GIS and Graduate IS Research

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Claremont Graduate University

GIS Workshop, ICIS Conference, Auckland New Zealand, December 14, 2014

Claremont GRADUATE UNIVERSITY

Agenda

- CGU and GIS
- A Transdisciplinary Science and Practice
- Overview of GIS/IS Concentration
- Current Research Streams
- Future Directions

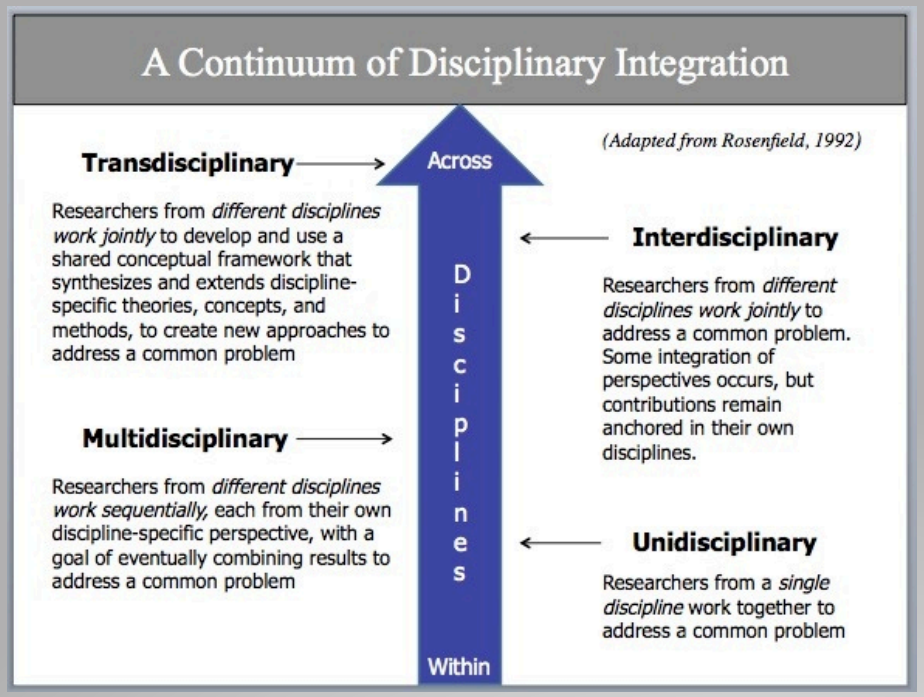
Historical Background of CGU

- Founded in 1925. The first university in North America to devote itself entirely to graduate study.
- Includes four Schools, and two Centers. Has established an intimate, student-focused environment designed to promote creative collaboration with faculty and fellow students.
- Part of the Claremont Colleges Consortium

About CISAT

- The Center for Information Systems and Technology (CISAT) was founded in 1983 by Dr. Paul Gray, an influential pioneer and world-renowned scholar in the field of information systems and technology (IS&T).
- CISAT takes an applied transdisplinary approach to IS& T, with multiple concentration options in both master's and doctoral program, as well as interfield options with any of the CGU schools.

GIS as a Transdisciplinary Science and Practice



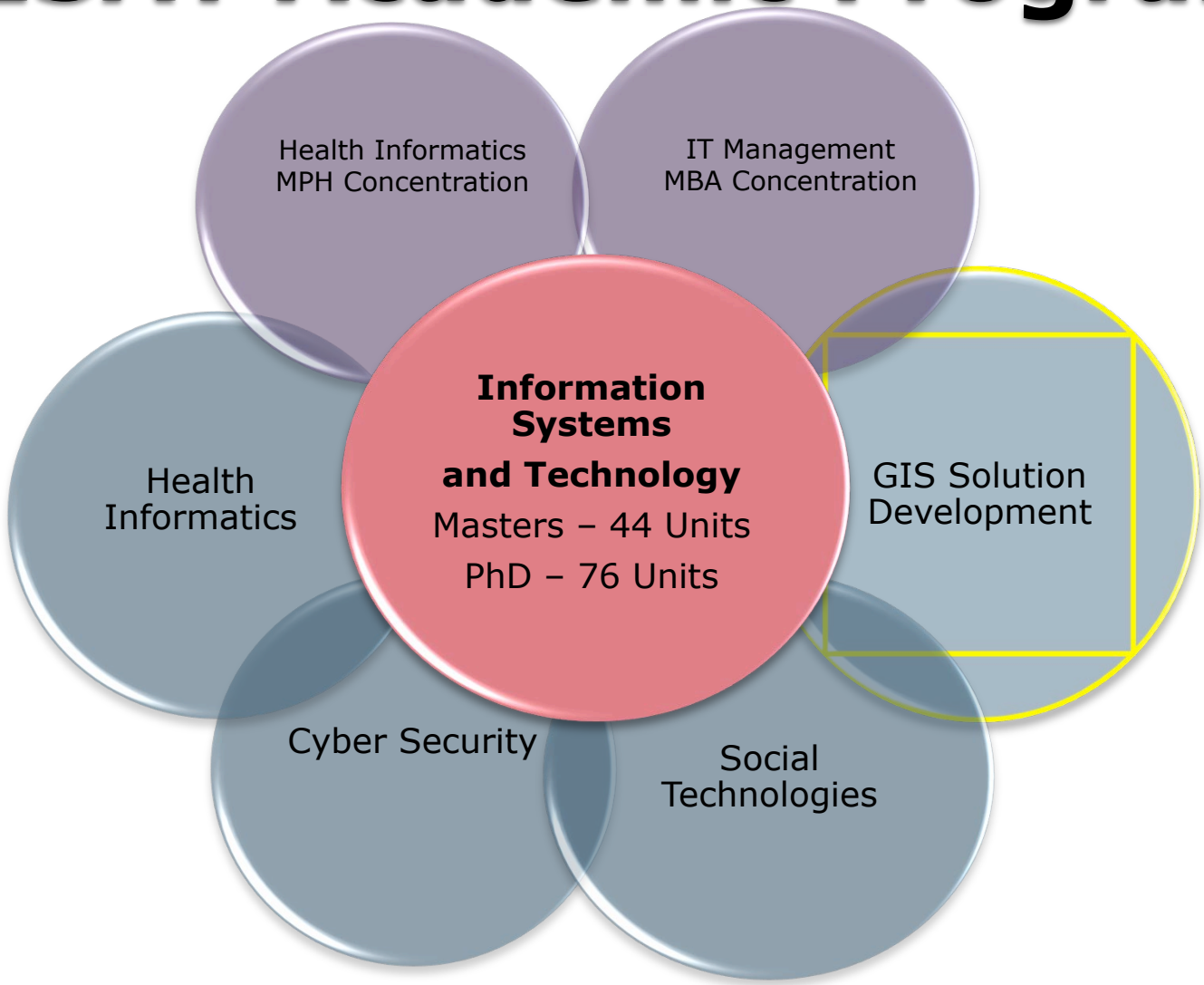
Geographic (Spatial) information science: is the science behind the technology and considers fundamental questions raised by the use of systems and technologies; GIS-T is the science needed to keep technology at the cutting edge; it is a *transdisciplinary* field with many disciplines contributing to these issues.

