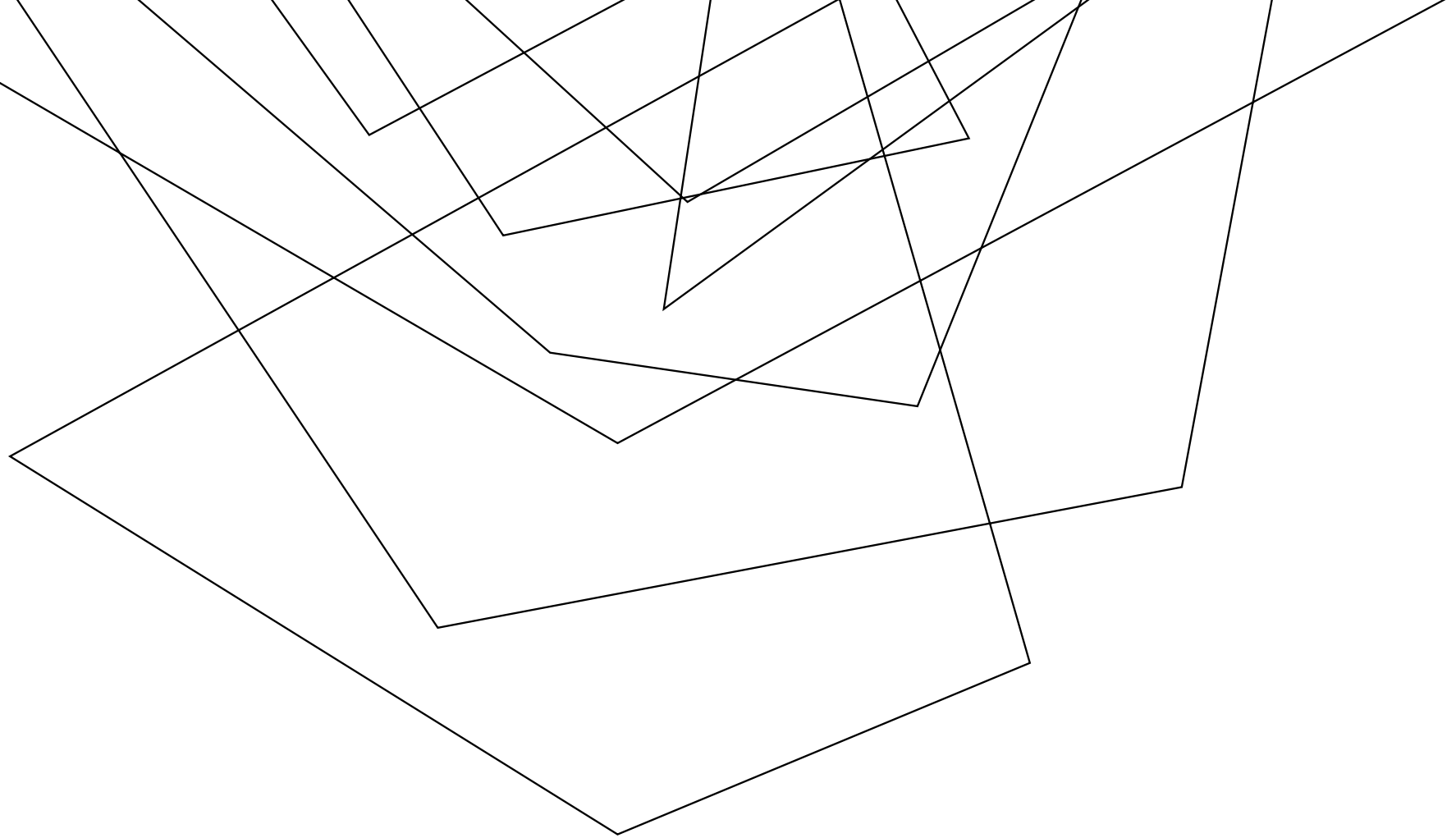
