26th ACM SIGSPATIAL
International Conference on
Advances in Geographic Information Systems
(ACM SIGSPATIAL GIS 2018)

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— Seattle, Washington, USA

Farnoush Banaei-Kashani
Erik Hoel
Ralf Hartmut Güting
Roberto Tamassia
Li Xiong

Editors
Preface

These proceedings contain the papers from the 26th ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems (ACM SIGSPATIAL 2018), held in Seattle, Washington, USA, November 6-9, 2018. The conference started as a series of workshops and symposia back in 1993 with the aim of promoting interdisciplinary discussions among researchers, developers, users, and practitioners and fostering research in all aspects of geographic information systems, especially in relation to novel systems based on geospatial data and knowledge. It continues to provide a forum for original research contributions covering all conceptual, design, and implementation aspects of geospatial data ranging from applications, user interfaces and visualization, to data storage, query processing, indexing and data mining. The conference is the premier annual event of the ACM Special Interest Group on Spatial Information (ACM SIGSPATIAL).

To create the conference’s technical program, each submitted paper was first reviewed by at least three members of a carefully chosen program committee (PC) consisting of experts in the relevant fields. Our PC had a total of 112 invited members from academia and industry, plus an additional 21 members who were designated as the Senior PC. The assignment of papers to reviewers followed a bidding stage, during which PC members were allowed to express ranked preferences regarding their willingness to review a particular submission. In addition to at least three, sometimes four, reviewers from the PC, each paper was also assigned a Senior PC member who studied the reviews, discussed the merits of the submission with the reviewers, wrote a metareview, and formulated an initial accept/reject recommendation. This was followed by a rebuttal phase where the authors received preliminary versions of the reviews and metareview and were offered the opportunity to address the concerns raised therein by submitting a response. The reviews, metareviews, and accept/reject recommendations were then finalized taking into account the responses. The final selection of papers to include in the conference program was made by the PC Chairs. Certain papers that were not accepted for the conference were forwarded, with the permission of the authors, to the conferences Workshop Chairs to be considered for inclusion in relevant workshops co-located with SIGSPATIAL.

Papers were submitted and accepted in different categories. We received a total of 150 research submissions and 19 industrial experience and systems submissions. We accepted 30 research and 8 industrial experience and systems submissions as full 10-page papers for oral presentation, resulting in acceptance rates of 20% and 42%, respectively. We accepted an additional 40 submissions as poster presentations, to be published as 4-page papers. We also received 24 demonstration submissions, of which we accepted 14 for live demonstrations, to be published as 4-page papers (acceptance rate of 58%). Finally, once again we have a vision paper track sponsored by the Computing Community Consortium (CCC) encouraging the submission of papers describing visionary ideas. All vision papers were reviewed by at least three senior PC members. Of the 12 vision papers submitted, 4 were accepted for oral presentation (33% acceptance rate) and publication as 4-page papers. Our reviewers put in a significant amount of effort in reviewing the papers and our hope is that the reviews were beneficial even to those authors whose papers were not accepted.
A paper to receive the best paper award was selected from all the accepted full papers in the research and industrial experience and systems categories. In years past, SIGSPATIAL has selected each conference’s best paper after the conference, but this year it was selected before the conference and the award presented at the conference. This is also the first year that we have official recognition of our best paper and 10-year impact award from ACM. For the best paper award, the top six papers with highest average review scores were selected as candidates. A best paper award committee consisting of 5 members including two of the PC Co-Chairs, one member from the SIGSPATIAL executive committee, and two other members reviewed the candidate papers and reviews and selected the best paper after discussions.

In addition, the top three papers out of the 4 accepted vision papers received the Blue Sky Idea award from the Computing Research Association’s Computing Community Consortium (CCC).

This year we held once again the SIGSPATIAL Cup programming contest, which focused on analyzing large spatial networks in order to find upstream features from a given set of starting points. The competition received 15 submissions and the teams totaled 42 members submitting formal entries. Three entries were selected as winners, and were additionally qualified for an invited paper, an oral presentation and award prizes during the banquet.

For the third time, after starting it in 2016, the conference had a Student Research Competition that aimed at providing a forum for undergraduate and graduate students to share their research results and exchange ideas with other students, judges, and conference attendees. This year, 5 papers authored by graduate students and 2 papers authored by undergraduate students were selected for presentation during the conference and were further assessed for advancement to the next round of the competition, the ACM Grand Finals.

