In this presentation we introduce two innovative econometric model structures that allow us to better analyze discrete outcome processes. The first part of the presentation describes the development of a behavioral framework for analyzing commuter train users’ access mode and station choice. Typically, access mode and station choice for commuter train users is modeled as a hierarchical choice with mode being considered as the first choice in the sequence. We discuss a latent segmentation based approach that simultaneously considers two segments of station and access mode choice behavior: Segment 1 - station first and mode second and Segment 2 – mode first and station second. The allocation to the two segments is achieved through a latent segmentation approach that determines the probability of assigning the individual to either of these segments as a function of socio-demographic variables, level of service (LOS) parameters, trip characteristics, land-use and built environment factors, and station characteristics. The approach offers many advantages compared to the traditional alternatives. First, we gain a better understanding of the decision processes by examining who are the individuals who choose the station (or mode) first. Second, the approach proposed is free from simulation and easy to implement. Third, the results from our analysis will provide insights to transit agencies on how to improve transit service to reduce the automobile travel to commuter train stations. The model is employed to investigate the role of socio-demographic variables, LOS parameters, trip characteristics, land-use and built environment factors, and station characteristics on commuter train user behavior.

The second part of the talk is focused on determining the appropriate model framework to study ordered discrete variables. The objective of this research is to investigate the performance of the ordered and unordered response frameworks at a fundamental level. Towards this end, we undertake a comparison of the alternative frameworks by estimating ordered and unordered response models using data generated through ordered, unordered data and a combination of ordered and unordered data generation processes. We also examine the influence of aggregate sample shares on the appropriateness of the modeling framework. Rather than be limited by the aggregate sample shares in an empirical dataset, simulation allows us to explore the influence of a broad spectrum of sample shares on the performance of ordered and unordered frameworks. Based on these simulation exercises, we provide a discussion of the merits of the different approaches. Finally, we also empirically compare the ordered response and unordered response models in the context of driver injury severity in traffic crashes. The results clearly highlight the emergence of the generalized ordered logit model as a true equivalent ordered response model to the multinomial logit model for ordinal discrete variables.