

# The 13th ACM SIGSPATIAL International Workshop on Computational Transportation Science (IWCTS 2020), Seattle, WA, USA - November 3, 2020

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## Introduction

Today's growth in big data, edge computing, high-performance computing, and machine learning has opened tremendous opportunities for advances in mobility. The 13<sup>th</sup> International Workshop on Computational Transportation Science (IWCTS 2020) is particularly timely given the prominence of connected automated vehicles technologies in the global auto industry's near-term growth strategies, of big data analytics, unprecedented access to sensing data of mobility, and of integration of this analytics into the optimization of mobility and transport. These developments (as listed below) are deeply computational.

- Transportation Planning & Modeling: travel behavioral analysis, modeling and simulation of population movements and freight transportation systems.
- Transportation Operations: Connected and Autonomous (CAVs), Computational traffic flow models and control algorithms, role of transportation in community spread of a pandemic (COVID-19).
- Infrastructure Sensing: Digital Twin, Data-driven approaches to transportation systems operations
- Other Technologies: Urban sensing technologies, Geoinformatics and Regional Science

## IWCTS 2020 Submissions

This year, we had a call for short papers or full papers. We received submissions for 3 short papers and 8 full papers. One of the full papers was withdrawn prior to completion of the review process. The remaining 10 papers were reviewed by the organizers and program committee members. Based on the peer review process, 3 short papers and 6 full papers were selected for presentation at the conference and publication in the workshop proceedings [1].

The program committee members are

- Anne Berres, Oak Ridge National Laboratory
- Kuldeep Kurte, Oak Ridge National Laboratory
- Srinath Ravulaparthi, Lawrence Berkeley National Laboratory
- Jibonananda Sanyal, Oak Ridge National Laboratory
- Gautam Thakur, Oak Ridge National Laboratory

- Ambarish Nag, National Renewable Energy Laboratory
- Chieh Ross Wang, Oak Ridge National Laboratory
- Lee Han, University of Tennessee at Knoxville
- Digvijay Pawar, IIT Hyderabad
- Mina Sartipi, University of Tennessee at Chattanooga
- Punit Tulpule, The Ohio State University
- Jackeline Rios-Torres, Oak Ridge National Laboratory

## IWCTS 2020 Workshop Program

Since this year's workshop is fully virtual due to COVID, we changed this year's workshop program a little from the usual program to accommodate participants joining from Europe, Australia, and the Americas. Each provided an hour long break to give participants in different time zones the opportunity to have lunch or dinner at a reasonable time. Furthermore, we added a half-hour of open discussion at the end of the day, which served as an opportunity for all workshop participants to get to know each other and discuss future collaborations. Throughout the workshop, we had an average of 17-18 people, peaking at 21 attendees during the keyWe grouped the workshop presentations in the following three sessions.

### Session 1

Session 1 groups papers on the advanced data-driven approaches in mobility. Swetava Ganguli presented a deep learning based approach called VAE-Info-cGAN (Variational Autoencoder with a conditional Information Maximizing Generative Adversarial Network (InfoGAN)) to generate target data for data augmentation of various geospatial applications [2]. Experimental results presented on a GPS trajectory dataset showed the applicability of the proposed approach in generating various forms of spatio-temporal aggregates across different geographic locations [3]. Next, Lukas Rottkamp presented their work on developing a generalised approach to calculate the cost associated with the various types of detours while travelling, such as charging stations, finding a place for parking, etc. Lukas also presented their approach on generating sufficiently realistic parking data when real-data is not available. Towards the end of session 1, Paolo Pintor explained that the traffic prediction solely based on the historical data may fail with the real-time events such as road works and traffic accidents [4]. Paolo presented a system that combines both the historical and real-time traffic data and uses a stochastic process for short-term traffic forecasting.

### Keynote

The workshop keynote was presented by Dr. Mina Sartipi, an expert in the computation transportation domain. Dr. Mina Sartipi is the Founding Director of the Center for Urban Informatics and Progress (CUIP) at the University of Tennessee at Chattanooga (UTC), where she is also a Guerry Professor in the Computer Science and Engineering Department. She talked about how data, connectivity, and machine learning technologies can improve the traffic flow safely, while minimizing environmental impact. The talk started with the brief introduction to the safety in mobility and path to the data driven mobility approaches. Towards the end of the keynote session, all the participants engaged in a lively discussion and question and answer with Dr. Mina.



