

# **GEO 7364 – GEOCOMPUTATION**

## **TEXAS STATE UNIVERSITY\*, SPRING 2009**

**Instructor:** Mark A. Fonstad

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**Office Hours:** 12:00 PM – 2:00 PM Mondays or by appointment

**Class Time:** 9:00 AM – 11:50 AM Mondays

**Classroom:** Evans Liberal Arts (ELA) Building, Room 122

**Course Line Number:** 342359

### **COURSE DESCRIPTION**

Geocomputation reviews and analyzes concepts of computational modeling in Geography. The course will include modeling theory and advanced topics such as parallel processing, neural networks, cellular automata, scientific visualization, and fuzzy modeling. Students will practice model development, specifically spatially explicit simulation.

### **LEARNING OUTCOMES**

*Knowledge Outcomes:* Develop a meaningful and theoretically significant term paper on a topic of significance in the field of geocomputation. Lead a classroom discussion on research papers in geocomputation, and illustrate how this research informs a discussion of geocomputation. Demonstrate understanding of the components of literature and concepts of geocomputation, how they have evolved, and knowledge of schools of thought in geocomputation. *Skills Outcomes:* Write a term paper on a significant topic in the field of geocomputation, complete a series of readings on a topic in geocomputation and lead a classroom discussion on them. Participate in discussions of papers assigned in class each week. The Department of Geography's Student Learning Outcomes for all departmental programs may be reviewed at: <http://uweb.txstate.edu/~mc12/LOSIndex.htm>.

### **COURSE MATERIALS**

The primary (and required) text for this class is *Environmental Modelling: Finding Simplicity in Complexity* by Wainwright and Mulligan, available in the library or from John Wiley and Sons.. Readings for this class will also be from several recent geocomputation research articles. Most of these articles can be distributed electronically as PDF files, although a few will be distributed as paper copies. There will be no charge for the articles. Students will be expected to have read the assigned materials and to be prepared to discuss them in an in-depth seminar setting. Readings are from the recent and current literature in geocomputation, with special emphasis on current research papers.

### **EVALUATION AND GRADING POLICIES**

I will evaluate your performance in this course on the basis of three components: 1) in-class participation, comprising 25 points (25%) of your grade; 2) an in-class leadership and discussion of 2 readings chosen by the student, comprising another 25 points (25%) of your grade, in which you present your analyses of 2 recent papers in the field of geocomputation and lead a class discussion of these works; and 3) a written term paper of no less than 15 pages of double-spaced text, plus figures, tables, references, an abstract, and cover page, on a topic that examines an aspect of the discipline of geocomputation of interest to you. The paper shall have standard 1-inch margins, be presented in 12-point typeface, and formatted in the style of a paper in the *Annals of the Association of American Geographers*. The term paper will be due on the last day of class, in class, and is worth 50 points

(50%) of your grade. There are a total of 100 possible points in this course. Course grades will be assigned as follows: A=90 points or more; B=80-89 points; C=< 80 points.

### **CLASSROOM AND ATTENDANCE POLICIES**

Good attendance in the class is key to your success in this course. First, the student discussions in class will require knowledge from previous weeks. Second, the individual research projects will require a deep familiarity with class material. In a 7000-level class, attendance is both assumed and required.

If you must miss class because of an illness, a personal emergency, or some other extenuating circumstance, please contact me as soon as possible so I can make alternative arrangements for you (this is key). Of course, good attendance means more than just showing up for class. Please read and adhere to the policy on classroom etiquette that appears below. These codes of conduct will allow everyone to participate equally as learners. Thank you for your cooperation.

In the Department of Geography, instructors strive to create an atmosphere of mutual trust and respect in which learning, debate, and intellectual growth can thrive. Creating this atmosphere, however, requires that instructors and students work to achieve a classroom in which learning is not disrupted. At the most basic level, this means that everyone should attend class, be prepared with readings and assignments completed, and that students pay attention. This means no conversations with friends, reading the newspaper, coming late, or leaving early. Such behavior is disruptive to the instructor and to your fellow classmates.

### **STUDENTS WITH DISABILITIES**

Students having special needs/disabilities (as documented by the Office of Disability Services) that will require compensatory arrangements must contact the instructor no later than the fourth class period to discuss specific arrangements and logistics. Students who have not already done so will be required to contact the Office of Disability Services located at LBJ 5-5.1 (512-245-3451). Texas State is dedicated to providing these students with necessary academic adjustments and auxiliary aids to facilitate their participation and performance in the classroom.

### **TEXAS STATE UNIVERSITY ACADEMIC HONOR CODE**

Learning and teaching take place best in an atmosphere of intellectual fair-minded openness. All members of the academic community are responsible for supporting freedom and openness through rigorous personal standards of honesty and fairness. Plagiarism and other forms of academic dishonesty undermine the very purpose of the university and diminish the value of an education. Specific sanctions for academic dishonesty are outlined in the *Texas State Student Handbook*.

