2020 IEEE International Conference on Services Computing (SCC 2020)

Beijing, China
18 – 24 October 2020

IEEE Catalog Number: CFP20345-POD
ISBN: 978-1-7281-8790-7

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:	CFP20345-POD
ISBN (Print-On-Demand):	978-1-7281-8790-7
ISBN (Online):	978-1-7281-8789-1
ISSN:	2474-8137

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
Web: www.proceedings.com

2020 IEEE International Conference on Services Computing (SCC)

SCC 2020

Table of Contents

Message from the SERVICES 2020 Steering Committee Chair xv
Message from the SERVICES 2020 Symposia General Chair xvi
Welcome Message from Congress 2020 General Chairs xvii
Message from the SERVICES 2020 Program Chairs in Chief xix
Message from the SERVICES 2020 Technical Committee Chair on Services Computing of IEEE Computer Society xx
Welcome Message from the SERVICES 2020 Women in Services Computing Symposium Chair xxi
Symposium on Women in Services Computing Program xxii
SERVICES 2020 Steering Committee xxiv
SERVICES 2020 Program Committee xxviii
Message from the SCC 2020 Chairs xxix
SCC 2020 Organizing Commitee xxx

Session SCC 1: Foundations of Service Computing and Serviceology/Services Science

A Framework for Situation-Aware Access Control in Federated Data-as-a-Service Systems Based on Query Rewriting 1
Samson Oni (University of Maryland Baltimore County), Zhiyuan Chen (University of Maryland Baltimore County), Adina Crainiceanu (US Naval Academy), Karuna Joshi (Unversity of Maryland Baltimore County), and Don Needham (US Naval Academy)

Research on the Synecological Model and Dynamic Evolution Mechanism of Service Internet 12
Zhixuan Jia (Peking University), Shuangxi Huang (Tsinghua University), and Yushun Fan (Tsinghua University)

A Scenario-Based Modeling Method for Crossover Services 20
Meng Xi (Zhejiang University), Jianwei Yin (Zhejiang University), Yongna Wei (Zhejiang University), Maolin Zhang (Zhejiang University), Shuiguang Deng (Zhejiang University), and Ying Li (Zhejiang University)

Bringing Semantics to Support Ocean FAIR Data Services with Ontologies .30
Xiaoli Ren (National University of Defense Technology), Xiaoyong Li (National University of Defense Technology), Kefeng Deng (National University of Defense Technology), Kaijun Ren (National University of Defense Technology), Aolong Zhou (National University of Defense Technology), and Junqiang Song (National University of Defense Technology)

Service Pattern Modeling and Simulation: A Case Study of Rural Taobao .38
Jintao Chen (Zhejiang University), Jianwei Yin (Zhejiang University), Meng Xi (Zhejiang University), Siwei Tan (Zhejiang University), Yongna Wei (Zhejiang University), and Shuiguang Deng (Zhejiang University)

Session SCC 2: SCC Work-In-Progress Papers 1

A Swarm-Based Approach for Function Placement in Federated Edges .48
Andrei Palade (Trinity College Dublin), Atri Mukhopadhyay (Trinity College Dublin), Aqeel Kazmi (Trinity College Dublin), Christian Cabrera (Trinity College Dublin), Evelyn Nomayo (Trinity College Dublin), Georgios Iosifidis (Trinity College Dublin), Marco Ruffini (Trinity College Dublin), and Siobhán Clarke (Trinity College Dublin)

A Pre-Joined Service Composition Approach with Dynamic Services in a Graph Database .51
Jing Li (Shandong University of Technology, China), Ming Zhu (Shandong University of Technology, China), Miao Yu (University of Lincoln), Yuhong Yan (Concordia University), and Lizhen Cui (Shandong University)

Personality Traits Prediction Based on Users' Digital Footprints in Social Networks via Attention RNN .54
Shipeng Wang (Shandong University), Lizhen Cui (Shandong University), Lei Liu (Shandong University), Xudong Lu (Shandong University), and Qingzhong Li (Shandong University)

