

URBANITY

Automated modelling and analysis of multidimensional networks in cities

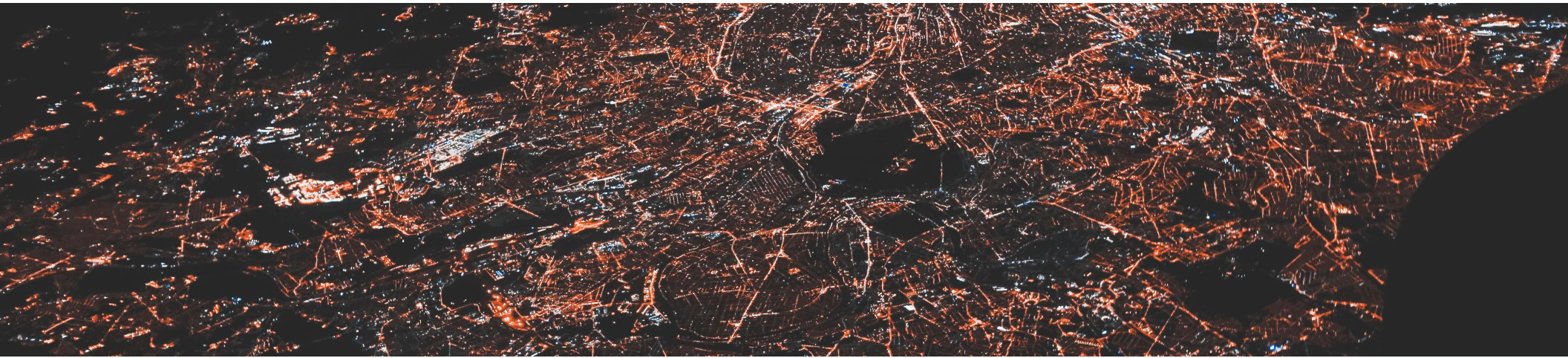


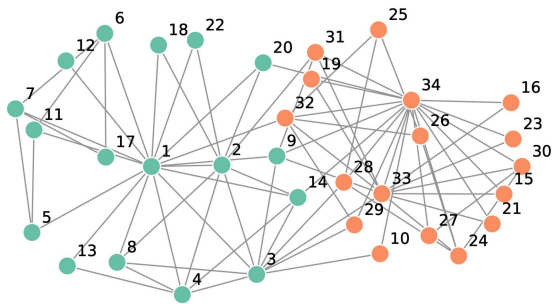
Photo by Nastya Dulhier on Unsplash

Winston Yap

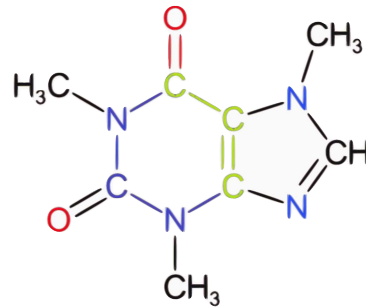
PhD Researcher @ Urban Analytics Lab | NUS



