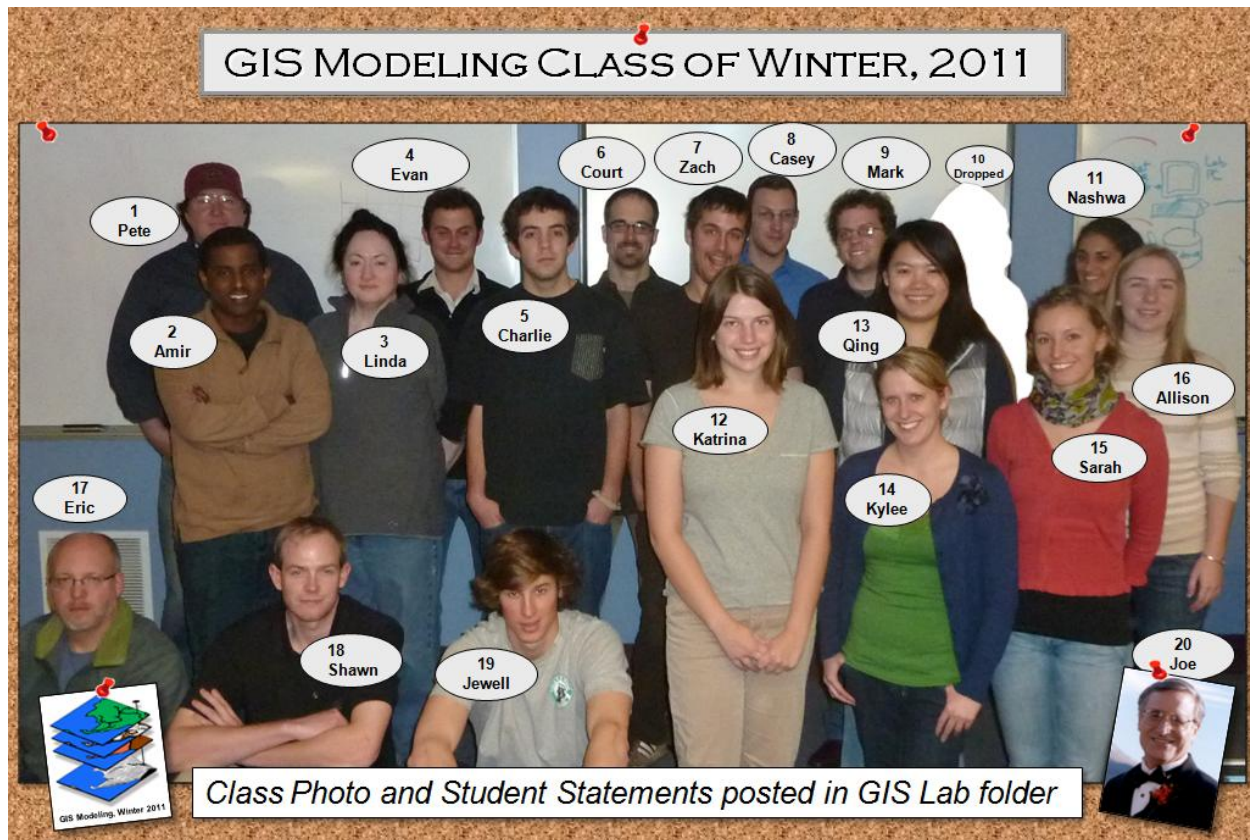


GIS Modeling Class, GEOG 3110, Winter Term 2011



Class Photo and Student Statements posted in GIS Lab folder

The following listing includes [Student Statements](#) about themselves and their goals for the course, as well as [Instructor Responses](#) to many of the statements that might shed some light on the course approach, content and logistics.

Student Statements

Court

I am an undergraduate student with a major in Geography with a focus on human geography. As for prior GIS course work I have taken the Intro to GIS with professor Steve Hicks. I have heard a great deal of positive feedback from former students as well I would want to gain a more complete understanding of this subject and think GIS modeling would be useful for a career in urban planning, which I have an interest in pursuing after completing my undergraduate degree.

