GEOG 780: *Knowledge Visualization*

Mon 11:00–13:40

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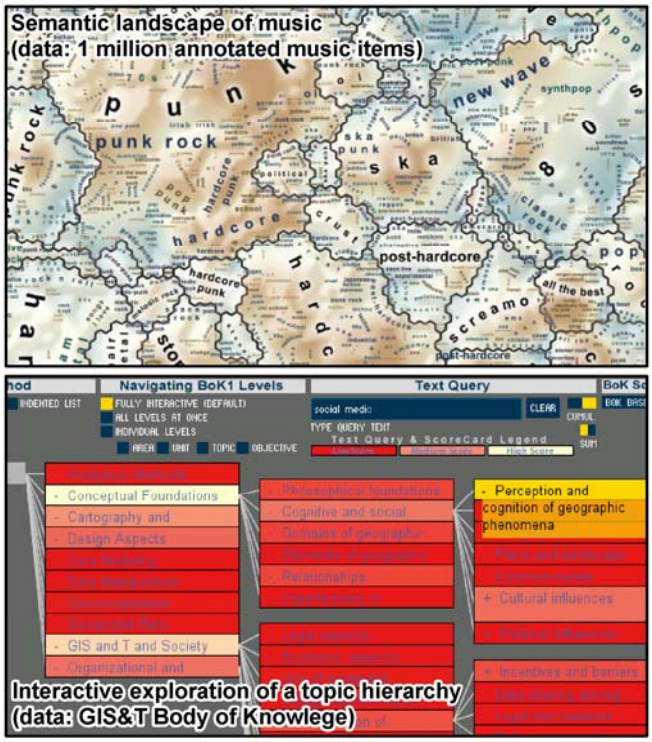

1. Purpose of Course

Visualization has emerged as a key strategy for dealing with the flood of data generated in contemporary society. The topic addressed in this seminar deals with a particular sub-discipline of information visualization known as ***knowledge visualization***. It deals with all types of human knowledge artifacts, including scientific papers, news articles, Web pages, social media tags, and others. In particular, knowledge visualization is meant to help us study those artifacts in an aggregated manner, so that hidden structures and relationships may be uncovered. This approach is seen as crucial in a growing number of domains, from social media analyses pursued in counter-terrorism efforts to the analysis of thousands of documents within the digital humanities.

This seminar will chart the current state and emerging future of knowledge visualization, based on a discussion of contemporary trends, evolving techniques, and real-world applications. The seminar will specifically address several distinct data types and the different means for handling them, including **vector spaces** (e.g., the content of text documents) and **network spaces** (e.g., social media networks, citation networks).

Students will be participating in hands-on projects with the goal of authoring usable visualizations. Through the readings, classroom discussion, and practical work, students will:

1) gain a significant understanding of the **concepts and techniques** driving knowledge visualization,
2) acquire **practical skills** in dealing with novel computational methods, and
3) develop scientific **discourse skills**.

This class requires only a commitment to active, participatory learning. An active interest in computational solutions is presumed, but in-depth programming expertise is NOT a requirement. We will be working with a programming environment called *Processing* that was specifically designed to allow novice programmers to easily turn data into engaging, interactive visualizations (http://www.processing.org/). Students will also be working with standard tools for collaborative software development.

2. Readings

The following will be key readings for the course:

- Börner, K. (2010) ***Atlas of Science: Visualizing What We Know***. Cambridge, MA: MIT Press.
- Widdows, D. (2004) ***Geometry and Meaning***. Stanford, CA: CSLI Publications, Center for the Study of Language and Information

In order to gain practical experience in developing interactive visualizations using Processing, the following will be useful resources:

- Reas, C. and Fry, B. (2010) ***Getting Started with Processing***. Sebastopol, CA: O'Reilly Media, Inc.
- Fry, B. (2008) ***Visualizing Data***. Sebastopol, CA: O'Reilly Media, Inc.
- Shiffman, D. (2008) ***Learning Processing: A Beginner's Guide to Programming Images, Animation, and Interaction***. Morgan Kauffmann Publishers.

Additional readings may be assigned throughout the semester.

3. Student Evaluation

Students will be evaluated based on the following criteria:

- **discussion leader** (25%)
- **active participation** (25%)
- **studio work** (50%)

3.1. Discussion Leader (25%)

During weekly classes, students will take turns in leading the discussion on a given subject. Students are assigned as discussion leaders and may of course choose to collaborate in this. These discussion leaders are expected to study the given text sources in depth and use them as starting points to branch out to other related information (e.g., research articles, books, Internet). Where appropriate, the outline specifies which software products should be demonstrated in connection with the topic. All of this is meant to spark lively discussion, instead of just being a series of presentations. The role of students as such discussion leaders will account for 25% of the final course grade.

3.2. Active Participation (25%)

The role of the faculty instructor in a graduate seminar mostly involves facilitation and guidance. Therefore, the success of the course greatly depends on the active participation of every student. Accordingly, 25% percent of the grade is determined by the degree to which a student contributes to the classroom discussion. In order to facilitate a meaningful, informed discussion it is expected that every student will have read the literature assigned for each week. Active participation also includes providing feedback and help regarding the various studio projects students are working on.

3.3. Studio Work (50%)

Beginning early in the semester, students are expected to begin work on significant projects related to the topic of this seminar. The faculty instructor will assign these projects, except for topically well-suited projects put forth by a student, which are subject to approval by the instructor. Portions of class time throughout the semester will be devoted to discussing the methodology, technology, overall progress of this project, in a studio environment, with active participation from all students. You will be working as lead developer on one such project. In addition, you will be assigned as collaborator to one other project. Thus, each student will serve as lead and collaborative developer, but on different projects and with different partners.

After a few weeks of developing your project, a short concept paper (3,000-4,000 words) is required, written by the lead developer, that links your project to the theoretical readings done during the course. The purpose of this paper is to provide a broader context for your project so that the latter is not limited to a programming exercise, but instead reflects the blending of theory with your implementation. The concept paper should also inform the subsequent development of your project.

Finally, the lead developer must prepare a final report, in which the theory, design, implementation, and use of your code is fully documented. A final presentation has to be given at the end of the course.

Studio work, concept paper, final report, and final presentation will account for 50% of the final grade. Smaller studio projects aimed at developing practical skills may be assigned throughout the seminar.