We had two distinguished speakers: Daniel Delling (Apple Maps), with a keynote presentation “Route Planning in Transportation - From Research to Practice,” and Xin Chen (HERE Technologies) whose keynote addressed “HD Live Maps for Automated Driving: An AI Approach.”

The conference was expertly chaired by Farnoush Banaei-Kashani (University of Colorado, Denver, USA) and Erik Hoel (Esri, USA). It was preceded by 13 associated workshops managed by the Workshop Co-Chairs John Krumm (Microsoft Research, USA) and Mohamed Sarwat (Arizona State University, USA), in addition to the respective individual workshop organizers.

It takes many people working together to recreate this vibrant conference from year to year. As PC Co-Chairs, we are especially grateful to our PC, Senior PC and external reviewers, who generously and carefully reviewed the submissions and produced valuable feedback for both us and the authors. To produce this volume, we had the pleasure to work closely with Proceedings Co-Chairs Gabriel Ghinita (UMass, USA) and Raymond Wong (HKUST, Hong Kong), who took a lot of the burden and did a great job. We thank our Webmasters Chrysovalantis Anastasiou (University of Southern California, USA) and Xu Teng (Iowa State University, USA) who carefully managed the web pages and we are also very thankful to the Publicity Co-Chairs: Muhammad Aamir Cheema (Monash University, Australia), Sangho Kim (Esri, USA), and Yanhua Li (Worcester Polytechnic Institute, USA).
Furthermore we thank Martin Werner (Leibniz-University Hannover, Germany) and Xun Zhou (University of Iowa, USA) who served as Poster Co-Chairs and extend our special thanks to Dev Oliver (Esri, USA), Yuanyuan Pao (Lyft, USA), and Bo Xu (HERE, USA) who organized the SIGSPATIAL Cup programming contest this year.

There are many other individuals who did a tremendous job for the technical organization of the event and were in charge of many related activities. We thank Wei-Shinn Ku (Auburn University, USA) and Amr Magdy (University of California, Riverside, USA) who served as Treasurer Co-Chairs, along with our special thanks to Kyriakos Mouratidis (Singapore Management University) and Fusheng Wang (Stony Brook University, USA) who were in charge of organizing the SRC (Student Research Competition). We are indebted to Jing (David) Dai (Google, USA) and Zhenhui Li (Penn State University, USA) who served as Registrations Co-Chairs. Local Arrangements Co-Chairs James Biagioni (CARMERA, USA), Ahmed Eldawy (University of California, Riverside, USA) and Hien To (Amazon, USA) are those to whom we are all indebted for the hard work that they put in ensuring that everything ran smoothly at the venue.

We are also thankful to the ACM SIGSPATIAL Officers for their expert, sustaining guidance of the conference: Cyrus Shahabi (Chair, University of Southern California, USA), Goce Trajcevski (Vice-Chair, Iowa State University, USA), John Krumm (Treasurer, Microsoft Research, USA) and Egemen Tanin (Secretary, University of Melbourne, Australia)

A distinguished token of gratitude is due to Hanan Samet, Cyrus Shahabi, and Kentaro Toyama for bringing this conference to the forefront in 2007 and starting ACM SIGSPATIAL.

We give our very special thanks to our generous corporate sponsors - HERE, Amazon, Apple (Platinum Sponsors), Esri, Lyft, Uber (Silver Sponsors), Oracle (Bronze Sponsor), Microsoft, IBM, Google - many of whom have supported this conference for multiple years; and it is in order to recognize the appreciation of the work of Mark McKenney (Southern Illinois University Edwardsville, USA) and Chengyang Zhang (Amazon, USA) who were instrumental in getting these companies as our sponsors. We are also grateful for the publishing sponsorship by Springer Publishers (Bronze Publisher Sponsor) and special thanks are due to the US National Science Foundation (NSF) and the Computing Community Consortium (CCC) for their institutional sponsorship enabling travel-grants for students, along with Esri and IBM who provided sponsorship for the SIGSPATIAL Cup and the awards for the winners.

Every year, the conference highlights the most important advances in GIS and provides a forum for lively exchange of ideas among leading researchers and practitioners in the field. We are confident that you will find a similar value in this record of the conference. In conclusion, we would like to express once again our gratitude to all the authors who submitted papers, the members of the PC and senior PC, the conference officers, and all the other individuals who contributed their expertise and time to make the conference possible.