### ***Tentative Course Schedule***

<b>Schedule</b>	<b>Readings</b>
<b>Jan. 26<sup>th</sup></b>	Wilson JP, Burrough PA, 1999, Dynamic modeling, geostatistics, and fuzzy classification: New sneakers for a new geography? <i>Annals of the Association of American Geographers</i> 89: 736-746.
<b>Feb. 2<sup>nd</sup></b>	Zeng Y, Malanson GP. 2006. Endogenous fractal dynamics at alpine treeline ecotones. <i>Geographical Analysis</i> 38(3): 271-287.  Mueller EN, Wainwright J, Parsons AJ. 2007. The stability of vegetation boundaries and the propagation of desertification in the American Southwest: a modeling approach. <i>Ecological Modelling</i> 208(2-4): 91-101.
<b>Feb. 9<sup>th</sup></b>	Ch. 7: Spatial Population Models for Animals

	Marion G, Smith LA, Swain DI. 2008. Agent-based modeling of foraging behavior: the impact of spatial heterogeneity on disease risks from faeces in grazing systems. <i>Journal of Agricultural Science</i> 146: 507-520.
<b>Feb. 16<sup>th</sup></b>	Brown DG. 1998. Mapping historical forest types in Baraga County, Michigan as fuzzy sets. <i>Plant Ecology</i> , 134(1): 97-111.  Zhu AX, Hudson B, Burt J, Lubich K, Simonson D. 2001. Soil mapping using GIS, expert knowledge, and fuzzy logic. <i>Soil Science Society of America Journal</i> 65: 1463-1472.
<b>Feb. 23<sup>rd</sup></b>	Ch. 9: Erosion and Sediment Transport  Coulthard TJ, Kirkby MJ, Macklin MG. 2000. Modelling geomorphic response to environmental change in an upland catchment. <i>Hydrological Processes</i> 14: 2031-2045.
<b>Mar 2<sup>nd</sup></b>	Brown DJ, Duh JD. 2004. Spatial simulation for translating from land use to land cover.  An L, Brown DG. 2008. Survival analysis in land-change science: Integrating with GIS and remote sensing in Southeastern Michigan. <i>Annals of the Association of American Geographers</i> 98(2). 323-344.
<b>Mar 9<sup>th</sup></b>	Bouden M, Moulin B, Gosselin P. 2008. The geosimulation of West Nile virus propagation: a multi-agent and climate sensitive tool for risk management in public health. <i>International Journal of Health Geographics</i> 7: Article 35.  Bian L. 2004. A conceptual framework for an individually-based spatially-explicit epidemiological model. <i>Environment and Planning B – Planning and Design</i> 31: 381-395.
<b>Mar 16<sup>th</sup></b>	<b>SPRING BREAK (no class)</b>
<b>Mar 23<sup>rd</sup></b>	<b>AAG (no class)</b>
<b>Mar 30<sup>th</sup></b>	Ch. 13: Modelling land–use change  Torrens P. 2006. Simulating Sprawl. <i>Annals of the Association of American Geographers</i> 96(2): 248-275.
<b>Apr 6<sup>th</sup></b>	Vancheri A, Giordano P, Andrey D. 2008. Urban growth processes joining cellular automata and multiagent systems. Part 1: theory and models. <i>Environment and Planning B – Planning and Design</i> 35(4): 723-739.  Vancheri A, Giordano P, Andrey D. 2008. Urban growth processes joining cellular automata and multiagent systems. Part 2: computer simulations. <i>Environment and Planning B – Planning and Design</i> 35(5): 863-880.
<b>Apr 13<sup>th</sup></b>	Ch. 19: Scaling Issues in Environmental Modelling  Ballas D, Clarke GP, Wiemers E. 2005. Building a dynamic spatial microsimulation model for Ireland. <i>Population, Space and Place</i> 11(3): 157-172.
<b>Apr 20<sup>th</sup></b>	Student-led classroom topics
<b>Apr 27<sup>th</sup></b>	Student-led classroom topics
<b>May 4<sup>th</sup></b>	<b>DEAD DAY (no class)</b>
<b>May 5<sup>th</sup></b>	<b>“FINAL EXAM PERIOD”</b> – Final projects due at 5:00 pm May 5 <sup>th</sup> .

### **ABOUT THE INSTRUCTOR**

The instructor is Mark A. Fonstad, assistant professor of geography. He is a specialist in spatial and hydrological analysis of river systems, theoretical geomorphology, and applied remote sensing. Mark received his Ph.D. in Geography from Arizona State University (2000) where he researched mountain fluvial systems and the prediction of channel change in New Mexico. For the past eight years, Mark has directed the field research on channel morphology, watershed hydrology, and the remote sensing of rivers in Yellowstone National Park.



\* A member of the Texas State University System