Wave 1:geography, cartography, urban planning,

Wave 2: information/computer science, social sciences, economic and business applications.

(Adapted from Goodchild, 2002)

CISAT Academic Programs



A Brief History of GIS and Esri at CGU

1998 - Spatial Cognition of Neighborhoods Study
2000 - GIS Course Offered at CISAT
2003 - First Spatial Information System Development Dissertation
2006 - GIS Concentration Started
2008 - Named one of three inaugural EDC's by Esri
2009 - SafeRoadMaps achieves 10 million visits
2010 – First Esri MOU signed
2011 – CISAT Refines Concentrations, Accelerates GIS
2012 – Advanced GIS Lab formed to Enhanced CGU Research
2013 - Renewed Esri MOU and Scholarship Program
2013 - Horan and Hilton Invited to White House
2013 - GIS Becomes Top CISAT Concentration
2013 - CISAT Expands GIS Efforts Across CGU
2013 – Esri Visit for GIS Day and Student GIS Club Formed
2014 – Board of Trustees Approve Additional GIS Positions

The CGU Focus: Video

Location Analytics at CGU

http://is.cgu.edu

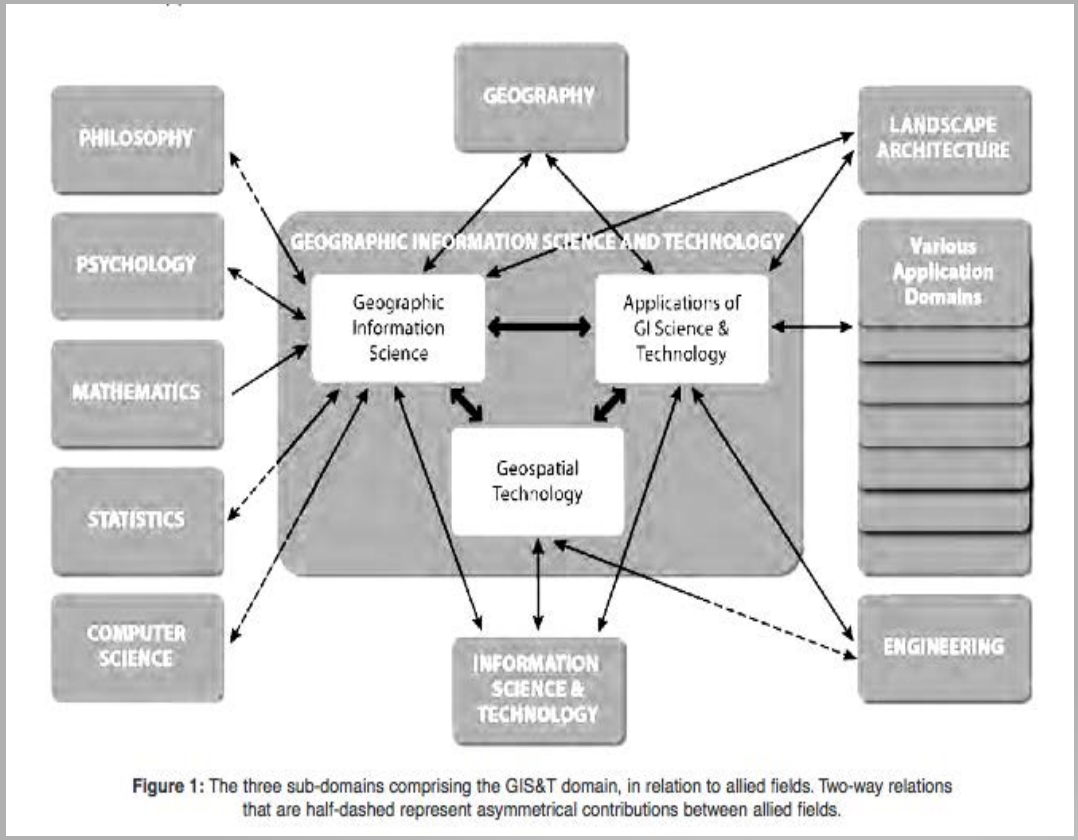
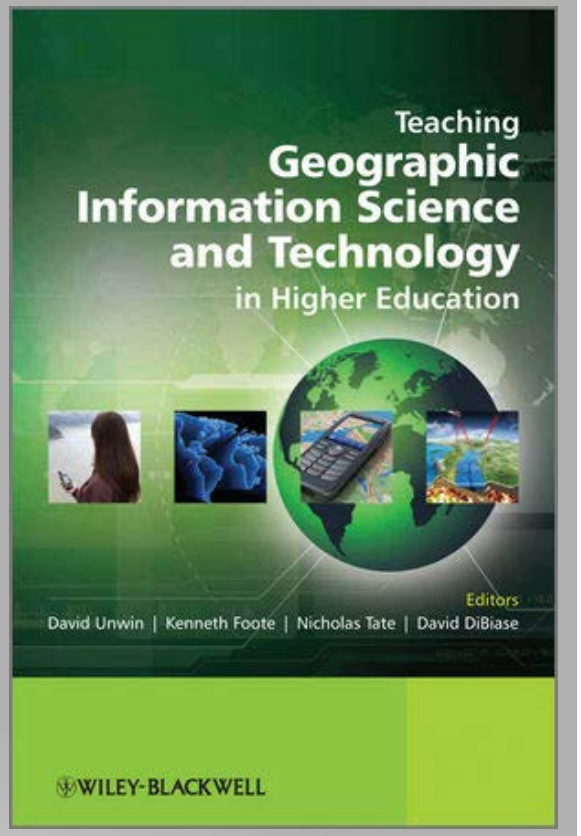


Figure 1: The three sub-domains comprising the GIS&T domain, in relation to allied fields. Two-way relations that are half-dashed represent asymmetrical contributions between allied fields.



Practicum: Practice-Based Learning

The Advanced GIS Lab in CISAT focuses on advanced location analysis and the research and development of advanced GIS solutions. The Lab stresses an integrated approach to knowledge, research, and problem-solving that takes the core ideas, methods, and concepts from several disciplines and uses them to study a broad range of problems.

Esri Partnership and Development Center (EDC)

One of the founding Esri Development Centers, (EDC).

New MOU supports education, research and training collaboration.

Applied focus unites research on pressing issues with new platforms, tools, and techniques

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Claremont Graduate University announces new partnership with Esri

Tuesday, June 04, 2013

Claremont Graduate University (CGU) has entered into a new comprehensive partnership agreement with Esri, the world's leading supplier of geographic information system (GIS) software.

Under the three-year agreement, Esri and CGU will provide scholarships for at least three Esri employees to begin a CGU master's or doctoral degree program per year. Additionally, Esri and CGU will engage in collaborative research and initiate a clinic program utilizing resources from several CGU programs, including the Center for Information Systems and Technology (CISAT), the Peter F. Drucker and Masatoshi Ito Graduate School of Management, and the Institute of Mathematical Sciences.

