# 2020 IEEE 36th International Conference on Data Engineering (ICDE 2020)

Dallas, Texas, USA 20-24 April 2020

Pages 1-696



IEEE Catalog Number: ISBN: CFP20026-POD 978-1-7281-2904-4

## 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:	
ISBN (Print-On-Demand):	
ISBN (Online):	
ISSN:	

CFP20026-POD 978-1-7281-2904-4 978-1-7281-2903-7 1063-6382

#### 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 36th International Conference on Data Engineering (ICDE) ICDE 2020

## **Table of Contents**

Message from the Chairs xxxiv
Organizing Committee xxxvii
Program Committees xxxix

## **Research Track**

## Crowdsourcing

Real-Time Cross Online Matching in Spatial Crowdsourcing .1 Yurong Cheng (Beijing Institute of Technology, China), Boyang Li (Northeastern University, China), Xiangmin Zhou (RMIT University, Melbourne, Australia), Ye Yuan (Beijing Institute of Technology, China), Guoren Wang (Beijing Institute of Technology, China), and Lei Chen (Hong Kong University of Science and Technology)
Predictive Task Assignment in Spatial Crowdsourcing: A Data-Driven Approach .1.3 Yan Zhao (Soochow University), Kai Zheng (University of Electronic Science and Technology of China), Yue Cui (University of Electronic Science and Technology of China), Han Su (University of Electronic Science and Technology of China), Feida Zhu (Singapore Management University), and Xiaofang Zhou (University of Queensland)
Curiosity-Driven Energy-Efficient Worker Scheduling in Vehicular Crowdsourcing: A Deep Reinforcement Learning Approach .25 <i>Chi Harold Liu (Beijing Institute of Technology), Yinuo Zhao (Beijing Institute of Technology), Zipeng Dai (Beijing Institute of Technology), Ye Yuan (Beijing Institute of Technology), Guoren Wang (Beijing Institute of Technology), Dapeng Wu (University of Florida), and Kin K. Leung (Imperial College)</i>
Crowdsourced Collective Entity Resolution with Relational Match Propagation .37 Jiacheng Huang (Nanjing University), Wei Hu (Nanjing University), Zhifeng Bao (RMIT University), and Yuzhong Qu (Nanjing University)
An End-to-End Deep RL Framework for Task Arrangement in Crowdsourcing Platforms .49 Caihua Shan (The University of Hong Kong), Nikos Mamoulis (University of Ioannina), Reynold Cheng (The University of Hong Kong), Guoliang Li (Tsinghua University), Xiang Li (The University of Hong Kong), and Yuqiu Qian (Tencent Inc.)

#### **Data Integration and Machine Learning**

Efficient Bidirectional Order Dependency Discovery .61 Ylfeng Jin (Fudan University), Lin Zhu (Fudan University), and Zijing Tan (Fudan University)
Efficient Diversity-Driven Ensemble for Deep Neural Networks .7.3 Zhang Wentao (Peking University), Jiang Jiawei (ETH Zurich), Shao Yingxia (Beijing University of Posts and Telecommunications), and Cui Bin (Peking University)
Adaptive Network Alignment with Unsupervised and Multi-Order Convolutional Networks .85 Thanh Trung Huynh (Griffith University), Van Vinh Tong (Hanoi University of Science and Technology), Thanh Tam Nguyen (Ho Chi Minh City University of Technology), Hongzhi Yin (The University of Queensland), Matthias Weidlich (Humboldt-Universitat zu Berlin), and Quoc Viet Hung Nguyen (Griffith University)
A Natural Language Interface for Database: Achieving Transfer-Learnability Using Adversarial Method for Question Understanding .9.7 Wenlu Wang (Auburn University), Yingtao Tian (Stony Brook University), Haixun Wang (WeWork Research), and Wei-Shinn Ku (Auburn University)
Array-Based Data Management for Genomics .1.0.9. Olha Horlova (Politecnico di Milano), Abdulrahman Kaitoua (TU-Berlin & DFKI), and Stefano Ceri (Politecnico di Milano)

#### **Recommendation Systems**

Group Recommendation with Latent Voting Mechanism .1.21.... Lei Guo (Shandong Normal University), Hongzhi Yin (The University of Queensland), Qinyong Wang (The University of Queensland), Bin Cui (Department of Computer Science & Key Laboratory of High Confidence Software Technologies (MOE), Peking University), Zi Huang (The University of Queensland), and Lizhen Cui (Shandong University)

Price-Aware Recommendation with Graph Convolutional Networks .1.3..... Yu Zheng (Beijing National Research Center for Information Science and Technology (BNRist), Tsinghua University, Beijing, China), Chen Gao (Beijing National Research Center for Information Science and Technology (BNRist), Tsinghua University, Beijing, China), Xiangnan He (School of Information Science and Technology, University of Science and Technology of China), Yong Li (Beijing National Research Center for Information Science and Technology (BNRist), Tsinghua University, Beijing, China), and Depeng Jin (Beijing National Research Center for Information Science and Technology (BNRist), Tsinghua University, Beijing, China) Aviv University), and Masaru Kitsuregawa (The University of Tokyo / NII)

## **Graphs and Social Networks 1**

Exploring Finer Granularity within the Cores: Efficient (k,p)-Core Computation .1.81 Chen Zhang (Guangzhou University; University of New South Wales), Fan Zhang (Guangzhou University), Wenjie Zhang (University of New South Wales), Boge Liu (University of New South Wales), Ying Zhang (University of Technology Sydney), Lu Qin (University of Technology Sydney), and Xuemin Lin (University of New South Wales)
Kaskade: Graph Views for Efficient Graph Analytics .1.93 Joana M. F. da Trindade (MIT CSAIL), Konstantinos Karanasos (Microsoft), Carlo Curino (Microsoft), Samuel Madden (MIT CSAIL), and Julian Shun (MIT CSAIL)
Efficient Top-k Edge Structural Diversity Search .205. <i>Qi Zhang (Beijing Institute of Technology), Rong-Hua Li (Beijing Institute of Technology), Qixuan Yang (Beijing Institute of Technology), Guoren Wang (Beijing Institute of Technology), and Lu Qin (University of Technology, Sydney)</i>
Adaptive Relation Discovery from Focusing Seeds on Large Networks .21.7 Zhuo Wang (Institute of Information Engineering, Chinese Academy of Sciences, Beijing, China; School of Cyber Security, University of Chinese Academy of Sciences, Beijing, China), Chaokun Wang (School of Software, Tsinghua University, Beijing, China), Weiping Wang (Institute of Information Engineering, Chinese Academy of Sciences, Beijing, China), Xiaoyan Gu (Institute of Information Engineering, Chinese Academy of Sciences, Beijing, China), Bo Li (Institute of Information Engineering, Chinese Academy of Sciences, Beijing, China), and Dan Meng (Institute of Information Engineering, Chinese Academy of Sciences, Beijing, China)

Repairing Entities using Star Constraints in Multirelational Graphs .229..... Peng Lin (Washington State University), Qi Song (Washington State University), Yinghui Wu (Case Western Reserve University, Pacific Northwest National Laboratory), and Jiaxing Pi (Siemens Corporation)

## **Database Security and Privacy 1**

Practical Anonymous Subscription with Revocation Based on Broadcast Encryption .24.1...... Xun Yi (RMIT University), Russell Paulet (RMIT Univerity), Elisa Bertino (Purdue University), and Fang-Yu Rao (Purdue University)

SVkNN: Efficient Secure and Verifiable k-Nearest Neighbor Query on the Cloud Platform .253.. Ningning Cui (Northeastern University), Xiaochun Yang (Northeastern University), Bin Wang (Northeastern University), Jianxin Li (Deakin University), and Guoren Wang (Beijing Institute of Technology)

An Anomaly Detection System for the Protection of Relational Database Systems against Data Leakage by Application Programs .265.....

Daren Fadolalkarim (Purdue University, W Lafayette, IN, USA), Elisa Bertino (Purdue University, W Lafayette, IN, USA), and Asmaa Sallam (Purdue University, W Lafayette, IN, USa)

SFour: A Protocol for Cryptographically Secure Record Linkage at Scale .277..... Basit Khurram (University of Waterloo) and Florian Kerschbaum (University of Waterloo)

## **Query Processing 1**

I/O Efficient Approximate Nearest Neighbour Search Based on Learned Functions .289...... Mingjie Li (Zhejiang Gongshang University, China; CAI, School of Computer Science, University of Technology Sydney, Australia), Ying Zhang (Zhejiang Gongshang University, China; CAI, School of Computer Science, University of Technology Sydney, Australia), Yifang Sun (University of New South Wales, Australia), Wei Wang (University of New South Wales, Australia), Ivor Tsang (CAI, School of Computer Science, University of Technology Sydney, Australia), and Xuemin Lin (University of New South Wales, Australia)

Efficient Query Processing with Optimistically Compressed Hash Tables & Strings in the USSR .301.....

*Tim Gubner (CWI), Viktor Leis (Friedrich Schiller University Jena), and Peter Boncz (CWI)* 

UniKV: Toward High-Performance and Scalable KV Storage in Mixed Workloads via Unified Indexing .313.