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Table of Contents

Keynotes
HD Live Maps for Automated Driving: An AI Approach
Xin Chen.................................................................................................................................1

Route Planning in Transportation Networks - From Research to Practice
Daniel Delling......................................................................................................................2

Research Track
RoadRunner: Improving the Precision of Road Network Inference from GPS Trajectories
Songtao He, Favyen Bastani, Sofiane Abbar, Mohammad Alizadeh, Hari Balakrishnan, Sanjay Chawla and Sam Madden.................................................................3

Efficient Generation of Geographically Accurately Transit Maps
Hannah Bast, Patrick Brosi and Sabine Storandt......................................................................13

Machine-Assisted Map Editing
Favyen Bastani, Songtao He, Sofiane Abbar, Mohammad Alizadeh, Hari Balakrishnan, Sanjay Chawla and Sam Madden.................................................................23

A Weakly Supervised Approach for Estimating Spatial Density Functions from High-Resolution Satellite Imagery
Nathan Jacobs, Adam Kraft, Muhammad Usman Rafique and Ranti Dev Sharma.......................33

What Is It Like Down There? Generating Dense Ground-Level Views and Image Features From Overhead Imagery Using Conditional Generative Adversarial Networks
Xueqing Deng, Yi Zhu and Shawn Newsam................................................................................43

Flood-Risk Analysis on Terrains under the Multiflow-Direction Model
Aaron Lowe and Pankaj K. Agarwal.........................................................................................53

A Multiresolution Approach for Viewsheds on 2D Terrains
Andrew Prescott and Laura Toma.............................................................................................63

Geofences in the Sky: Herding Drones with Blockchains and 5G
Tamraparni Dasu, Yaron Kanza and Divesh Srivastava............................................................73

Intelligent Geovisualizations for Open Government Data (Vision Paper)
Auriol Degbelo and Christian Kray ..........................................................................................77

Vision Paper: Reinforcement Learning in Smart Spatio-Temporal Environments
Sebastian Schmoll and Matthias Schubert................................................................................81

Understanding the Human Brain Via its Spatio-temporal Properties
Ouri Wolfson.............................................................................................................................85
Sensible Edge Weight Rounding for Realistic Path Planning
Sabine Storandt........................................................................................................................................89

Physics-guided Energy-efficient Path Selection: A Summary of Results
Yan Li, Shashi Shekhar, Pengyue Wang and William Northrop..............................................................99

Fast Similarity Search on Keyword-Induced Point Groups
Zhe Li, Yu Li and Man Lung Yiu..................................................................................................................109

Scalable Hybrid Similarity Join over Geolocated Time Series
Georgios Chatzigeorgakidis, Kostas Patroumpas, Dimitrios Skoutas, Spiros Athanasiou and Spiros
Skiadopoulos...............................................................................................................................................119

TurboReg: A Framework for Scaling Up Spatial Logistic Regression Models
Ibrahim Sabek, Mashaal Musleh, and Mohamed F. Mokbel........................................................................129

Improved Bounds on Information Dissemination by Manhattan Random Waypoint Model
Aria Rezaei, Jie Gao, Jeff M. Phillips and Csaba D. Tóth........................................................................139

Stepping Stone Graph for Public Movement Analysis
Sameera Kannangara, Egemen Tanin, Aaron Harwood and Shanika Karunasekera...............................149

Topological Signatures For Fast Mobility Analysis
Abhirup Ghosh, Benedek Rozemberczki, Subramanian Ramamoorthy and Rik Sarkar.........................159

Stella: Geotagging Images via Crowdsourcing
Christopher Jonathan and Mohamed F. Mokbel............................................................................................169

On the Value of Spatiotemporal Information: Principles and Scenarios
Heba Aly, John Krumm, Gireeja Ranade, and Eric Horvitz........................................................................179

ADAPT-Pricing: A Dynamic And Predictive Technique for Pricing to Maximize Revenue in Ridesharing
Platforms
Mohammad Asghari and Cyrus Shahabi........................................................................................................189

DOS: A Spatial System Offering Extremely High-Throughput Road Distance Computations
Shangfu Peng, Jagan Sankaranarayanan, and Hanan Samet......................................................................199

Evaluating Spatial-Keyword Queries on Streaming Data
Abdulaziz Almaslukha, Amr Magdy...........................................................................................................209