Characterizing Service Access Patterns under Heterogeneous Clients .57
Shuyu Zheng (Peking University, China), Fuqi Lin (Peking University, China), Xuan Lu (University of Michigan, USA), Yulian Yang (Umeng+, China), Hongfei Deng (Umeng+, China), Jun Zhang (Umeng+, China), Yun Ma (Tsinghua University, China), and Xuanzhe Liu (Peking University, China)

Session SCC 3: AI@Scale in Services Computing

BSE-MAML: Model Agnostic Meta-Reinforcement Learning via Bayesian Structured Exploration 60
Haonan Wang (National Lab for Parallel and Distributed Processing, National University of Defense Technology), Yiyun Zhang (National Lab for Parallel and Distributed Processing, National University of Defense Technology), Dawei Feng (National Lab for Parallel and Distributed Processing, National University of Defense Technology), Dongsheng Li (National Lab for Parallel and Distributed Processing, National University of Defense Technology,), and Feng Huang (National Lab for Parallel and Distributed Processing, National University of Defense Technology)

The Research of Link Prediction in Knowledge Graph Based on Distance Constraint .68
Linlu Wei (Shanghai University) and Fangfang Liu (Shanghai University)

D-colSimulation: A Distributed Approach for Frequent Graph Pattern Mining Based on colSimulation in a Single Large Graph .76
Guanqi Hua (Shandong University, China), Junhua Zhang (University of Technology Sydney, Australia), Lizhen Cui (Shandong University, China), Wei Guo (Shandong University, China), Xudong Lu (Shandong University, China), and Wei He (Shandong University, China)

Session SCC 4: AI@Scale in Services Computing

MLP4ML: Machine Learning Service Recommendation System using MLP .84
Bayan Alghofaily (Ryerson University) and Chen Ding (Ryerson University)

A Knowledge Graph Approach to Mashup Tag Recommendation .92
Benjamin Kwapong (University of Massachusetts Boston), Richard Anarfi (University of Massachusetts Boston), and Kenneth Fletcher (University of Massachusetts Boston)

Graph Neural Network and Multi-view Learning Based Mobile Application Recommendation in Heterogeneous Graphs .100
Fenfang Xie (Sun Yat-sen University), Zengxu Cao (Hangzhou Dianzi University), Yangjun Xu (Sun Yat-sen University), Liang Chen (Sun Yat-sen University), and Zibin Zheng (Sun Yat-sen University)

Session SCC 5: SCC Research Workshop

SEED: Confidential Big Data Workflow Scheduling with Intel SGX under Deadline Constraints .108
Ishtiaq Ahmed (Wayne State University), Saeid Mofrad (Wayne State University), Shiyong Lu (Wayne State University), Changxin Bai (Wayne State University), Fengwei Zhang (Southern University of Science and Technology), and Dunren Che (Southern Illinois University)

OpenDT: A Reference Framework for Service Publication and Discovery using Remote Programmable Digital Twins .116
Md Rakib Shahriar (University of Florida), Xiaoqing "Frank" Liu (Southern Illinois University), Md Mahfuzer Rahman (University of Arkansas at Fayetteville), and S M Nahian Al Sunny (University of Arkansas at Fayetteville)

Integrated Topic Modeling and User Interaction Enhanced WebAPI Recommendation using Regularized Matrix Factorization for Mashup Application Development .124
Md Mahfuzer Rahman (University of Arkansas, USA) and Xiaoqing "Frank" Liu (Southern Illinois University, USA)

Session SCC 6: Scientific Workflows & Business Process Integration and Management

A Survey of Modern Scientific Workflow Scheduling Algorithms and Systems in the Era of Big Data .132
Junwen Liu (Wayne State University), Shiyong Lu (Wayne State University), and Dunren Che (Southern Illinois University)

Data Provenance for Complex Event Processing Invoking Composition of Services .142
Malik Khalfallah (EADS) and Parisa Ghodous (Lyon 1 University)

A Meta Model for Mining Processes from Email Data .152
Marwa Elleuch (Orange Labs, France), Nour Assy (Lebanese International University, Lebanon), Nassim Laga (Orange Labs, France), Walid Gaaloul (Telecom SudParis, Institut Polytechnique de Paris), Oumaima Alaoui Ismaili (Orange Labs, France), and Boualem Benatallah (UNSW Sydney, Australia / LIRIS, France)

