Spatial Analysis Methods in Demography & Sustainability Science

Rob Strawderman
Department of Biological Statistics and Computational Biology
Department of Statistical Sciences

Monday, March 23, 2009
300 Rice Hall

The analysis of spatially explicit data is common to population research, especially demography, and contemporary sustainability science, whether around planning, spatiotemporal modeling of species distributions, or remote sensing/GIS and associated spatial modeling. There are numerous groups on campus with strengths in various areas of spatial analysis; however, the level of interaction and collaboration between these groups is currently unclear. Moreover, faculty, student and staff that lack specialization in spatial methods may be unaware of the resources and skills that currently exist on campus.

The objective of this lunch, sponsored jointly by the CCSF and the Cornell Population Program (www.cpp.cornell.edu), was to determine what sorts of activities are currently taking place on campus, where prospective collaborations might prove fruitful, what structural barriers to collaboration and research may or may not exist, and related topics. Three speakers from diverse groups (ORIE, Natural Resources, and Developmental Sociology) gave short presentations on their work to help initiate discussion. Ultimately, a wide range of topics were discussed; however, two central themes emerged from the discussion, both of which relate to facilitating and improving intra-campus collaboration as well as the quality of research carried out on campus:

1. Development of and support for advanced technology and analytical methodology. An important barrier here is the lack of faculty critical mass in various areas, including spatial statistics and remote sensing.

2. Development of and support for faculty, staff and students that desire/require assistance with the collection and analysis of spatially explicit data. Barriers here include the limited knowledge of available courses and workshops and/or availability of resources for consultation in GIS and geospatial analysis and associated statistical methods.

A web portal on geospatial analysis and statistics at Cornell was proposed as one step towards providing a more centralized source of information on existing campus resources, including course listings and workshops. Another proposal under consideration is the creation of a working group that will work towards improving existing intra-campus connections as well as better defining the strengths and weaknesses in key areas of spatial analysis that currently exist on Cornell's campus.

Attendees:

1. Rob Strawderman (rls54), Host
2. Chris Barrett (cbb2)
3. Liz Peters (ep22)
4. Helene Schember (hrs6)
5. Pat Sullivan (pjs31)
6. Peter Woodbury (pbw1)
7. Saskya Van Nouhuys (sdv2)
8. David Ruppert (dr24)

9. Dawn Woodard (dbw59)
10. David Dieterich (dd355)
11. Joe Francis (jdf2)
12. Keith Jenkins (kgj2)
13. Ben Zuckerberg (bz73)
14. Steve DeGloria (sdd4)
15. Laura Jones (lej4)
16. Jan Vink (jkv3)
17. Jeff Tester (jwt54)
18. Ann Forsyth (forsyth@cornell.edu)
19. Megan McDonald (mcdonald@cs.cornell.edu)

Geospatial Science and Technology Instruction at Cornell

S.D. DeGloria[1] and K.G. Jenkins[2]

[1] Institute for Resource Information Sciences (IRIS), Department of Crop and Soil Sciences, Cornell University, Ithaca, NY 14853

[2] Mann Library, Cornell University, Ithaca, NY 14853

College of Agriculture and Life Sciences

Crop and Soil Sciences

CSS 4110: Environmental Information Science

Experiential approaches emphasize use and integration of maps, spatial databases, aerospace imagery, field data, and the global positioning system (GPS) to discriminate, measure, inventory, and monitor agricultural and environmental resources and processes.

Contact: S. DeGloria, sdd4@cornell.edu

CSS 4200: Geographic Information Systems

Emphasizes accessing, updating, analyzing, and mapping geo-spatial data. Considers needs assessment; spatial data accession; coordinate systems; spatial database design, construction, and maintenance; modeling and analysis; map accuracy assessment; and digital cartography.

Contact: S. DeGloria, sdd4@cornell.edu

CSS 4650: Global Positioning System

Introduction to navigation-grade GPS instruments used in agricultural and environmental sciences, including instrument familiarization; field-data collection and processing; and GPS-GIS integration and mapping of geo-positional data.

Contact: S. DeGloria, sdd4@cornell.edu

CSS 6200: Spatial Modeling and Analysis

Theory and practice of applying geo-spatial data for resource inventory and analysis, biophysical process modeling, and land surveys, emphasizing spatial analytical methods. Laboratory sections are used to process, analyze, and visualize geo-spatial data of interest to the student.

Contact: S. DeGloria, sdd4@cornell.edu

CSS 6210: Applications of Space-Time Statistics

Introduction to space-time statistics with applications in agriculture and environmental management. Topics include geostatistics, temporal statistics, sampling, experimental design, state-space analysis, data mining, and fuzzy logic. Focuses on landscape-scale processes and a user's perspective.

Contact: H. vanEs, hmv1@cornell.edu

Development Sociology

DSOC 3140: Spatial Thinking, GIS, and Related Methods

The purpose of this course is to introduce the undergraduate to both aspects of spatial patterns, trends, and themes but also to methodologies for bringing spatial considerations into their research. The course will provide a practical introduction to GIS via lab assignments.