Qiang Zhang (University of Science and Technology of China), Yongkun Li (University of Science and Technology of China), Patrick P. C. Lee (The Chinese University of Hong Kong), Yinlong Xu (University of Science and Technology of China), Qiu Cui (PingCAP), and Liu Tang (PingCAP)

Improved Correlated Sampling for Join Size Estimation .325..... TaiNing Wang (National University of Singapore) and Chee-Yong Chan (National University of Singapore) MESSI: In-Memory Data Series Indexing .3.3.7. Botao Peng (LIPADE, Université de Paris), Panagiota Fatourou (FORTH ICS & Dept. of Comp. Science, Univ. of Crete), and Themis Palpanas (LIPADE, Université de Paris)

#### **Mining Time Series and Spatial Data**

Spatial Transition Learning on Road Networks with Deep Probabilistic Models .349..... Xiucheng Li (Nanyang Technological University), Gao Cong (Nanyang Technological University), and Yun Cheng (ETH Zurich)

Active Model Selection for Positive Unlabeled Time Series Classification .36.1..... Shen Liang (Fudan University; Cyberspace Institute of Advanced Technology (CIAT), Guangzhou University), Yanchun Zhang (Cyberspace Institute of Advanced Technology (CIAT), Guangzhou University; Institute for Sustainable Industries & Liveable Cities, Victoria University), and Jiangang Ma (Federation University Australia)

Neighbor Profile: Bagging Nearest Neighbors for Unsupervised Time Series Mining .373...... Yuanduo He (Peking University), Xu Chu (Peking University), and Yasha Wang (Peking University)

Massively-Parallel Change Detection for Satellite Time Series Data with Missing Values .385.... Fabian Gieseke (University of Copenhagen), Sabina Rosca (Wageningen University), Troels Henriksen (University of Copenhagen), Jan Verbesselt (Wageningen University), and Cosmin Eugen Oancea (University of Copenhagen)

Skyline Cohesive Group Queries in Large Road-Social Networks .3.9.7..... Qiyan Li (Wuhan University), Yuanyuan Zhu (Wuhan University), and Jeffrey Xu Yu (The Chinese University of Hong Kong)

## **Graph and Social Networks 2**

Anchored Vertex Exploration for Community Engagement in Social Networks .409..... Taotao Cai (Deakin University), Jianxin Li (Deakin University), Nur Al Hasan Haldar (The University of Western Australia), Ajmal Mian (The University of Western Australia), John Yearwood (Deakin University), and Timos Sellis (Swinburne University of Technology)

Optimizing Knowledge Graphs through Voting-Based User Feedback .421..... Ruida Yang (East China Normal University), Xin Lin (East China Normal University), Jianliang Xu (Hong Kong Baptist University), Liang He (East China Normal University), and Yan Yang (East China Normal University)

AutoSF: Searching Scoring Functions for Knowledge Graph Embedding .433..... Yongqi Zhang (The Hong Kong University of Science and Technology), Quanming Yao (4Paradigm Inc.), Wenyuan Dai (4Paradigm Inc.), and Lei Chen (The Hong Kong University of Science and Technology) Semantic Guided and Response Times Bounded Top-k Similarity Search over Knowledge Graphs . 445

Yuxiang Wang (Hangzhou Dianzi University), Arijit Khan (Nanyang Technological University, Singapore), Tianxing Wu (Nanyang Technological University, Singapore), Jiahui Jin (Southeast University), and Haijiang Yan (Hangzhou Dianzi University)

PPKWS: An Efficient Framework for Keyword Search on Public-Private Networks .457..... Jiaxin Jiang (Hong Kong Baptist University), Xin Huang (Hong Kong Baptist University), Byron Choi (Hong Kong Baptist University), Jianliang Xu (Hong Kong Baptist University), Sourav S. Bhowmick (Nanyang Technological University), and Lyu Xu (Hong Kong Baptist University)

#### **Database Security and Privacy 2**

Privacy-Preserving Real-Time Anomaly Detection Using Edge Computing .469 Shagufta Mehnaz (Purdue University) and Elisa Bertino (Purdue University)
To Warn or Not to Warn: Online Signaling in Audit Games .48.1 Chao Yan (Vanderbilt University), Haifeng Xu (University of Virginia), Yevgeniy Vorobeychik (Washington University at St. Louis), Bo Li (University of Illinois at Urbana-Champaign), Daniel Fabbri (Vanderbilt University Medical Center), and Bradley Malin (Vanderbilt University Medical Center)
One-Sided Differential Privacy .493 Ios Kotsogiannis (Snap Inc.), Stelios Doudalis (U.C. Irvine), Sam Haney (Duke University), Ashwin Machanavajjhala (Duke University), and Sharad Mehrotra (U.C. Irvine)
Providing Input-Discriminative Protection for Local Differential Privacy .505 Xiaolan Gu (University of Arizona), Ming Li (University of Arizona), Li Xiong (Emory University), and Yang Cao (Kyoto University)
Differentially Private Online Task Assignment in Spatial Crowdsourcing: A Tree-Based Approach .51.7 <i>Qian Tao (BDBC, SKLSDE Lab and IRI, Beihang University, China),</i> <i>Yongxin Tong (BDBC, SKLSDE Lab and IRI, Beihang University, China),</i> <i>Zimu Zhou (ETH Zurich, Zurich, Switzerland), Yexuan Shi (BDBC, SKLSDE Lab and IRI, Beihang University, China), Lei Chen (The Hong Kong University of Science and Technology, Hong Kong SAR, China), and Ke Xu (BDBC, SKLSDE Lab and IRI, Beihang University, China)</i>

## **Query Processing 2**

ChainLink: Indexing Big Time Series Data for Long Subsequence Matching .529..... Noura Alghamdi (Worcester Polytechnic Institute), Liang Zhang (Worcester Polytechnic Institute), Huayi Zhang (Worcester Polytechnic Institute), Elke Rundensteiner (Worcester Polytechnic Institute), and Mohamed Eltabakh (Worcester Polytechnic Institute)

Random Sampling for Group-By Queries <u>541</u> <i>Trong Duc Nguyen (Iowa State University), Ming-Hung Shih (Iowa State</i> <i>University), Sai Sree Parvathaneni (Iowa State University), Bojian Xu</i> <i>(Eastern Washington University), Divesh Srivastava (AT&amp;T</i> <i>Labs-Research), and Srikanta Tirthapura (Iowa State University)</i>
PA-Tree: Polled-Mode Asynchronous B+ Tree for NVMe .553 Li Wang (Yitu Tech. Pte. Ltd), Zining Zhang (National University of Singapore; Yitu Tech. Pte, Ltd.), Bingsheng He (National University of Singapore), and Zhenjie Zhang (Yitu Tech, Pte, Ltd.)
Distributed Streaming Set Similarity Join .565. Jianye Yang (Hunan University), Wenjie Zhang (University of New South Wales, Australia), Xiang Wang (University of New South Wales, Australia), Ying Zhang (CAI, University of Technology Sydney, Australia), and Xuemin Lin (University of New South Wales, Australia)
Cool: A COhort OnLine Analytical Processing System .57.7 Zhongle Xie (National University of Singapore), Hongbin Yin (MZH Tech), Cong Yue (National University of Singapore), Meihui Zhang (Beijing Institute of Technology), Gang Chen (Zhejiang University), and Beng Chin Ooi (National University of Singapore)

#### Data Mining and Knowledge Discovery 1

TransN: Heterogeneous Network Representation Learning by Translating Node Embeddings .589 Zijian Li (Hong Kong University of Science and Technology), Wenhao Zheng (Nanjing University), Xueling Lin (Hong Kong University of Science and Technology), Ziyuan Zhao (Tencent), Zhe Wang (Hong Kong University of Science and Technology), Yue Wang (Shenzhen Institute of Computing Sciences, Shenzhen University), Xun Jian (Hong Kong University of Science and Technology), Lei Chen (Hong Kong University of Science and Technology), Lei Chen (Hong Kong University of Science and Technology), Lei Chen (Hong Kong University of Science and Technology), Qiang Yan (Tencent), and Tiezheng Mao (Tencent) An Adaptive Master-Slave Regularized Model for Unexpected Revenue Prediction Enhanced with Alternative Data .601..... Jin Xu (Tsinghua University, China), Jingbo Zhou (Business Intelligence Lab, Baidu Research, China), Yongpo Jia (Tsinghua University, China), Jian Li (Tsinghua University, China), and Hui Xiong (Business Intelligence Lab, Baidu Research, China) Exact and Consistent Interpretation of Piecewise Linear Models Hidden behind APIs: A Closed Form Solution .613..... Zicun Cong (Simon Fraser University, Burnaby, Canada), Lingyang Chu (Huawei Technologies Canada Co., Ltd., Burnaby, Canada), Lanjun Wang (Huawei Technologies Canada Co., Ltd., Burnaby, Canada), Xia Hu (Simon Fraser University, Burnaby, Canada), and Jian Pei (Simon Fraser University, Burnaby, Canada) Statistical Estimation of Diffusion Network Topologies .625..... Keqi Han (Wuhan University), Yuan Tian (Wuhan University), Yunjia Zhang (University of Wisconsin-Madison), Ling Han (Wuhan University), Hao Huang (Wuhan University), and Yunjun Gao (Zhejiang University)

Multiple Dense Subtensor Estimation with High Density Guarantee .6.3.7..... Quang-Huy Duong (Norwegian University of Science and Technology), Heri Ramampiaro (Norwegian University of Science and Technology), and Kjetil Nørvåg (Norwegian University of Science and Technology)

## **Graphs and Social Networks 3**

Efficient Approximation Algorithms for Adaptive Target Profit Maximization .649..... Keke Huang (Nanyang Technological University), Jing Tang (National University of Singapore), Xiaokui Xiao (National University of Singapore), Aixin Sun (Nanyang Technological University), and Andrew Lim (National University of Singapore)