Linda

GIS Modeling will be focusing on grid-based map analysis and the mechanics thereof, made easier. This course fits exactly to my current interest/goals of implementing new methods/focuses of developing undiscovered sources of fresh water along with reconciliation of existing grey/brackish water with the output of energy. The practicality of implementing (patent pending process(s)) directly will have a positive effect on the Middle East crucible during its current water crises. Why? Because we (Americans) are next to be hit with water crises. Thus, I have started two companies whose mission is to help alleviate current water shortages worldwide, and then teach specific processes to others for continuation.

Peter

I am a first year PhD. student. My GIS background is light. I finished Steve Hick's class in Geospatial Data last quarter and did well in it. I have 10+ years experience in IBM mainframe systems/operations in

the Financial Services industry. My last job was as an IBM mainframe computer security technical administrator contractor. I am interested in learning GIS as a tool (one of the two research tool requirements for PhD. students). As for this class, I am interested in learning how to apply spatial statistics and spatial data mining to land use issues.

Nashwa

I am pursuing the MS GIS degree with the hope of eventually going into the field of emergency management and using GIS to enhance emergency preparation or response procedures. I am specifically interested in GIS modeling of disease incidence for public health applications. I have taken the class on GIS spatial analysis, which I found very interesting and applicable to my interest. I will also be taking geostatistics in the winter, so with your class, I'm hoping to have a good understanding of ways in which GIS modeling and spatial analysis can be used to track disease occurrence and spread. This is "technically" my second year in the program, so I have taken a variety of GIS classes. I say "technically" because I was in the online program last year and moved over to the on-campus program in the fall.

Evan

My experience with GIS is mainly educational. In my undergraduate studies I utilized remote sensing techniques (supervised classification, Land surface temperature, and other related practices) as well as Spatial Analyst and Geo-database design for GIS. In my first quarter as a graduate student I 'modeled' the High Speed Rail system of Spain using network analyst to generate and Origin Destination Cost Matrix for travel time between all major cities in the region. I hope to extend this research in transportation using the skills developed in your GIS modeling class.

Eric

I am a doctoral student in Graduate School of Social Work and took Steve Hick's Geospatial Analysis class last quarter. I am interested in learning how spatial analysis can be used in analyzing social phenomena such as social exclusion and poverty.

Kylee

I am a first year PhD student in the biology department. I really like insects and the things they can tell us about changing environments. Thus far, my project revolves around moth communities in urban habitat fragments. I really believe GIS is underutilized in ecology and I want to use it for more than fancy map making. My goal for the course is to learn how to do this. I took "Introduction to Geospatial Data" with Steve Hick where I got familiar with ArcGIS software. I would like to continue researching after I graduate.

Shawn

I am a second year grad student in the MSGIS program. I did my undergrad at University of Louisville in Geography. I have had quite a few GIS classes by this point and I am currently doing a GIS internship at DRCOG. After graduation I am interested in pursuing a career as a GIS Analyst.

Mark

I am a MA student in International Studies, where I study global health. I'm currently working on my thesis which deals with measuring the impact micro-financial services have on nutrition (and maybe a couple other indicators) in rural Cambodia. A major part of my analysis is using GIS to account for the geographic variation (if any) in the impact of microfinance. Previous GIS coursework includes Intro to GIS and Environmental Health and GIS (both with Marilyn Williams). My career goals are to work in public health for a few years before going to medical school. Out of this course I hope to get some quantitative spatial analysis skills.

Charles

I am a senior environmental science major, and have heard about broad applications of GIS. I decided to take this class because it offers more in-depth explorations of the possibilities for using GIS.

Qing

I am a first year PhD student in Geography. I did my undergraduate in GIS and Master of Science in GIS. I have taken Geospatial Data taught by Steven Hick in the Fall quarter. I took courses such as Intro GIS, Remote Sensing, Quantitative Geography, and Geo-visualization during my master's study, and worked on developing web GIS application afterwards. I am interested in GIS and remote sensing and applications combined with both technologies, especially the studies using nighttime imagery for population and social economic activities. My goal for the course is to learn concepts and procedures in analyzing spatial relationships and building effective models. I hope to use what I will learn from this course in my future studies to help me explore the geographic data and spatial pattern of human activities.

Katrina

I'm a first year biology grad student studying caterpillars, and I just completed the introductory GIS class taught by Steven Hick during fall quarter.

