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BEYOND DATA: DATA-DRIVEN DIGITAL TWINS FOR SUSTAINABLE FUTURE CITIES

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ABSTRACT

Urbanization is straining our transportation systems and road networks. The resulting congestion, delays and air pollution lead to a declined quality of life but also greatly contributes to climate change. The confluence of dramatic changes in the availability of data that measures mobility with significant increases in computational capabilities will allow us to develop next-generation traffic management systems that make it easier for cities to create safe and fluid traffic networks, while balancing the needs of a large variety of travellers. Advanced traffic management systems, founded on data-driven digital twins, will predict traffic congestion patterns and find alternative routing and control mechanisms to distribute mobility. This talk will highlight our urban-scale, parallel discrete event simulation platform – Mobiliti. Mobiliti is built on HPC and can simulate a day of travel in large urban networks in a matter of minutes, e.g., the Bay Area (1M road edges, 19M trip legs, ~4 minutes) and the full Los Angeles Basin (2M road edges, 40M trip legs, ~6 minutes). We will also describe our efforts in machine learning techniques to develop surrogate models for Mobiliti that not only provide predictive capabilities but will integrate into advanced control systems and orchestrate the movement of traffic in an efficient and effective manner. As important, this talk will highlight how we measure the improvements these technologies bring against the requirements of building liveable, equitable cities.

AUTHOR BIOGRAPHIES

JANE MACFARLANE is the Director of Smart Cities and Sustainable Mobility at the University of California at Berkeley and an affiliate scientist at Lawrence Berkeley National Laboratory. Dr. Macfarlane has over 30 years of experience in high performance computing, data analytics and geospatial mapping. For a large part of her career, she has been responsible for directing industry research. Including: Chief Scientist and Head of Research for HERE – a leader in geospatial mapping and Director of Advanced Technology Planning for OnStar at General Motors – the first at-scale, telematics solution in the US. Her research focus is on semantic analytics, big data analytics and visualization, contextualization of data streams and spatially distributed computing. Her thesis work focused on Dynamic Systems Understanding using an assumption-based truth maintenance system and symbolic analysis. She has authored over 26 patents, primarily in the domain of geospatial data analytics. She holds a Ph.D. in Mechanical Engineering from the University of Minnesota. Currently she is leading a DOE National Laboratory effort across three national labs focused on the use of High-Performance Computing and big data in transportation systems. Her email address is janemacfarlane@berkeley.edu. Her website is https://its.berkeley.edu/people/jane-macfarlane.