Efficient Bitruss Decomposition for Large-Scale Bipartite Graphs <u>.66</u>1..... Kai Wang (University of New South Wales), Xuemin Lin (University of New South Wales), Lu Qin (University of Technology Sydney), Wenjie Zhang (University of New South Wales), and Ying Zhang (University of Technology Sydney)

Kaleido: An Efficient Out-of-Core Graph Mining System on a Single Machine .673..... Cheng Zhao (Institute of Computing Technology, Chinese Academy of Sciences; University of Chinese Academy of Sciences), Zhibin Zhang (Institute of Computing Technology, Chinese Academy of Sciences), Peng Xu (Institute of Computing Technology, Chinese Academy of Sciences; University of Chinese Academy of Sciences), Tianqi Zheng (Institute of Computing Technology, Chinese Academy of Sciences; University of Chinese Academy of Sciences), and Jiafeng Guo (Institute of Computing Technology, Chinese Academy of Sciences)

Finding the Best k in Core Decomposition: A Time and Space Optimal Solution .685..... Deming Chu (Guangzhou University; East China Normal University), Fan Zhang (Guangzhou University), Xuemin Lin (University of New South Wales), Wenjie Zhang (University of New South Wales), Ying Zhang (University of Technology Sydney), Yinglong Xia (Facebook AI), and Chenyi Zhang (Huawei Technologies)

Updates-Aware Graph Pattern Based Node Matching .697..... Guohao Sun (Macquarie University, Sydney, NSW, Australia), Guanfeng Liu (Macquarie University, Sydney, NSW, Australia), Yan Wang (Macquarie University, Sydney, NSW, Australia), and Xiaofang Zhou (The University of Queensland, Brisbane, Australia)

## **Data Cleaning, Curation and Analytics**

Dataset Discovery in Data Lakes .709. Alex Teodor Bogatu (University of Manchester), Alvaro A.A. Fernandes (University of Manchester), Norman W. Paton (University of Manchester), and Nikolaos Konstantinou (University of Manchester)

- User-Driven Error Detection for Time Series with Events .745. *Kim-Hung Le (EURECOM) and Paolo Papotti (EURECOM)*
- An Agile Sample Maintenance Approach for Agile Analytics .7.5.7..... Hanbing Zhang (Fudan University), Yazhong Zhang (Fudan University), Zhenying He (Fudan University), Yinan Jing (Fudan University), Kai Zhang (Fudan University), and X. Sean Wang (Fudan University)

## **Query Processing 3**

Continuously Tracking Core Items in Data Streams with Probabilistic Decays .769 Junzhou Zhao (Xi'an Jiaotong University), Pinghui Wang (Xi'an Jiaotong University), Jing Tao (Xi'an Jiaotong University), Shuo Zhang (Xi'an Jiaotong University), and John C.S. Lui (The Chinese University of Hong Kong)
The Art of Efficient In-Memory Query Processing on NUMA Systems: a Systematic Approach .781 Puya Memarzia (University of New Brunswick), Suprio Ray (University of New Brunswick), and Virendra C. Bhavsar (University of New Brunswick)
Speeding Up GED Verification for Graph Similarity Search .7.9.3. Lijun Chang (The University of Sydney), Xing Feng (University of New South Wales), Xuemin Lin (University of New South Wales), Lu Qin (University of New South Wales), Wenjie Zhang (University of New South Wales), and Dian Ouyang (The University of Sydney)
Scaling Out Schema-Free Stream Joins .805. Damjan Gjurovski (TU Kaiserslautern (TUK)) and Sebastian Michel (TU Kaiserslautern (TUK))
Contribution Maximization in Probabilistic Datalog .81.7 Tova Milo (Tel Aviv University), Yuval Moskovitch (Tel Aviv University), and Brit Youngmann (Tel Aviv University)

## Data Mining and Knowledge Discovery 2

Multiscale Frequent Co-Movement Pattern Mining .829. Shahab Helmi (University of Colorado Denver) and Farnoush Banaei-Kashani (University of Colorado Denver) Self-Paced Ensemble for Highly Imbalanced Massive Data Classification .84.1.... Zhining Liu (Jilin University, Changchun, China), Wei Cao (Microsoft Research, Beijing, China), Zhifeng Gao (Microsoft Research, Beijing, China), Jiang Bian (Microsoft Research, Beijing, China), Hechang Chen (Jilin University, Changchun, China), Yi Chang (Jilin University, Changchun, China), and Tie-Yan Liu (Microsoft Research, Beijing, China) SAN: Scale-Space Attention Networks .853..... Yash Garg (Arizona State University), K. Selcuk Candan (Arizona State University), and Maria Luisa Sapino (University of Turin) A Novel Approach to Learning Consensus and Complementary Information for Multi-View Data Clustering 865 Khanh Luong (Queensland University of Technology) and Richi Nayak (Queensland University of Technology) Summarizing Hierarchical Multidimensional Data .87.7..... Alexandra Kim (University of British Columbia), Laks V.S. Lakshmanan (University of British Columbia), and Divesh Srivastava (AT&T Labs-Research)

#### **Graphs and Social Networks 4**

Efficient Team Formation in Social Networks Based on Constrained Pattern Graph .889...... Yue Kou (Northeastern University, China), Derong Shen (Northeastern University, China), Quinn Snell (Brigham Young University, United States), Dong Li (Northeastern University, China), Tiezheng Nie (Northeastern University, China), Ge Yu (Northeastern University, China), and Shuai Ma (SKLSDE Lab, Beihang University, China)

Effective and Efficient Truss Computation over Large Heterogeneous Information Networks .901 Yixing Yang (The University of New South Wales), Yixiang Fang (The University of New South Wales), Xuemin Lin (The University of New South Wales), and Wenjie Zhang (The University of New South Wales)

Index-Free Approach with Theoretical Guarantee for Efficient Random Walk with Restart Query .913.....

Dandan Lin (The Hong Kong University of Science and Technology), Raymond Chi-Wing Wong (The Hong Kong University of Science and Technology), Min Xie (Shenzhen Institute of Computing Sciences, Shenzhen University), and Victor Junqiu Wei (Noah's Ark Lab of Huawei)

Optimization of GPU-Based Sparse Matrix Multiplication for Large Sparse Networks .925...... Jeongmyung Lee (Hanyang University), Seokwon Kang (Hanyang University), Yongseung Yu (Hanyang University), Yong-Yeon Jo (Hanyang University), Sang-Wook Kim (Hanyang University), and Yongjun Park (Hanyang University)

VAC: Vertex-Centric Attributed Community Search .937..... Qing Liu (Hong Kong Baptist University), Yifan Zhu (Zhejiang University), Minjun Zhao (Zhejiang University), Xin Huang (Hong Kong Baptist University), Jianliang Xu (Hong Kong Baptist University), and Yunjun Gao (Zhejiang University)

## **Temporal and Spatial Data 1**

Online Anomalous Trajectory Detection with Deep Generative Sequence Modeling .949..... Yiding Liu (Nanyang Technological University), Kaiqi Zhao (University of Auckland), Gao Cong (Nanyang Technological University), and Zhifeng Bao (RMIT University) Mobility-Aware Dynamic Taxi Ridesharing .961..... *Zhidan Liu (Guangdong Laboratory of Artificial Intelligence and* Digital Economy (SZ), Shenzhen University, P. R. China; College of Computer Science and Software Engineering, Shenzhen University, P. R. China), Zengyang Gong (College of Computer Science and Software Engineering, Shenzhen University, P. R. China), Jiangzhou Li (College of Computer Science and Software Engineering, Shenzhen University, P. R. China), and Kaishun Wu (Guangdong Laboratory of Artificial Intelligence and Digital Economy (SZ), Shenzhen University, P. R. China: College of Computer Science and Software Engineering, Shenzhen University, P. R. China; PCL Research Center of Networks and Communications, Peng Cheng Laboratory, Shenzhen, P. R. China) Online Trichromatic Pickup and Delivery Scheduling in Spatial Crowdsourcing .973..... Bolong Zheng (Huazhong University of Science and Technology), Chenze Huang (Sun Yat-sen University), Christian Jensen (Aalborg University), Lu Chen (Aalborg University), Quoc Viet Hung Nguyen (Griffith University), Guanfeng Liu (Macquarie University), Guohui Li (Huazhong University of Science and Technology), and Kai Zheng (University of Electronic Science and Technology of China) Task Allocation in Dependency-Aware Spatial Crowdsourcing .985..... Wangze Ni (The Hong Kong University of Science and Technology), Peng Cheng (East China Normal University), Lei Chen (The Hong Kong University of Science and Technology), and Xuemin Lin (The University of New South Wales) Parallel Semantic Trajectory Similarity Join .997..... Lisi Chen (Inception Institute of Artificial Intelligence), Shuo Shang (University of Electronic Science and Technology of China), Christian S. Jensen (Aalborg University), Bin Yao (Shanghai Jiao Tong University), and Panos Kalnis (King Abdullah University of Science and Technology)

## **Search and Information Extraction**

Being Happy with the Least: Achieving α-Happiness with Minimum Number of Tuples <u>1009</u>.. Min Xie (Shenzhen Institute of Computing Sciences, Shenzhen University), Raymond Chi-Wing Wong (The Hong Kong University of Science and Technology), Peng Peng (inspir.ai), and Vassilis J. Tsotras (UC Riverside) Improving Neural Relation Extraction with Implicit Mutual Relations .1.02.1..... Jun Kuang (East China Normal University), Yixin Cao (National University of Singapore), Jianbing Zheng (East China Normal University), Xiangnan He (University of Science and Technology of China), Ming Gao (East China Normal University; KLATASDS-MOE, School of Statistics, East China Normal University), and Aoying Zhou (East China Normal University)