Liz

I am an Environmental Science major from Milwaukee, Wisconsin. I traveled abroad to the Turks and Caicos islands fall semester of this year for a marine biology field study program. I learned a little bit about GIS while there, but complete only two classes on the subject. I am not entirely sure what I will be doing with my major; either going into marine biology or considering Environmental Law.

Sarah

I am currently a master's student at Korbel studying International Development and getting the certificate in Global Health Affairs. I did my undergrad in Psychology and Peace and Justice Studies, so geography is a relatively new interest. I have taken both Intro to GIS and Marilyn Williams Environmental Health and GIS class. I am currently working for the Clinton Health Access Initiative helping them map diseases, cold chains, health facilities, etc. in Ethiopia, Malawi, Kenya and Nigeria. I also have done research with Professor Randall Kuhn (of Korbel) on mapping incidence of obstetric fistula in Nigeria, and on access to health clinics in an urban slum in Delhi, India. I have a strong international health bend, and am trying to gain the greatest GIS foundation possible to serve me in this capacity in the future. As such, my career goals are to become a program manager in a health capacity, using GIS to improve supply chains, enhance services delivered, improve M&E and overall impact.

Zach

I only recently declared Geography as a minor so I don't have any previous course experience. I currently don't have any specific goals for the course as of yet. I am a hospitality major, and unsure of which aspect within the hospitality world I would like to go into. I am an avid backcountry skier who also enjoys biking, hiking, camping, and brewing.

Amanda

I am a senior undergrad majoring in International Studies with minors in Mandarin and Sustainability. I hope to work for an agency such as Greenprint Denver or the EPA to utilize my sustainability background and do something I believe in. I have heard that GIS is useful for such fields and thus I decided to take

some GIS courses to develop practical skills. Hopefully this will make me more marketable for future job prospects by providing me with a tool that I can use in my career.

Casey

I utilized several mapping applications as a military officer for navigation and analysis of events. This was my user introduction to maps and I immediately realized the endless applications for mapping technology. I am combining a series of GIS classes into a technical aspect of my M.A., International Development from Korbelt as a way to interpret and present data under the idea that a picture is worth a thousand words. My prior related courses are Stats I/II and Intro to GIS with Steve Hick in Fall '10. My course goals are to learn how to interpret and analyze data to produce useful and meaningful results. My career goals are to work in a "to be determined" realm of international civil-military affairs. GIS has been an underutilized component of most projects I have worked on so I intend to combine this with other forms of quantitative and qualitative research to produce increasingly strong outcomes in projects.

Amir

B.Sc in Mathematics and M.A. in Climate Society (Columbia University) and now working for a PhD in Geography. Experience developing tools for data capture, processing and modeling (including GIS) in studies and interventions related to natural and human systems especially in public health. My Career goal is to obtain a position in disease control and prevention programs and work on assessment and development of tools for data capture, analysis and modeling certain epidemiological situations, to inform intervention strategies in implementation of sustainable programs to enhance health of the population.

Shannon

I am a senior Environmental Science major. I recently got back from studying abroad in the Turks and Caicos Islands where I studied marine resource management and the economic and social factors that play into marine ecosystems. I hope to be a part of ecology/biology research projects in the future; therefore I think that having knowledge in GIS will benefit me. I hope to be able to apply GIS skills to spatially analyze habitat preferences and ranges of key species in order to produce results forming models. I think this research will be valuable in today's developing world; particularly in places where construction has led to habitat destruction and a breakdown in many ecosystems. I have never taken a GIS course before, however I have done some basic cartography mapping.

Allison

I am a first year MS GISc student. I studied geography at Valparaiso University focusing on GIS, although I have not previously learned about spatial modeling. My interests lie in explaining spatial patterns with my current research related to spatial crime analysis. For GIS modeling I am interested in optimal travel paths and best business locations. My career goals are to get a job as a GIS Analyst or Crime Analyst.

Jewell

I am from Chicago, IL. I have just recently switched majors from business to environmental science. I feel that the environment is one of the most important issues facing my generation and I am interested in learning about it and the way it is changing and affecting lives. My FSEM teacher and advisor, Dr. Sutton, recommended that I take this class. I am not really sure exactly what GIS modeling is but it seems interesting. As for career goals, I am not really sure what I want to do yet. I am trying to take a wide variety of classes to find out which topic interests me the most.