Fig 1. Dr. Mina Sartipi giving keynote talk

## Session 2

Session 2 combined papers on driving pattern analysis. Christian Röger presented an interesting approach to implement the Floating Car Observers (FCO) that uses particulate matter sensors for obtaining road abrasion from cars driving ahead of a test vehicle [5]. Further, Christian explained the random forest based machine learning approach to predict the presence and absence of the ambient traffic in the vicinity of the vehicle using particulate matter readings. Next, Yan Li presented a lagrangian perspective for the hotspot discovery problem that considers the linear dependence of the events occurring on the paths and trajectories which usually is ignored in the state-of-the-art euclidean perspective of hotspot discovery [6]. At the end of session 2, Antonios Karatzoglou presented a preliminary work on relevant feature extraction from a spatio-temporal signal based on the topographic properties such as prominence and isolation for recognizing critical driving patterns in speed signals [7]. Various driving behaviours identified by this approach included harsh acceleration, abrupt braking as well as over-speeding phases.

## Session 3

Session 3 combined the presentations on routing optimization. Bin Yang presented a deep learning based approach called dual-input long-short term memory (DI-LSTM) to estimate the travel speed distribution of paths [8]. The important objective of this work was to capture the traffic uncertainty from the speed information obtained from the sensor technologies. Next, Renjie Chen started the presentation by describing the importance of the fastest-path queries between two points in the large road network. Further, Renjie presented a Hierarchical Separator Heuristic (HSH) for fastest path travel time that accelerates the classical A\* algorithm for fastest path [9]. At the end of session 3, Sadegh Motallebi presented a new route assignment algorithm for the era of connected autonomous vehicles that optimizes traffic based on both the real-time and prior traffic data [10].

