The Case for Space in the Social Sciences

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Center for Spatially Integrated Social Science
University of California, Santa Barbara

Roundtable on
“Geographical Voices and Geographical Analysis Methods”

Pontifical Catholic University of Minas Gerais
Universidade Católica de Salvador

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Center for Spatially Integrated Social Science

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Co-PI: R.P. Appelbaum
Program Director: D.G. Janelle

Building resources for spatial analysis in the social sciences

• Internet Gateway to Spatial Analysis
• Resources for Researchers and Teachers
• Summer National Workshop Program
• Spatial Analytic Tools Development L. Anselin

www.CSISS.org
The CSISS Mission recognizes the growing significance of space, spatiality, location, and place in social science research. It seeks to develop unrestricted access to tools and perspectives that will advance the spatial analytic capabilities of researchers throughout the social sciences. CSISS was funded in 1999 with support from the National Science Foundation under its program to promote research infrastructure in the social and behavioral sciences.

| CSISS News |  |
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<th>Core Programs</th>
<th>Learning Resources</th>
<th>Spatial Resources</th>
<th>Spatial Tools</th>
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<td>2007 Workshop Programs:</td>
<td>These introductory materials include <strong>CSISS Classics</strong> and select video clips from the CSISS summer workshops.</td>
<td>CSISS has compiled e-journals, bibliographies, and other spatial resources for the social sciences.</td>
<td>Here’s where you’ll find information about software for the exploration and analysis of spatial data.</td>
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<td>Try out one of our custom search engines to find spatial analysis resources on the Internet.</td>
<td>Here’s where you’ll find information and registration for workshops, conferences and specialist meetings.</td>
<td>Bibliographies and publications related to spatial methods and their use in the social sciences.</td>
<td>CSISS presentations, news, personnel, and sitemap. Our Strategic Plan and Annual Reports are also found here.</td>
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The CSISS Strategy and Plan
Modeling a Center for Spatially Integrated Social Science

Critical Themes in Social Science

+ 

Tools and Concepts for Spatial Thinking

+ 

Infrastructure

= 

Advances in Spatial Social Science
Some Critical Themes in the Social Sciences

- Space-time accessibility
- Equity
- Externality effects
- Risk assessment
- Small-area analysis
- Sense of place
- Cultural analysis
- Demographic processes
- Health and disease
- Crime mapping and law enforcement
- Community organization
- Governance
- Electoral processes
- Globalization
- International conflict
- Coupling human and environmental systems
- etc
Questions from the Skeptics
Spatial Social Science?

• Do spatial perspectives draw on and contribute to theory in the social sciences?

• Why should social scientists accept that variance across space really matters? And, is it worth the effort to incorporate space?

• Is there a tension between GIS (the technique) and “thinking spatially”?

• What structures in the social sciences have emerged in support of spatial analysis/thinking?

• Is there a community of spatial social science and can its growth be measured?
Documenting a Spatial Turn in the Social Sciences
Interest in Spatial Perspectives

• New initiatives at leading universities and by science funding agencies

• A “spatial turn” in the social sciences
  
  • The New Economic Geography – adding space to social science theory (space impeding flows of information, operation of markets, transport costs)

• Popularization of Spatial technologies:
  – Google Earth, Google Maps, Microsoft Virtual Earth
  – geotagging in Wikimapia, Flikr, …
  – GIS, remote sensing, GPS

• Geovisualization has impacted all science and media representation

• National Research Council report Learning to Think Spatially
Building on the Numbers

• Growth in scientific literature using spatial perspectives
• CSISS summer workshops (since 2000) >700 participants
• GeoDa (CSISS / Anselin) >20,000 downloads (May 2007)
• Need for documentation of the trends in literature, software adoption, and conference presence of spatial analysis across the sciences
Agent-Based Models of Land-Use and Land-Cover Change
Report and Review of an International Workshop
Irvine, California, USA
October 4-7, 2001
LUCC Report Series No. 6
A Growing Literature

