

Founding Editors

Gerhard Goos

Karlsruhe Institute of Technology, Karlsruhe, Germany

Juris Hartmanis

Cornell University, Ithaca, NY, USA

Editorial Board Members

Elisa Bertino

Purdue University, West Lafayette, IN, USA

Wen Gao

Peking University, Beijing, China

Bernhard Steffen 

TU Dortmund University, Dortmund, Germany

Gerhard Woeginger 

RWTH Aachen, Aachen, Germany

Moti Yung

Columbia University, New York, NY, USA

More information about this series at <http://www.springer.com/series/7409>

Yujiu Yang · Lei Yu · Liang-Jie Zhang (Eds.)

Cognitive Computing – ICCC 2020

4th International Conference

Held as Part of the Services Conference Federation, SCF 2020


Honolulu, HI, USA, September 18–20, 2020

Proceedings

Editors

Yujiu Yang
Tsinghua Shenzhen International
Graduate School
Shenzhen, China

Lei Yu
IBM Research – Thomas J. Watson
Research
New York, NY, USA

Liang-Jie Zhang 
Kingdee International Software
Group Co., Ltd,
Shenzhen, China

ISSN 0302-9743 ISSN 1611-3349 (electronic)
Lecture Notes in Computer Science
ISBN 978-3-030-59584-5 ISBN 978-3-030-59585-2 (eBook)
<https://doi.org/10.1007/978-3-030-59585-2>

LNCS Sublibrary: SL3 – Information Systems and Applications, incl. Internet/Web, and HCI

© Springer Nature Switzerland AG 2020

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

The International Conference on Cognitive Computing (ICCC) was created to cover all aspects of Sensing Intelligence (SI) as a Service (SIaaS). Cognitive Computing is a sensing-driven-computing (SDC) scheme that explores and integrates intelligence from all types of senses in various scenarios and solution contexts. It is well beyond traditional human being's senses, which has four major senses (sight, smell, hearing, and taste) located in specific parts of the body, as well as a sense of touch located all over a body.

ICCC 2020 is a member of the Services Conference Federation (SCF). SCF 2020 had the following 10 collocated service-oriented sister conferences: the International Conference on Web Services (ICWS 2020), the International Conference on Cloud Computing (CLOUD 2020), the International Conference on Services Computing (SCC 2020), the International Congress on Big Data (BigData 2020), the International Conference on AI & Mobile Services (AIMS 2020), the World Congress on Services (SERVICES 2020), the International Congress on Internet of Things (ICIOT 2020), the International conference on Cognitive Computing (ICCC 2020), the International Conference on Edge Computing (EDGE 2020), and the International Conference on Blockchain (ICBC 2020). As the founding member of SCF, the First International Conference on Web Services (ICWS 2003) was held in June 2003 in Las Vegas, USA. Meanwhile, the First International Conference on Web Services - Europe 2003 (ICWS-Europe 2003) was held in Germany in October 2003. ICWS-Europe 2003 was an extended event of ICWS 2003, and held in Europe. In 2004, ICWS-Europe was changed to the European Conference on Web Services (ECOWS), which was held in Erfurt, Germany. To celebrate its 18th birthday, SCF 2020 was held virtually during September 18–20, 2020.

This volume presents the accepted papers of ICCC 2020, held as a fully virtual conference during September 18–20, 2020. The major topics presented at ICCC 2020 included, but were not limited to: Cognitive Computing Technologies and Infrastructure, Cognitive Computing Applications, SI, Cognitive Analysis, Mobile Services, and Cognitive Computing on Smart Home, and Cognitive Computing on Smart City.

We accepted 10 papers, including 8 full papers and 2 short papers. Each was reviewed and selected by three independent members of the ICCC 2020 International Program Committee. We are pleased to thank the authors whose submissions and participation made this conference possible. We also want to express our thanks to the Program Committee members, for their dedication in helping to organize the conference and reviewing the submissions. We thank the volunteers, authors, and conference

participants for their great contributions to the fast-growing worldwide services innovations community.

July 2020

Yujiu Yang
Lei Yu
Liang-Jie Zhang

Organization

Program Chairs

Yujia Yang	Tsinghua Shenzhen International Graduate School, China
Lei Yu	IBM Thomas J. Watson Research Center, USA

Services Conference Federation (SCF 2020)

General Chairs

Yi Pan	Georgia State University, USA
Samee U. Khan	North Dakota State University, USA
Wu Chou	Vice President of Artificial Intelligence & Software at Essenlix Corporation, USA
Ali Arsanjani	Amazon Web Services (AWS), USA

Program Chair

Liang-Jie Zhang	Kingdee International Software Group Co., Ltd, China
-----------------	--

Industry Track Chair

Siva Kantamneni	Principal/Partner at Deloitte Consulting, USA
-----------------	---

