



# Urban Infrastructure Networks: Functional Topology and Interdependence

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**Chris Klinkhamer**

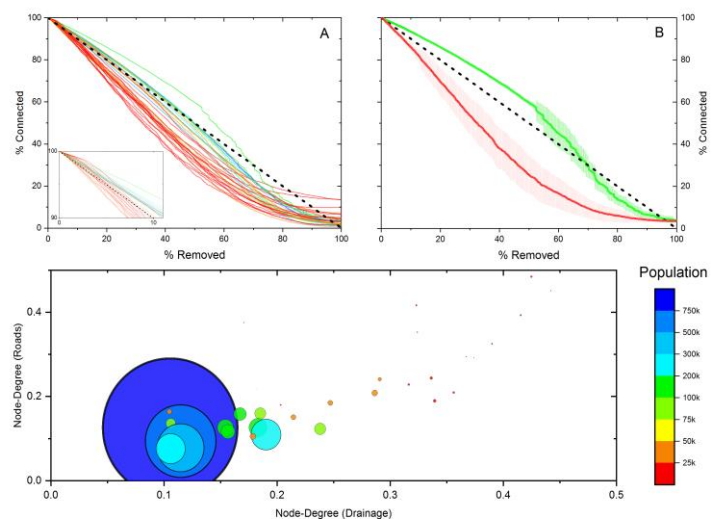
PhD Defense

**Lyles School of Civil  
Engineering**

**& Ecological Science &  
Engineering**

**Advisor:**

**P. Suresh C. Rao  
(CE & AGRY)**



## ABSTRACT:

Urban citizens derive diverse critical services from multiple interconnected, interdependent infrastructure networks. These networks are expected to continuously operate at near 100% of their designed service capacities. When the operation of just one of these networks is disrupted the effects are often not contained to a single network. How these networks function and interact is critically important in increasing urban community resilience when subjected to stochastic disruptions. Despite apparent differences in the physical qualities of both infrastructure and cities, this work uses principles of complex network analysis to reveal stunning similarities in the functional topology of infrastructure networks around the globe. Network-based models are used to demonstrate how failures cascade between infrastructure networks. The severity of these cascades is shown to be influenced by population, design decisions, and localized variance within the larger infrastructure networks. These results hold major implications for the network design, maintenance, retrofitting, and resilience of urban communities relying on interdependent infrastructure networks for mobility within the city, water supply, and wastewater collection and treatment.