GIS Concentration Highlights

Foundation Courses (Required)

- IST 370: Geographic Information Systems: Essential Concepts
- IST 371: GIS Solution Development

Advanced Courses (Choose 1)

- IST 372: Advanced GIS Analytics and Solution Development
- IST 380: Geospatial Business Intelligence
- IST 380: Health Geoinformatics
- IST 380: Spatial Thinking and Statistics (planned)

Specialized Topics (Choose 1)

- IST 380: Cloud Computing
- IST 380: Mobile Applications

Practicum (Required)

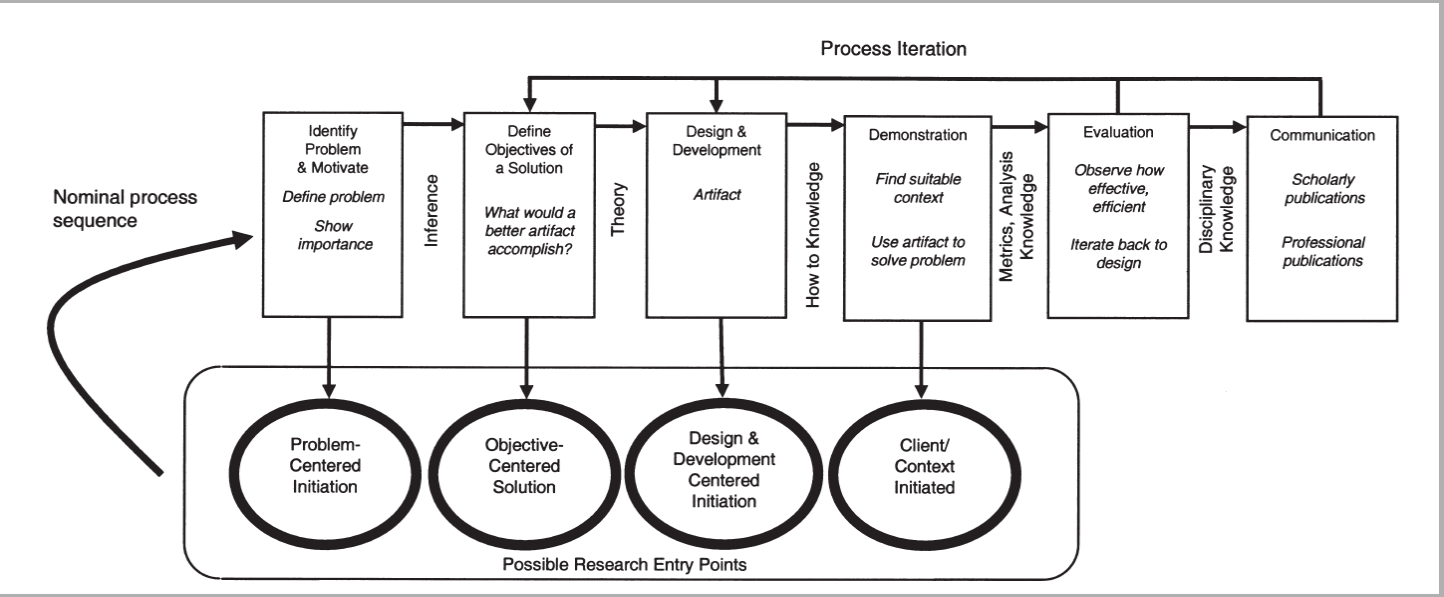
- IST 373: GIS Practicum

360 student enrollees in GIS Concentration Courses, 204 since 2011

Current Lab Projects Underway

Topic and/or Organization	PI	GIS Lab Role	Students	Domain
Freight Rail BNSF / Esri	Horan / Hilton	Lead	Yaser Khouja, Ziyun Xu (Riki), Watanyoo Suksa-Ngiam	Transportation
Tribal Transportation Safety / Esri	Horan	Lead	Ziyun Xu (Riki), Rachel Camacho	Transportation
Health Spatial Decisions Inland Empire / Esri	Horan / Hilton	Lead	Michael McElroy	Health
Spatial De-identification / Esri	Horan	Lead/Support	Abdullah Murad	Healthcare/Statistics
Community Vital Signs Data	Hilton	Lead	April Moreno	Health
Tobacco Use Among Youth	Hilton	Lead/Support	Hilary Tannenbaum, Rachel Camacho	Health
Personal Safety Spatial Decision Making	Horan / Hilton	Lead	Juliette Gutierrez	Health
Retail Food Environment Index	Hilton	Lead	Hilary Tannenbaum, Rachel Camacho	Health
Montana Native American Voting	Jean Schroedel	Support	Ziyun Xu (Riki)	Political Science
Energy Infrastructure	Hal Nelson	Support	John Urata	Politica Science
Community College Engagement	Cecilia Rios-Aguilar	Support	Maria Reyes	Education
GIS in High School Teaching - CHS	Hilton	Lead	Sarah Osailan	Education
Upland USD Spatial Data Analysis	Hilton	Lead/Support	Rachel Camacho, Marco Antonio Cruz	Education
Las Vegas Real-time Spatial Social Analysis	Horan / Hilton / Zak	Lead/Support	Sarah Osailan, Yaser Khouja, Omar Aboulola	Economics

Design Science Research Methodology



Design Science is an outcome based information technology research methodology, which offers specific guidelines for evaluation and iteration within research projects.

Design science research requires the creation of an innovative, purposeful artifact for a special problem domain.