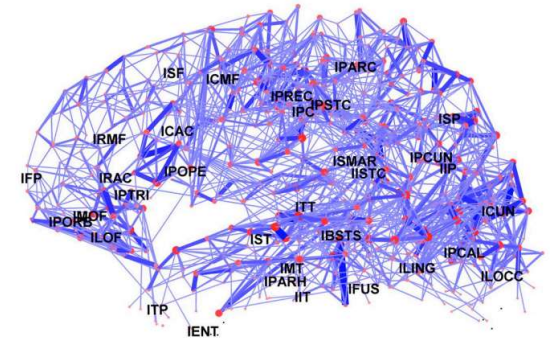
NETWORKS ARE POWERFUL AND UBIQUITOUS



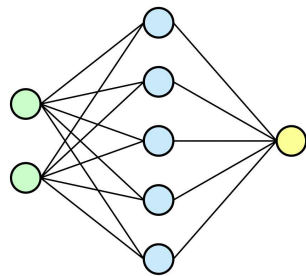
Zachary's Karate Club Social Network



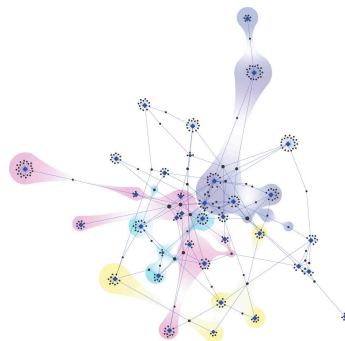
Caffeine Chemical Network Structure



Brain Connectivity Network



Artificial Neural Network

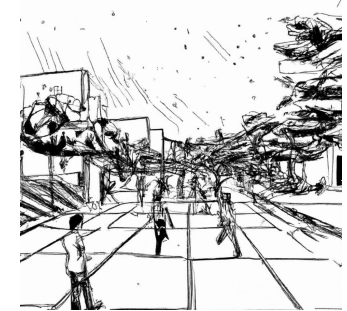
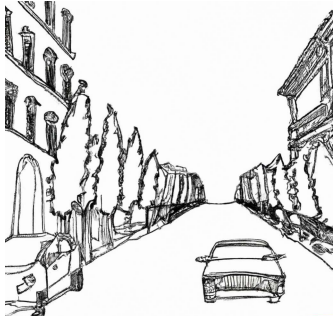
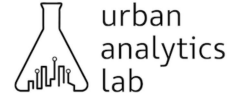