Contact: J. Francis, jdf2@cornell.edu

DSOC 5600: Analytical Mapping and Spatial Modeling

The first part of the course focuses on various features of GIS that are most useful to social scientists in their endeavors. The second part of the course introduces spatial statistics that further this understanding as well as control for spatial autocorrelation when it exists.

Contact: J. Francis, jdf2@cornell.edu

DSOC 7190: Logistic Regression and Spatial Linear Regression

This course focuses on logistic regression and spatial linear regression modeling. Some time will be devoted to an overview of maximum likelihood procedures which form the basis of these spatial regression methods.

Contact: J. Francis, jdf2@cornell.edu

Landscape Architecture

LA 494: GIS for Landscape Architecture

Course explores central New York's cultural and natural history within a GIS framework. Students compile, format, and analyze spatial data, which will be incorporated into a comprehensive spatial database for on-going research in the Department.

Contact: A. Hammer, agh25@cornell.edu

Natural Resources

NTRES 6700: Spatial Statistics

Develops and applies spatial statistical concepts and techniques to ecological and natural resource issues including visualizing spatial data and analysis and modeling of geostatistical, lattice, and spatial point processes. Students are encouraged to enroll simultaneously in CSS 6200.

Contact: P. Sullivan, pjs31@cornell.edu

College of Architecture, Art, and Planning

City and Regional Planning

CRP 3540/5540: Introduction to Environmental Planning

This course focuses on role of GIS in environmental planning practice. Topics include spatial analysis techniques, spatial data management, and the use of raster-based environmental data. Issues include coastal erosion, infrastructure management, development regulation, watershed delineation and land cover analysis.

Contact: S. Schmidt, sjs96@cornell.edu

CRP 4080: Introduction to Geographic Information Systems

Course focuses on GIS applied to city and regional planning practice. Topics include network analysis, geo-referencing and projecting, data models, GIS data structures, data classification and management, sources of planning data, spatial analysis techniques, editing and creating spatial data, manipulating census data, and designing a GIS project.

Contact: S. Schmidt, sjs96@cornell.edu

CRP 5250: Introductory Methods of Planning Analysis

Quantitative and qualitative analysis of neighborhoods, cities, and regions. Analytical tools include descriptive and inferential statistics, mapping, and observation. Required lab exposes students to essential microcomputer applications and builds skills in writing and analysis.

Contact: R. Pendall, rjp17@cornell.edu

College of Engineering

Civil and Environmental Engineering

CEE 6100: Remote Sensing Fundamentals

Introduction to the principles, equipment, and methods used in remote sensing of Earth resources by aircraft or satellite sensors. Topics include interactions of electromagnetic radiation, sensors, sensor and ground-data acquisition, data analysis and interpretation, and project design.

Contact: W. Philpot, wdp2@cornell.edu

CEE 6150: Digital Image Processing

An introduction to digital image-processing concepts and techniques, with emphasis on remote-sensing applications. Topics include image acquisition, enhancement procedures, spatial and spectral feature extraction, and classification, with an introduction to hyperspectral data analysis.

Contact: W. Philpot, wdp2@cornell.edu

Extension, Outreach, and Library Resources

IRIS

Geospatial Literacy for Youth

A statewide and regional applied research and education program to advance spatial data literacy that includes the fundamental aspects of creation, comprehension, and utilization of spatial data for resource inventory and management; and K-12 teacher and 4H geospatial science training.

Contact: S. Hoskins, sbh1@cornell.edu

GIS & GPS Workshops for Extension Educators & Environmental Professionals

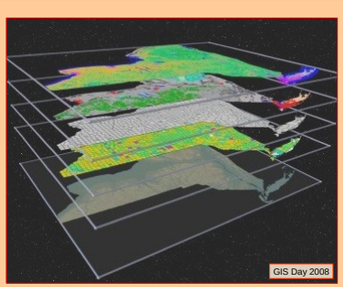
Dissemination of information on the features, functionalities, and implementation of geographic information systems (GIS) and image processing (IP) software. Workshop participants are offered hands-on experience in the use of GIS/IP software for practical solutions and skill development.

Contact: S. Smith, sds3@cornell.edu

Geospatial Software License Support

Management of SUNY-Cornell site license for the ESRI suite of geospatial software and ERDAS image processing software license (HEAK) for academic instruction and extension/outreach programming.

Contact: S. Smith, sds3@cornell.edu



Library Resources

Mann Library Workshops, Consultations, and Equipment

Workshops on introductory GIS mapping and analysis using ArcGIS and Manifold software. Individual consultations for help finding data, and using geospatial tools and software. GPS (Global Positioning System) units available for loan.

Contact: K. Jenkins, kgj2@cornell.edu

Cornell University Geospatial Information Repository (CUGIR)

CUGIR is an active online repository in the National Spatial Data Clearinghouse program. CUGIR provides geospatial data and metadata for New York State, with special emphasis on those natural features relevant to agriculture, ecology, natural resources, and human-environment interactions.

Contact: K. Jenkins, kgj2@cornell.edu

Olin Map & Geospatial Information Collection

Collection of maps, books, atlases, compact disks, and related materials. Core collection is supplemented by topographic maps, historic and modern city plans, nautical charts, geological maps, reproductions of rare or historic maps, aerial photographs, globes and a growing collection of GIS data.

Contact: R. Kibbee, rk14@cornell.edu