TEMPLE UNIVERSITY
Department of Mathematics

Applied Mathematics and Scientific Computing Seminar

Room 617 Wachman Hall

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Explaining Set-Valued Fundamental Diagrams in Traffic Flow via Phantom Traffic Jams

by Benjamin Seibold

Temple University

Abstract.

Fundamental diagrams of vehicular traffic flow are observed to exhibit a multi-valued behavior in the congested flow regime. We show that such set-valued fundamental diagrams can be constructed systematically from second order macroscopic traffic models, such as the classical Payne-Whitham model or the inhomogeneous Aw-Rascle-Zhang model. These second order models possess nonlinear traveling wave solutions, called jamitons, and each jamiton-dominated solution corresponds to a multi-valued part in the fundamental diagram. Through this connection, it is shown that transitions from function-valued to set-valued parts in a fundamental diagram arise naturally as intrinsic properties of well-known second order models.