

16:455:501 Seminar in Geospatial Information Science (3)

Course Meets:

Mondays 6-7th period (6-9PM)

Environmental & Natural Resources Science, Room 145

14 College Farm Rd, Cook Campus-Rutgers University, New Brunswick, NJ

Coordinator:

Richard G. Lathrop, Center for Remote Sensing & Spatial Analysis

14 College Farm Rd, Cook Campus

Phone: 732 732-1580

Fax: 732 932-2587

Email: lathrop@crssa.rutgers.edu

Instructors:

Richard Lathrop, Department of Ecology, Evolution & Natural Resources

Lyna Wiggins, Bloustein School of Urban Planning & Policy Development

lyna@rci.rutgers.edu

David Tulloch, Department of Landscape Architecture

dtulloch@crssa.rutgers.edu

This seminar serves as a capstone course for students completing the new Certificate in Geospatial Information Science and is designed to bring together a multidisciplinary audience to explore a number of issues related to the development of this new disciplinary field. Students should have a good grasp of the technical aspects of geospatial information sciences as a prerequisite for enrolling in this seminar.

For more information on the GIS certificate, go to:

www.crssa.rutgers.edu/courses/gradcert.htm

Course content: Three foci define research in geospatial information science:

- 1) the fundamental questions of the human conceptualization of space and how geospatial information is generated, located, recorded, modeled, manipulated and/or communicated through computer technology;
- 2) how geospatial information science and technology can be applied to real world problems across a variety of physical, environmental and social science disciplines;
- 3) the societal implications of GIS technology on social interactions on a variety of levels, e.g., people to the environment, people-to-people, and people-to-government.

Readings:

The book "Research Agenda for Geographic Information Science," 2005 (Ed.: R. B. McMaster & E.L. Uery), CRC Press will be used as the general text to introduce each topic. Additional course readings will include key peer reviewed journal articles and white papers on the subject. Individual students will supplement this initial compilation with other pertinent papers.

16:455:501 Seminar in Geospatial Information Science (3)

Topic Outline

Week 1	Geospatial Information Science: What is it?
Week 2	Fundamental theory: Spatial-temporal Representation in GIS
Week 3	Fundamental theory: Ontology
Week 4	Fundamental theory: Uncertainty in GIS
Week 5	Fundamental theory: Student chosen topic(s)
Week 6	Application: Object-Oriented Classification of Remotely Sensed Data
Week 7	Application: Spatial Analysis and GIS
Week 8	Application: Data Mining
Week 9	Application: Student chosen topic(s)
Week 10	Societal Implications: Building a GSDI/NSDI/GIS Institution
Week 11	Societal Implications: PPGIS and Public Data For the Public? Data Sharing
Week 12	Societal Implications: What is a GIS Worth? Is It Worth Anything To The Community? Democratization?
Week 13	Societal Implications: Student chosen topic(s)
Week 14	Student presentations
Week 15	Student presentations

Expectations:

- Class readings/discussion: Each student will read the assigned readings and participate in class discussion. Each week a student will be assigned to lead discussion on one of the papers.
- Student chosen topics: For each of the 3 GI Science strands, one week's topic(s) will be up to the discretion of the students. Each student will lead the presentation/discussion of a self-chosen paper(s) or topic to the class. The presentation will consist of an oral presentation and preparation of background material that will include at a minimum: 1) summary outline of the paper's highlights; and 2) a 4-5p synopsis of the topic (i.e., synthesis/critique of the readings on a topic) due the week after the class meeting. Alternatively for one of the strands, a book review (in a style suitable for publication) on an appropriate topic should be undertaken and presented.
- Individual project paper/presentation: each student will do an individual project concerning some GI Science topic of interest. The project will be written up in the form of a typical research paper. A 30 minute oral presentation discussing the project (with appropriate visual aids) will be given to the class.

Grading: 45% Class presentation/synopsis for 3 strand topics
 45% Individual final project paper & oral presentation
 10% overall class participation

16:455:501 Seminar in Geospatial Information Science (3)

Reading List

Week 1 Geospatial Information Science: What is it? Text: Chapter 1

Michael F. Goodchild. (1997) What is Geographic Information Science?, *NCGIA Core Curriculum in GIScience*,
<http://www.ncgia.ucsb.edu/giscc/units/u002/u002.html>, posted October 7, 1997.

Week 2 Fundamental theory: Spatial-temporal Text: Chapter 5

- 1) Yuan, May and John McIntosh, "GIS Representation for Visualizing and Mining Geographic Dynamics," *Transactions in GIS*, Vol. 3, No. 2, pp. 3-10.
- 2) Peuquet, Donna. 2002. *Representations of Space and Time*. The Guilford Press: New York. (Selected chapters.)
- 3) Hariharan, Ramaswamy and Kentaro Toyama, "Project Lachesis: Parsing and Modeling Location Histories," *Geographic Information Science: Third International Conference, GIScience 2004, Proceedings*. Springer. 2004, pp. 106-124.
- 4) Worboys, Michael and Kathleen Hornsby, "From Objects to Events: GEM, the Geospatial Event Model," *Geographic Information Science: Third International Conference, GIScience 2004, Proceedings*. Springer. 2004, pp. 327-343.

