

Geo-Statistical Methods for Economic Analysis

June 20 - 24, 2022



Overview of the Workshop:

The workshop will provide an introduction to remote sensing, GIS, spatial econometric modelling and hands-on application on ArcGIS and R. The workshop consists of a series of twenty lectures and is supported by a grant from the Bill and Melinda Gates Foundation.

Resource Persons:

Gaurav Arora: Gaurav Arora specialises in natural resource economics, agricultural economics, applied econometrics and remote sensing. As an empiricist, he enjoys developing and applying econometric models to tease out causal mechanisms that are rooted in the microeconomic theory for decision problems at the intersection of agricultural production and natural resource management. He is a recipient of Faculty Research Fellowship (2020-2022) at IIT-Delhi; James R. Prescott scholarship (2016) for outstanding creativity in doctoral research; and Earl O. Heady Fellowship (2012) for academic excellence at Iowa State University (ISU). Prior to his PhD in Economics, he obtained M.S. in Agricultural and Resource Economics from the University of Arizona; and B.Tech. in Environmental Engineering from Indian School of Mines Dhanbad.

Saif Ali: Saif Ali is a transplant to academics from the Silicon Valley where he worked in the 3D graphics industry for 10 years. He studied computer science and engineering at Arizona State University (M.S), and Jamia Millia Islamia, New Delhi (B.Tech). His current research interests are in computational methods for economics, information design, interactive learning environments and the ethics of computing technology. Saif is currently working on problems relating to optimal groundwater management for the Indo-Gangetic river basin. Saif spends his spare time learning the Arabic language and calligraphy.

Workshop Outline:

DAY 1			
Morning 1	Morning 2	Afternoon 1	Afternoon 2
Topic	Topic	Topic	Topic
Introduction to Remote Sensing and GIS (data generating process); Geospatial Data : popular sources (ISRO's Bhuvan; USDA's CropScape) and applications (Economic Survey of India; industry applications)	Characterising spatial patterns: spatial heterogeneity and spatial dependence; Data storage: raster and vector formats; Spatial Data Models/Structures: geostatistical; point patterns; lattice (regular/irregular). Consequence(s) of spatial autocorrelation on statistical inference (an introduction)	Hands-on ArcGIS Part I - Introduction, adding data, looking at metadata, attribute tables, categorization and symbologies	Hands-on ArcGIS Part II - Constructing econometric datasets and maps from raster/vector data
DAY 2			
Morning 1	Morning 2	Afternoon 1	Afternoon 2
Topic	Topic	Topic	Topic
Exploratory Spatial Data Analysis - Textbook; Practical Application - U statistic; local stationarity	Spatial Stationarity - concept; decision not hypothesis; different types. Spatial Contiguity - its utility and alternative measures i.e., variogram; covariogram; correlogram	Hands-on ArcGIS Part III - Exploratory data analysis	Hands-on ArcGIS Part IV - Assignment/Exercise
DAY 3			
Morning 1	Morning 2	Afternoon 1	Afternoon 2
Topic	Topic	Topic	Topic
Theoretical Variogram to Experimental Variogram; Experimental Variogram to Variogram Model	Spatial interpolation and Kriging	Hands-on R Part I - Tabular data, spatial data, plotting, variogram clouds, variogram visualization	Hands-on R Part II - Experimental variogram estimation, trend removal, anisotropy, binning
DAY 4			
Morning 1	Morning 2	Afternoon 1	Afternoon 2
Topic	Topic	Topic	Topic
Spatial Regression; Introduction to Spatial Weights; Moran's-I and Geary's C statistics	Correlation to causation in spatial regression models (Manski's (1993) reflection problem)	Hands-on R Part III - Fitting model variograms, variogram parameters, goodness of fit	Hands-on R Part IV - Kriging, cross validation
DAY 5			
Morning 1	Morning 2	Afternoon 1	Afternoon 2
Topic	Topic	Topic	Topic
Spatial Lag; Spatial Error; SLX models and relevant results. Choosing an appropriate spatial regression model	Case studies	Hands-on R Part V - Spatial regressions	Hands-on R Part VI - Live coding exercise