- SONG: Approximate Nearest Neighbor Search on GPU .1.033..... Weijie Zhao (Baidu Research), Shulong Tan (Baidu Research), and Ping Li (Baidu Research)
- R2LSH: A Nearest Neighbor Search Scheme Based on Two-Dimensional Projected Spaces .1.045 *Kejing Lu (Hokkaido University, Japan) and Mineichi Kudo (Hokkaido University, Japan)*
- Online Indices for Predictive Top-k Entity and Aggregate Queries on Knowledge Graphs .1.05.7 Yan Li (University of Massachusetts, Lowell), Tingjian Ge (University of Massachusetts, Lowell), and Cindy Chen (University of Massachusetts, Lowell)

## **Query and Stream Processing**

Enabling Efficient Random Access to Hierarchically-Compressed Data <u>1069</u>..... Feng Zhang (Renmin University of China), Jidong Zhai (Tsinghua University), Xipeng Shen (North Carolina State University), Onur Mutlu (ETH Zürich), and Xiaoyong Du (Renmin University of China)

Adaptive Top-k Overlap Set Similarity Joins .1.081..... Zhong Yang (Huazhong University of Science and Technology), Bolong Zheng (Huazhong University of Science and Technology), Guohui Li (Huazhong University of Science and Technology), Xi Zhao (Huazhong University of Science and Technology), Xiaofang Zhou (The University of Queensland), and Christian Jensen (Aalborg University)

Load Shedding for Complex Event Processing: Input-Based and State-Based Techniques .1.0.93 Bo Zhao (Humboldt-Universität zu Berlin), Quoc Viet Hung Nguyen (Griffith University), and Matthias Weidlich (Humboldt-Universität zu Berlin)

SPEAr: Expediting Stream Processing with Accuracy Guarantees .1.1.05..... Nikos R. Katsipoulakis (Amazon.com Web Services Inc.), Alexandros Labrinidis (University of Pittsburgh), and Panos K. Chrysanthis (University of Pittsburgh)

## **Temporal Graphs**

Temporal Network Representation Learning via Historical Neighborhoods Aggregation .1.1.17 Shixun Huang (RMIT University), Zhifeng Bao (RMIT University), Guoliang Li (Tsinghua University), Yanghao Zhou (RMIT University), and J. Shane Culpepper (RMIT University)

- An Interval-Centric Model for Distributed Computing over Temporal Graphs .1.129..... Swapnil Gandhi (Indian Institute of Science) and Yogesh Simmhan (Indian Institute of Science)
- CrashSim: An Efficient Algorithm for Computing SimRank over Static and Temporal Graphs .1141 Mo Li (Northeastern University, China), Farhana Murtaza Choudhury (University of Melbourne, Australia), Renata Borovica-Gajic (University of Melbourne, Australia), Zhiqiong Wang (Northeastern University, China), Junchang Xin (Northeastern University, China), and Jianxin Li (Deakin University, Australia)

Efficiently Answering Span-Reachability Queries in Large Temporal Graphs .1.153..... Dong Wen (University of Technology Sydney), Yilun Huang (University of Technology Sydney), Ying Zhang (University of Technology Sydney), Lu Qin (University of Technology Sydney), WenJie Zhang (University of New South Wales), and Xuemin Lin (University of New South Wales)

## **Temporal and Spatial Data 2**

Turbocharging Geospatial Visualization Dashboards via a Materialized Sampling Cube Approach 1165 Jia Yu (Arizona State University) and Mohamed Sarwat (Arizona State University) Sya: Enabling Spatial Awareness inside Probabilistic Knowledge Base Construction .1177..... Ibrahim Sabek (University of Minnesota, USA) and Mohamed Mokbel (Oatar Computing Research Institute, Qatar) Fast Query Decomposition for Batch Shortest Path Processing in Road Networks .1.189...... Lei Li (The University of Queensland, Australia), Mengxuan Zhang (The University of Queensland, Australia), Wen Hua (The University of Queensland, Australia), and Xiaofang Zhou (The University of Queensland, Australia) Efficient Attribute-Constrained Co-Located Community Search .1.20.1..... Jiehuan Luo (USTC), Xin Cao (UNSW), Xike Xie (USTC), Qiang Qu (SIAT, CAS), Zhiqiang Xu (Baidu), and Christian S. Jensen (AAU) Indoor Top-k Keyword-Aware Routing Query .1.213..... Zijin Feng (Hong Kong Baptist University), Tiantian Liu (Aalborg University), Huan Li (Aalborg University), Hua Lu (Aalborg University), Lidan Shou (Zhejiang University), and Jianliang Xu (Hong Kong Baptist University)

## **Modern Hardware 1**

LATTE: A Native Table Engine on NVMe Storage .1.225..... Jiajia Chu (East China Normal University), Yunshan Tu (East China Normal University), Yao Zhang (East China Normal University), and Chuliang Weng (East China Normal University)

- Doubleheader Logging: Eliminating Journal Write Overhead for Mobile DBMS .1.23.7..... Sehyeon Oh (UNIST (Ulsan National Institute of Science and Technology)), Wook-Hee Kim (SungKyunKwan University), Jihye Seo (Naver Corp.), Hyeonho Song (UNIST (Ulsan National Institute of Science and Technology)), Sam H. Noh (UNIST (Ulsan National Institute of Science and Technology)), and Beomseok Nam (SungKyunKwan University)
- GSI: GPU-Friendly Subgraph Isomorphism .1.249. Li Zeng (Peking University), Lei Zou (Peking University), M. Tamer Özsu (University of Waterloo), Lin Hu (Peking University), and Fan Zhang (Peking University)

FPGA-Based Compaction Engine for Accelerating LSM-Tree Key-Value Stores .1.26.1..... Xuan Sun (City University of Hong Kong), Jinghuan Yu (City University of Hong Kong), Zimeng Zhou (City University of Hong Kong), and Chun Jason Xue (City University of Hong Kong)

#### **ML & Databases 1**

(Alibaba Group), Sheng Wang (Alibaba Group), Xiaowei Shen (Alibaba Group), Huijun Mai (Alibaba Group), and Yue Xie (Alibaba Group)

## **Distributed and Parallel Data Management**

SeeMoRe: A Fault-Tolerant Protocol for Hybrid Cloud Environments .1.3.45..... Mohammad Javad Amiri (University of California Santa Barbara), Sujaya Maiyya (University of California Santa Barbara), Divyakant Agrawal (University of California Santa Barbara), and Amr El Abbadi (University of California Santa Barbara)

Getting Swole: Generating Access-Aware Code with Predicate Pullups .1.273..... Andrew Crotty (Brown University), Alex Galakatos (Brown University), and Tim Kraska (MIT CSAIL)

- Fela: Incorporating Flexible Parallelism and Elastic Tuning to Accelerate Large-Scale DML <u>1393</u> Jinkun Geng (Tsinghua University), Dan Li (Tsinghua University), and Shuai Wang (Tsinghua University)

## **Temporal and Spatial Data 3**

Sequence-Aware Factorization Machines for Temporal Predictive Analytics .1.405..... Tong Chen (The University of Queensland), Hongzhi Yin (The University of Queensland), Quoc Viet Hung Nguyen (Griffith University), Wen-Chih Peng (National Chiao Tung University), Xue Li (The University of Queensland), and Xiaofang Zhou (The University of Queensland)

Stochastic Origin-Destination Matrix Forecasting Using Dual-Stage Graph Convolutional, Recurrent Neural Networks <u>1417</u>.....

Jilin Hu (Aalborg University), Bin Yang (Aalborg University), Chenjuan Guo (Aalborg University), Christian S. Jensen (Aalborg University), and Hui Xiong (Rutgers, the State University of New Jersey)

Query Results over Ongoing Databases that Remain Valid as Time Passes By <u>1429</u>..... *Yvonne Mülle (University of Zurich) and Michael H. Böhlen (University of Zurich)* 

Indoor Mobility Semantics Annotation Using Coupled Conditional Markov Networks .1.4.1.... Huan Li (Aalborg University, Denmark), Hua Lu (Aalborg University, Denmark), Muhammad Aamir Cheema (Monash University, Australia), Lidan Shou (Zhejiang University, China), and Gang Chen (Zhejiang University, China)

#### **Modern Hardware 2**

Towards Factorized SVM with Gaussian Kernels over Normalized Data <u>1.4.53</u>..... Keyu Yang (Zhejiang University), Yunjun Gao (Zhejiang University), Lei Liang (Zhejiang University), Bin Yao (Shanghai Jiao Tong University), Shiting Wen (Ningbo Institute of Technology, Zhejiang University), and Gang Chen (Zhejiang University) FESIA: A Fast and SIMD-Efficient Set Intersection Approach on Modern CPUs <u>.1.465</u>..... Jiyuan Zhang (Carnegie Mellon University), Yi Lu (MIT CSAIL), Daniele Spampinato (Carnegie Mellon University), and Franz Franchetti (Carnegie Mellon University)

Low-Latency Communication for Fast DBMS Using RDMA and Shared Memory .1.4.7.7...... Philipp Fent (Technische Universität München), Alexander Van Renen (Technische Universität München), Andreas Kipf (Technische Universität München), Viktor Leis (Friedrich-Schiller-Universität Jena), Thomas Neumann (Technische Universität München), and Alfons Kemper (Technische Universität München)