Week 3 Fundamental theory: Ontology Text: Chapter 12

- 1) Brodaric, Boyd and Mark Gahegan, "Distinguishing Instances and Evidence of Geographical Concepts for Geospatial Database Design," *Geographic Information Science: Second International Conference, GIScience 2002, Proceedings*. Springer. 2002, pp. 22-37.
- 2) Fonseca, Frederico, James Martin, and M. Andrea Rodriguez, "From Geo- to Eco-ontologies," *Geographic Information Science: Second International Conference, GIScience 2002, Proceedings*. Springer. 2002, pp. 93-107.
- 3) Werner Kuhn, "Modeling the Semantics of Geographic Categories through Conceptual Integration," *Geographic Information Science: Second International Conference, GIScience 2002, Proceedings*. Springer. 2002, pp. 108-118.

4) Argarwal, Pragma, "Contested Nature of Place: Knowledge Mapping for Resolving Ontological Distinctions Between Geographical Concepts," *Geographic Information Science: Third International Conference, GIScience 2004, Proceedings*. Springer. 2004, pp. 1-21.

5) Cruz, Isabel F., William Sunna, and Anjali Chaudhry, "Semi-automatic Ontology Alignment for Geospatial Data Integration," *Geographic Information Science: Third International Conference, GIScience 2004, Proceedings*. Springer. 2004, pp. 51-66.

6) Soon, Keanhar and Werner Kuhn, "Formalizing User Actions for Ontologies," *Geographic Information Science: Third International Conference, GIScience 2004, Proceedings*. Springer. 2004, pp. 299-312.

Week 4 Fundamental theory: Uncertainty in GIS
Text: Chapter 7

1) Zhu, A-Xing, "Research Issues on Uncertainty in Geographic Data and GIS-Based Analysis," Chapter 7 in McMaster and Uery (ed), 2004, *A Research Agenda for Geographic Information Science*. CRC Press: New York.

2) Hunter, Gary. 1999. "New Tools for Handling Spatial Data Quality: Moving from Academic Concepts to Practical Reality." *Journal of the Urban and Regional Information Systems Association*, Vol. 11, No. 2, pp. 25-34.

3) Arbia, G., Griffith D. and Haining, R. 1998. "Error Propagation Modeling in Raster GIS: Overlay Operations." *International Journal of Geographical Information Science*, Vol. 12, pp. 145-167.

4) Heuvelink, G.B.M. 1999. "Propagation of Error in Spatial Modeling with GIS," in Longley, P.A., Goodchild, M.F., Maguire, D.J. and Rhind, D.W. (eds), *Geographical Information Systems: Principles and Technical Issues*, John Wiley & Sons, Inc.: New York, pp. 207-217.

5) Atkinson, P.M. and G.M. Foody. 2002. Uncertainty in Remote Sensing and GIS: Fundamentals. *In: Uncertainty in Remote Sensing and GIS* (ed. Foody and Atkinson). Wiley. Pp. 1-18.

Week 5 Fundamental theory: Student chosen topic(s)

Week 6 Application: Object-Oriented Classification in Remote Sensing
Text: Chapter 13

- 1) Benz et al. 2004. Multi resolution object oriented fuzzy analysis of remote sensing data for GIS ready information. ISPRS J. Photogrammetry and RS 58:239-258. web available
- 2) Blaschke & Strobl. 2001. What's wrong with pixels? Some recent developments interfacing remote sensing and GIS. GIS, pp. 12- 17.
<http://www.definiens-imaging.com/documents/publications/GIS200106012.pdf>
- 3) Burnett, C. and T. Blaschke. 2003. A multi-scale segmentation/object relationship modeling methodology for landscape analysis. Ecological Modelling 168:233-249. web available
- 4) Walter, V. 2004. Object-based classification of remote sensing data for change detection. ISPRS Photogrammetry & Remote Sensing 58:225-238. web available
- 5) Jacquez, G.M., S. Maruca and M.J. Fortin. 2000. From fields to objects: A review of geographic boundary analysis. J. Geographical Systems 2:221-241. web available

Week 7 Application: Spatial Analysis
Text: Chapter 6

- 1) Special Issue of J. of Geographical Systems. Getis, A. Introduction: Spatial analysis and GIS. 2000. J. of Geographical Systems 2(1): 1-3. web available
- 2) Goodchild, M.F. 2000. Spatial analysis and GIS practitioners: The current Status of GIS and spatial analysis. J. of Geographical Systems 2(1): 5-10. web available
- 3) Anselin, L. 2000. The Link between GIS and spatial analysis: GIS. Spatial econometrics and social science research. J. of Geographical Systems 2(1): 11-15. web available
- 4) Box, P.W. 2000. Specialized aspects of GIS and spatial analysis. J. of Geographical Systems 2(1): 49-54. web available
- 5) Frank, A. 2000. Technology and the future of GIS and spatial analysis: Geographic Information Science: New methods and technology. J. of Geographical Systems 2(1): 99-105. web available

Week 8 Application: Data Mining and Knowledge Discovery

Text: Chapter 9 & 14

1) Miller, H.J. & Han, J. 2001. Geographic Data Mining and Knowledge Discovery. Taylor & Francis, London.

