PAF 516
Community Analytics

Program Evaluation & Data Analytics · Graduate · Asynchronous Online

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PAF 516 | Program Evaluation & Data Analytics

Anthony Howell, PhD

Course Number	PAF 516
Level	Graduate
Format	Asynchronous Online
Prerequisites	Introductory data programming in R (or equivalent)
Course Website	Canvas (ASU Online)
Instructor	Anthony Howell, PhD
Email	Anthony.Howell@asu.edu
GitHub	github.com/AntJam-Howell
Scholar	scholar.google.com/citations?user=am1zl6cAAAAJ
Office Hours	Flexible — by appointment via Zoom

I. Course Description

This course applies data science skills to the analysis of urban communities and neighborhoods. Students work with U.S. Census Bureau data, geospatial tools in R, and visualization frameworks to operationalize theories of neighborhood quality and community change. Through a cumulative applied project, students construct a composite economic hardship index, map spatial patterns, detect statistically significant clusters, track change over time, and deliver an interactive policy dashboard to a stakeholder audience.

The course introduces spatial analysis using R packages such as **tidycensus**, **sf**, and **spdep**, and builds toward professional communication through evidence-based policy briefs and Quarto dashboards deployed to the web.

Students will replicate and extend results from lectures using Census data from a metropolitan area of their choosing.

II. Course Learning Objectives

Upon successful completion of this course, students will be able to:

- Construct reliable composite indices from census data using measurement theory principles (Cronbach's alpha, z-score standardization)
- Apply variable classification and spatial scale principles to create professional, audience-appropriate choropleth maps
- Integrate tabular and spatial datasets using joins, buffers, and proximity operations in R
- Detect and interpret spatial autocorrelation using Moran's I and LISA statistics
- Analyze demographic and economic neighborhood change across multiple ACS survey years

- Communicate analytical findings to non-technical stakeholders through policy briefs and dashboards
- Deploy interactive Quarto dashboards to GitHub Pages for public access

III. Course Structure & Pedagogical Approach

Mastering advanced analytics is like learning a language — progress requires consistency and practice. Lectures are delivered in short, modular units with embedded comprehension questions. Weekly labs apply techniques to real Census data. A **cumulative project thread** runs across all seven modules, building toward a final interactive dashboard.

Students are encouraged to engage the material daily rather than in occasional long sessions. Online discussion boards (YellowDig) support peer-to-peer learning and help build professional networks among future colleagues in the field.

Readings: There is no required textbook. All readings, references, and lab materials are available on the course website and Canvas.

Communications & Instructor Feedback

- Post technical and coding questions to the course discussion board
- Email the instructor directly for private matters — allow 24–48 hours for replies
- Graded feedback is returned within 5–10 business days

IV. Assessments & Grading

Grading Scale

Grade	Range
A+	99–100%
A	94–98%
A—	90–93%
B+	87–89%
B	84–86%
B—	80–83%
C/D/F	Below 80%

Assignment Overview

Assignment	Weight	Description
Weekly Labs	**60%**	Each week includes a lab synthesizing lecture content through data exercises. Graded **pass/fail**: credit awarded when a sincere attempt is made and more than half of responses are correct. Once answer keys are posted, late submissions are not accepted.
Final Dashboard	**30%**	Integrate course skills into an interactive Quarto dashboard analyzing neighborhood change in a major metro area. A detailed rubric will be distributed with the assignment.
Discussion Topics	**10%**	YellowDig board participation. Earn at least 100 points through posts, comments, reactions, and instructor badges.

V. Course Policies

Late & Missing Work

Each assignment is accompanied by detailed instructions and adequate time for completion. Once solutions are posted, no credit can be awarded for late submissions. Contact the instructor in advance if complications

arise.

Academic Integrity

ASU expects the highest standards of academic integrity. Violations — including plagiarism, fabrication, and facilitation — will be reported to the College of Public Programs. **Plagiarized work receives zero points and risks course failure.** See provost.asu.edu/academicintegrity.

All course content, including lectures, is copyrighted. Students may not share, upload, sell, or distribute course materials outside the class. Written permission from the instructor is required before any course content may be reproduced or sold as notes (per ACD 304-06).

Professional Conduct

Respectful dialogue is expected at all times. Threatening, harassing, or otherwise inappropriate behavior during discussion may result in administrative removal from the course per ASU policy USI 201-10.

Disability Accommodations

Students seeking academic accommodations must contact the ASU Disability Resources Center directly at eoss.asu.edu/drc. The Center will coordinate appropriate accommodations with the instructor.

Religious & Military Accommodations

Students will not be penalized for absences due to religious observance or military activation. Notify the instructor as far in advance as possible to arrange alternatives. See ASU policy USI 201-18 for military-related withdrawals and incompletes.

VI. Course Schedule

The course runs for seven modules. Each module includes lecture content, a weekly lab, and discussion board activity. Specific due dates are posted in Canvas. The instructor may adjust assigned readings or due dates as circumstances warrant; core learning objectives will not change.

M1 Measurement, Indexing & Multi-Scale Mapping | Census Data · Reliability · Composite Indices

- Latent constructs and composite index building
- Z-score standardization and Cronbach's alpha
- `tidycensus` data retrieval and `corrplot` visualization
- Multi-scale choropleth mapping (county → tract → CBG)

M2 Classification & Spatial Scale | Classification Schemes · Visual Communication

- Data classification: equal interval, quantile, Jenks, standard deviation
- Color theory and ColorBrewer palettes
- Diverging vs. sequential vs. qualitative schemes
- Designing maps that accurately communicate inequality

M3 Spatial Data Integration | Spatial Joins · Point Data · Environmental Context

- Joining tabular census data with external point datasets

- Spatial operations: buffers, proximity, containment
- Incorporating environmental hazards and community amenities
- Building enriched neighborhood quality measures

M4 Spatial Autocorrelation | Cluster Detection · Moran's I · LISA

- Global vs. local spatial autocorrelation
- Moran's I statistic and interpretation
- LISA: Local Indicators of Spatial Association
- Identifying statistically significant hotspots and coldspots

M5 Spatio-Temporal Change (Part 1) | Temporal Dynamics · Spatial Unit Matching · Change Scores

- Choosing the right ACS time periods and matching spatial units
- Pooled z-score standardization across survey vintages
- Change scores, significance testing, and diverging color scales
- LISA overlay: reading two measurements (level and change) at once

M6 Spatio-Temporal Change (Part 2) | LISA Trajectories · Space-Time Moran's I · Multi-Point Analysis

- LISA trajectory analysis: classifying neighborhood change paths
- Space-Time Moran's I and emerging vs. persistent clusters
- Multi-point trend analysis across three or more ACS vintages
- From trajectories to policy design: targeting interventions

M7 Final Project Dashboard | Quarto Dashboard · Integration · Deployment

- Assembling all prior analyses into an interactive Quarto dashboard
- Layout, widgets, and interactivity design
- Deploying to GitHub Pages for public access
- Presenting findings to a policy-maker audience

Note on Dates: Specific due dates for labs, the explainer assignment, discussion posts, and the final dashboard are posted on Canvas at the start of the session. The instructor may adjust deadlines as circumstances warrant with advance notice to students.