CFO

Min Luo	Huawei, USA
---------	-------------

Industry Exhibit and International Affairs Chair

Zhixiong Chen	Mercy College, USA
---------------	--------------------

Operations Committee

Jing Zeng	Yundee Intelligence Co., Ltd, China
Yishuang Ning	Tsinghua University, China
Sheng He	Tsinghua University, China
Yang Liu	Tsinghua University, China

Steering Committee

Calton Pu (Co-chair)	Georgia Tech, USA
Liang-Jie Zhang (Co-chair)	Kingdee International Software Group Co., Ltd, China

ICCC 2020 Program Committee

Luca Cagliero	Politecnico di Torino, Italy
Schahram Dustdar	Vienna University of Technology, Austria
Mehmet Emre Gursoy	Georgia Tech, USA
Meng Han	Kennesaw State University, USA
Eleanna Kafeza	Athens University of Economics and Business, Greece
Nagarajan Kandasamy	Drexel University, USA
Supratik Mukhopadhyay	Louisiana State University, USA
Roberto Natella	Federico II University of Naples and Critiware, Italy
Rui André Oliveira	University of Lisbon, Portugal
Stacey Truex	Georgia Tech, USA
Lingling Zhao	Harbin Institute of Technology, China

Conference Sponsor – Services Society

Services Society (S2) is a nonprofit professional organization that has been created to promote worldwide research and technical collaboration in services innovation among academia and industrial professionals. Its members are volunteers from industry and academia with common interests. S2 is registered in the USA as a “501(c) organization,” which means that it is an American tax-exempt nonprofit organization. S2 collaborates with other professional organizations to sponsor or co-sponsor conferences and to promote an effective services curriculum in colleges and universities. The S2 initiates and promotes a “Services University” program worldwide to bridge the gap between industrial needs and university instruction.

The services sector accounted for 79.5% of the USA’s GDP in 2016. The world’s most service-oriented economy, with service sectors accounting for more than 90% of the GDP. S2 has formed 10 Special Interest Groups (SIGs) to support technology and domain specific professional activities:

- Special Interest Group on Web Services (SIG-WS)
- Special Interest Group on Services Computing (SIG-SC)
- Special Interest Group on Services Industry (SIG-SI)
- Special Interest Group on Big Data (SIG-BD)
- Special Interest Group on Cloud Computing (SIG-CLOUD)
- Special Interest Group on Artificial Intelligence (SIG-AI)
- Special Interest Group on Edge Computing (SIG-EC)
- Special Interest Group on Cognitive Computing (SIG-CC)
- Special Interest Group on Blockchain (SIG-BC)
- Special Interest Group on Internet of Things (SIG-IOT)

About the Services Conference Federation (SCF)

As the founding member of the Services Conference Federation (SCF), the First International Conference on Web Services (ICWS 2003) was held in June 2003 in Las Vegas, USA. Meanwhile, the First International Conference on Web Services - Europe 2003 (ICWS-Europe 2003) was held in Germany in October 2003. ICWS-Europe 2003 was an extended event of ICWS 2003, and held in Europe. In 2004, ICWS-Europe was changed to the European Conference on Web Services (ECOWS), which was held in Erfurt, Germany. SCF 2019 was held successfully in San Diego, USA. To celebrate its 18th birthday, SCF 2020 was held virtually during September 18–20, 2020.

In the past 17 years, the ICWS community has expanded from Web engineering innovations to scientific research for the whole services industry. The service delivery platforms have been expanded to mobile platforms, Internet of Things (IoT), cloud computing, and edge computing. The services ecosystem is gradually enabled, value added, and intelligence embedded through enabling technologies such as big data, artificial intelligence (AI), and cognitive computing. In the coming years, all the transactions with multiple parties involved will be transformed to blockchain.

Based on the technology trends and best practices in the field, SCF will continue serving as the conference umbrella's code name for all service-related conferences. SCF 2020 defines the future of New ABCDE (AI, Blockchain, Cloud, Big Data, Everything is connected), which enable IoT and enter the 5G for the Services Era. SCF 2020's 10 collocated theme topic conferences all center around "services," while each focusing on exploring different themes (web-based services, cloud-based services, big data-based services, services innovation lifecycle, AI-driven ubiquitous services, blockchain driven trust service-ecosystems, industry-specific services and applications, and emerging service-oriented technologies). SCF includes 10 service-oriented conferences: ICWS, CLOUD, SCC, BigData, AIMS, SERVICES, ICIOT, EDGE, ICCS, and ICBC. The SCF 2020 members are listed as follows:

- [1] The International Conference on Web Services (ICWS 2020, <http://icws.org/>) is the flagship theme-topic conference for Web-based services, featuring Web services modeling, development, publishing, discovery, composition, testing, adaptation, delivery, as well as the latest API standards.
- [2] The International Conference on Cloud Computing (CLOUD 2020, <http://thecloudcomputing.org/>) is the flagship theme-topic conference for modeling, developing, publishing, monitoring, managing, delivering XaaS (Everything as a Service) in the context of various types of cloud environments.
- [3] The International Conference on Big Data (BigData 2020, <http://bigdatacongress.org/>) is the emerging theme-topic conference for the scientific and engineering innovations of big data.
- [4] The International Conference on Services Computing (SCC 2020, <http://thescc.org/>) is the flagship theme-topic conference for services innovation lifecycle that includes enterprise modeling, business consulting, solution creation, services

orchestration, services optimization, services management, services marketing, and business process integration and management.

