

Dr Kevin Credit, Maynooth University

Title: Understanding urban street network structure with graph representation learning

Abstract:

Urban planning scholars have long been interested in the ways that street networks structure activity patterns in cities (Jacobs, 1961). While much of this research has focused on the apparent heterogeneity in street network form (Boeing, 2019) – from 19th century grid patterns to suburban ‘loops and lollipops’ – some recent work has suggested that the fundamental hierarchical structure of urban street networks is invariant across cities and time periods (Kirkley et al. 2018). The purpose of this paper is to use a newer neural network-based graph representation method – node2vec – to better understand the competing role of heterogeneity vs. invariance in urban street networks. In particular, we’re interested in understanding the role of spatial scale in street network invariance, analysing differences in walking and driving networks, and better explaining (in a qualitative sense) the distribution of embeddings produced by the graph representation models by looking at the spatial patterns of embeddings. From a preliminary analysis of street networks in two cities, Chicago and London, it appears that the results of the graph representation learning method supports the two-part invariant structure observed by Kirkley et al. (2018), but more work is needed to understand the nature of these results and how they interact with actual travel (e.g., edge weights) across these networks. This is joint work with Qian Xiao, Trinity College Dublin.