Graduate school research opportunities in
Smart Mobility Systems at Vanderbilt University

Principle investigator: Prof. Dan Work (https://lab-work.github.io)

Our research brings together computational and data-driven solutions to physical, real-world transportation problems, which is a domain referred to as "cyber-physical systems". By leveraging technologies such as sensing, control, and artificial intelligence, we hope to improve the sustainability, societal benefit, and efficiency of these systems.

Traffic Control with autonomous vehicles

Prior research in closed-course experimental settings has shown that a small number of autonomous vehicles, if properly controlled, can reduce certain types of traffic jams. This can lead to more stable traffic, fewer braking events, and reduced emissions. The future of this work will deploy semi-autonomous vehicles with specialized algorithms in real traffic to demonstrate this jam-dampening behavior at scale. This involves modifying stock vehicles for control access, modeling traffic behavior, and designing vehicle control algorithms.
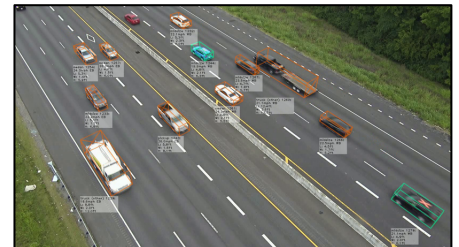

Computer vision and big data in the I-24 MOTION autonomous vehicle testbed

The I-24 MOTION testbed (https://i24motion.org) is under construction and will be one of the largest deployments of traffic instrumentation in the world. Four miles of infrastructure are being constructed in 2022. The testbed will generate millions of vehicle trajectory data points each day and will run around the clock. This abundant, high-resolution vehicle data will unlock new research in traffic simulation, human driver modeling, traffic safety, mixed autonomy traffic, and more.

Generating 280 million miles per year of precise vehicle trajectories from the testbed's 4K-resolution cameras requires research in state-of-the-art computer vision, machine learning, and high-performance computing. Using these trajectories for new traffic science will be an interdisciplinary effort across engineering, simulation, human factors studies, and data science.

Additional research opportunities are available in smart cities sensing, urban mobility, and personal mobility devices.

Desired experience related to the following areas:
– Proficiency and desire to improve in data-science oriented programming language (e.g., Python, Matlab)
– Technical writing, communication, and presentation skills
– Experience with machine learning or applied data science
– Experience with transportation or systems engineering

If you are interested or have any questions, please send a copy of your resume along with any relevant coursework to Prof. Dan Work (dan.work@vanderbilt.edu).