Session SCC 7: Scientific Workflows & Business Priocess Integration and Management

A Predictive-Trend-Aware and Critical-Path-Estimation-Based Method for Workflow Scheduling upon Cloud Services .162
Yi Pan (Chongqing University, China), Xiaoning Sun (Chongqing University, China), Yunni Xia (Chongqing University, China), Wanbo Zheng (Kunming University of Science and Technology, China), and Xin Luo (Institute of Green and Intelligent Technology, Chinese Academy of Sciences, China)

Bootstrapping Natural Language Querying on Process Automation Data .170
Xue Han (IBM Research AI, China), Lianxue Hu (IBM Research AI, China), Jaydeep Sen (IBM Research AI, India), Yabin Dang (IBM Research AI, China), Buyu Gao (IBM Research AI, China), Vatche Isahagian (IBM Research AI, Cambridge, US), Chuan Lei (IBM Research AI, Almaden, USA), Vasilis Efthymiou (IBM Research AI, Almaden, USA), Fatma Ozcan (IBM Research AI, Almaden, USA), Abdul Quamar (IBM Research AI, Almaden, USA), Ziming Huang (IBM Research AI, China), and Vinod Muthusamy (IBM Research AI, Cambridge, USA)

A Process Convergence Approach for Crossover Services Based on Message Flow Partition and Merging .178
Yiwei Shan (Wuhan University), Yu Qiao (Wuhan University), Bing Li (Wuhan University), and Jian Wang (Wuhan University)

Session SCC 8: API Economy, Microservices, and Digital Service Composition

Survey on Requirement-Driven Microservice System Evolution .186
Zhongjie Wang (Harbin Institute of Technology), Xiang He (Harbin Institute of Technology), Lei Liu (Harbin Institute of Technology), Zhiying Tu (Harbin Institute of Technology), and Hanchuan Xu (Harbin Institute of Technology)

MV4MS: A Spring Cloud Based Framework for the Co-deployment of Multi-version Microservices.. 194
Lei Liu (Harbin Institute of Technology), Xiang He (Harbin Institute of Technology), Zhiying Tu (Harbin Institute of Technology), and Zhongjie Wang (Harbin Institute of Technology)

Selection of Cloud Service Providers for Hosting Web Applications in a Multi-cloud Environment .202
Arun Ramamurthy (TCS Research, Tata Consultancy Services, India), Saket Saurabh (TCS Research, Tata Consultancy Services, India), Mangesh Gharote (TCS Research, Tata Consultancy Services, India), and Sachin Lodha (TCS Research, Tata Consultancy Services, India)

Session SCC 9: Service QoS, Lifecycle Management, and DevOps

Event-Based Detection of Changes in IaaS Performance Signatures .210
Sheik Mohammad Mostakim Fattah (University of Sydney, Australia) and Athman Bouguettaya (University of Sydney, Australia)

Dynamic Task Allocation for Cost-Efficient Edge Cloud Computing .218
Shiyao Ding (Kyoto University) and Donghui Lin (Kyoto University)

PETA: Privacy Enabled Task Allocation .226
Nitin Phuke (TCS Research, Tata Consultancy Services, India), Saket Saurabh (TCS Research, Tata Consultancy Services, India), Mangesh Gharote (TCS Research, Tata Consultancy Services, India), and Sachin Lodha (TCS Research, Tata Consultancy Services, India)

A Temporal-Spatial-Domain Distribution Model and Alignment Method for Quality Attributes .234
Zhongjie Wang (Harbin Institute of Technology), Min Li (Harbin Institute of Technology), and Zhiying Tu (Harbin Institute of Technology)

Session SCC 10: SCC Research Workshop

Seeding-Based Multi-Objective Evolutionary Algorithms for Multi-Cloud Composite Applications Deployment .240
Tao Shi (Victoria University of Wellington), Hui Ma (Victoria University of Wellington), and Gang Chen (Victoria University of Wellington)

