Session 3.2 Advancements in Transport Modelling

Bridging Decisions and Destinations: Advanced Computational Models for Household Decision-Making in Land Use and Transportation

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The complexity of urban living demands multifaceted research to address converging issues of land-use, transport networks, and sustainability. Developed over an exhaustive PhD journey, this presentation outlines four innovative projects that collectively model household decision-making. These models account for socio-demographic variables, life-course events, and environmental factors, all aimed at fostering both affordability and sustainability in urban planning.

The first project utilizes a Bayesian time-varying hazard-based model to examine residential relocation behavior in Sydney and Chicago. This study underscores the crucial role of residential choices in land-use planning. It compares household behavior between Sydney and Chicago residents and explores the full benefits of Bayesian statistical modeling. The second project deploys a copula-based hazard model within a Bayesian framework to investigate the mutual dependencies between home and job relocations. This work significantly informs our understanding of how these two decisions are interrelated. The paper evaluates multiple copula formulations and includes data from both Sydney and Chicago. In the third project, machine-learning algorithms refine hazard-based models for residential relocation. Multiple algorithms and feature selection methods are evaluated, offering a benchmark comparison to traditional hazard-based models. The study further explores how home accessibility influences household decisions to relocate. The fourth project introduces a Dynamic Discrete Choice Modeling (DDCM) approach that offers a comprehensive understanding of human decision-making by seamlessly incorporating past and present data with future expectations into a unified model. This tool serves as an invaluable resource for time-sensitive policy interventions. The study incorporates affordability metrics, addressing a current and high-value concern in Sydney.

Collectively, these projects offer an intricate view of household decision-making mechanics and their subsequent impact on land-use and transport planning. They furnish empirical evidence and methodological insights that can inform policy strategies aimed at creating sustainable, affordable, and efficient urban ecosystems, thereby promoting both environmental sustainability and human well-being.