Bibliographic Network



Transportation Networks

REAL WORLD NETWORKS LACK CONTEXT AND SEMANTICS



LENGTH NO. LANE WIDTH

CITIES REQUIRE CONTEXT-BASED UNDERSTANDING



Illustration source: University of Groningen



DIGITAL TWINS

KNOWLEDGE GRAPHS

CITY INFORMATION MODELS

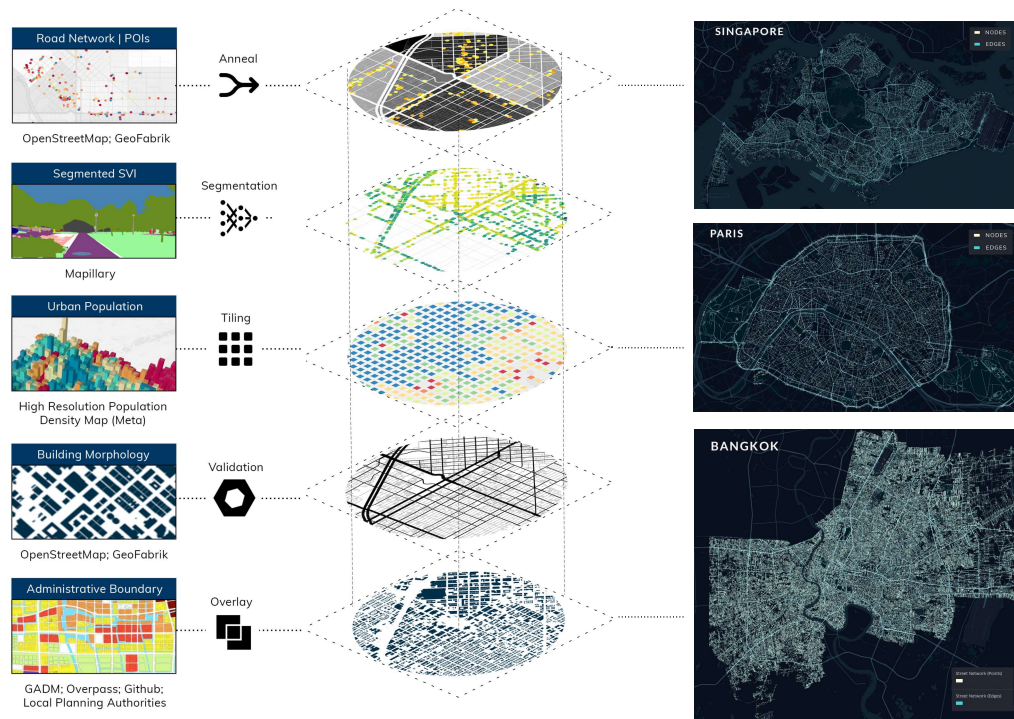