Instructor Responses to Student Statements

Jewell— most environmental issues and problems are spatial by nature. Our environmental science legacy, however, is primarily non-spatial as analyzing the complex geographic distributions of the variables involved was overwhelming just a couple of decades ago—hence, spatially aggregated math/stat procedures were employed (e.g., average and standard deviation characterizing the “typical condition” over large expanses of the landscape). With the advent of the digital map (and “big-honking” computer power in everyone’s lap/palm) environmental science is rapidly becoming map-*ematical*. For example, check out “*Lumpers and Splitters Propel GIS*” article in the **Epilog** to the online book *Beyond Mapping* posted at...

http://www.innovativegis.com/basis/MapAnalysis/MA_Epilogs/MA_Epilogs.htm#Lumpers_and_splitters
...that investigates the different mindsets for approaching spatial issues.

Shawn— your prior GIS and geography experience should be valuable in the team assignments. The weekly exercises provide “hands-on” experience with the concepts discussed in class. In addition, the report preparation provides an opportunity for the group to gain experience in writing skills and report formatting. This “added bonus” attempts to mimic the real-world demands for team interaction, group dynamics and workload allocation—the professional report writing that will likely dominate your post-academic days. I have been straddling the private and academic sectors for over 30 years and put my MBA experience to help students in transitioning from academic lab write-ups, essays and papers toward professional reports—a subtly different kind of communication animal.

Qing— your background for the course is excellent ...extensive experience that can contribute a lot to the class. My doctorate (in the pre-Pleistocene era of mainframe computers and card decks) was in machine processing of remotely sensed data ...origins of raster and grid approaches in GIS for math/stat analytics, rather than the usual mapping and database geo-query of vector analysis. The course focuses on “*Maps as Data*, pictures later;” check out **Topic 18: Understanding Grid-based Data**, in the online book *Beyond Mapping* posted at...

<http://www.innovativegis.com/basis/MapAnalysis/Topic18/Topic18.htm>
...that ought to resonate with much of your experience. What is interesting is a lot of the non-spatial approaches move into grid-based map analysis—it’s just that entire map layers composed of spatially organized sets of numbers replace the usual variables. For example, in a current project for wildfire risk modeling we are using night imagery and proximity to roads for determining population “clusters” in assessing potential impacts ...the usual census data is too coarse and old to identify the small mountain communities.

Court— urban planning is very fertile turf for map analysis and GIS modeling, with the Distance and Neighborhood operations particularly useful. For example, Least Cost Routing is commonly used in locating linear infrastructure, such as power and pipelines; check out **Topic 19: Routing and Optimal Paths**, in the online book *Beyond Mapping* posted at...

<http://www.innovativegis.com/basis/MapAnalysis/Topic19/Topic19.htm>

Liz— there are lots of GIS modeling applications in environmental science ...any particular focus to your interests? The legal side of ES could certainly benefit from more “realistic” regulations, such as “variable-width buffers” instead of simple geographic distance reaches that ignore intervening conditions. Similar extensions to traditional simple buffer thinking include downhill, downwind, and down-current to characterize potential impacts. A big driver of the future of GIS technology are “new ways of doing business;” not just automating paper map legacy procedures through mapping and geo-query. In this pursuit, society needs fresh new minds that understand the innovative analytical capabilities and have the spatial reasoning skills to apply them in non-traditional ways. This intellectual soup requires domain expertise as much, or more, than GIS expertise. An argument for broadening the traditional perspective of GIS is made in **Topic 4: Where Is GIS Education**, sub-topic “*GIS Education’s Need for Hitchhikers*” in the online book *Beyond Mapping III* posted at...

<http://www.innovativegis.com/basis/MapAnalysis/Topic4/Topic4.htm>

The downside of expanding GIS from maps to spatial solutions is that “domain experts” have to be committed ...a working knowledge of GIS modeling is a bit more involved than just inventory mapping. The course will demand a significant part of your attention and time this term.

Sarah— your interest in Global Health aligns well with GIS Modeling; as does your prior GIS academic and practical experiences. In your project for mapping disease incidence I presume you utilized some sort of “surface modeling” procedure to generate a continuous map surface of relative levels of disease occurrence from point data. All of the techniques I know of utilize a “roving” window with the character of the weighted “filter” producing different results. If this rings a bell with you, you might want to check out **Topic 26: Assessing Spatially-Defined Neighborhoods** (particularly sub-topic “Nearby Things Are More Alike”) in the online book *Beyond Mapping III* posted at...