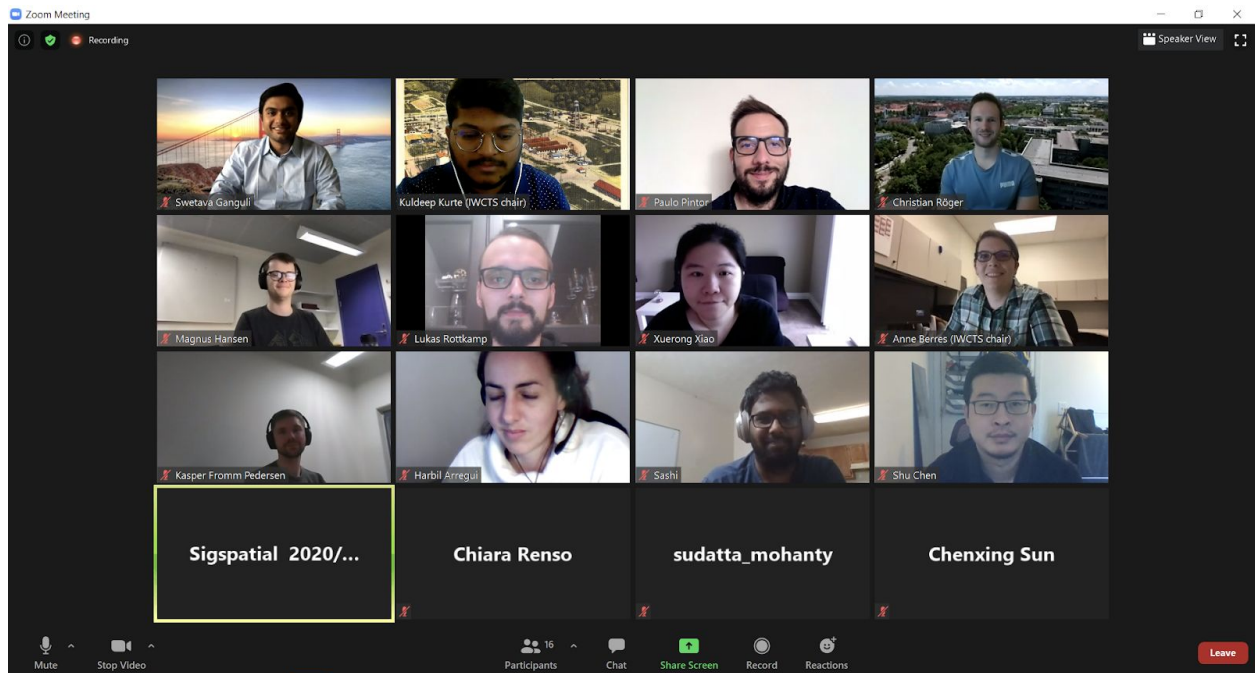
## Conclusion

In summary, the 13<sup>th</sup> edition of IWCTS have seen a balanced mix of works ranging from the advancements in the traditional approaches to the deep learning based approaches to solve various computational transportation science problems. In subsequent series of this workshop, we expect to see more work on advanced data-driven approaches such as deep learning to address more complex problems at the intersection of computational transportation and geospatial domain.

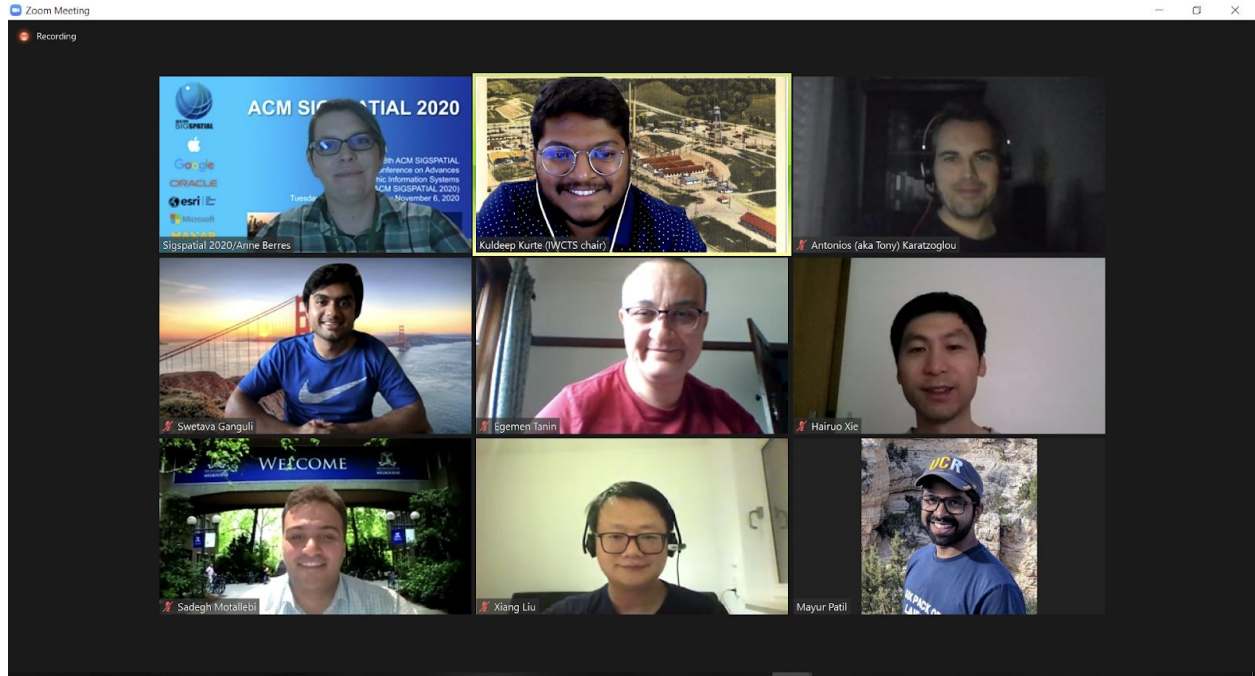
The workshop organizers thank all submitters, presenters, PC members, and participants for their contributions to this successful workshop. We hope the IWCTS workshop series will continue to provide a leading international forum for researchers, developers, and practitioners in the field of computational transportation sciences to identify current and future areas of research.

## Snapshots from the Workshop Zoom Meeting

In lieu of a group photo, we took a few snapshots for which we asked participants to turn on their cameras.



(a) Before the beginning of the workshop



(b) During the final discussion session of the workshop

Fig. 2: Snapshots of zoom meeting during workshop

## References

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