Spatial Data Analysis with PySAL And GeoSNAP

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Description

A unique feature of this tutorial is the use of Python based software tools for spatial data analysis. Python is an object oriented scripting language that is gaining rapid adoption in the computational sciences. Since its initial release in July 2010, PySAL has been downloaded over 1 million times. This two-part tutorial will first provide participants with an introduction to Python and related tools for spatial and regional analysis. In the second part of the tutorial participants will learn version 2.5 of PySAL applied to spatial and regional analysis. Part I is thus designed for participants with no prior Python experience, while the second part assumes knowledge of materials covered in Part I.

Instructors

Sergio J. Rey is Professor of Public Policy and Founding director of the Center for Geospatial Sciences at the University of California, Riverside. Prior to joining UCR, he held professor and director positions at Arizona State University and San Diego State University. He is a Fellow of the Spatial Econometrics Association, the Regional Science Association International, and the recipient of the 2016 University Consortium of Geographical Information Science Research Award.

Rey is project director for PySAL and the creator of the open source package STARS: Space-Time Analysis of Regional Systems. His research interests are in the area of geocomputation, exploratory space-time data analysis, spatial econometrics and urban/regional modeling with substantive applications to problems in regional economics, criminology, epidemiology, spatial demography and urban dynamics, among others. Rey has served as editor of the *International Regional Science Review (1999-2015),* editor of *Geographical Analysis* (2014-17) and as an editorial board member of

Computers, Environment and Urban systems, Geographical Analysis, Papers in Regional Science, Professional Geographer, Region et Devloppement, and Spatial Demography.

Elijah Knaap is the Associate Director of the Center for Geospatial Sciences at the University of California-Riverside. He holds a PhD in Urban Studies and Planning from the University of Maryland and is a core developer for the PySAL ecosystem of spatial analysis software. His work examines question of urban and regional inequality, and he leads development of geosnap, a Python package for applied neighborhood analyses. is Postdoctoral Scholar at the Center for Geospatial Sciences, University of California, Riverside.

Format

The tutorial is planned for a full day, broken into two half-day sessions. Each session is organized into two 80-minute components separated by a 20 minute break.

Objectives

This tutorial will offer participants the following:
- Introduction to Python for spatial data and regional analysis
- Introduction to PySAL for exploratory spatial data analysis
- Introduction the GeoSNAP: the Geospatial Neighborhood Analysis Package

Outline

AM Session

1. Software and Tools Installation (80 min)
    a. Anaconda Python Distribution
    b. IPython/Jupyter Notebooks
2. Python Primer (80 min)
    a. Data structures
    b. Control and Iteration
    c. Functions and Modules
    d. Files

PM Session

3. PySAL for ESDA (80 min)
    a. PySAL Overview and Setup (20 min)

      b. Spatial data processing with PySAL (30 min)
          i. Processing spatial data with PySAL
          ii. Spatial weights in PySAL
      c. ESDA with PySAL (30 min)
          i. Global spatial autocorrelation analysis
          ii. Local spatial autocorrelation analysis
4. PySAL for Regional Analysis (80 min)
      a. Regionalization (20 minutes)
          i. clustering
          ii. spatially constrained clustering
      b. Segregation (20 min)
          i. segregation measures
          ii. comparative segregation analysis
      c. GeoSNAP (40 min)
          i. neighborhood definition
          ii. neighborhood dynamics

Audience

Regional scientists, GIScientists, researchers and students interested in learning Python and using PySAL for computational scripting in spatial analysis and spatial econometrics.

Prerequisites

This tutorial is geared towards individuals who have a basic understanding of exploratory spatial data analysis.

Required Materials

- The tutorial will consist of computationally-based instruction. This will include basic scientific scripting with Python and an introduction to PySAL.
- Participants are encouraged to bring their own laptops. We will cover installation of all required software in the morning session.
- Software Requirements
  - Software will be made available on site.
- Sample data sets will be provided with the packages.
- Workshop repository: https://github.com/sjsrey/pysalgeosnapnarsc21

Expected Number of Participants

We have taught similar workshops to audiences of up to 75.