Adaptive Processing of Spatial-Keyword Data Over a Distributed Streaming Cluster
G. Aref.........................................................................................................................................................219

Efficient astronomical query processing using Spark
Mariem Brahem, Laurent Yeh, and Karine Zeitouni.......................................................................................229

Prescriptive Analytics System for Long-Range Aircraft Conflict Detection and Resolution
Samet Ayhan, Pablo Costas, and Hanan Samet..............................................................................................239

A Trace Framework for Analyzing Utility Networks: A Summary of Results (Industrial Paper)
Dev Oliver and Erik G. Hoel........................................................................................................................249
On-the-fly Mobility Event Detection over Aircraft Trajectories
Kostas Patroumpas, Nikos Pelekis, and Yannis Theodoridis

StreetNet: Preference Learning with Convolutional Neural Network on Urban Crime Perception
Kaiqun Fu, Zhiqian Chen, and Chang-Tien Lu

Multi-resolution sketches and locality sensitive hashing for fast trajectory processing
Maria Astefanoaei, Paul Cesaretti, Panagiota Katsikouli, Mayank Goswami, Rik Sarkar

A Generic Database Indexing Framework for Large-Scale Geographic Knowledge Graphs
Yuhan Sun and Mohamed Sarwat

Efficient Progressive and Diversified Top-k Best Region Search
Dimitrios Skoutas, Dimitris Sacharidis, and Kostas Patroumpas

Global Map Matching using BLE Beacons for Indoor Route and Stay Estimation
Daisuke Yamamoto, Ryosuke Tanaka, Shinsuke Kajioka, Naohisa Takahashi

A Force-Directed Approach for Offline GPS Trajectory Map Matching
Efstratios Rappos, Stephan Robert, and Philippe Cudré-Mauroux

Trajectory annotation using sequences of spatial perception
Sebastian Feld, Steffen Illium, Andreas Sedlmeyer, and Lenz Belzner

DeepLoc: A Ubiquitous Accurate and Low-Overhead Outdoor Cellular Localization System
Ahmed Shokry, Marwan Torki, and Moustafa Youssef

An Unsupervised Augmentation Framework for Deep Learning based Geospatial Object Detection: A Summary of Results
Yiqun Xie, Rahul Bhojwani, Shashi Shekhar and Joseph Knight

Exploiting Spatiotemporal Patterns for Accurate Air Quality Forecasting using Deep Learning
Yijun Lin, Nikhit Mago, Yu Gao, Yaguang Li, Yao-Yi Chiang, Cyrus Shahabi, and José Luis Ambite

Trajectory-based Social Circle Inference
Qiang Gao, Goce Trajcevski, Fan Zhou, Kunpeng Zhang, Ting Zhong, and Fengli Zhang

Creating Full Individual-level Location Timelines from Sparse Social Media Data
Nabeel Abdur Rehman, Kunal Relia, and Rumi Chunara

Balanced Centroidal Power Diagrams for Redistricting
Vincent Cohen-Addad, Philip N. Klein, and Neal E. Young

Poster Track

Bike Flow Prediction with Multi-Graph Convolutional Networks
Di Chai, Leye Wang, and Qiang Yang

Lighthouse: Enabling Landmark-based Accurate and Robust Next Generation Indoor LBSs on a Worldwide Scale
Moustafa Youssef
Finding k-Dissimilar Paths with Minimum Collective Length
Theodoros Chondrogiannis, Panagiotis Bouros, Johann Gamper, Ulf Leser, and David B. Blumenthal………404

Adversarial Examples in Remote Sensing
Wojciech Czaja and Neil Fendley, Michael Pekala, Christopher Ratto, and I-Jeng Wang…………………408

Computing Commonsense Cardinal Direction Relations
Gregory Kritzman and Torsten Hahmann……………………………………………………………………412

Indexing Moving Object Trajectories With Hilbert Curves
Reaz Uddin, Chinya Ravishankar, Vassilis Tsotras…………………………………………………………………..416

RBox-CNN: Rotated Bounding Box based CNN for Ship Detection in Remote Sensing Image
Jamyoung Koo, Junghoon Seo, Seunghyun Jeon, Jeongyeol Choe, and Taegyun Jeon…………………………420