#### ML & Databases 2

ML-Based Cross-Platform Query Optimization .1.489..... Zoi Kaoudi (Technische Universität Berlin), Jorge-Arnulfo Quiané-Ruiz (Technische Universität Berlin), Bertty Contreras-Rojas (Qatar Computing Research Institute, HBKU), Rodrigo Pardo-Meza (Qatar Computing Research Institute, HBKU), Anis Troudi (Qatar Computing Research Institute, HBKU), and Sanjay Chawla (Qatar Computing Research Institute, HBKU)

Automatic View Generation with Deep Learning and Reinforcement Learning .1.50.1..... Haitao Yuan (Tsinghua University), Guoliang Li (Tsinghua University), Ling Feng (Tsinghua University), Ji Sun (Tsinghua University), and Yue Han (Tsinghua University)

ColumnSGD: A Column-Oriented Framework for Distributed Stochastic Gradient Descent .1.513 Zhipeng Zhang (Peking University), Wentao Wu (Microsoft Research, Redmond, USA), Jiawei Jiang (ETH Zurich), Lele Yu (Tencent Inc.), Bin Cui (Peking University), and Ce Zhang (ETH Zurich)

In-Database Connected Component Analysis .1.525..... Harald Bögeholz (Monash University, Melbourne, Australia), Michael Brand (Faculty of Information Technology Monash University Melbourne, Australia), and Radu-Alexandru Todor (UBSv Zürich, Switzerland)

Towards Concurrent Stateful Stream Processing on Multicore Processors .1.537..... shuhao zhang (Technische Universität Berlin), Yingjun Wu (Amazon Web Services), Feng Zhang (Renmin University of China), and Bingsheng He (National University of Singapore)

## **Industry Track**

#### **Industry 1: High Performance and Scalable Data Platforms**

PSGraph: How Tencent Trains Extremely Large-Scale Graphs with Spark? .1.5.49. Jiawei Jiang (ETH Zürich), Pin Xiao (Tencent Inc.), Lele Yu (Tencent Inc.), Xiaosen Li (Tencent Inc.), Jiefeng Cheng (Tencent Inc.), Xupeng Miao (Peking University), Zhipeng Zhang (Peking University), and Bin Cui (Peking University) JUST: JD Urban Spatio-Temporal Data Engine .1.558.... Ruiyuan Li (Xidian University, JD Intelligent Cities Research), Huajun He (Southwest Jiaotong University, JD Intelligent Cities Research), Rubin Wang (Southwest Jiaotong University, JD Intelligent Cities Research), Yuchuan Huang (JD Intelligent Cities Research), Junwen Liu (JD Intelligent Cities Research), Sijie Ruan (Xidian University, JD Intelligent Cities Research), Tianfu He (Harbin Institute of Technology, JD Intelligent Cities Research), Jie Bao (JD Intelligent Cities Research), and Yu Zheng (Xidian University, JD Intelligent Cities Research)

Oracle Database In-Memory on Active Data Guard: Real-Time Analytics on a Standby Database .... 1570

Sukhada Pendse (Oracle America, Inc), Vasudha Krishnaswamy (Oracle America, Inc), Kartik Kulkarni (Oracle America, Inc), Yunrui Li (Oracle America, Inc), Tirthankar Lahiri (Oracle America, Inc), Vivekanandhan Raja (Oracle America, Inc), Jing Zheng (Oracle America, Inc), Mahesh Girkar (Oracle America, Inc), and Akshay Kulkarni (Oracle America, Inc)

Data Sentinel: A Declarative Production-Scale Data Validation Platform .1.5.79..... Arun Swami (LinkedIn Corporation), Sriram Vasudevan (LinkedIn Corporation), and Joojay Huyn (LinkedIn Corporation)

Turbine: Facebook's Service Management Platform for Stream Processing .1.5.9.1..... Yuan Mei (Facebook), Luwei Chen (Facebook), Vanish Talwar (Facebook), Michael Levin (Facebook), Gabriela Jacques-Silva (Facebook), Nikhil Simha (Facebook), Anirban Banerjee (Facebook), Brian Smith (Facebook), Tim Williamson (Facebook), Serhat Yilmaz (Facebook), Weitao Chen (Facebook), and Guoqiang Jerry Chen (Facebook)

## **Industry 2: Information Discovery and Management**

Speed Kit: A Polyglot & GDPR-Compliant Approach for Caching Personalized Content .1.603... Wolfram Wingerath (Baqend), Felix Gessert (Baqend), Erik Witt (Baqend), Hannes Kuhlmann (Baqend), Florian Bücklers (Baqend), Benjamin Wollmer (University of Hamburg), and Norbert Ritter (University of Hamburg)

De-Health: All Your Online Health Information Are Belong to Us .1.6.09..... Shouling Ji (Zhejiang University), Qinchen Gu (Georgia Tech), Haiqin Weng (Ant Financial Service Group), Qianjun Liu (Zhejiang University), Pan Zhou (HUST), Jing Chen (Wuhan University), Zhao Li (Alibaba Group), Raheem Beyah (Georgia Tech), and Ting Wang (Penn State University) Maxson: Reduce Duplicate Parsing Overhead on Raw Data .1.62.1..... Xuanhua Shi (Huazhong University of Science and Technology), Yipeng Zhang (Huazhong University of Science and Technology), Hong Huang (Huazhong University of Science and Technology), Zhenyu Hu (Huazhong University of Science and Technology), Hai Jin (Huazhong University of Science and Technology), Huan Shen (Huazhong University of Science and Technology), Yongluan Zhou (University of Copenhagen), Bingsheng He (National University of Singapore), Ruibo Li (Alibaba Group), and Keyong Zhou (Alibaba Group)

Automatic Calibration of Road Intersection Topology using Trajectories .1.633.....
Lisheng Zhao (East China Normal University), Jiali Mao (East China
Normal University), Min Pu (East China Normal University), Guoping Liu
(Didi Chuxing), Cheqing Jin (East China Normal University), Weining
Qian (East China Normal University), Aoying Zhou (East China Normal
University), Xiang Wen (Didi Chuxing), Runbo Hu (Didi Chuxing), and
Hua Chai (Didi Chuxing)

SAFE: Scalable Automatic Feature Engineering Framework for Industrial Tasks .1.6.45..... Qitao Shi (Ant Financial Services Group), Ya-Lin Zhang (Ant Financial Services Group), Longfei Li (Ant Financial Services Group), Xinxing Yang (Ant Financial Services Group), Meng Li (Ant Financial Services Group), and Jun Zhou (Ant Financial Services Group)

## **Industry 3: Deep Learning and Novel Applications**

Cross-Graph Convolution Learning for Large-Scale Text-Picture Shopping Guide in E-Commerce Search 1657

arch .1657.... Tong Zhang (Nanjing University of Science and Technology, Nanjing, China), Baoliang Cui (Alibaba Group, Hangzhou, China), Zhen Cui (Nanjing University of Science and Technology, Nanjing, China), Haikuan Huang (Alibaba Group, Hangzhou, China), Jian Yang (Nanjing University of Science and Technology, Nanjing, China), Hongbo Deng (Alibaba Group, Hangzhou, China), and Bo Zheng (Alibaba Group, Hangzhou, China)

Billion-Scale Recommendation with Heterogeneous Side Information at Taobao .1.667...... Andreas Pfadler (Alibaba Group), Huan Zhao (The Hong Kong University of Science and Technology), Jizhe Wang (Alibaba Group), Lifeng Wang (Alibaba Group), Pipei Huang (Alibaba Group), and Dik Lun Lee (The Hong Kong University of Science and Technology)

Hierarchical Bipartite Graph Neural Networks: Towards Large-Scale E-Commerce Applications ..... 1677

Zhao Li (Alibaba Group), Xin Shen (Zhejiang University), Yuhang Jiao (Central University of Finance and Economics), Xuming Pan (Alibaba Group), Pengcheng Zou (Alibaba Group), Xianling Meng (Zhejiang University), Chengwei Yao (Zhejiang University), and Jiajun Bu (Zhejiang University)

LoCEC: Local Community-Based Edge Classification in Large Online Social Networks .1.689.... Chonggang Song (Tencent), Qian Lin (National University of Singapore), Guohui Ling (Tencent), Zongyi Zhang (Tencent), Hongzhao Chen (Tencent), Jun Liao (Tencent), and Chuan Chen (Tencent) APTrace: A Responsive System for Agile Enterprise Level Causality Analysis .1.70.1......
 Jiaping Gui (NEC Labs America Inc.), Ding Li (NEC Labs America Inc.),
 Zhengzhang Chen (NEC Labs America Inc.), Junghwan Rhee (NEC Labs
 America Inc.), Xusheng Xiao (Case Western Reserve University), Mu
 Zhang (University of Utah), Kangkook Jee (Unversity of Texas at
 Dallas), Zhichun Li (Stellar Cyber), and Haifeng Chen (NEC Labs

## Demonstrations

Qifei Li (Harbin Institute of Technology), Zhicong Huang (Alibaba Group), Wen-jie Lu (Alibaba Group), Cheng Hong (Alibaba Group), Hunter Qu (Alibaba Group), Hui He (Harbin Institute of Technology), and Weizhe Zhang (Harbin Institute of Technology)

ForkBase: Immutable, Tamper-Evident Storage Substrate for Branchable Applications .1.7.18. Qian Lin (National University of Singapore), Kaiyuan Yang (National University of Singapore), Tien Tuan Anh Dinh (Singapore University of Technology and Design), Qingchao Cai (Hudson River Trading Singapore), Gang Chen (Zhejiang University), Beng Chin Ooi (National University of Singapore), Pingcheng Ruan (National University of Singapore), Sheng Wang (Alibaba Group), Zhongle Xie (National University of Singapore), Meihui Zhang (Beijing Institute of Technology), and Olafs Vandans (Synspective Inc.)