PLANNING SUPPORT SYSTEMS

DYNAMIC INTER-RELATED COMPONENTS

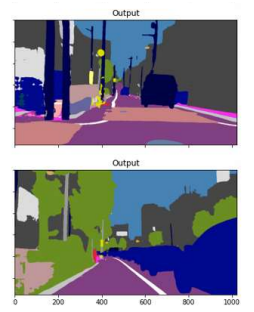
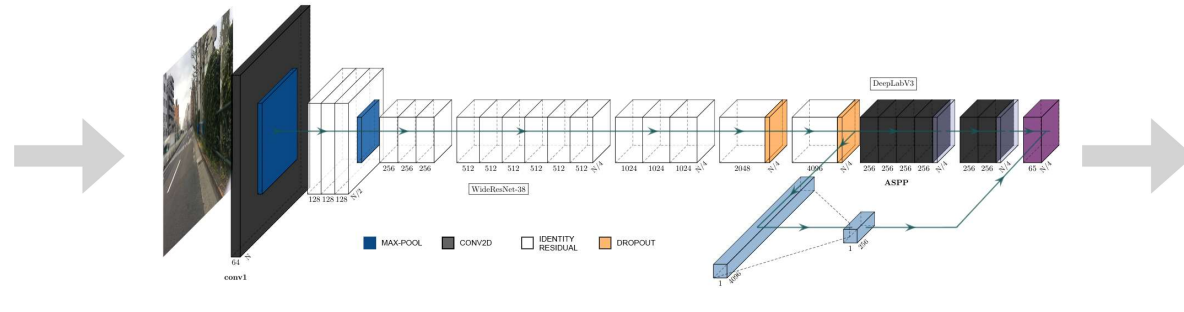
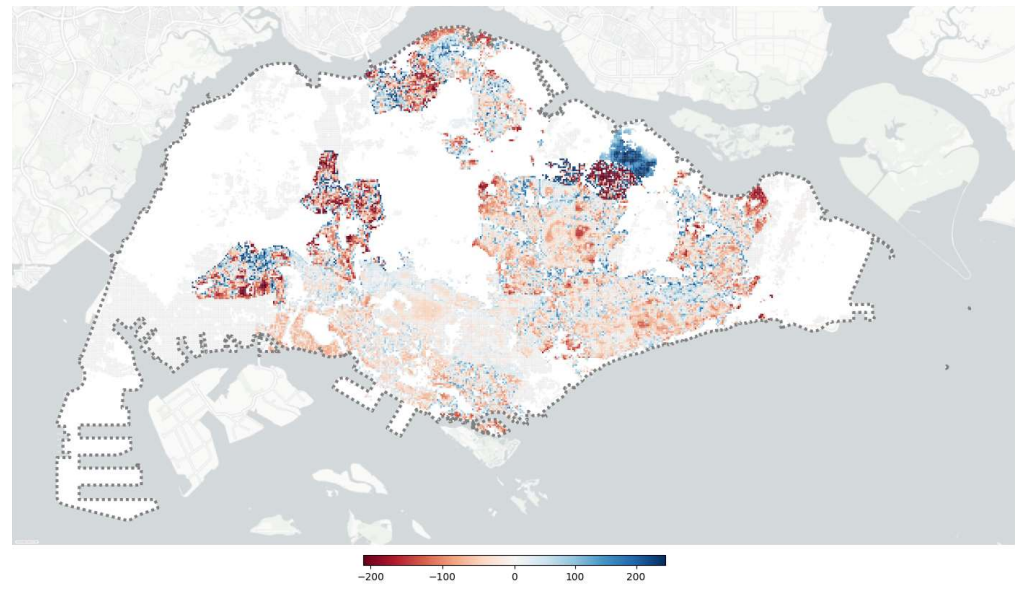
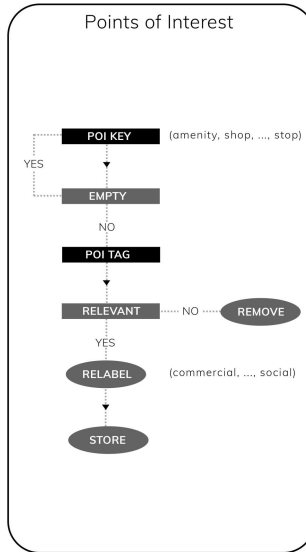
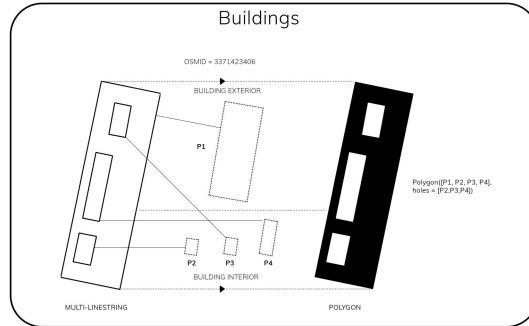
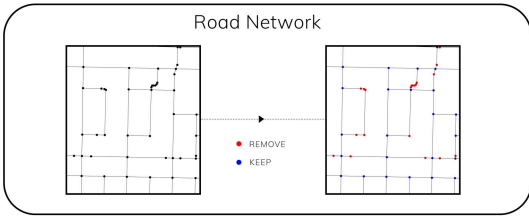
MULTI-DIMENSIONAL / SCALAR