<http://www.innovativegis.com/basis/MapAnalysis/Topic23/Topic23.htm>

While the application described involves wildfire occurrences over time, it might resonate with some of your work with disease incidences. Once a reliable “Occurrence Surface” is derived the data can be mined for relationships with other mapped data, such as a “downwind” proximity map. At the start of the Spatial Statistics portion of the course (week 7) I’ll describe a study linking non-point source pollution from a lead smelter plant outside of Dallas to induced mental retardation in children. The approach used is classic even though it was completed in the 1980s when we were passing card decks through a window to a mainframe computer.

Amanda— sustainability is right down the GIS Modeling alley (not sure about the Mandarin other than Asia has very strong programs in GIS). Most of my “sustainability” related experience has been in forestry where we attempt to balance utilization with conservation to insure forest health and non-depletion. While I haven’t been involved directly in “carbon banking” and cap-and-trade, GIS has long been an actor in defining the base resource levels and calculating increase/decrease carbon sequestration in biomass. It is a very interesting application that must be in place before truly effective global solutions can be put into play.

Nashwa— emergency response modeling is one of my favorite applications... my approach uses grid-based map analysis that considers off-road as well as on-road response. You might be interested in “E11 for the Backcountry” section in **Topic 29, Spatial Modeling in Natural Resources** in the online book *Beyond Mapping III* posted at...

<http://www.innovativegis.com/basis/MapAnalysis/Topic29/Topic29.htm>

Also I am currently involved in a project for the US Forest Service that is evaluating helicopter “Rappel Country” for wildfire response for all of the western US National Forests (125 west to the Pacific Ocean) at a 30 meter resolution ...that’s a lot of little quarter-acre squares. In evaluating where it is best to rappel (jump out of the helicopter and slide down a rope to the fire) we have to model ground crew attack (on- and off-road travel) and helicopter landing attack (then off-road travel for 30 minutes), as well as the optimal arrangement of Heli-base locations. We are in our second month and have just two more to complete ...I’ll keep you abreast of successes, as well as scar tissue we gain along the way. Some of this might translate to tracking disease occurrence and spread as that movement doesn’t respect roads either. *Extended Discussion*: working with Sanborn and DTS we have completed wildfire risk maps for most of the continental US and then mixed this information with assessor’s parcel data for fire effect/impact analysis of potential economic loss that is extremely useful in mitigation planning... do some fuel loading alteration, such as prescribed burning, in those areas that both fire behavior factors and economic loss exposure are high. A short paper on “**Mapping a Firewall: Modeling and Visualizations Assess Wildfire Threats, Risks and Economic Exposure**” is posted at...

http://www.innovativegis.com/basis/present/GW09_wildfire/Wildfire_GW09.htm

Currently I am involved with a proposal to summarize these concerns for power lines ...their “economic exposure” to ignition by line breakage during Santa Anna winds in southern California can be in the billions. It sure makes sense that the power companies team with fire protection districts/organizations to support mitigation outside their right of way in areas that will do the most to lower their economic exposure ...win, win by combining power line and fire protection budgets.

Shannon— GIS plays a big role in habitat modeling and mapping ...most critters have very specific preferences when it comes to geographic space. While marine habitat modeling isn’t as well developed as terrestrial applications, there are plenty of opportunities provided base data is available. Our first lab assignment involves tinkering with a very simple habitat model for the “Hugag” as a means to become familiar with some very basic map analysis/modeling procedures and the grid-based software we will be

using in the class. You can get a sneak preview by checking out **Topic 23, Suitability Modeling** in the online book [Beyond Mapping III](#) posted at...

<http://www.innovativegis.com/basis/MapAnalysis/Topic23/Topic23.htm>

...that will give you a leg up on some of the material in the first class meeting and the first lab, as well as some basic concepts in habitat modeling (win, win, win). Be aware that the coursework is fairly demanding. Hopefully your class schedule this term isn't packed with a lot of "crunchers."

Zach— an introductory course is not a prerequisite and shouldn't be a problem. However, keep in mind that the GIS Modeling course is taught at the **upper division/grad student level and involves a fair amount of work** ...weekly team assignments are done outside of class and generally requires 4-6 hours of homework. This plus 2 hours reading and 3 hours in class suggest **about a 10+ hour commitment per week** which is manageable as long as students are able to keep up.