W-edge: weighing the edges of the road network
Rade Stanojevic, Sofiane Abbar, Mohamed Mokbel………………………………………………………………………424

Robust Tracking of Objects with Dynamic Topology
Padraig Corcoran, Christopher B. Jones………………………………………………………………………………………..428

Detecting Skewness of Big Spatial Data in SpatialHadoop
Alberto Belussi, Sara Migliorini, and Ahmed Eldawy………………………………………………………………………432

HiCaPS: Hierarchical Contextual POI Sequence Recommender
Ramesh Baral, S. S. Iyengar, Tao Li, XiaoLong Zhu…………………………………………………………………………436

Replicating Urban Dynamics by Generating Human-like Agents from Smartphone GPS Data
Yanbo Pang, Kota Tsubouchi, Takahiro Yabe, and Yoshihide Sekimoto………………………………………………440

Volume-based Similarity of Linear Features on Terrains
Willem Sonke, Marc van Kreveld, Tim Ophelders, Bettina Speckmann, and Kevin Verbeek………………444

An Efficient Approximation Algorithm for Multi-criteria Indoor Route Planning Queries
Chaluka Salgado, Muhammad Aamir Cheema, and David Taniar……………………………………………………………448

Mining Spatio-temporal Data for Computing Driver Stress and Observing Its Effects on Driving Behavior
Rohit Verma, Gyanesha Prajwal, Bivas Mitra, Sandip Chakraborty…………………………………………………………452

An Ontology-based Algorithm for Managing the Evolution of Multi-Level Territorial Partitions
Camille Bernard, Christine Plumejeaud-Perreau, Marlène Villanova-Oliver, Jérôme Gensel, and Hy Dao…456

A Time-Inhomogeneous Markov Model for Resource Availability under sparse Observations
Lukas Rottkamp and Matthias Schubert………………………………………………………………………………………460

FUTURES-DPE: Towards Dynamic Provisioning and Execution of Geosimulations in HPC environments
Ashwin Shashidharan, Ranga Raju Vatsavai, and Ross K. Meentemeyer……………………………………………………464

Beyond the traffic sign recognition: constructing an auto-pilot map for autonomous vehicle
Zhenhua Zhang, Leon Stenneth, Ram Marappan, Zaba Sebastian, Philip S. Yu………………………………………………468

Signal Reconstruction Approach for Map Inference from Crowd-Sourced GPS Traces
Eric He, Fan Bai, Vijayakumar Bhagavatula, and Curtis Hay…………………………………………………………………472
Parallelizing Top-k Frequent Spatiotemporal Terms Computation on Key-Value Stores
Hong Van Le, Atsuhiro Takasu ................................................................. 476

Sparse Map-Matching in Public Transit Networks with Turn Restrictions
Hannah Bast and Patrick Brosi ................................................................. 480

Time-aware Location Sequence Recommendation for Cold-start Mobile Users
Ting Shen, Haiquan Chen, and Wei-Shinn Ku ........................................ 484

Realtime Linear Cartograms and Metro Maps
Thomas C. van Dijk and Dieter Lutz ....................................................... 488

Coverage Constrained Spatial CO-clustering
Roxana Ohriniuc, Aaron Reich, and KwangSoo Yang ................................. 492

DISTIL: A Distributed In-Memory Data Processing System for Location-Based Services
Maria Patrou, Md Mahbub Alam, Puya Memarzia, Sapiro Ray, Virendra C. Bhavsar, Kenneth B. Kent, and Gerhard W. Dueck ......................................................... 496

Size Constrained k Simple Polygons
Aaron Reich, Roxana Ohriniuc, and KwangSoo Yang ................................ 500

Predictive Population Behavior Analysis from Multiple Contexts with Multilinear Poisson Regression
Masamichi Shimosaka, Takeshi Tsukiji, Hideyuki Wada, and Kota Tsubouchi ................................................................. 504

Fine Scale Registration of Walking Paths and other Ribbon-like Features
Zhongyu Liu, Xian Liu, and John Femiani ............................................... 508

A Feature Set for Spatial Behavior Characterization
Rui Zhang, Kevin G. Stanley, Scott Bell, and Daniel Fuller ........................ 512

Probabilistic Reachability Query in Evolving Spatiotemporal Contact Networks of Moving Objects
Zohreh Raghebi, Farnoush Banaei-Kashani ............................................ 516