MC-Explorer: Analyzing and Visualizing Motif-Cliques on Large Networks <u>1722</u>..... Boxuan Li (The University of Hong Kong), Reynold Cheng (The University of Hong Kong), Jiafeng Hu (Google), Yixiang Fang (The University of New South Wales), Min Ou (The University of Hong Kong), Ruibang Luo (The University of Hong Kong), Kevin Chen-Chuan Chang (University of Illinois at Urbana-Champaign), and Xuemin Lin (The University of New South Wales)

JODA: A Vertically Scalable, Lightweight JSON Processor for Big Data Transformations .1.72.6.. Nico Schäfer (TU Kaiserslautern (TUK)) and Sebastian Michel (TU Kaiserslautern (TUK))

- vCBIR: A Verifiable Search Engine for Content-Based Image Retrieval <u>1730</u>..... Shangwei Guo (Hong Kong Baptist University, Hong Kong, China), Yang Ji (Hong Kong Baptist University, Hong Kong, China), Ce Zhang (Hong Kong Baptist University, Hong Kong, China), Cheng Xu (Hong Kong Baptist University, Hong Kong, China), and Jianliang Xu (Hong Kong Baptist University, Hong Kong, China)
- MusX: Online Exploring and Visualizing Graph-Based Musical Adaptations .1.734..... François Lévesque (Polytechnique Montréal), Marielle St-Germain (EBSI, Université de Montréal), Dominique Piché (Polytechnique Montréal), Jean-François Gauvin (Bibliothèque et Archives nationales du Québec (BAnQ)), and Thomas Hurtut (Polytechnique Montréal)

RIDE: A System for Generalized Region of Interest Discovery and Exploration .1.738 Qiyu Liu (The Hong Kong University of Science and Technology), Libin Zheng (The Hong Kong University of Science and Technology), and Lei Chen (The Hong Kong University of Science and Technology)
PocketView: A Concise and Informative Data Summarizer .1.7.42 Yihai Xi (Beijing Jiaotong University), Ning Wang (Beijing Jiaotong University), Shuang Hao (Beijing Jiaotong University), Wenyang Yang (Beijing Jiaotong University), and Li Li (Beijing Jiaotong University)
CSQ System: A System to Support Constrained Skyline Queries on Transportation Networks 1746 Qixu Gong (New Mexico State University), Jiefei Liu (New Mexico State University), and Huiping Cao (New Mexico State University)
SUDAF: Sharing User-Defined Aggregate Functions .1.750 Chao Zhang (LIMOS, CNRS, University Clermont Auvergne), Farouk Toumani (LIMOS, CNRS, University Clermont Auvergne), and Bastien Doreau (LIMOS, CNRS, University Clermont Auvergne)
Automating Software Citation using GitCite .1.754 Leshang Chen (University of Pennsylvania) and Susan Davidson (University of Pennsylvania)
<ul> <li>SCLPD: Smart Cargo Loading Plan Decision Framework .1.758</li> <li>Jiaye Liu (East China Normal University, Shanghai, China), Mao Jiali</li> <li>(East China Normal University, Shanghai, China), Liao Jiajun (East</li> <li>China Normal University, Shanghai, China), Hu Huiqi (East China Normal</li> <li>University, Shanghai, China), Guo Ye (Jing Chuang Zhi Hui (Shanghai)</li> <li>Logistics Technology., LTD), and Zhou Aoying (East China Normal</li> <li>University, Shanghai, China)</li> </ul>
DCDT: A Digital Clock Drawing Test System for Cognitive Impairment Screening .1.762 Feiyang Xu (iFlytek Research, iFlytek Co.Ltd), Yue Ding (iFlytek Research, iFlytek Co.Ltd), Zhenhua Ling (NELSLIP, University of Science and Technology of China), Xin Li (iFlytek Research, iFlytek Co.Ltd), Yunxia Li (Department of Neuology, Shanghai Tongji Hospital), and Shijin Wang (iFlytek Research, iFlytek Co.Ltd)
Kronos: Lightweight Knowledge-Based Event Analysis in Cyber-Physical Data Streams .1.766 MohammadHossein Namaki (Washington State University), Xin Zhang (University of California, Riverside), Sukhjinder Singh (Washington State University), Arman Ahmed (Washington State University), Armina Foroutan (Washington State University), Yinghui Wu (Case Western Reserve University), Anurag K. Srivastava (Washington State University), and Anton Kocheturov (Siemens Corporation Technology)
DLEEL: Multi-Predicate Spatial Queries on User-Generated Streaming Data <u>1770</u> Abdulaziz Almaslukh (University of California, Riverside), Laila Abdelhafeez (University of Califronia, Riverside), and Amr Magdy (University of Califronia, Riverside)
Querying Streaming System Monitoring Data for Enterprise System Anomaly Detection .1.7.74 Peng Gao (UC Berkeley), Xusheng Xiao (Case Western Reserve University), Ding Li (NEC Labs America), Kangkook Jee (UT Dallas), Haifeng Chen (NEC Labs America), Sanjeev Kulkarni (Princeton

Haifeng Chen (NEC Labs America), Sanjeev Kulkarni (F University), and Prateek Mittal (Princeton University) SAD: An Unsupervised System for Subsequence Anomaly Detection .1.7.78..... Paul Boniol (EDF R&D, Université de Paris), Michele Linardi (Université de Paris), Federico Roncallo (Université de Paris), and Themis Palpanas (Université de Paris)

## Tutorials

Machine Learning Meets Big Spatial Data .1.782 Ibrahim Sabek (University of Minnesota, USA) and Mohamed Mokbel (Qatar Computing Research Institute, Qatar)
On the Integration of Machine Learning and Array Databases .1.786 Sebastian Villarroya (Jacobs University Bremen) and Peter Baumann (Jacobs University Bremen)
Visualization Systems for Linked Datasets .1.790. Maria Krommyda (NTUA) and Verena Kantere (NTUA)
Modern Large-Scale Data Management Systems after 40 Years of Consensus .1.7.9.4 Mohammad Javad Amiri (University of California Santa Barbara), Divyakant Agrawal (University of California Santa Barbara), and Amr El Abbadi (University of California Santa Barbara)
Advances in Cryptography and Secure Hardware for Data Outsourcing <u>1798</u>

Shantanu Sharma (University of California, Irvine, USA), Anton Burtsev (University of California, Irvine, USA), and Sharad Mehrotra (University of California, Irvine, USA)

## Posters

PushdownDB: Accelerating a DBMS Using S3 Computation .1.802 Xiangyao Yu (University of Wisconsin-Madison), Matt Youill (Burnian), Matthew Woicik (Massachusetts Institute of Technology), Abdurrahman Ghanem (Qatar Computing Research Institute), Marco Serafini (University of Massachusetts Amherst), Ashraf Aboulnaga (Qatar Computing Research Institute), and Michael Stonebraker (Massachusetts Institute of Technology)
Task Deployment Recommendation with Worker Availability .1.8.06 Dong Wei (New Jersey Institute of Technology), Senjuti Basu Roy (New Jersey Institute of Technology), and Sihem Amer-Yahia (CNRS, Univ. Grenoble Alpes)
Towards Extracting Highlights from Recorded Live Videos: An Implicit Crowdsourcing Approach .1.810 Ruochen Jiang (Ohio State University), Changbo Qu (Simon Fraser University), Jiannan Wang (Simon Fraser University), Chi Wang (Microsoft), and Yudian Zheng (Twitter)
Crowdsourcing-Based Data Extraction from Visualization Charts <u>1814</u> Chengliang Chai (Tsinghua University), Guoliang Li (Tsinghua University), Ju Fan (Renmin University), and Yuyu Luo (Tsinghua University)

Predicting Origin-Destination Flow via Multi-perspective Graph Convolutional Network .1.8.18 Learning to Simulate Vehicle Trajectories from Demonstrations .1.822 <i>Guanjie Zheng (The Pennsylvania State University), Hanyang Liu</i> <i>(Washington University in St. Louis), Kai Xu (Tianrang Inc.), and</i> <i>Zhenhui Li (The Pennsylvania State University)</i>
FAKEDETECTOR: Effective Fake News Detection with Deep Diffusive Neural Network .1.826 Jiawei Zhang (IFM Lab, Florida State University), Bowen Dong (University of Illinois at Chicago), and Philip S. Yu (University of Illinois at Chicago)
Mining Verb-Oriented Commonsense Knowledge .1.8.30. Jingping Liu (Fudan University), Yuanfu Zhou (Fudan University), Dan Wu (Fudan University), Chao Wang (Fudan University), Haiyun Jiang (Fudan University), Sheng Zhang (Ping An Health Technology), Bo Xu (Donghua University), and Yanghua Xiao (Fudan University)
Automated Anomaly Detection in Large Sequences .1.834 Paul Boniol (EDF R&D, Université de Paris), Michele Linardi (Université de Paris), Federico Roncallo (Université de Paris), and Themis Palpanas (Université de Paris)
SLED: Semi-Supervised Locally-Weighted Ensemble Detector <u>1838</u> Shuxiang Zhang (The University of Auckland), David Tse Jung Huang (The University of Auckland), Gillian Dobbie (The University of Auckland), and Yun Sing Koh (The University of Auckland)
<ul> <li>Hierarchical Quick Shift Guided Recurrent Clustering .1.8.42.</li> <li>Muzaffer Can Altinigneli (Institut für Informatik, LMU München, Munich, Germany), Lukas Miklautz (University of Vienna, Vienna, Austria), Christian Böhm (Institut für Informatik, MCML, LMU München, Munich, Germany), and Claudia Plant (ds:UniVie, University of Vienna, Vienna, Austria)</li> </ul>
Matrix Profile XVII: Indexing the Matrix Profile to Allow Arbitrary Range Queries .1.846 Yan Zhu (University of California, Riverside), Chin-Chia Michael Yeh (University of California, Riverside), Zachary Zimmerman (University of California, Riverside), and Eamonn Keogh (University of California, Riverside)
D-Tucker: Fast and Memory-Efficient Tucker Decomposition for Dense Tensors . <u>1.850</u> Jun-Gi Jang (Seoul National University) and U. Kang (Seoul National University)
A Unified Framework for Multi-view Spectral Clustering .1.854 Guo Zhong (University of Macau) and Chi-Man Pun (University of Macau)
Comprehensive and Efficient Data Labeling via Adaptive Model Scheduling .1.858 Mu Yuan (University of Science and Technology of China), Lan Zhang (University of Science and Technology of China), Xiang-Yang Li (University of Science and Technology of China), and Hui Xiong (Rutgers University)
Target Privacy Preserving for Social Networks .1862 Zhongyuan Jiang (Xidian University), Lichao Sun (University of Illinois at Chicago), Philip S. Yu (University of Illinois at Chicago), Hui Li (Xidian University), Jianfeng Ma (Xidian University), and Yulong Shen (Xidian University)