SELF-ORGANISING BOTTOM-UP EMERGENCE

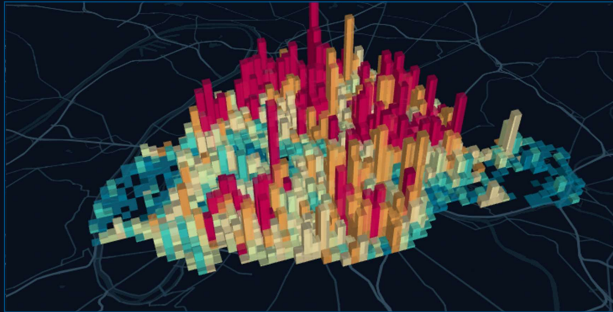
BRINGING SPATIAL CONTEXT INTO NETWORKS




OPEN WORKFLOWS AND PREPROCESSING PIPELINES



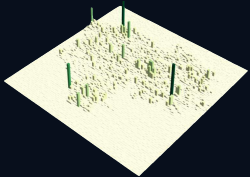
PARIS POPULATION DENSITY



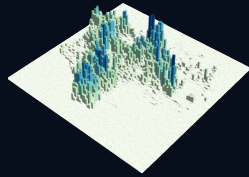
Basemap by  mapbox

TOKYO

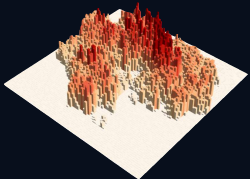
Recreational POI



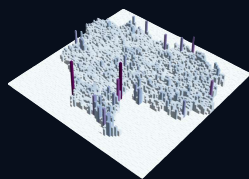
Building Count



No. Of Older Adults

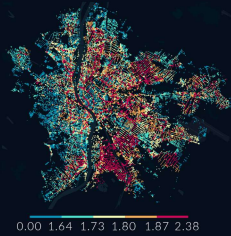


Node Density



GLOBAL CITIES DISTRIBUTION OF URBAN VISUAL COMPLEXITY

BUDAPEST



0.00 1.64 1.73 1.80 1.87 2.38

SINGAPORE



0.00 1.59 1.68 1.74 1.81 2.43

BERLIN



0.00 1.47 1.56 1.63 1.71 2.36

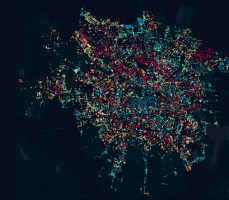
▲
N

BOGOTÁ



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MILAN



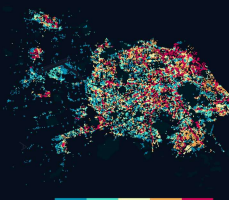
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ZAGREB