*Spatially Integrated Social Science* (Goodchild and Janelle, OUP, 2004) [www.csiss.org/best_practices/siss](http://www.csiss.org/best_practices/siss)
The database includes 2329 demography articles from 1956 through 2004 drawn from the CSISS database and from nearly one thousand articles from journals and online databases that specialize in demography and population studies. See [http://www.csiss.org/GISPopSci/resources/bibliography/](http://www.csiss.org/GISPopSci/resources/bibliography/)
### CSISS Residential Workshops


(building expertise and capacity for spatial thinking in the social sciences)

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<th>Field</th>
<th>Attended</th>
<th>Applied</th>
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<tr>
<td>Anthropology / Archaeology</td>
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<td>123</td>
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<td>Criminology</td>
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<td>Demography, Population &amp; Health</td>
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<td>Economics</td>
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<td>GIS</td>
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<tr>
<td>History</td>
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<td>Human Geography</td>
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<td>Political Science</td>
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<tr>
<td>Public Policy</td>
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<td>Regional Science</td>
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<tr>
<td>Sociology</td>
<td>115</td>
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<tr>
<td>Statistics</td>
<td>9</td>
<td>22</td>
</tr>
<tr>
<td>Urban Studies &amp; Urban Planning</td>
<td>44</td>
<td>133</td>
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<tr>
<td>Other</td>
<td>31</td>
<td>99</td>
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<td><strong>Totals:</strong></td>
<td><strong>706</strong></td>
<td><strong>1789</strong></td>
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CSISS Resources for Spatial Social Science
www.geoda.uiuc.edu

Download GeoDa 0.9.5-i
• Tutorials
• Sample Data
• Workbook
• Openspace Mailing List

Luc Anselin
Tobler's FlowMapper

http://www.csiss.org/clearinghouse/FlowMapper
# CSISS Video Clips of Summer Workshops

## Introduction to Spatial Pattern Analysis in a GIS Environment

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<tr>
<th>Topic</th>
<th>Time</th>
<th>Quality</th>
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<tr>
<td>The Nature of Spatial Pattern Analysis</td>
<td>9:58</td>
<td>High - 31MB</td>
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<tr>
<td>Problems Associated with Spatial Pattern Analysis</td>
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<td>High - 31MB</td>
</tr>
<tr>
<td>An Introduction to GIS</td>
<td>7:29</td>
<td>Audio Only - 2MB</td>
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<td>GIS Functionality</td>
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<td>High - 33MB</td>
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<tr>
<td>Current Technologies in GIS</td>
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<td>High - 48MB</td>
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<tr>
<td>Spatial Patterns of Birth Data</td>
<td>15:42</td>
<td>Audio Only - 5MB</td>
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<tr>
<td>Spatial Patterns of Fertility in Egypt</td>
<td>10:18</td>
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Download Flash player now.
http://www.csiss.org/streaming_video/2002/
Background

Between 1886 and 1903 Charles Booth produced a remarkable series of maps of London carefully coded for social class with data gathered by visiting, literally, every street in London. Equally remarkable, Booth devised, funded a research team, and conducted the study in his spare time while running a successful international leather trade and steamship company. In the 1880s, the question of increasing poverty in an increasingly wealthy Industrial-age Britain was becoming more central to citizens, politicians and philanthropists. A series of riots and sensational journalism sparked fears of social unrest. Booth encountered the squalid conditions of London neighborhoods while campaigning for an unsuccessful
Florence Kelley: Slums of the Great Cities Survey Maps, 1893
By Nina Brown

A section of the Hull House Wage Map of Chicago.

The original maps were published in color and the map key appears below.

- (White) $5.00 and less
- (Black) $5.00 to $10.00
- (Blue) $10.00 to $15.00
- (Red) $15.00 to $20.00
- (Green) $20.00 and over
- (Yellow) Unknown

887) and corresponded with Engels returned to the United States she married a socialist labor leader, but the marriage was short lived. In 1891 Kelley divorced and moved to Chicago, where she became a resident of Hull House, the
Henry Mayhew: London Labour and the London Poor, 1861
By Nina Brown

Back to Classics

The Intensity of Criminality

Map showing the number of criminal offenders to every 10,000 of population in each county of England and Wales.
The Road to Universal Education in Spatial Thinking
Why Spatial Thinking?