<ul> <li>Traffic Incident Detection: A Trajectory-Based Approach .1.8.66</li> <li>Xiaolin Han (The University of Hong Kong), Tobias Grubenmann (The University of Hong Kong), Reynold Cheng (The University of Hong Kong),</li> <li>Sze Chun Wong (The University of Hong Kong), Xiaodong Li (The University of Hong Kong), and Wenya Sun (The University of Hong Kong)</li> </ul>
Collective Entity Alignment via Adaptive Features .1.870 Weixin Zeng (National University of Defense Technology), Xiang Zhao (National University of Defense Technology), Jiuyang Tang (National University of Defense Technology), and Xuemin Lin (The University of New South Wales)
InvaliDB: Scalable Push-Based Real-Time Queries on Top of Pull-Based Databases .1.8.7.4 Wolfram Wingerath (Baqend), Felix Gessert (Baqend), and Norbert Ritter (University of Hamburg)
Discovering Band Order Dependencies <u>1878</u> Pei Li (Onedot A.G.), Jaroslaw Szlichta (Ontario Tech University), Michael Böhlen (University of Zurich), and Divesh Srivastava (AT&T Labs-Research)
The Pastwatch: On the Usability of Provenance Datain Relational Databases .1.8.82 Omar Alomeir (UBC), Eugenie Yujing Lai (UBC), Mostafa Milani (UBC), and Rachel Pottinger (UBC)
Query-Driven Repair of Functional Dependency Violations <u>1886</u> Stella Giannakopoulou (EPFL), Manos Karpathiotakis (Facebook), and Anastasia Ailamaki (EPFL)
Outdated Fact Detection in Knowledge Bases .1.890 Shuang Hao (Beijing Jiaotong University), Chengliang Chai (Tsinghua University), Guoliang Li (Tsinghua University), Nan Tang (Hamad Bin Khalifa University), Ning Wang (Beijing Jiaotong University), and Xiang Yu (Tsinghua University)
Preserving Contextual Information in Relational Matrix Operations .1.894 Oksana Dolmatova (University of Zurich), Nikolaus Augsten (University of Salzburg), and Michael Boehlen (University of Zurich)
<ul> <li>Stay Ahead of Poachers: Illegal Wildlife Poaching Prediction and Patrol Planning under Uncertainty with Field Test Evaluations .1.898</li> <li>Lily Xu (Harvard University), Shahrzad Gholami (University of Southern California), Sara McCarthy (University of Southern California), Bistra Dilkina (University of Southern California), Andrew Plumptre (Key Biodiversity Area Secretariat), Milind Tambe (Harvard University), Rohit Singh (World Wide Fund for Nature), Mustapha Nsubuga (Wildlife Conservation Society), Joshua Mabonga (Wildlife Conservation Society), Margaret Driciru (Uganda Wildlife Authority), Fred Wanyama (Uganda Wildlife Authority), Aggrey Rwetsiba (Uganda Wildlife Authority), Tom Okello (Uganda Wildlife Authority), and Eric Enyel (Uganda Wildlife Authority)</li> </ul>

Telescope: An Automatic Feature Extraction and Transformation Approach for Time Series Forecasting on a Level-Playing Field <u>1902</u> André Bauer (University of Wuerzburg), Marwin Züfle (University of Wuerzburg), Nikolas Herbst (University of Wuerzburg), Samuel Kounev (University of Wuerzburg), and Valentin Curtef (Cosmo Consult Data Science GmbH, Wuerzburg)
Auto-Model: Utilizing Research Papers and HPO Techniques to Deal with the CASH Problem 1906 Chunnan Wang (Harbin Institute of Technology), Hongzhi Wang (Harbin Institute of Technology), Tianyu Mu (Harbin Institute of Technology), Jianzhong Li (Harbin Institute of Technology), and Hong Gao (Harbin Institute of Technology)
Toward Sampling for Deep Learning Model Diagnosis <u>1910</u> Parmita Mehta (University of Washington), Stephen Portillo (University of Washington), Magdalena Balazinska (University of Washington), and Andy Connolly (University of Washington)
Approximate Quantiles for Datacenter Telemetry Monitoring .1.9.1.4 Gangmuk Lim (Ulsan National Institution of Science and Technology), Mohamed S. Hassan (Oracle), Ze Jin (Facebook), Stavros Volos (Microsoft Research), and Myeongjae Jeon (UNIST and Microsoft Research)
An Intersectional Definition of Fairness .1.9.18. James Foulds (University of Maryland, Baltimore County), Rashidul Islam (University of Maryland, Baltimore County), Kamrun Naher Keya (University of Maryland, Baltimore County), and Shimei Pan (University of Maryland, Baltimore County)
Towards Locally Differentially Private Generic Graph Metric Estimation <u>1922</u> Qingqing Ye (Renmin University of China), Haibo Hu (The Hong Kong Polytechnic University), Man Ho Au (The Hong Kong Polytechnic University), Xiaofeng Meng (Renmin University of China), and Xiaokui Xiao (National University of Singapore)
BFT-Store: Storage Partition for Permissioned Blockchain via Erasure Coding .1.926 Xiaodong Qi (East China Normal University, Shanghai, China), Zhao Zhang (East China Normal University, Shanghai, China), Cheqing Jin (East China Normal University, Shanghai, Chin), and Aoying Zhou (East China Normal University, Shanghai, China)
Reasoning about the Future in Blockchain Databases .1.930 Sara Cohen (Hebrew University of Jerusalem), Adam Rosenthal (Hebrew University of Jerusalem), and Aviv Zohar (Hebrew University of Jerusalem)
Deciding When to Trade Data Freshness for Performance in MongoDB-as-a-Service .1.934 Chenhao Huang (University of Sydney), Michael Cahill (MongoDB Inc), Alan Fekete (University of Sydney), and Uwe Röhm (University of Sydney)
PrefixFPM: A Parallel Framework for General-Purpose Frequent Pattern Mining .1.938 Da Yan (University of Alabama at Birmingham), Wenwen Qu (East China Normal University), Guimu Guo (University of Alabama at Birmingham), and Xiaoling Wang (East China Normal University)

HBP: Hotness Balanced Partition for Prioritized Iterative Graph Computations <u>1942</u> Shufeng Gong (Northeastern University, China), Yanfeng Zhang (Northeastern University), and Ge Yu (Northeastern University)
Computing Mutual Information of Big Categorical Data and Its Application to Feature Grouping .1.946 Junli Li (Taiyuan University of Science and Technology), Chaowei Zhang (Auburn University), Jifu Zhang (Taiyuan University of Science and Technology), and Xiao Qin (Auburn University)
StructSim: Querying Structural Node Similarity at Billion Scale <u>1950</u> Xiaoshuang Chen (University of New South Wales), Longbin Lai (East Normal China University, University of New South Wales), Lu Qin (University of Technology Sydney), and Xuemin Lin (University of New South Wales, East Normal China University)
<ul> <li>HowSim: A General and Effective Similarity Measure on Heterogeneous Information Networks</li> <li>1954 <ul> <li>Yue Wang (Shenzhen Institute of Computing Sciences, Shenzhen</li> <li>University), Zhe Wang (the Hong Kong University of Science and</li> <li>Technology), Ziyuan Zhao (WeChat Group, Tencent), Zijian Li (the Hong</li> <li>Kong University of Science and Technology), Xun Jian (the Hong Kong</li> <li>University of Science and Technology), Lei Chen (the Hong Kong</li> <li>University of Science and Technology), and Jianchun Song (WeChat</li> <li>Group, Tencent)</li> </ul> </li> </ul>
GraphAE: Adaptive Embedding across Graphs .1.958 Bencheng Yan (Tsinghua University) and Chaokun Wang (Tsinghua University)
FlashSchema: Achieving High Quality XML Schemas with Powerful Inference Algorithms and Large-Scale Schema Data <u>1.962</u> Yeting Li (State Key Laboratory of Computer Science, Institute of Software, Chinese Academy of Sciences, Beijing, China;University of Chinese Academy of Sciences, Beijing, China), Jialun Cao (The Hong Kong University of Science and Technology, Hong Kong, China), Haiming Chen (State Key Laboratory of Computer Science, Institute of Software, Chinese Academy of Sciences, Beijing, China), Tingjian Ge (University of Massachusetts, Lowell, United States), Zhiwu Xu (College of Computer Science and Software Engineering, Shenzhen University, Shenzhen, China), and Qiancheng Peng (State Key Laboratory of Computer Science, Institute of Software, Chinese Academy of Sciences, Beijing, China;University of Chinese Academy of Sciences, Beijing, China)
Efficient Structural Clustering in Large Uncertain Graphs .1.9.6.6 Yongjiang Liang (Florida State University), Tingting Hu (Embry-Riddle Aeronautical University), and Peixiang Zhao (Florida State University)
Efficient Weighted Independent Set Computation over Large Graphs .1.9.70 Weiguo Zheng (Fudan University, China), Jiewei Gu (Hunan University, China), Peng Peng (Hunan University, China), and Jeffrey Xu Yu (The Chinese University of Hong Kong, China)

