaborative Scheduling Mechanism Based on Grading Mapping for Resource Balance in Distributed Object Cloud Storage System . . . . .	533
<i>Yu Lu, Ningjiang Chen, Wenjuan Pu, and Ruifeng Wang</i>	
A Blockchain Based Cloud Integrated IoT Architecture Using a Hybrid Design . . . . .	550
<i>Ch Rupa, Gautam Srivastava, Thippa Reddy Gadekallu, Praveen Kumar Reddy Maddikunta, and Sweta Bhattacharya</i>	
User Perspective Discovery Method Based on Deep Learning in Cloud Service Community . . . . .	560
<i>Lei Yu, Yaoyao Wen, and Shanshan Liang</i>	
<b>Author Index</b> . . . . .	575

# Contents – Part I

## Collaborative Applications for Network and E-Commerce

Towards Accurate Search for E-Commerce in Steel Industry: A Knowledge-Graph-Based Approach . . . . .	3
<i>Maojian Chen, Hailun Shen, Ziyang Huang, Xiong Luo, and Junluo Yin</i>	
WSN Coverage Optimization Based on Two-Stage PSO . . . . .	19
<i>Wei Qi, Huiqun Yu, Guisheng Fan, Liang Chen, and Xinxiu Wen</i>	
A Covert Ultrasonic Phone-to-Phone Communication Scheme . . . . .	36
<i>Liming Shi, Limin Yu, Kaizhu Huang, Xu Zhu, Zhi Wang, Xiaofei Li, Wenwu Wang, and Xinheng Wang</i>	
An Efficient and Truthful Online Incentive Mechanism for a Social Crowdsensing Network . . . . .	49
<i>Lu Fang, Tong Liu, Honghao Gao, Chenhong Cao, Weimin Li, and Weiqin Tong</i>	
CPNSA: Cascade Prediction with Network Structure Attention . . . . .	64
<i>Chaochao Liu, Wenjun Wang, Pengfei Jiao, Yueheng Sun, Xiaoming Li, and Xue Chen</i>	

## Optimization for Collaborate System

Speech2Stroke: Generate Chinese Character Strokes Directly from Speech . . .	83
<i>Yinhui Zhang, Wei Xi, Zhao Yang, Sitao Men, Rui Jiang, Yuxin Yang, and Jizhong Zhao</i>	
TAB: CSI Lossless Compression for MU-MIMO Network . . . . .	95
<i>Qigui Xu, Wei Xi, Lubing Han, and Kun Zhao</i>	
Towards Mobility-Aware Dynamic Service Migration in Mobile Edge Computing . . . . .	115
<i>Fangzheng Liu, Bofeng Lv, Jiwei Huang, and Sikandar Ali</i>	
Research on Debugging Interaction of IoT Devices Based on Visible Light Communication. . . . .	132
<i>Jiefan Qiu, Chenglin Li, Yuanchu Yin, and Mingsheng Cao</i>	
Attacking the Dialogue System at Smart Home. . . . .	148
<i>Erqiang Deng, Zhen Qin, Meng Li, Yi Ding, and Zhiguang Qin</i>	

Boosting the Performance of Object Detection CNNs with Context-Based Anomaly Detection . . . . .	159
<i>Jan Blaha, George Broughton, and Tomáš Krajník</i>	

## Cloud and Edge Computing

The Design and Implementation of Secure Distributed Image Classification Model Training System for Heterogenous Edge Computing . . . . .	179
<i>Cong Cheng, Huan Dai, Lingzhi Li, Jin Wang, and Fei Gu</i>	

HIM: A Systematic Model to Evaluate the Health of Platform-Based Service Ecosystems . . . . .	199
<i>Yiran Feng, Zhiyong Feng, Xiao Xue, and Shizhan Chen</i>	

SETE: A Trans-Boundary Evolution Model of Service Ecosystem Based on Diversity Measurement . . . . .	217
<i>Tong Gao, Zhiyong Feng, Shizhan Chen, and Xue Xiao</i>	

A DNN Inference Acceleration Algorithm in Heterogeneous Edge Computing: Joint Task Allocation and Model Partition . . . . .	237
<i>Lei Shi, Zhigang Xu, Yi Shi, Yuqi Fan, Xu Ding, and Yabo Sun</i>	

A Novel Probabilistic-Performance-Aware and Evolutionary Game-Theoretic Approach to Task Offloading in the Hybrid Cloud-Edge Environment . . . . .	255
<i>Ying Lei, Wanbo Zheng, Yong Ma, Yunni Xia, and Qing Xia</i>	

## Artificial Intelligence

Identification of Sequential Feature for Volcanic Ash Cloud Using FNN-LSTM Collaborative Computing . . . . .	273
<i>Lan Liu, Cheng-fan Li, Xian-kun Sun, and Jiangang Shi</i>	

Hybrid CF on Modeling Feature Importance with Joint Denoising AutoEncoder and SVD++ . . . . .	290
<i>Qing Yang, Heyong Li, Ya Zhou, Jingwei Zhang, and Stelios Fuentes</i>	

Sentiment Analysis of Film Reviews Based on Deep Learning Model Collaborated with Content Credibility Filtering . . . . .	305
<i>Xindong You, Xueqiang Lv, Shangqian Zhang, Dawei Sun, and Shang Gao</i>	