2) Smyth, P. 2000. Data Mining: Data analysis on a grand scale?. [Statistical Methods in Medical Research](#) 9(4):309-327.
<http://lysander.ingentaselect.com/vl=1542255/cl=78/nw=1/rpsv/cw/arn/09622802/v9n4/s2/p309>

3) Feng, Q. and Zhu, A. 2003. IJGIS Knowledge discovery from soil maps using inductive learning. IJGIS 17(8):771-795.
<http://oberon.ingentaselect.com/vl=7751616/cl=71/nw=1/rpsv/cw/tandf/13658816/v17n8/s3/p771>

4) Gahegan, M. 2003. Is inductive machine learning just another wild goose (or might it lay the golden egg)? IJGIS 17(1):69-92.
<http://oberon.ingentaselect.com/vl=7751616/cl=71/nw=1/rpsv/cw/tandf/13658816/v17n1/s4/p69>

5) Jones, Christopher B. Alia I. Abdelmoty, David French, Gaihua Fu, and Subodh Vaid. "The SPIRIT Spatial Search Engine: Architecture, Ontologies and Spatial Indexing," *Geographic Information Science: Third International Conference, GIScience 2004, Proceedings*. Springer. 2004, pp. 125-139.

Week 9 Application: Student chosen topic(s)

Week 10 Societal Implications: BUILDING A GSDI/NSDI/GIS INSTITUTION

-- INSTITUTIONAL ISSUES

Text: Chapter 8

1) De Man, W. H. E. (1988). Establishing a geographical information system in relation to its use: A process of strategic choices. *International Journal of Geographical Information Systems* 2(2): 245-61.

2) Federal Geographic Data Committee, 1997. *Framework Introduction and Guide*. Washington, DC: Federal Geographic Data Committee.

3) Hissong, Frank. 2002. "The Sisyphean Death of the U.S. NSDI: Oh, Prometheus...Prometheus?" *Earth Observation Magazine* 11 (November) 11: 31.

4) Nedovic-Budic, Zorica, and Jeffrey K. Pinto, 1999. "Understanding Interorganizational GIS Activities: A Conceptual Framework," URISA Journal, 11 (Spring) 1: 53 – 64.

5) Tosta, N., 1999. "NSDI was supposed to be a verb: A personal perspective on progress in the evolution of the U.S. National Spatial data Infrastructure," Chapter 2 in B. Gittings (Ed.) Integrating Information Infrastructures with GI Technology: Innovations in GIS 6 Philadelphia; Taylor and Francis.

Week 11 Societal Implications: PPGIS AND PUBLIC DATA FOR THE PUBLIC? DATA SHARING
Text: Chapter 10

1) Azad, B., and L. L. Wiggins. 1995. "Dynamics of Inter-Organizational Geographic Data Sharing: A Conceptual Framework for Research," pages 22-43 in Onsrud and Rushton 1995.

2) Epstein E F 1991 In My Opinion. Journal of the Urban and Regional Information Systems Association 3 (1): 2-4
Brown K 1992 A Response to Earl Epstein. Journal of the Urban and Regional Information Systems Association 4 (1): 6-8

3) Lopez, Z. R. 1996. "Stimulating GIS Innovation Through the Dissemination of Geographic Information," URISA Journal 8 (Fall): 2, 24-37.

4) Onsrud, H. J., J. Johnson, and J. Winnecki. 1996. "GIS Dissemination Policy: Two Surveys and a Suggested Approach," URISA Journal 8 (Fall): 2, 8-23.

5) Sawicki D S and W J Craig 1996 The Democratization of Data - Bridging the Gap for Community Groups. Journal of the American Planning Association 62 (4): 512-23

6) Tulloch, D. L. 2003. "What PPGIS Really Needs Is....," 2nd Annual PPGIS Conference, Portland, OR, URISA.

7) Tulloch, D. L., and T. Shapiro, 2003, "The Intersection Of Data Access And Public Participation: Impacting GIS Users' Success?" URISA Journal (<http://www.urisa.org/Journal/APANo2/Tulloch.pdf>).

Week 12 Societal Implications: WHAT IS A GIS WORTH? IS IT WORTH ANYTHING TO THE COMMUNITY? DEMOCRATIZATION?

1) Chrisman N R 1987 Design of information systems based on social and cultural goals Photogrammetric Engineering and Remote Sensing 53: 1367-1370

2) Epstein E and Duchesneau T 1990 Use and Value of a Geodetic Reference System. Journal of the Urban and Regional Information Systems Association 2 (1): 11-25

3) Wilcox D L 1990 Concerning 'The Economic Evaluation of Implementing a GIS'. International Journal of Geographical Information Systems 4 (2): 203-10

4) Tulloch, D. L., and E. Epstein. 2002. "Benefits Of Community MPLIS: Efficiency, Effectiveness, And Equity," Transactions in Geographic Information Systems, 6 (2): 195-212.

Week 13 Societal Implications: Student chosen topic(s)

Week 14 Student presentations

Week 15 Student presentations