Transportation systems models are needed for conducting traffic engineering studies, operations analyses, and transportation impact studies. Transportation systems models can be analytically based or simulation based. Once the model is constructed, one can then experiment with different control strategies and design configurations and determine their impact on the system, in an effort to figure out the optimal course of action.

Transportation models can be applied to transportation applications in two fashions. The first is in an off-line fashion where the focus is on evaluating the impact of proposed design changes and infrastructure improvement projects on system performance. A critical step here is that of model calibration, which typically involves adjusting the model's parameters, in order to get the model results to agree with real-world observations. The second approach focuses on the on-line modeling or simulation of transportation systems driven by data obtained from traffic sensors in real-time. On-line modeling or simulation of transportation systems is an application that lies at the heart of many applications of Intelligent Transportation Systems (ITS), including advanced traffic management and traveler information systems.

The focus of this research area is on researching issues associated with the development, calibration and adjustment of continuum models as well as agent-based simulation models of transportation systems, and on using these models to develop transportation management strategies that improve efficiency, safety and protect the environment. A special emphasis is placed on accurately modeling traffic behavior during inclement weather, and on researching computational issues associated with the use of on-line simulation modeling for transportation systems management and control. Potential research projects include:

- Multiscale traffic simulation approach based on complex systems theory
- On-line modeling and simulation for Intelligent Transportation Systems