A Distance-Based Genetic Algorithm for Robust Data-Intensive Web Service Composition in Dynamic Bandwidth Environment .248
Soheila Sadeghiram (Victoria University of Wellington), Hui Ma (Victoria University of Wellington), and Gang Chen (Victoria University of Wellington)

GPSO: A Graph-Based Heuristic Algorithm for Service Function Chain Placement in Data Center Networks .256
Meng Niu (Beijing University of Posts and Telecommunications), Bo Cheng (Beijing University of Posts and Telecommunications), and Jun-Liang Chen (Beijing University of Posts and Telecommunications)

Analytics on Health of Mobile Software Ecosystem Based on the Internal Operating Mechanism.... 264
Jianmao Xiao (Tianjin University, China), Shizhan Chen (Tianjin University, China), Shiping Chen (CSIRO Data61, Australia), Chao Gao (Tianjin University, China), Hongyue Wu (Tianjin University, China), Xiao Xue (Tianjin University, China), and Zhiyong Feng (Tianjin University, China)

Session SCC 11: Service QoS, Lifecycle Management, and DevOps

Credible and Online QoS Prediction for Services in Unreliable Cloud Environment .272.....
Yilei Zhang (Anhui Normal University), Xiao Zhang (Anhui Normal University), Peiyun Zhang (Anhui Normal University), and Jun Luo (Lenovo Machine Intelligence Center)

A Reference Method for Performance Evaluation in Big Data Architectures .280.....
Wictor Souza Martins (Federal University of Itajuba), Bruno Tardiole Kuehne (Federal University of Itajuba), Rafael Ferreira Sobrinho (Federal University of Itajuba), and Fábio Preti (DDMX)

Diversified QoS-Centric Service Recommendation for Uncertain QoS Preferences .288.....
Guosheng Kang (Hunan University of Science and Technology), Jianxun Liu (Hunan University of Science and Technology), Buqing Cao (Hunan University of Science and Technology), and Yong Xiao (Hunan University of Science and Technology)

QoS-Aware Automatic Service Composition Based on Service Execution Timeline with Multi-objective Optimization .296.....
Zhaoning Wang (State Key Laboratory of Networking and Switching Technology, Beijing University of Posts and Telecommunications), Bo Cheng (State Key Laboratory of Networking and Switching Technology, Beijing University of Posts and Telecommunications), Wenkai Zhang (State Key Laboratory of Networking and Switching Technology, Beijing University of Posts and Telecommunications), and Junliang Chen (State Key Laboratory of Networking and Switching Technology, Beijing University of Posts and Telecommunications)

Session SCC 12: Internet of Things as a Service

Incentive-Based Selection and Composition of IoT Energy Services .304.....
Amani Abusafia (The University of Sydney), Athman Bouguettaya (The University of Sydney), and Sajib Mistrysaji (Curtin University)

An IoT-Owned Service for Global IoT Device Discovery, Integration and (Re) use .312.....
Anas Dawod (The University of Melbourne, Australia), Dimitrios Georgakopoulos (Swinburne University of Technology, Australia), Prem Prakash Jayaraman (Swinburne University of Technology, Australia), and Ampalavanapillai Nirmalathas (The University of Melbourne, Australia)

Fine-Grained Conflict Detection of IoT Services .321.....
Dipankar Chaki (University of Sydney, Australia) and Athman Bouguettaya (University of Sydney, Australia)

Fluid Composition of Intermittent IoT Energy Services .329
Abdallah Lakhdari (The University of Sydney) and Athman Bouguettaya (The University of Sydney)

Session SCC 13: Enterprise Services and Service Verticals

A Novel Data-to-Text Generation Model with Transformer Planning and a Wasserstein Auto-Encoder .337
Xiaohong Xu (Huaqiao University), Ting He (Huaqiao University), and Huazhen Wang (Huaqiao University)

FDA-VeD: A Future-Demand-Aware Vehicle Dispatching Service .345
Yang Guo (Macquarie University, Australia), Weiliang Zhao (Dong Hua University, P.R. China.), Jian Yang (Macquarie University, Australia; Dong Hua University, P.R. China.), Zizhu Zhang (Macquarie University, Australia), Jia Wu (Macquarie University, Australia), and Tarique Anwar (Macquarie University, Australia)