- [5] The International Conference on AI & Mobile Services (AIMS 2020, <http://ai1000.org/>) is the emerging theme-topic conference for the science and technology of AI, and the development, publication, discovery, orchestration, invocation, testing, delivery, and certification of AI-enabled services and mobile applications.
- [6] The World Congress on Services (SERVICES 2020, <http://servicescongress.org/>) focuses on emerging service-oriented technologies and the industry-specific services and solutions.
- [7] The International Conference on Cognitive Computing (ICCC 2020, <http://thecognitivecomputing.org/>) focuses on the Sensing Intelligence (SI) as a Service (SIaaS) which makes systems listen, speak, see, smell, taste, understand, interact, and walk in the context of scientific research and engineering solutions.
- [8] The International Conference on Internet of Things (ICIOT 2020, <http://iciot.org/>) focuses on the creation of IoT technologies and development of IOT services.
- [9] The International Conference on Edge Computing (EDGE 2020, <http://theedgecomputing.org/>) focuses on the state of the art and practice of edge computing including but not limited to localized resource sharing, connections with the cloud, and 5G devices and applications.
- [10] The International Conference on Blockchain (ICBC 2020, <http://blockchain1000.org/>) concentrates on blockchain-based services and enabling technologies.

Some highlights of SCF 2020 are shown below:

- **Bigger Platform:** The 10 collocated conferences (SCF 2020) are sponsored by the Services Society (S2) which is the world-leading nonprofit organization (501 c(3)) dedicated to serving more than 30,000 worldwide services computing researchers and practitioners. Bigger platform means bigger opportunities to all volunteers, authors, and participants. Meanwhile, Springer sponsors the Best Paper Awards and other professional activities. All the 10 conference proceedings of SCF 2020 have been published by Springer and indexed in ISI Conference Proceedings Citation Index (included in Web of Science), Engineering Index EI (Compendex and Inspec databases), DBLP, Google Scholar, IO-Port, MathSciNet, Scopus, and ZBIMath.
- **Brighter Future:** While celebrating the 2020 version of ICWS, SCF 2020 highlights the Third International Conference on Blockchain (ICBC 2020) to build the fundamental infrastructure for enabling secure and trusted service ecosystems. It will also lead our community members to create their own brighter future.
- **Better Model:** SCF 2020 continues to leverage the invented Conference Blockchain Model (CBM) to innovate the organizing practices for all the 10 theme conferences.

Contents

Research Track

HFF: Hybrid Feature Fusion Model for Click-Through Rate Prediction	3
<i>Yunzhou Shi and Yujiu Yang</i>	
PRTransE: Emphasize More Important Facts Based on Pagerank for Knowledge Graph Completion.	15
<i>Zhongwen Li, Bin Zhang, Yang Liu, and Qing Liao</i>	
Context Based Quantum Language Model with Application to Question Answering	27
<i>Qin Zhao, Chenguang Hou, and Ruifeng Xu</i>	
Improving Fake Product Detection with Aspect-Based Sentiment Analysis . . .	39
<i>Jiaming Li, Yonghao Fu, Daoxing Liu, and Ruifeng Xu</i>	
A Dual Layer Regression Model for Cross-border E-commerce Industry Sale and Hot Product Prediction	50
<i>Wangda Luo, Hang Su, Yuhan Liu, and Ruifeng Xu</i>	
End-to-End Nested Multi-Attention Network for 3D Brain Tumor Segmentation	62
<i>Xinrui Zhuang and Yujiu Yang</i>	

Application Track

ALBERT-Based Chinese Named Entity Recognition	79
<i>Haifeng Lv, Yishuang Ning, and Ke Ning</i>	
Cognitive and Predictive Analytics on Big Open Data	88
<i>Kevin Hoang, Carson K. Leung, Matthew R. Spelchak, Bonnie Tang, Duncan P. Taylor-Quiring, and Nicholas J. Wiebe</i>	

Short Paper Track

Semantic Enhancement Based Dynamic Construction of Domain Knowledge Graph	107
<i>Yao Sun, Lun Meng, and Yan Zhang</i>	

Traffic Incident Detection from Massive Multivariate Time-Series Data 115
 Nicholas Sterling and John A. Miller

Author Index 125