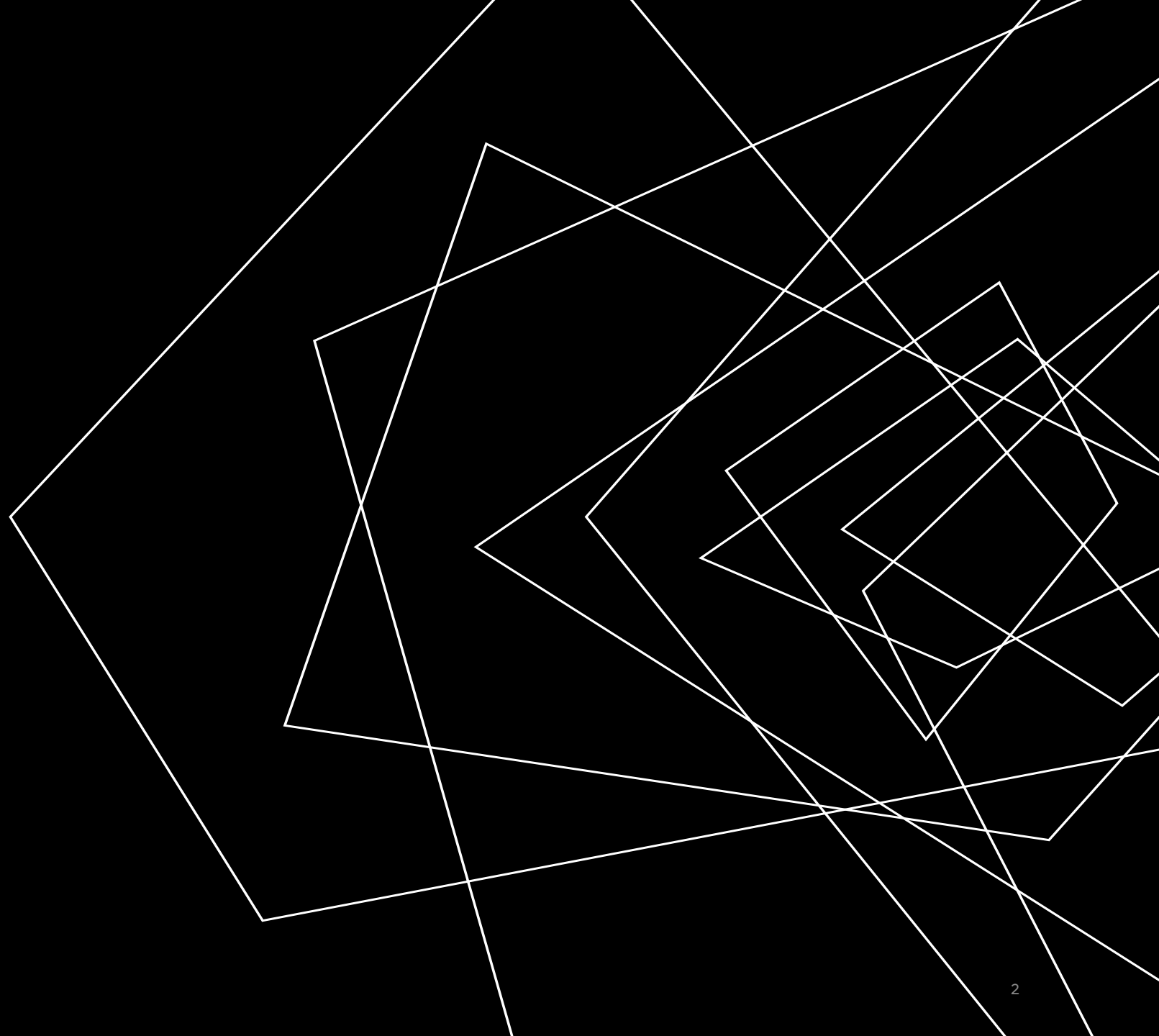