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EDINBURGH



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AMSTERDAM

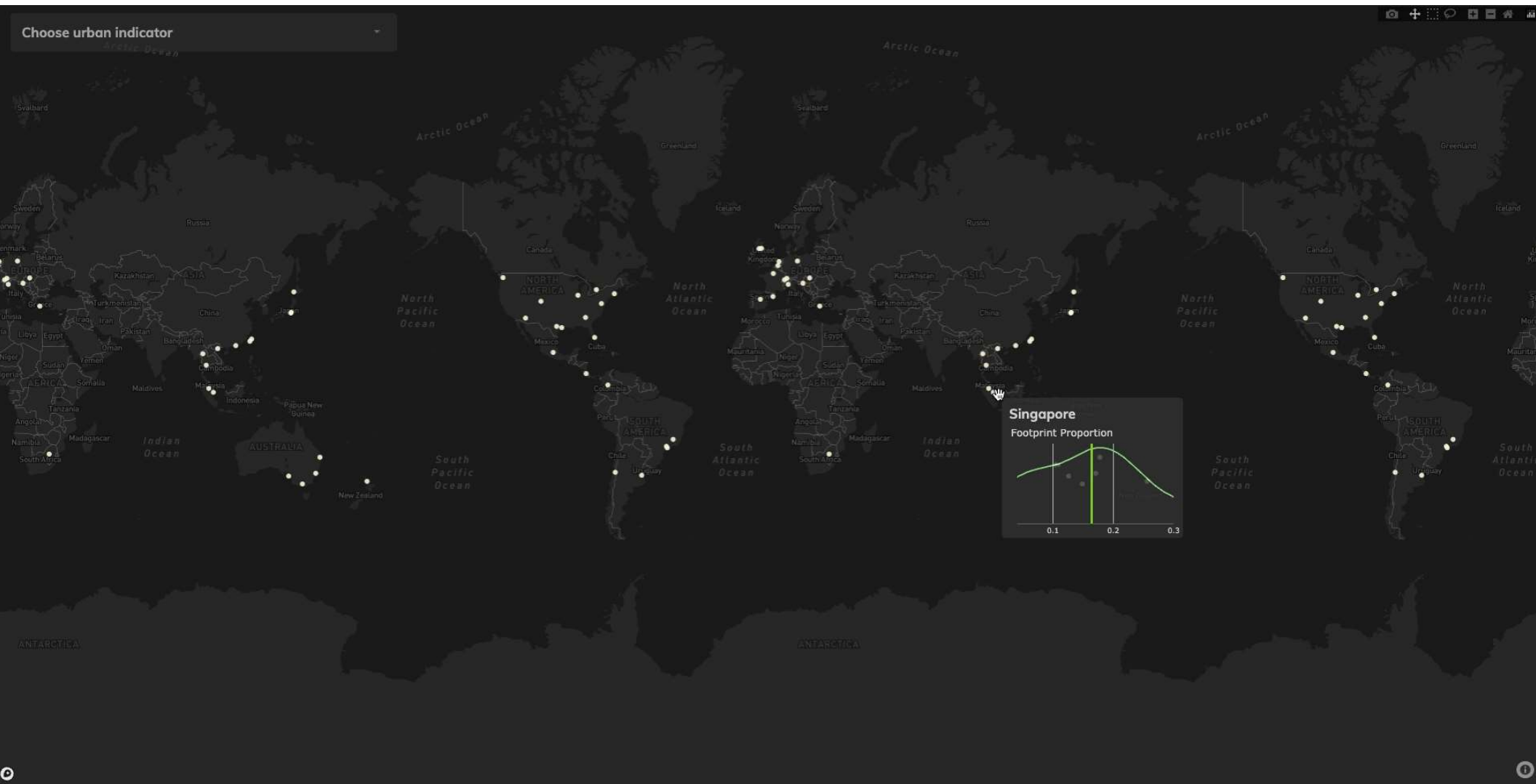


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SAN JOSÉ

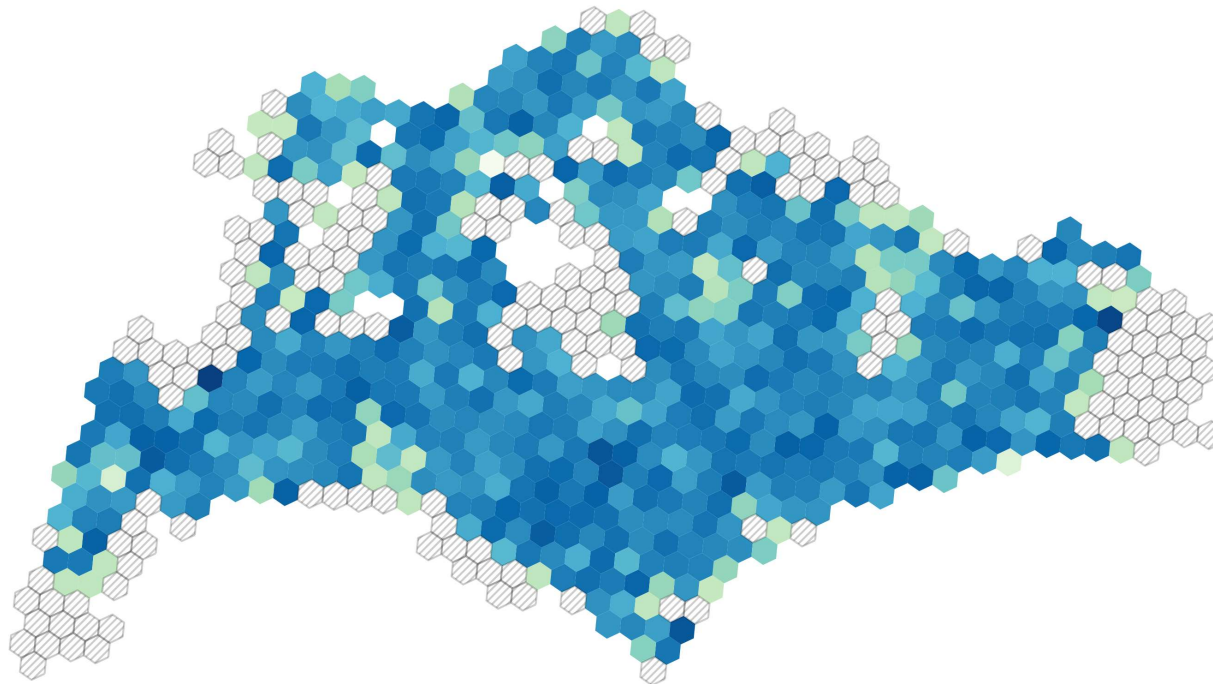
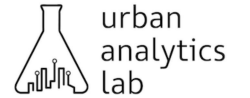


0.00 1.58 1.62 1.68 1.74 2.16



EXAMINING PATTERNS OF SEGREGATION IN NETWORKS

NETWORK ASSORTATIVITY (NEWMAN, 2003)