Detecting Latest Local Events from Geotagged Tweet Streams
Hong Wei, Hao Zhou, Jagan Sankaranarayanan, Sudipta Sengupta and Hanan Samet ................................................................. 520

In-Route Task Selection in Crowdsourcing
Camila F. Costa and Mario A. Nascimento ............................................ 524

A Seq2seq Learning Approach for Modeling Semantic Trajectories and Predicting the Next Location
Antonios Karatzoglou, Adrian Jablonski, and Michael Beigl ......................................................... 528

R-Grove: Growing a Family of R-trees in the Big-Data Forest
Tin Vu and Ahmed Eldawy ................................................................. 532

Distributed Zonal Statistics of Big Raster and Vector Data
Samriddhi Singla and Ahmed Eldawy ..................................................... 536

Cryptotransport: Blockchain-Powered Ride Hailing While Preserving Privacy, Pseudonymity and Trust
Yaron Kanza and Eliyahu Safra ............................................................. 540

Playing with Matches: Vehicular Mobility through Analysis of Trip Similarity and Matching
Roozbeh Ketabi, Babak Alipour, and Ahmed Helmy ................................ 544
Fusion of Aerial Lidar and Images for Road Segmentation with Deep CNN
Biswas Parajuli, Piyush Kumar, Tathagata Mukherjee, Eduardo Pasiliao, and Sachin Jambawalikar………548

Theft Prediction with Individual Risk Factor of Visitors
Shakila Khan Rumi, Ke Deng, and Flora D. Salim………………………………………………………………………..552

Demo Track
A Modular Software Framework for Compression of Structured Climate Data
Ugur Cayoglu, Jennifer Schröter, Jörg Meyer, Achim Streit, and Peter Braesicke………………………………………..556

Los Angeles Metro Bus Data Analysis Using GPS Trajectory and Schedule Data (Demo Paper)
Kien Nguyen, Jingyun Yang, Yijun Lin, Jianfa Lin, Yao-Yi Chiang, Cyrus Shahabi………………………………………..560

A Spatio-temporal Entropy-based Approach for the Analysis of Cyber Attacks (Demo Paper)
Thibaud Mérien, Xavier Bellekens, David Brosset, and Christophe Claramunt………………………………………564

LocXplore: A System for Profiling Urban Regions
András Komáromy and Paras Mehta………………………………………………………………………………………568

EaserGeocoder: Integrative Geocoding with Machine Learning (Demo Paper)
Sina Rashidian, Xinyu Dong, Shubham Kumar Jain, and Fusheng Wang…………………………………………….572

CYCLOPS: CYCLE route Options Planning Service
Florian Barth, Stefan Funke, and Sabine Storandt……………………………………………………………………………576

Studying Transportation Problems with the SMARTS Simulator (Demo Paper)
Hairuo Xie, Egemen Tanin, Shanika Karunasekera, Lars Kulik, Rui Zhang, Jianzhong Qi, and Kotagiri Ramamohanarao……………………………………………………………………………………………..580

Periodic stops discovery through density-based trajectory segmentation
Fatima Hachem and Maria Luisa Damiani……………………………………………………………………………………584

3D Semantic Segmentation for High-resolution Aerial Survey Derived Point Clouds using Deep Learning (Demonstration)
Haoyi Xiu, Poliyapram Vinayaraj, Kyoung-Sook Kim,ca, Ryosuke Nakamura, Wanglin Yan………………………588

Pine: A System For Crowdsourced Spatial Data Source Discovery While Map BrowsingMyles Haynes, Abdeltawab Hendawi, and Mohamed Ali………………………………………………………………………………………………………..592

Dynamic Spatio-temporal Integration of Traffic Accident Data
Ove Andersen and Kristian Torp…………………………………………………………………………………………596

Multi-Level Filtering to Retrieve Similar Trajectories under the Frechet Distance
Hong Wei, Riccardo Fellegara, Yin Wang, Leila De Floriani and Hanan Samet………………………………………………600

rasdaman: Datacubes on Steroids
Peter Baumann, Dimitar Misev, Vlad Merticariu, Bang Pham Huu, Brennan Bell………………………………………604

Activity-Based Ride-Sharing in Action (Demo Paper)
Oscar Correa, Egemen Tanin, Lars Kulik, and Kotagiri Ramamohanarao………………………………………………608
Student Research Competition
Summit: A Scalable System for Massive Trajectory Data Management
Louai Alarabi