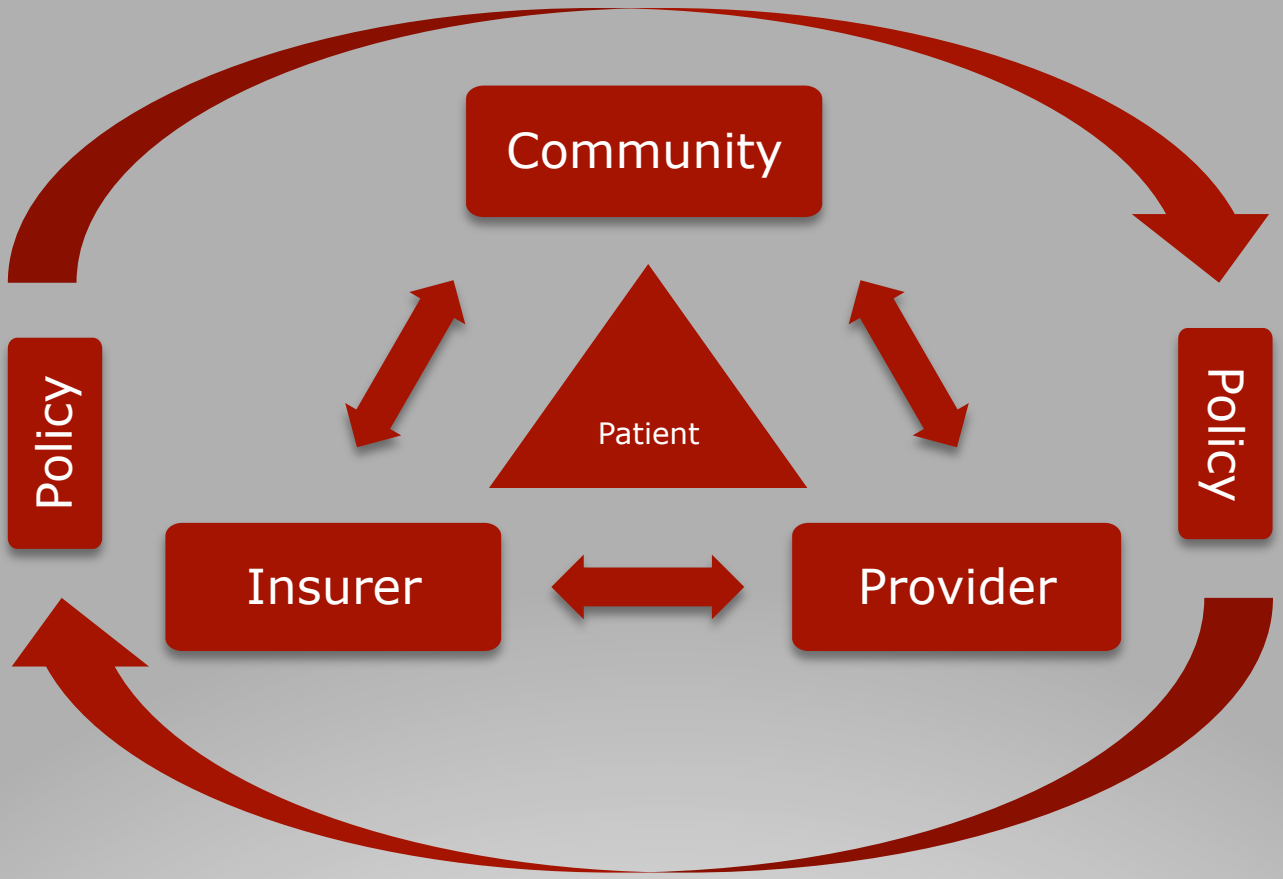
Design Science Research Methodology

Lab Research and Development Methodology

The artifact must be evaluated in order to ensure its utility for the specified problem. In order to form a novel research contribution, the artifact must either solve a problem that has not yet been solved, or provide a more effective solution.

Both the construction and evaluation of the artifact must be done rigorously, and the results of the research must be accepted from both presented effectively both to technology-oriented and management-oriented audiences.

GeoHealth Informatics Ecosystem



GIS as a Business Intelligence Tool
Michael McElroy

Gartner: 8 essential components of BI

- Reporting
- Dashboards
- Ad hoc query
- Search-based
- OLAP
- Interactive visualization
- Scorecards
- Predictive modeling
- Data mining

GIS is similar in that it:

- Provides highly robust capabilities in most of these areas, and extends visualization and predictive modeling beyond traditional BI systems
- Allows for the leveraging of the spatial component of data, which is not a native component of traditional BI systems
- Maps and other visualization can help tell a story that is otherwise difficult to realize in traditional scorecards, charts, tables, etc.

Research Questions

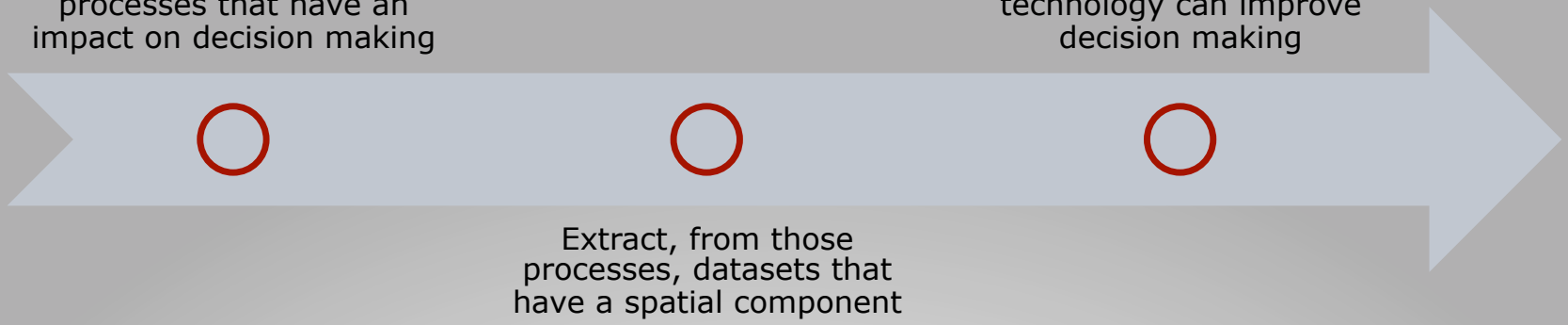
How can spatially enabled data inform healthcare decision making at the community and clinical service delivery level?

What current healthcare business imperatives could benefit from a spatial perspective?

What are the range of organizational decisions that might be affected by introducing GIS-based IT artifacts?