RelWeights: A Spatially Explicit Approach for understanding Risk Propagation

Shamil Khedgikar, Data Scientist (AECOM Urban Analytics CoE)

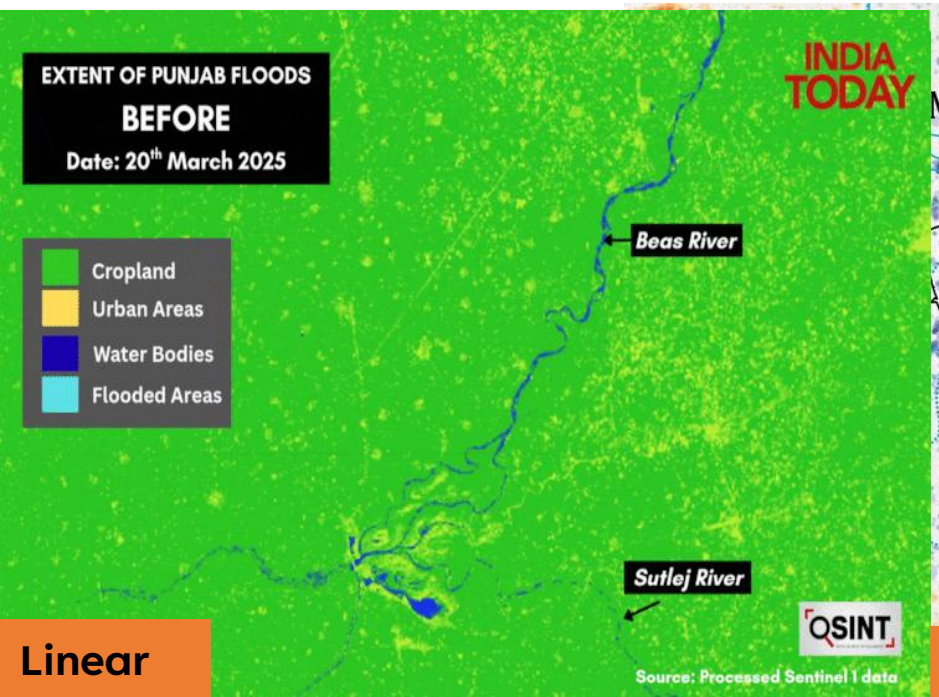
OUTLINE

- Motivation
- Concept/Examples
- Demo/Resources
- Q&A



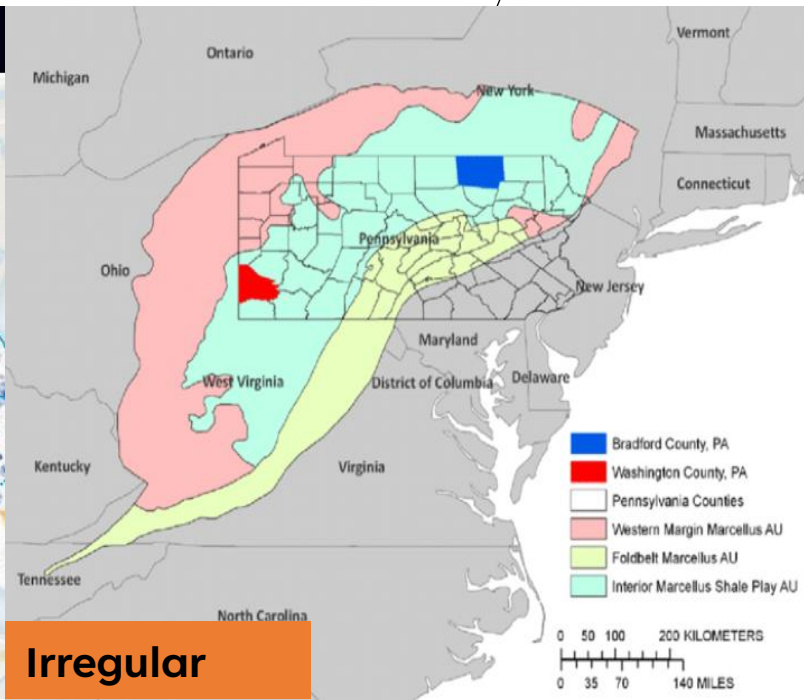
MOTIVATION

- The **W** – Why it matters?
- Capturing the Spatial Extent of Risk
  - Risk of Flooding/Overextraction
  - Cyclone Catchments
  - Risks beyond Shale Well Pads
- <u>Spatial Patterns in which Risk Propagates ≠ Spatial Unit of Decisions</u>