Ponzi Contracts Detection Based on Improved Convolutional Neural Network .353
Yincheng Lou (Central University of Finance and Economics, China), Yanmei Zhang (Central University of Finance and Economics, China), and Shiping Chen (CSIRO Data61, Australia)

Suitability-Based Task Assignment in Crowdsourcing Markets .361
Pengwei Wang (Donghua University), Zhen Chen (Donghua University), and Zhaohui Zhang (Donghua University)

Session SCC 14: Innovative Service Applications and Human-Centered Services

App Competition Matters: How to Identify Your Competitor Apps? .370
MD Kafil Uddin (Swinburne University of Technology), Qiang He (Swinburne University of Technology), Jun Han (Swinburne University of Technology), and Caslon Chua (Swinburne University of Technology)

Blockchain-Based Controlled Information Sharing in Inter-Organizational Workflows .378
Christian Rondanini (DiSTA, University of Insubria, Italy), Barbara Carminati (DiSTA, University of Insubria, Italy), Federico Daidone (DiSTA, University of Insubria, Italy), and Elena Ferrari (DiSTA, University of Insubria, Italy)

DeepRouting: A Deep Neural Network Approach for Ticket Routing in Expert Network .386
Jianglei Han (SAP) and Aixin Sun (Nanyang Technological University)

Adaptive Request Scheduling for Device Cloud .394
Han Dong (Peking University, China), Enze Xu (Peking University, China), Xiang Jing (Peking University, China), Huaqian Cai (Peking University,, China), and Gang Huang (Peking University, China)

User Portraits and Investment Planning Based on Accounting Data ..404
Yibing Wu (Central University of Finance and Economics), Rongxuan Wang (Central University of Finance and Economics), Wei Dai (Central University of Finance and Economics), Shixuan Dong (Central University of Finance and Economics), Xiaohe You (Central University of Finance and Economics), Huanxiong You (Central University of Finance and Economics), and Lijie Liu (Central University of Finance and Economics)

Session FFS 1: New Frontiers in Financial Services (Panel 1)

Session FFS 2: New Financial Models and Blockchain Applications

An Empirical Study of an Open Ecosystem Model for Inclusive Financial Services ..412
Ko-Yang Wang (Fusion$360), Grace Lin (Asia University), Kevin Kuo (Fusion$360), Han-Chao Lee (United Financial Intelligence), Brick Tsai (United Financial Intelligence), and Webster Peng (Fusion$360)

Detecting Artifact Anomalies in Microservice-Based Financial Applications ..418
Faisal Fahmi (National Chiao-Tung University, Taiwan), Pei-Shu Huang (National Chiao-Tung University, Taiwan), and Feng-Jian Wang (National Chiao-Tung University, Taiwan)

FFS Session 3, Panel: Future Financial Services Trends & Opportunities

Session SCC 15: SCC Research Workshop

A Blockchain-Based Trustworthy Certification Process for Composite Services ..422
Claudio A. Ardagna (Università Degli Studi di Milano), Marco Anisetti (Università Degli Studi di Milano), Barbara Carminati (University of Insubria), Elena Ferrari (University of Insubria), Ernesto Damiani (Khalifa University), and Christian Rondanini (University of Insubria)

Temporal-Spatial-Domanial Features Oriented Modeling Framework for Transboundary Service ... 430
Min Li (Harbin Institute of Technology, China), Zhiying Tu (Harbin Institute of Technology, China), Hanchuan Xu (Harbin Institute of Technology, China), and Zhongjie Wang (Harbin Institute of Technology, China)

JTang Dubhe: A Service Pattern Modeling and Analysis System ..438
Jianwei Yin (Zhejiang University, Hangzhou, China), Siwei Tan (Zhejiang University, Hangzhou, China), Meng Xi (Zhejiang University, Hangzhou, China), Jintao Chen (Zhejiang University, Hangzhou, China), Yongna Wei (Zhejiang University, Hangzhou, China), and Shuiguang Deng (Zhejiang University, Hangzhou, China)