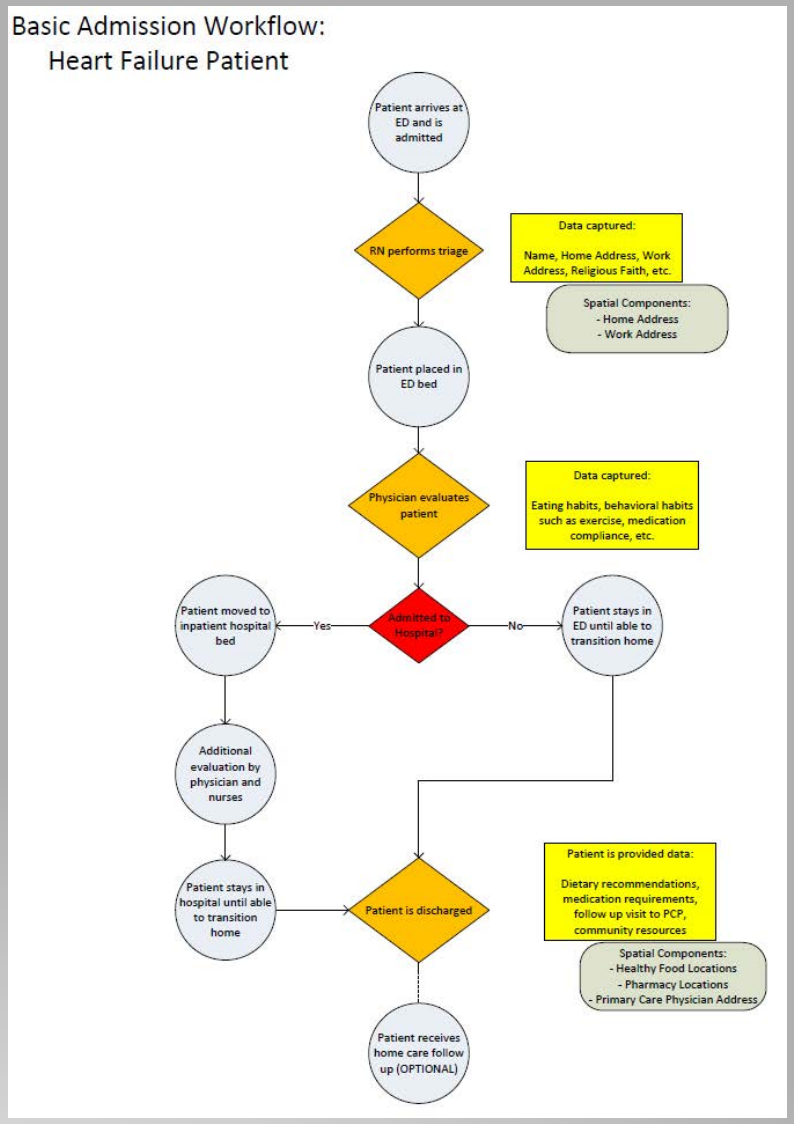
Methodology

Action Design Research



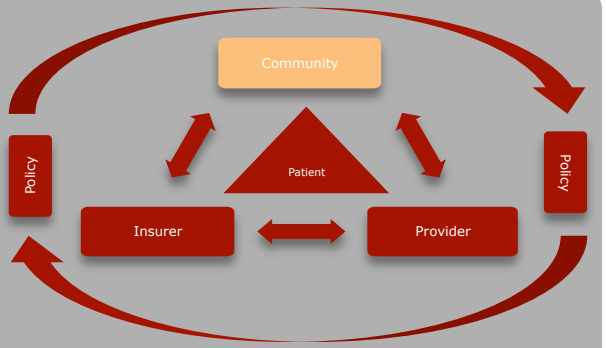
Process Modeling

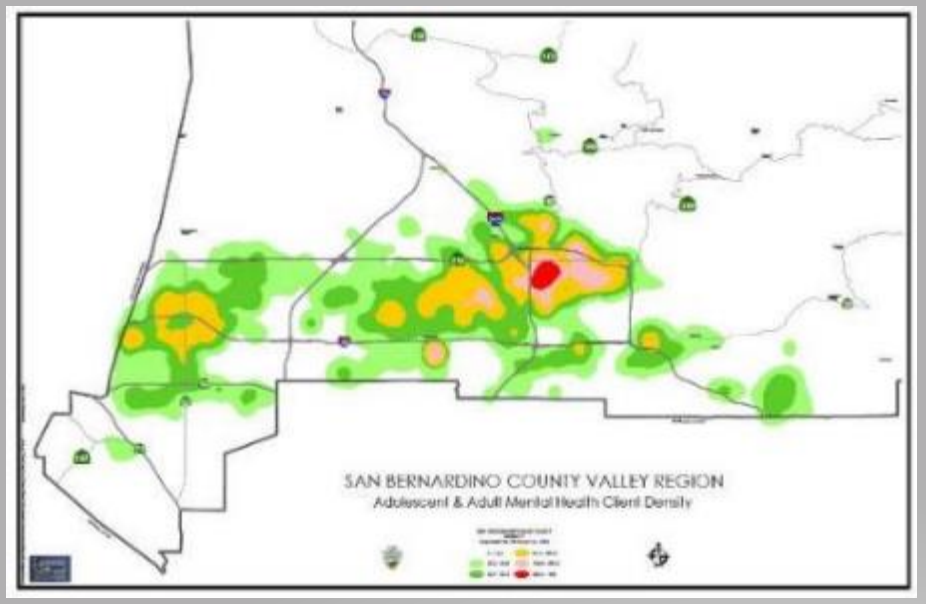
- Identify business imperatives
- Model current process
- Identify spatial components
- Define opportunities for use of GIS
- Prototype application



Behavioral Health Assessment

San Bernardino County Behavioral Health

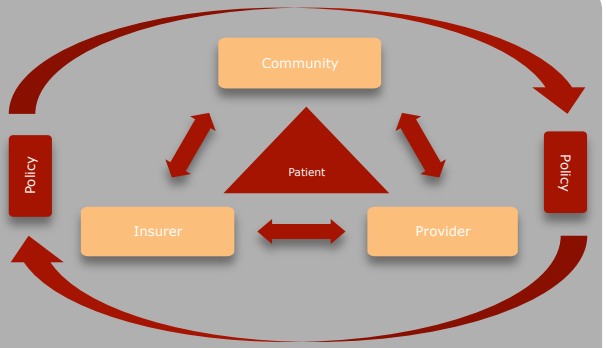




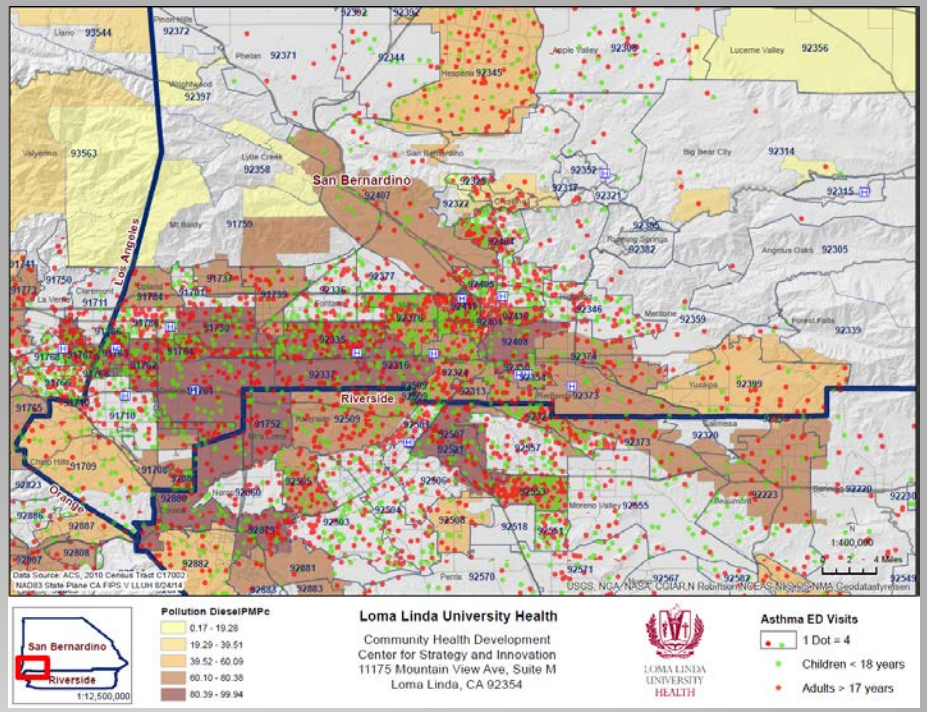
- Visualization of mental health client density
- Overlay existing resources
- Useful to plan where to place new resources

Childhood Asthma Risk

Loma Linda University Health (LLUH)



- Map environmental factors in real time
  - Wind
  - Air Quality
- Overlay location of children with history of asthma
- Develop a risk score for potential attack
- Send targeted notifications
  - Parents
  - School Nurses



Spatial Analysis of Freight Economy and Supply Chain

GeoSpatial Supply Chain: Freight Rail

- The purpose of this study was to focus the nation's attention on the economic role of freight system in the US.
- The focus of the study is on industry clusters in Minnesota and the relationship of these geographic economic clusters on the freight rail system.
- The study has interwoven research and outreach elements.