Keys as Features for Graph Entity Matching .1.9.74. <i>Ting Deng (Beijing Advanced Institution on Big Data and Brain</i> <i>Computing, Beihang University), Lei Hou (Beijing Advanced Institution</i> <i>on Big Data and Brain Computing, Beihang University), and Ziyan Han</i> <i>(Beijing Advanced Institution on Big Data and Brain Computing, Beihang</i> <i>University)</i>
Online Pricing with Reserve Price Constraint for Personal Data Markets .1.9.78 Chaoyue Niu (Shanghai Jiao Tong University), Zhenzhe Zheng (Shanghai Jiao Tong University), Fan Wu (Shanghai Jiao Tong University), Shaojie Tang (University of Texas at Dallas), and Guihai Chen (Shanghai Jiao Tong University)
Permutation Index: Exploiting Data Skew for Improved Query Performance . <u>1.982</u> Wangda Zhang (Columbia University) and Kenneth A. Ross (Columbia University)
Efficient Locality-Sensitive Hashing over High-Dimensional Data Streams .1.986 Chengcheng Yang (King Abdullah University of Science and Technology), Dong Deng (Rutgers University), Shuo Shang (University of Electronic Science and Technology of China), and Ling Shao (Inception Institute of Artificial Intelligence)
A Class of R*-Tree Indexes for Spatial-Visual Search of Geo-Tagged Street Images .1.9.9.0 Abdullah Alfarrarjeh (University of Southern California), Seon Ho Kim (University of Southern California), Vinuta Hegde (University of Southern California), Akshansh Akshansh (University of Southern California), Cyrus Shahabi (University of Southern California), Qingyun Xie (Oracle), and Siva Ravada (Oracle)
Graph Embeddings for One-Pass Processing of Heterogeneous Queries .1.9.9.4 Chi Thang Duong (EPFL), Hongzhi Yin (The University of Queensland), Dung Hoang (HUST), Minh Hung Nguyen (Masaryk University), Matthias Weidlich (Humboldt-Universitat zu Berlin), Quoc Viet Hung Nguyen (Griffith University), and Karl Aberer (EPFL)
Fast Error-Tolerant Location-Aware Query Autocompletion <u>1998</u> Jin Wang (UCLA) and Chunbin Lin (Amazon AWS)
TrajMesa: A Distributed NoSQL Storage Engine for Big Trajectory Data .2002 Ruiyuan Li (Xidian University), Huajun He (JD Intelligent Cities Research, China; Southwest Jiaotong University, China), Rubin Wang (JD Intelligent Cities Research, China; Southwest Jiaotong University, China), Sijie Ruan (Xidian University), Yuan Sui (JD Intelligent Cities Research, China), Jie Bao (JD Intelligent Cities Research, China), and Yu Zheng (Xidian University)
Learning to Rank Paths in Spatial Networks .2006 Sean Bin Yang (Aalborg University, Denmark) and Bin Yang (Aalborg University, Denmark)
A Hybrid Learning Approach to Stochastic Routing .2010 Simon Aagaard Pedersen (Aalborg University), Bin Yang (Aalborg University), and Christian S. Jensen (Aalborg University)

Shortest Path Queries for Indoor Venues with Temporal Variations .20.1.4...... Tiantian Liu (Aalborg University), Zijin Feng (The Chinese University of Hong Kong), Huan Li (Aalborg University), Hua Lu (Aalborg University), Muhammad Aamir Cheema (Monash University), Hong Cheng (The Chinese University of Hong Kong), and Jianliang Xu (Hong Kong Baptist University)

## **TKDE Poster Papers**

DAG: A General Model for Privacy-Preserving Data Mining .2018 Sin Gee Teo (Insitute for Infocomm Research), Jianneng Cao (Insitute for Infocomm Research), and Vincent C.S. Lee (Monash University)
TIDY: Publishing a Time Interval Dataset with Differential Privacy (Extended Abstract) .2020 Woowhan Jung (Seoul National University), Suyong Kwon (Seoul National University), and Kyuseok Shim (Seoul National University)
The Power of Bounds: Answering Approximate Earth Mover's Distance with Parametric Bounds (Extended Abstract) .2022 <i>Tsz Nam Chan (The University of Hong Kong), Man Lung Yiu (The Hong Kong Polytechnic University), and Leong Hou U (State Key Laboratory of Internet of Things for Smart City, Department of Computer and Information Science, University of Macau)</i>
On Nearby-Fit Spatial Keyword Queries (Extended Abstract) 2024 Victor Junqiu Wei (Noah's Ark Lab, Huawei Technologies), Raymond Chi-Wing Wong (The Hong Kong University of Science and Technology), Cheng Long (Nanyang Technological University), and Pan Hui (The Hong Kong University of Science and Technology & University of Helsinki)
ChronoGraph: Enabling Temporal Graph Traversals for Efficient Information Diffusion Analysis over Time (Extended Abstract) .2026. Jaewook Byun (Sejong University), Sungpil Woo (ETRI), and Daeyoung Kim (KAIST)
Efficient Distance Sensitivity Oracles for Real-World Graph Data (Extended Abstract) .2028 Jong-Ryul Lee (Korea Advanced Institute of Science and Technology (KAIST)) and Chin-Wan Chung (Korea Advanced Institute of Science and Technology (KAIST), Chongqing University of Technology (CQUT))
Demythization of Structural XML Query Processing: Comparison of Holistic and Binary Approaches (Extended Abstract) .2030 Petr Lukáš (VSB - Technical University of Ostrava), Radim Bača (VSB - Technical University of Ostrava), Michal Krátký (VSB - Technical University of Ostrava), and Tok Wang Ling (National University of Singapore)
Answering Skyline Queries over Incomplete Data with Crowdsourcing (Extended Abstract) .2032 Xiaoye Miao (Zhejiang University), Yunjun Gao (Zhejiang University), Su Guo (Zhejiang University), Lu Chen (Aalborg University), Jianwei Yin (Zhejiang University), and Qing Li (The Hong Kong Polytechnic University)

<ul> <li>HisRect: Features from Historical Visits and Recent Tweet for Co-Location Judgement</li> <li>[Extended Abstract] .2034.</li> <li>Pengfei Li (Zhejiang University, China), Hua Lu (Aalborg University, Denmark), Qian Zheng (Zhejiang University, China), Shijian Li</li> <li>(Zhejiang University, China), and Gang Pan (State Key Lab of CAD&amp;CG, Zhejiang University, China)</li> </ul>
K-SPIN: Efficiently Processing Spatial Keyword Queries on Road Networks .2036 Tenindra Abeywickrama (National University of Singapore), Muhammad Aamir Cheema (Monash University), and Arijit Khan (Nanyang Technological University)
ESPM: Efficient Spatial Pattern Matching (Extended Abstract) .2038 Hongmei Chen (Yunnan University), Yixiang Fang (University of New South Wales), Ying Zhang (University of Technology, Sydney), Wenjie Zhang (University of New South Wales), and Lizhen Wang (Yunnan University)
A Transformation-Based Framework for KNN Set Similarity Search (Extended Abstract) .2040 Yong Zhang (Tsinghua University), Jiacheng Wu (Tsinghua Univeristy), Jin Wang (University of California, Los Angeles), and Chunxiao Xing (Tsinghua University)
Matrix Factorization with Interval-Valued Data (Extended Abstract) .20.42 Francesco Di Mauro (University of Torino, Turin, Italy), K Selcuk Candan (Arizona State University, Tempe, United States), and Maria Luisa Sapino (University of Torino, Turin, Italy)

## **PhD Symposium Papers**

## PhD Symposium 1

Neighborhood Density Correlation Clustering .2044. Zhenggang Wang (Chengdu Institute of Computer Application, Chinese Academy of Sciences University of Chinese Academy of Sciences Chengdu Customs of People's Republic of China)

## PhD Symposium 2

Spark Performance Optimization Analysis in Memory Management with Deploy Mode In Standalone Cluster Computing .2049
Mesay Adinew (University of Electronic Science and Technology College), Zhou Shijie (University of Electronic Science and Technology College), and Yongjian Liao (University of Electronic Science and Technology College)
Design of Database Systems with DRAM-Only Heterogeneous Memory Architecture .2054 Yifan Qiao (Rensselaer Polytechnic Institute)
Data Series Indexing Gone Parallel .2059. Botao Peng Peng (Universit´e de Paris)
Area Queries Based on Voronoi Diagrams .2064 Yang Li (China University of Geosciences)

Picube for Fast Exploration of Large Datasets	2069
Wenxiao Fu (York University)	

**Author Index**