Evan— your "raster" experience with Spatial Analyst and RS packages is right down the learning alley for the GIS Modeling class—Spatial Analysis and Spatial Statistics. For example, we will extend the "effective distance" concepts in Network Analyst (vector) to continuous geographic space (raster) by relaxing the assumption that movement is restricted to just the road network ...such as introduced in the "Harvesting an Understanding of GIS Modeling" and "E11 for the Backcountry" sections in **Topic 29, Spatial Modeling in Natural Resources** in the online book [Beyond Mapping III](#) posted at...

<http://www.innovativegis.com/basis/MapAnalysis/Topic29/Topic29.htm>

Kylee— when you think about it, at the organism level, what research fields could be more spatial than biology and ecology. While the individual insect space might be small from our perspective, it's a whole world to them ...the smallest space I have applied map analysis is at the nanometer level investigating brain neuron networks as if they were a 3D highway system. Why an insect chooses a certain position on a plant or corner in a house must have some "micro-geography" niche theory behind the choice.

Katrina— we will be **focusing on grid-based map analysis and modeling (raster)** which is a bit different from traditional vector-based procedures. I believe you will find the "mechanics" easier but some of the concepts are sort of "non-traditional" as the familiar discrete spatial objects of point, line and polygon are extended to continuous map surfaces. Hence we don't have separate spatial and attribute tables— rather each map variable (e.g., elevation, slope, roads, water, etc.) is stored as a separate map layer (matrix) with a value at each grid location indicating the characteristic/condition of the variable. This map data form is more suited for analysis and modeling than the mapping and geo-query vector form. *Update:* For example, grid-based processing allows for certainty maps and error propagation modeling that result in the spatial distribution of error in map overlay instead of the assumed "100% certain of the joint condition everywhere in a derived son/daughter polygon" in vector-based map overlay; see...

http://www.innovativegis.com/basis/BeyondMapping_II/Topic4/BM_II_T4.htm#Uncertainty

Casey— in the class we will treat maps as data and apply a map-ematical-like framework to develop solutions. While maps are "numbers first, pictures later" there are a bunch of new operations that arise from the spatial relationships among the geographically organized sets of numbers—add, subtract multiply, divide and even differentiate and integrate are move forward into map analysis, but there are some unfamiliar new ones like visual exposure density, Nth optimal path, contiguity and narrowness. The new ones aren't difficult concepts with complicated mechanics ...it's just that they are new ways of spatial reasoning brought on by modern computers and the digital map. The class ought to be fun as we explore this new landscape.

Mark— your thesis topic dealing with measuring the impact micro-financial services have on nutrition in rural Cambodia is a very interesting public health application ...the course ought to give you insight on how GIS modeling might be useful in incorporating spatial relationships into your studies. *Update:* ...as peculiar as it might sound, epidemiological/health applications in many ways mirror *Precision Agriculture* (and *Geo-business*) more than traditional map legacy applications. Check out **Topic 16: Characterizing Patterns and Relationships** in the online book [Beyond Mapping III](#) posted at...

<http://www.innovativegis.com/basis/MapAnalysis/Topic16/Topic16.htm>

...and mentally substitute your dependent variable(s) for crop yield and your independent variables for phosphorous, potassium and nitrogen— the spatial expression of multivariate statistics as continuous map surfaces enables the incorporation spatial patterns and relationships (spatial autocorrelation) into the analysis instead of ignoring them and attempting to explain variable associations through broad aggregated statistics (e.g., average, standard deviation, etc.).

Amir— we will approach GIS Modeling as a basic “map-ematics” and with solutions formed by sequencing commands—“thinking with maps.” Spatial reasoning skills are a combination of understanding the analytical procedures and thoughtfully assembling them in creative ways. A combination of the Spatial Analysis and Spatial Statistics procedures are right down the public health and epidemiology ally. *Extended Discussion*: check out **Topic 24, Overview of Spatial Analysis and Statistics** in the online book Beyond Mapping III posted at...

<http://www.innovativegis.com/basis/MapAnalysis/Topic24/Topic24.htm>

...for a discussion of the GIS analysis/modeling framework that we will use in the class.