Study Methods

- **Economic and Related GIS Data Analysis**
  - Industry cluster, GSP shift-share, and GIS analysis
- **National and Regional Expert Interviews**
  - Class 1 and shortline railroads; federal, state and local policymakers; system users; economic development officials.
- **Report Reviews and Synthesis**
  - Various sources: NCFRP, SHRP, economic research, Minnesota state freight and rail plans.
- **Outreach and Feedback**
  - Interim/ Final Presentations, TPEC Advisory Committee.

Minnesota Industry Cluster Story Maps

Metal Mining Industry Cluster

Iron ore has been one of Minnesota's most abundant natural resources for many years...

Click to open story map

Agriculture Industry Cluster

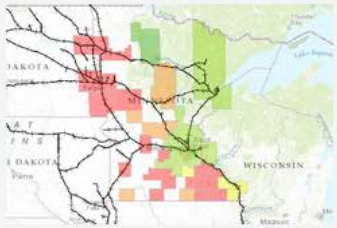
Agricultural products have been a staple of the Minnesota economy...

Click to open story map

Food Processing Industry Cluster

The food processing industry of Minnesota is one of the most competitive industries...

Click to open story map



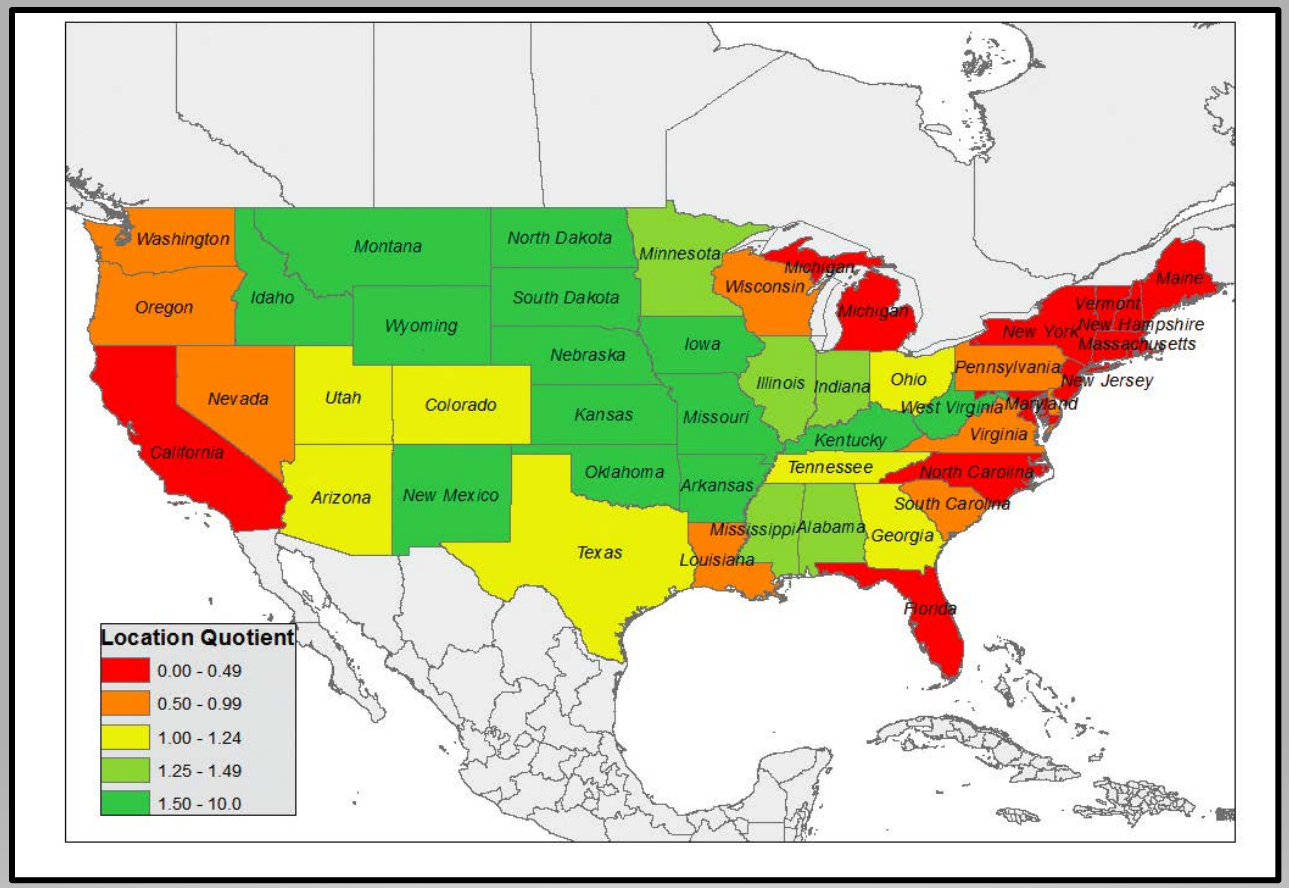
Interactive Atlas

Visit our interactive map, loaded with data about freight rail's impact... (high bandwidth required)

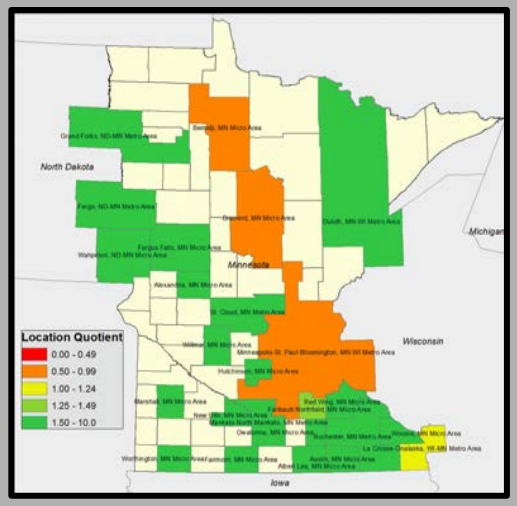
Click to open interactive atlas

http://freighteconomy.org

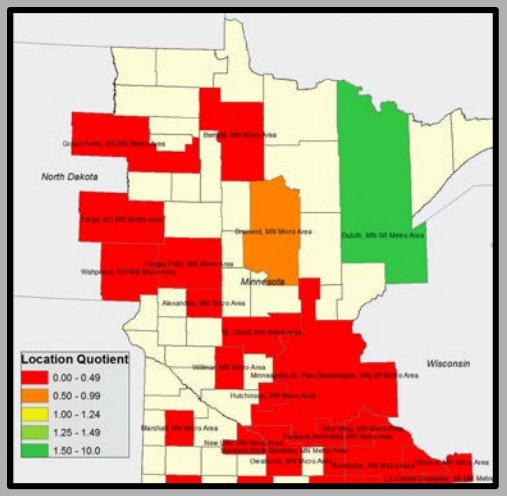
Rail Critical to Supply Chain and Industries in Midwest