Essence Computation Oriented Multi-semantic Analysis Crossing Multi-modal DIKW Graphs . . . . .	320
<i>Shijing Hu, Yucong Duan, and Mengmeng Song</i>	



Distributed Reinforcement Learning with States Feature Encoding and States Stacking in Continuous Action Space . . . . .	340
<i>Tianqi Xu, Dianxi Shi, Zhiyuan Wang, Xucan Chen, and Yaowen Zhang</i>	

## AI Application and Optimization

An Efficient Approach for Parameters Learning of Bayesian Network with Multiple Latent Variables Using Neural Networks and P-EM . . . . .	357
<i>Kaiyu Song, Kun Yue, Xinran Wu, and Jia Hao</i>	
DECS: Collaborative Edge-Edge Data Storage Service for Edge Computing. . .	373
<i>Fuxiao Zhou and Haopeng Chen</i>	
DCT: A Deep Collaborative Filtering Approach Based on Content-Text Fused for Recommender Systems . . . . .	392
<i>Zhiqiao Zhang, Junhao Wen, and Jianing Zhou</i>	
Real-Time Self-defense Approach Based on Customized Netlink Connection for Industrial Linux-Based Devices. . . . .	406
<i>Ming Wan, Jiawei Li, and Jiangyuan Yao</i>	
API Misuse Detection Based on Stacked LSTM . . . . .	421
<i>Shuyin OuYang, Fan Ge, Li Kuang, and Yuyu Yin</i>	

## Edge Computing and CollaborateNet

Location-Aware Edge Service Migration for Mobile User Reallocation in Crowded Scenes . . . . .	441
<i>Xuan Xiao, Yin Li, Yunni Xia, Yong Ma, Chunxu Jiang, and Xingli Zhong</i>	
Bidding Strategy Based on Adaptive Differential Evolution Algorithm for Dynamic Pricing IaaS Instances . . . . .	458
<i>Dawei Kong, Guangze Liu, Li Pan, and Shijun Liu</i>	
SBiNE: Signed Bipartite Network Embedding . . . . .	479
<i>Youwen Zhang, Wei Li, Dengcheng Yan, Yiwen Zhang, and Qiang He</i>	
Usable and Secure Pairing Based on Handshake for Wrist-Worn Smart Devices on Different Users. . . . .	493
<i>Xiaohan Huang, Guichuan Zhao, Qi Jiang, Xindi Ma, Youliang Tian, and Jianfeng Ma</i>	

## Classification and Recommendation

SC-GAT: Web Services Classification Based on Graph Attention Network. . .	513
<i>Mi Peng, Buqing Cao, Junjie Chen, Jianxun Liu, and Bing Li</i>	

<b>A Novel Multidimensional Comments and Co-preference Aware Recommendation Algorithm . . . . .</b>	<b>530</b>
<i>Yanmei Zhang, Nana Song, Xiaoyi Tang, and Huaihu Cao</i>	
<b>A Deep Recommendation Framework for Completely New Users in Mashup Creation . . . . .</b>	<b>550</b>
<i>Yanmei Zhang, Jinglin Su, and Shiping Chen</i>	
<b>Combining Feature Selection Methods with BERT: An In-depth Experimental Study of Long Text Classification . . . . .</b>	<b>567</b>
<i>Kai Wang, Jiahui Huang, Yuqi Liu, Bin Cao, and Jing Fan</i>	
<b>Defending Use-After-Free via Relationship Between Memory and Pointer . . .</b>	<b>583</b>
<i>Guangquan Xu, Miao Li, Xiaotong Li, Kai Chen, Ran Wang, Wei Wang, Kaitai Liang, Qiang Tang, and Shaoying Liu</i>	
<b>Internet of Things</b>	
<b>Networked Multi-robot Collaboration in Cooperative–Competitive Scenarios Under Communication Interference . . . . .</b>	<b>601</b>
<i>Yaowen Zhang, Dianxi Shi, Yunlong Wu, Yongjun Zhang, Liuqing Wang, and Fujiang She</i>	
<b>Adaptive Online Estimation of Thrashing-Avoiding Memory Reservations for Long-Lived Containers . . . . .</b>	<b>620</b>
<i>Jiayun Lin, Fang Liu, Zhenhua Cai, Zhijie Huang, Weijun Li, and Nong Xiao</i>	
<b>A Novel Probabilistic-Performance-Aware Approach to Multi-workflow Scheduling in the Edge Computing Environment. . . . .</b>	<b>640</b>
<i>Yuyin Ma, Ruilong Yang, Yiqiao Peng, Mei Long, Xiaoning Sun, Wanbo Zheng, Xiaobo Li, and Yong Ma</i>	
<b>RCFC: A Region-Based POI Recommendation Model with Collaborative Filtering and User Context . . . . .</b>	<b>656</b>
<i>Jun Zeng, Haoran Tang, and Xin He</i>	
<b>Delay Constraint Energy Efficient Cooperative Offloading in MEC for IoT . . . .</b>	<b>671</b>
<i>Haifeng Sun, Jun Wang, Haixia Peng, Lili Song, and Mingwei Qin</i>	
<b>Author Index . . . . .</b>	<b>687</b>