- ***Train Planning On a Single Track Shared-Use Passenger and Freight Corridor with Demand Considerations*** *(Ahmadreza Talebian, Bo Zou -- University of Illinois at Chicago)*

  This paper studies strategic level train operation planning on shared use passenger and freight rail corridors. With comprehensive consideration of realistic values for different cost components involved and the fact that passenger trains are given scheduling priority over freight trains on shared corridors in the US, we develop a hypergraph based, two-level modeling approach in which passenger and freight side costs are sequentially minimized. We explicitly consider passenger schedule delay and freight foregone demand as a function of train schedules, which are largely ignored in previous research. In particular, incorporating passenger schedule delay makes the passenger train scheduling a quadratic integer programming problem. We explore different solution approaches and conclude that a modified linearized formulation which takes advantage of the special structure of the problem achieves superior computational performance. We find that schedule delay cost could be as important as line-haul travel time. Scheduling more passenger trains on a shared corridor lowers passenger schedule delay but at the price of freight side cost increase. The resulting marginal freight cost increase is in most cases higher than the marginal passenger schedule delay reduction, especially when frequent passenger train services already exist on the corridor. The results also indicate that the train speed heterogeneity significantly affects freight side cost, most of which comes from foregone demand.