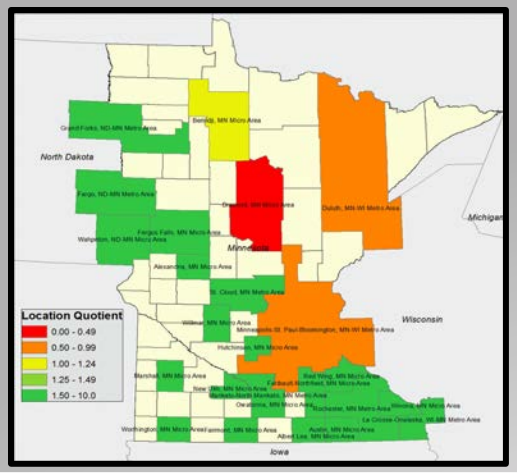
Agricultural Products



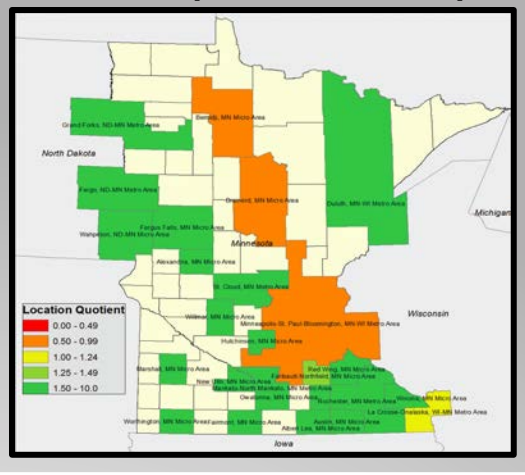
Metal Mining



Processed Food



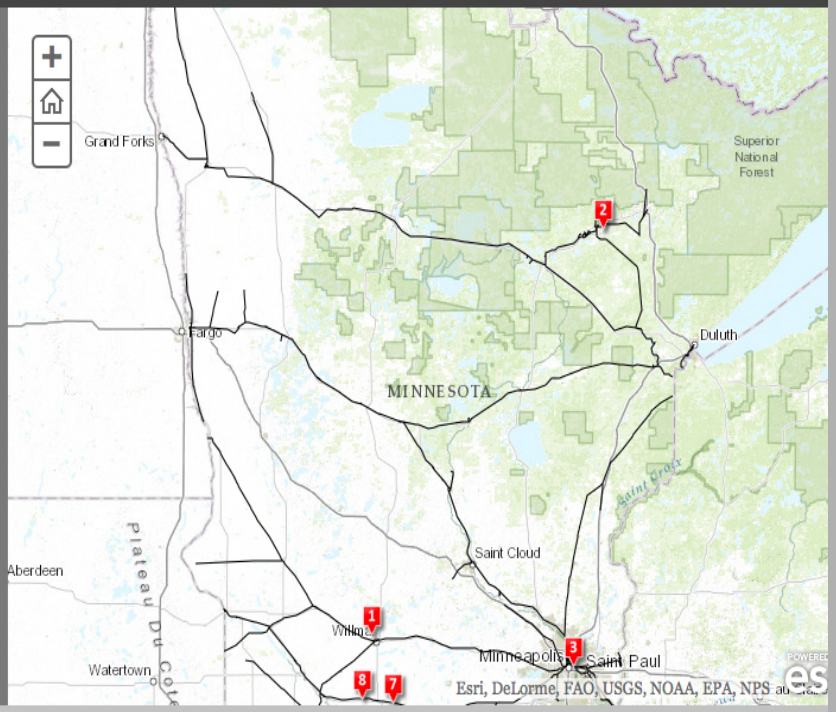
Heavy Machinery



"The Best Single Map.."

Understanding and Enhancing the Value of Freight Economy in Minnesota

Freight rail is important to Minnesota's economic competitiveness and plays a vital role in key Minnesotan industries. State GDP has been higher than the national average in a few key areas - some of which are directly linked to freight.




1 Willmar Poultry Company (WPC)


2 Essar Steel Minnesota LLC


3 Murphy Warehouse


4 Minnesota Prarie Line: An example of the importance


5 Seneca Foods Plant - Arlington MN (Population

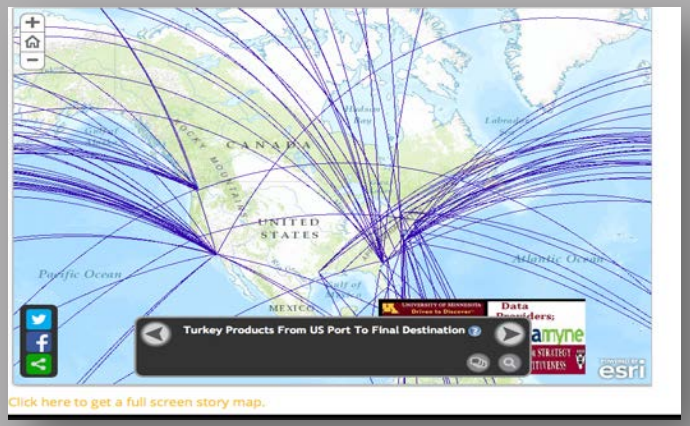

6 Heartland Corn Products


7 Bird Island Bean Company


8 Southern Minnesota Beet Sugar Cooperative

Impact


HUMPHREY SCHOOL
OF PUBLIC AFFAIRS


CANADA
UNITED STATES
Pacific Ocean
Atlantic Ocean
MEXICO
Turkey Products From US Port To Final Destination
esri
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New Study: Freight Rail Linked to Healthier Economy
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Updated: 09/19/2013 11:20 PM
Created: 09/19/2013 10:05 PM KSTP.com | Print | Email
By: Naomi Pescovitz
New Study: Freight Rail Linked to Healthier Economy

New Directions

Big Data Offerings @ CISAT/CGU

Transdisciplinary Big Data Fundamentals

BIG DATA, NEW WORLDS: DATA ANALYTICAL TOOLS ACROSS THE DISCIPLINES

TNDY 405I (SPONSORED BY T-STUDIES PROGRAM, IN COLLABORATION WITH H. TCHALIAN,DRUCKER SCHOOL)

This course focuses on using Big Data tools and technologies effectively across various disciplines and settings – social sciences, humanities, information systems, business, policy, and healthcare. The enormous volume, velocity, and variety of data created every day from social media in the form of Twitter feeds, Facebook posts, and countless other platforms and sensors shows no signs of abating. The class takes a wide-ranging, transdisciplinary, hands-on approach to introducing, learning , using, and managing such Big Data opportunities. In the course, you not only explore the what, but the how and the why, of big data analysis in different disciplines.