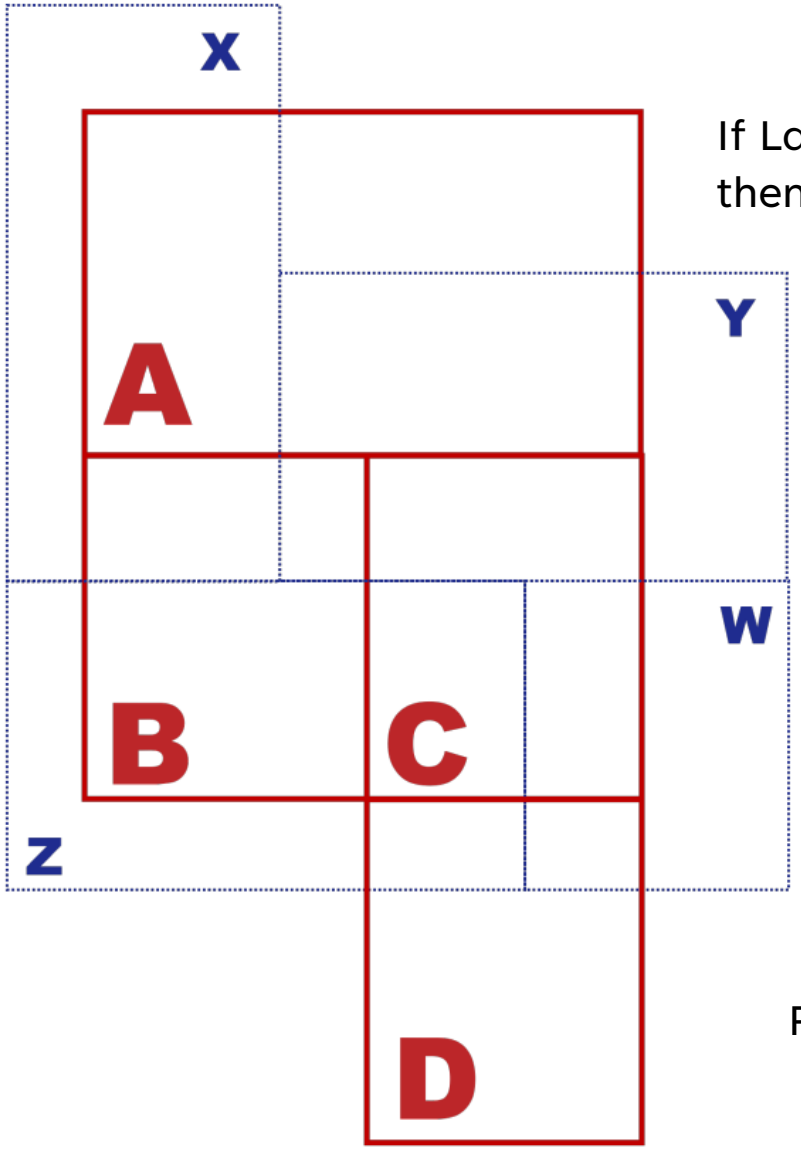
Linear

Geodesic

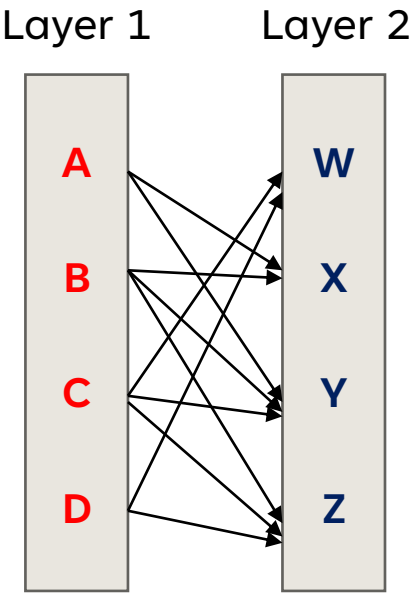


Irregular

CONCEPT/EXAMPLES

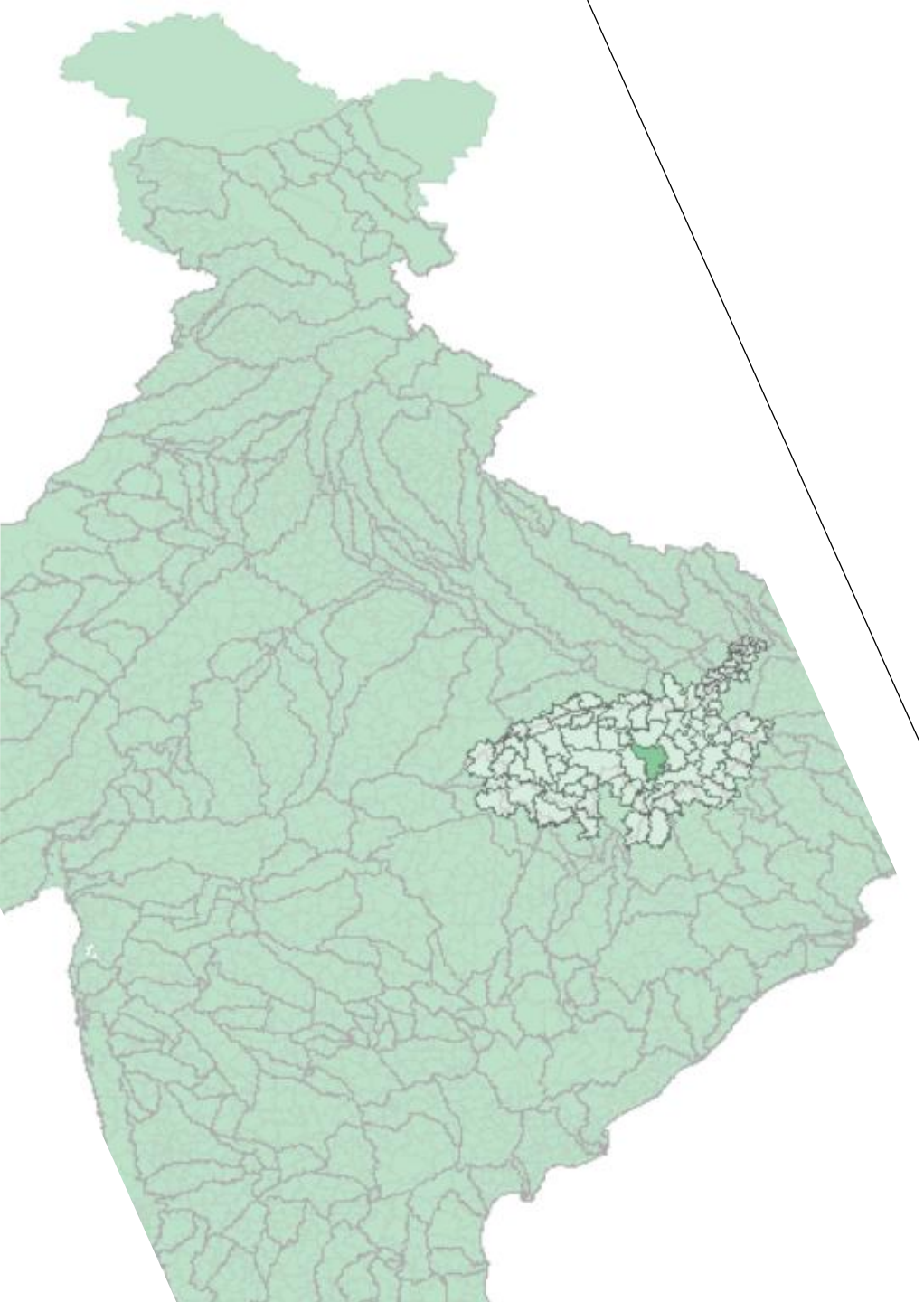


If Layer 1 (dim = n) and Layer 2 (dim = k), then incidence matrix **W** (dim = n x k)*



RelWeights for A~B = **WW` - diag(WW`)**

DEMO/RESOURCES



https://github.com/shamilkhedgikar/RelWeights
https://github.com/shamilkhedgikar/sample_shps

RelWeights Public

main · 1 Branch · 0 Tags · Go to file t

shamilkhedgikar fix README.md

.gitignore	initial commit
README.md	fix README.md
relweights.py	initial commit
relweights_sfdep.R	initial commit
relweights_spdep.R	initial commit
sample_script.R	initial commit

sample_shps Public

main · 1 Branch · 0 Tags · Go to file t

shamilkhedgikar add sub-basins

README.md	Initial commit
Sub-basins.zip	add sub-basins
Village_Merge.zip	add shapefiles
india_2012-17_AC.zip	add ac files

Advantages of RelWeights

- Model **irregular but non-arbitrary spatial lags** induced by overlay structures (e.g., flood risk propagating across watersheds into administrative districts).
- Capture **fragmentation effects**, where small overlay units (sub-basins, land parcels) create multiple inherited linkages.
- Generate richer **variance structures** in neighborhood density, with implications for detecting clustering, spillovers, and heterogeneous risk exposure.
- Achieve **vastly better model fits** on econometric tests with justifiable choice of Spatial Weights.

THANK YOU!