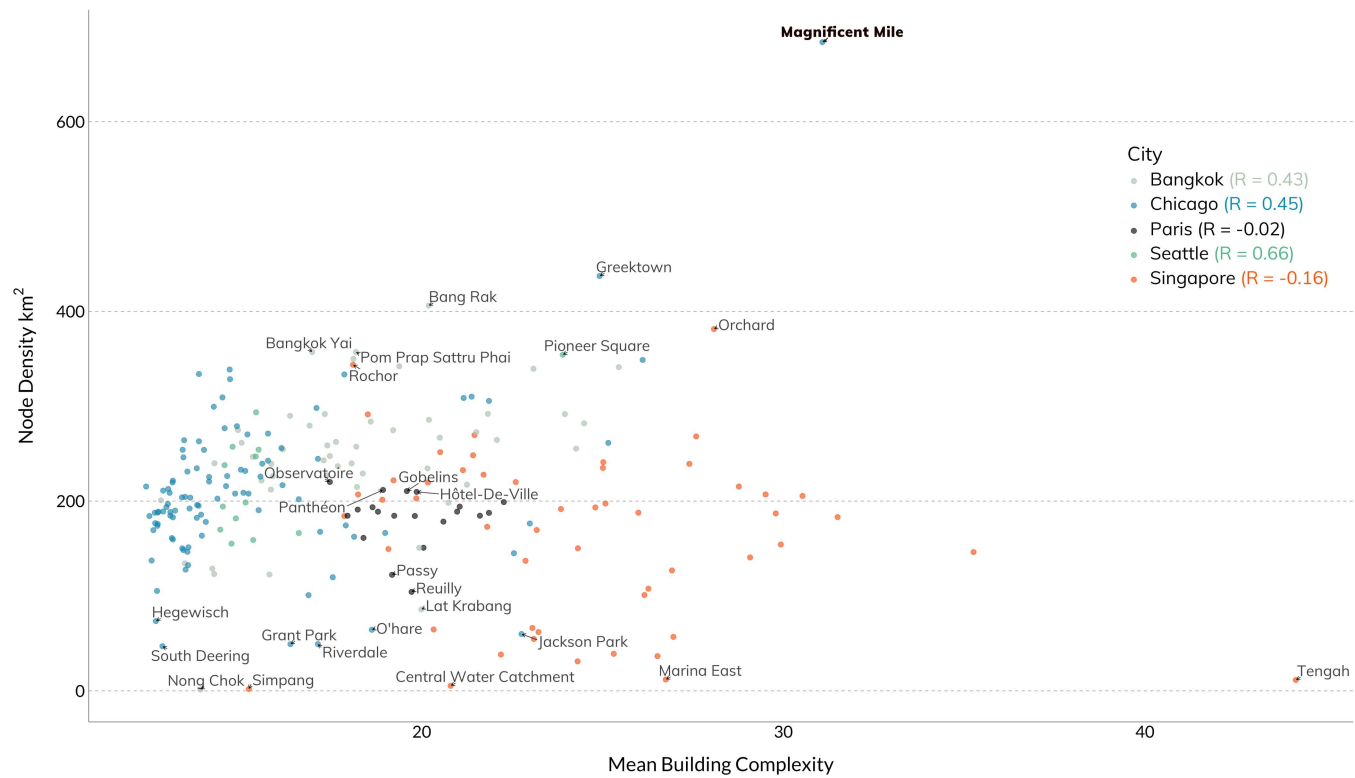
DISSOCIATIVE



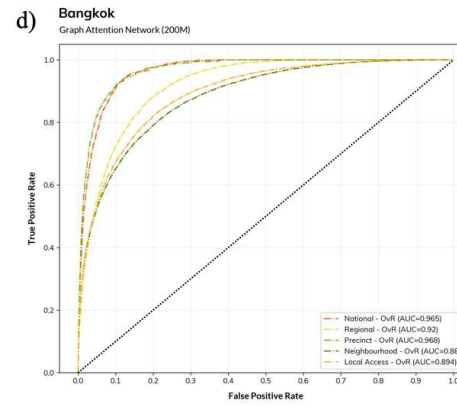
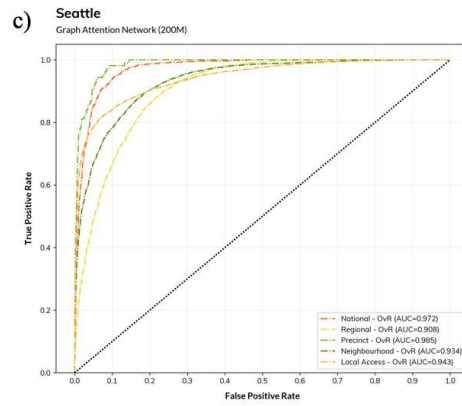
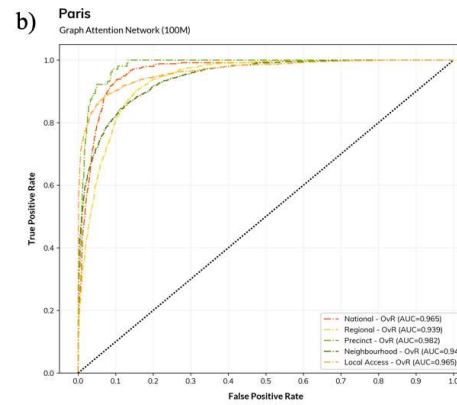
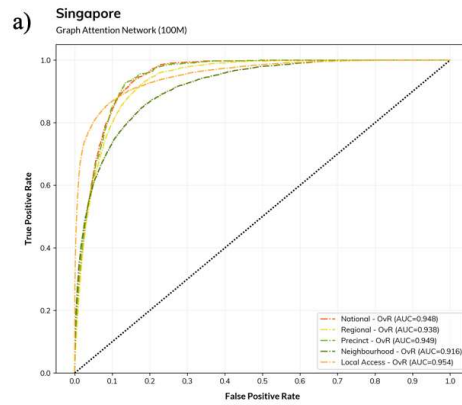
ASSOCIATIVE

COMPARING CITIES BY MUNICIPALITIES

Comparison across Cities and Subzones
Node Density vs Mean Building Complexity



PREDICTING ROAD CATEGORY WITH GNN



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