Domain Priori Knowledge Based Integrated Solution Design for Internet of Services .446.....
Hanchuan Xu (Harbin Institute of Technology, China), Xiao Wang (Harbin Institute of Technology, China), Yuxin Wang (Harbin Institute of Technology, China), Nan Li (Harbin Institute of Technology, China), Zhiying Tu (Harbin Institute of Technology, China), Zhongjie Wang (Harbin Institute of Technology, China), and Xiaofei Xu (Harbin Institute of Technology, China)

Session SCC 16: SCC Work-In-Progress Papers 2

Hybrid Architecture for Handwriting Perceptual Service Based on Edge Computing .454.....
Tonghua Su (Harbin Institute of Technology, China), Huiyan Wen (Harbin Institute of Technology, China), Mingyue Zhang (Harbin Institute of Technology, China), Shuchen Liu (Harbin Institute of Technology, China), Zhongjie Wang (Harbin Institute of Technology, China), and Xiaofei Xu (Harbin Institute of Technology, China)

Multi-Factor-Based Motion Detection for Server Rack Doors Left Open .457.....
Ruriko Kudo (IBM Research -Tokyo), Yasuharu Katsuno (IBM Research -Tokyo), and Fumiko Satoh (IBM Research -Tokyo)

Automatic Cross-City API Matching for Urban Service Collaboration Based on Semantics .460..
Yongshen Long (Harbin Institute of Technology, Shenzhen), Wuqiao Chen (Harbin Institute of Technology, Shenzhen), Xutao Li (Harbin Institute of Technology, Shenzhen), and Yunming Ye (Harbin Institute of Technology, Shenzhen)

A Service Computing Framework for Proteomics Analysis and Collaboration of Pathogenic Mechanism Studies .463.....
Huaming Chen (University of Wollongong, NSW, Australia), Fucun Li (University of Wollongong, NSW, Australia), Geng Sun (University of Wollongong, NSW, Australia), Xuyun Zhang (Macquarie University, Sydney, NSW, Australia), Xianjun Dong (Brigham and Women's Hospital, Harvard Medical School), Lei Wang (University of Wollongong, NSW, Australia), Kewen Liao (Peter Faber Business School, Australian Catholic University), Haifeng Shen (Peter Faber Business School, Australian Catholic University), and Jun Shen (University of Wollongong, NSW, Australia)

Session SCC 17: SCC Work-In-Progress Papers 3

Summarization of Multidimensional Process Traces for Analysis under Edit-Distance Constraints .466.....
Nguyen Phuong (University of Illinois Urbana Champaign), Isahagian Vatche (IBM Research), Muthusamy Vinod (IBM Research), and Slominski Aleksander (IBM Research)

Novel EEG Risk Framework to Identify Insider Threats in National Critical Infrastructure Using Deep Learning Techniques .469.....
Ahmed Y. Al Hammadi (Khalifa University of Science and Technology), Chan Yeob Yeun (Khalifa University of Science and Technology), and Ernesto Damiani (Khalifa University of Science and Technology)

Towards a Methodology for Creating Internet of Things (IoT) Applications Based on Microservices 472
Edwin Cabrera (Universidad de Cuenca), Paola Cardenas (Universidad de Cuenca), Priscila Cedillo (Universidad de Cuenca), and Paola Pesántez-Cabrera (Universidad de Cuenca)

desc2tag: A Reinforcement Learning Approach to Mashup Tag Recommendation 475
Richard Anarfi (University of Massachusetts Boston), Benjamin Kwapong (University of Massachusetts Boston), and Kenneth Fletcher (University of Massachusetts Boston)

An Ethical Multi-stakeholder Recommender System Based on Evolutionary Multi-objective Optimization 478
Naime Ranjbar Kermany (Macquarie University, Australia), Weiliang Zhao (Dong Hua University, P.R. China), Jian Yang (Macquarie University, Australia; Dong Hua University, P.R. China), Jia Wu (Macquarie University, Australia), and Luiz Pizzato (AI Labs, Commonwealth Bank of Australia)

Author Index 481