Transferring scale-independent features to support cross-scale object recognition with deep convolutional neural network
Xiran Zhou

Centroid-Amenities An Interactive Visual Analytical Tool for Exploring and Analyzing Amenities in Singapore
Jazreel Siew Xue Qian, Sean Koh Jia Ming

Automatic Intersection Extraction and Building Arrangement with StarCraft II Maps
Yuanbin Cheng

An Intelligent and Interactive Route Planning Maker for Deploying New Transportation Services
Fandel Lin

GIS Cup
Fast Analysis of Upstream Features on Spatial Networks (GIS Cup)
Salles Viana Gomes Magalhães, W. Randolph Franklin, and Ricardo dos Santos Ferreira

Wüpstream: Efficient Enumeration of Upstream Features (GIS Cup)
Thomas C. van Dijk, Tobias Greiner, Bas den Heijer, Nadja Henning, Felix Klesen, and Andre Lößler

Using Biconnected Components for Efficient Identification of Upstream Features in Large Spatial Networks (GIS Cup)
Zach Goldthorpe, Jason Cannon, Jesse Farebrother, Zachary Friggstad, and Mario A. Nascimento
ABSTRACT
HD Maps, one of the key components of automated driving and a life-saving safety feature, serve as the hub for sensing, perception and decision. Making and maintaining a near-real time HD map on a global scale is an extremely challenging task. I will present how we apply AI technologies to automate the creation of HD Live Maps using both industrial capture and crowd-sourced based data collection. Quality Index is introduced to provide automated driving customers with the confidence of HD map accuracy and reliability in a dynamic world. We implement low power and high throughput edge perception as a reference implementation to enable crowd-sourced based HD map maintenance. Finally I will share best practices to democratize AI in our engineering organization and transition research into production.

CCS CONCEPTS
• Information systems → Geographic information systems;
• Computer systems organization → Real-time system architecture;

KEYWORDS
mapping, automated driving, transportation

ACM Reference Format:

BIOGRAPHY
Dr. Xin Chen is a Director of Engineering in the Highly Automated Driving organization at HERE Technologies whose team is completing pioneering work to achieve the automation of next generation map creation using computer vision and machine learning technologies. He has over 50 U.S. Patents in LIDAR and image analysis for mapping and he has served on an NSF (National Science Foundation) panel to evaluate and award funding to multi-million dollar projects advancing research in these areas. Xin has been awarded 2010 and 2011 IMPACT awards to recognize “employees making outstanding contributions”, an award recognizing “Significant Intellectual Property Contributors” for 2011-2012, 2013 and 2014 company-wide Hack top awards, and 2015 Berkeley Office Hackathon top award. He has numerous publications at CVPR and CVIU. Xin is an adjunct professor and PhD advisor at Northwestern University and Illinois Institute of Technology teaching “Geospatial Vision and Visualization” and “Biometrics” courses. Xin obtained his Ph.D. in Computer Science and Engineering from the University of Notre Dame.
Route Planning in Transportation Networks - From Research to Practice

Daniel Delling
Apple Inc.
1 Infinite Loop, Cupertino, California, USA
ddelling@apple.com

ABSTRACT
The last 15 years have seen astonishing progress in the performance of shortest path algorithms for transportation networks. In particular, for road networks, modern algorithms can be up to seven orders of magnitude faster than standard solutions. Since these algorithms enable several new applications, many of them have found their way into navigation services of major technology companies serving hundreds of millions of users every day. This talk highlights key techniques, discusses their impact on the industry, and provides an outlook on upcoming challenges.

CCS CONCEPTS
• Information systems → Geographic information systems;
• Computer systems organization → Real-time system architecture;

KEYWORDS
Route planning, transportation

ACM Reference Format:

BIOGRAPHY
Daniel Delling is a researcher and architect at Apple Inc. in Cupertino, USA. His research focuses on the design, analysis, and implementation of efficient algorithms and data structures. Before joining Apple, he received his PhD from the Karlsruhe Institute of Technology and was a Researcher at Microsoft Research Silicon Valley. Daniel Delling is a researcher and architect at Apple Inc. in Cupertino, USA. His research focuses on the design, analysis, and implementation of efficient algorithms and data structures. Before joining Apple, he received his PhD from the Karlsruhe Institute of Technology and was a Researcher at Microsoft Research Silicon Valley.