• Spatial thinking should be one of the foundations for general undergraduate education (for informed citizenship and for general information analysis and assessment)

• Spatial perspectives provide a means of integrating theory within and across disciplines, and for matching it with evidence

• Spatial analysis can serve as a foundation for interdisciplinary cooperation (e.g., the coupling of environmental and social processes)
Identifying Foundation Concepts for Spatial Thinking

• Demonstrable at all levels of space & time
• Applicable to all of science
• Expandable from simple illustrations to advanced thought processes about scientific and social problems
• Expandable from a 5-minute explanation to a life-time career of research and/or application
### Eight Foundation Concepts in Spatial Thinking

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<tbody>
<tr>
<td><strong>1 Location</strong></td>
<td>Places abstracted as points, lines, and areas, and represented as points, polylines, and polygons. Rasters and grid cells. Mathematical approximations to the geoid, map projections, coordinate systems. Measurement and tracking of location: GPS. Location in human discourse: place names, prepositions, and movement verbs. Positional accuracy. The characteristics or attributes of places: scales of measurement. Concepts of land ownership in different cultures, administrative hierarchies, postcodes, linear referencing.</td>
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<tr>
<td><strong>2 Distance</strong></td>
<td>Metrics of distance on the plane and globe. Travel cost, travel time, and impacts on interaction and spatial behavior by humans and other organisms. Distance decay and spatial interaction models. Buffers. Weights matrices and their applications in spatial analysis and modeling. Geodesics, potential fields, and optimum paths.</td>
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<tr>
<td>5 Scale</td>
<td>Level of detail in spatial data sets. Definitions of scale: extent and resolution. Scale-related concepts: self-similarity (fractals), generalization and down-scaling, line and surface smoothing, recursive subdivision, variance decomposition, and multi-level analysis. The role of scale in process.</td>
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<tr>
<td>6 Spatial Heterogeneity</td>
<td>Heterogeneity as a fundamental characteristic of spatial data. First-order effects, non-stationarity, and uncontrolled variance. Implications of spatial heterogeneity for sampling and statistical inference. Place-based analysis, local indicators of spatial association, and geographically weighted regression.</td>
</tr>
<tr>
<td>8 Objects and Fields</td>
<td>Discrete objects and continuous fields as fundamental conceptualizations of space and as the basis for models of process. The dichotomy as an underpinning of methods of representation and analysis. Spatial correlation. Concepts of uncertainty in both conceptualizations.</td>
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</table>
Linking Foundation Concepts of Spatial Thinking to the Theories and Themes of the Social Sciences

- Social inequality
- Concentrated disadvantage
- Uneven development
- Externalities
- Neighborhood
- Community
- Social networks
- Social capital
- Collective efficacy
- Trust
- Power
- Service optimization
- Etc.
Building Foundations for Spatial Thinking in the Social Sciences
Lessons from CSISS

• Recognize social science theoretic and thematic perspectives

• Emphasize added value of spatial thinking to social science theory and problem solving, re:
  – integration of information / disciplines
  – inference from form to process
  – organizing and retrieving information
  – links to policy
Challenges

• Leadership is needed to position spatial thinking as important (essential) to scientific understanding and to sound public policies

• Support resources need to be assembled, organized, and made easily accessible:
  – Course units, exercises, instruments for learning assessment, etc.
  – Networks of scholars / mentors

• GI Science tools need enhancement to meet the needs of science:
  – Technologies for space-time integration of data
  – Capabilities in analysis are needed that match the capabilities of micro-simulation methods to display space-time processes
Conclusions

• The relevance of spatial perspective in science is increasingly appreciated across disciplines – providing grounds for curriculum change.

• A growing level of expertise exists across disciplines – allies and potential leaders in curriculum change (need for documentation).

• The *necessary conditions* to imbue science education with the powerful insights of the spatial perspective and visualization are now in place.
Obrigado

Please visit www.csiss.org
Under development: www.spatial.ucsb.edu