Data Science Analytics

DATA SCIENCE PROGRAMMING –

IST 380 (SPONSORED BY BLAIS GRANT, IN COLLABORTION WITH Z. DODDS, HARVEY MUDD COLLEGE)

The term "Data Science" is a recent one that captures gamut of analytic approaches to data gathering, analysis, visualization and utilization. This course provides you with an introduction into computational thinking, and how this thinking guides software programming for Data Science applications. You will be taken through a hands-on and engaging process for learning and using Python and related Data Science programming languages.

KNOWLEDGE DISCOVERY AND DATA MINING – IST 333

Do you want to help predict the next popular product or customer- product matching? Find what will trend next on social media? Help prevent crimes? Then the Knowledge Discovery and Data Mining course can teach you the data mining techniques to do that. In this course you will look at the entire knowledge discovery process, including interesting data mining techniques for Big Data that can be used in a wide variety of settings (business, science, web).

GEOSPATIAL SOLUTIONS – IST 371

Does spatial location matter in your research or practice? This course introduces you to the design and development of geospatial (GIS)applications and systems. You will develop the fundamental components of a GIS solution and demonstrate your mastery of basic GIS solution development practices with the delivery of a prototype GIS. The course ensures that you are exposed to the most current locational analytic tools for use in the emerging geospatial Big Data world.

Sample Domain Applications

BUSINESS: TECHNOLOGICAL INNOVATION AND ENTREPRENEURSHIP – IST 316

This class is designed to expose you to the transformative and wealth generating effect innovation has on enterprise in our increasing globalized and data rich society. There are several key themes you will discuss during the course, such as: innovation is the heart of a business and the foundation for entrepreneurship, current trends in technology (including Big Data) provide a new set of challenges and opportunities for innovation, and successful enterprises organize themselves to continuously innovate throughout these technological changes.

HEALTH: GEOINFORMATICS - IST 380C (Summer 2015)

Did you know that where you live can have a strong association with your health? The use of geospatial technologies and information can improve our understanding of the relationships between, people, location, time, and health and healthcare issues. In this course you will examine how these technologies and Big Data analyses can assist in: discovering and eliminating disease, disease prevention and health promotion for community health, and healthcare service planning and delivery.

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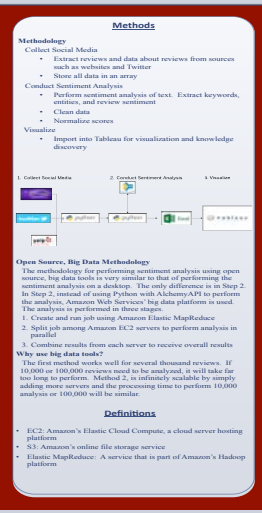
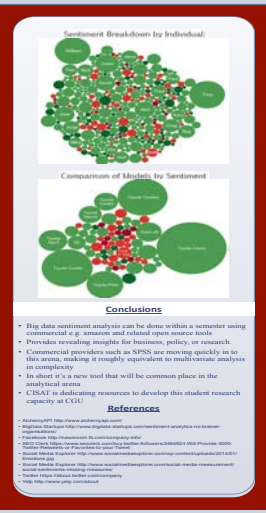
Sentiment Analysis for Business: A Student Case Study

Sean Bjurstrom
Claremont Graduate University, Center for Information Systems and Technology





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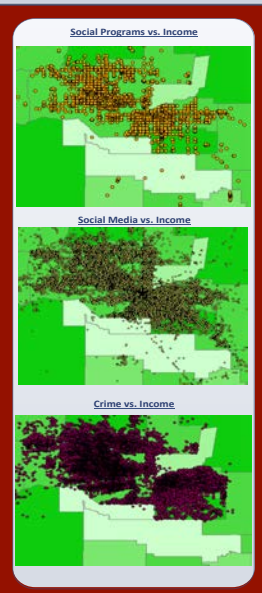
Toward Predictive Analysis via Social Media, Big Data, and GIS

Anthony J. Corso
Claremont Graduate University



Emerging Hot Spot Analysis

A Space-Time Approach to Pattern Mining

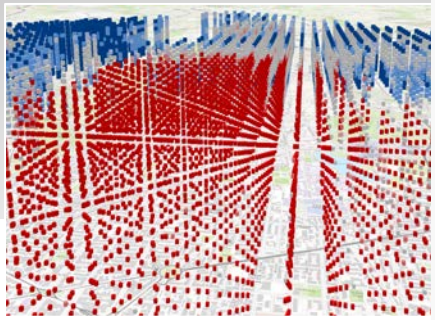
Lauren Bennett

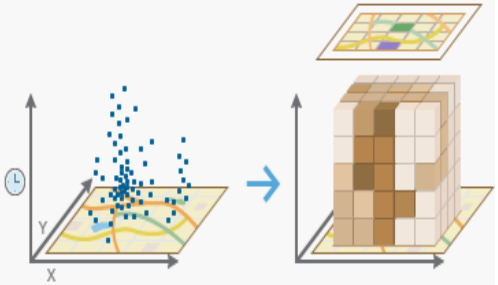
Aggregation
- MAUP
- Temporal equivalent?

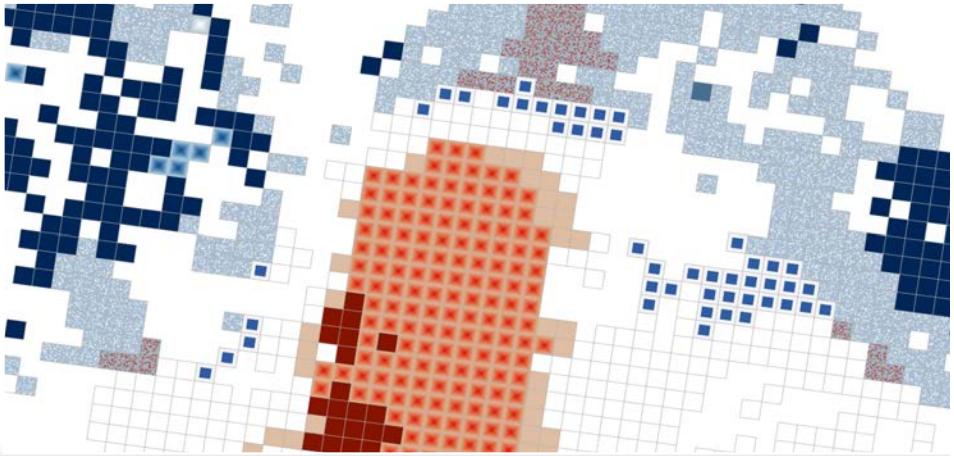
Conceptualization
- Relationships in space
- Relationships in time

Interpretation
- Categorizing locations
- Incorporating temporal trend statistics

Communication
- Visualization in 3D
- Value of categories for storytelling







For More Information

Acknowledgements

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