ECE S-690/ CS 680/ 490 -- "Computational Archaeology"
Winter 2011

Instructors: Fernand Cohen (Course Coordinator); Bossone 410, 215-895-1420; fscohen@coe.drexel.edu
Glen Muschio; 608 Nesbitt Hall, phone 215-895-2056; email: muschio@drexel.edu
Patricia Jeppson; e-mail: pjeppson@speakeasy.net
Ko Nishino; Crossings 108, phone 215-895-2678; e-mail: kon@drexel.edu
Ali Shokoufandeh; Crossings 141, phone # 215-895-2671; e-mail: as79@drexel.edu

Prerequisites: Basic linear algebra.

Course description:

Computational Archaeology is a rapidly growing field in which conventional archaeological data is used for purposes of analysis, interpretations and exposition in specially designed software and applications including geographical information systems, statistical or mathematical modeling, and simulations. This class will use NSF grant award number 0803670 "The 3D Colonial Philadelphia Project -- Digital Restoration of Thin-Shell Objects for Historical Archeological Research and Interpretation" and other research projects as learning tools, springboards, and sources of inspiration to gain familiarity in best practices in computational archaeology. Field trips will be made to Independence National Historic Park's (INHP) archaeological lab where computational techniques are being developed, a Park exhibit where archaeology field evidence is being interpreted and an archaeological field site where excavations and recovery are underway. Class participants will form interdisciplinary teams to develop to develop and execute projects based on acquired computational archaeological knowledge and the application of cutting edge techniques. The class is open to seniors and graduate students in Engineering, Computer Science, Digital Media, and students in the Honors Program.

Course goals and objectives:

- To gain familiarity with the scope of computational archaeology including geographical information systems, statistical or mathematical modeling, and simulations.
- To obtain working knowledge of computational theory and methods.
- To acquire knowledge about Archaeology as a humanistic science and cultural heritage resource.
- To observe and participate in archaeological practices.
- To study and work in interdisciplinary teams to develop preliminary ideas and concepts that will contribute to the field.

Field Trips:

- Independence National Historic Park Archaeology Lab
- The President's House (INHP)
- The National Constitution Center (INHP)
- Penn Dot archaeological site (I-95 excavation site between Spring Garden Street and Allegany Avenue)

Projects and Class Presentations: (35% in class presentation and 65% project)

- Based on class lectures, readings, discussions and field trips students will form 3 to 5 member teams each team will research an archaeological process, problem, or issue that may be addressed through computational archaeology. The team will be assigned or propose (subject to instructor(s) approval) a project to address a selected topic. There will also be a presentation of assigned or proposed reading material in the state of the art of computational methods. All presentations are given during the 10^{th} week.

Lectures' Content

- Archaeology and Cultural Heritage components, 4 classes in all:
  - 1 class session (3hrs.) devoted to Archaeology Patti Jeppson (see below for more details)
  - 1 class session (3hrs.) devoted Cultural Heritage Glen Muschio (see below for more details)
  - 2 class sessions (6 hrs.) devoted to field trips Jeppson/Muschio (see below for more details)
- Computational Methods, 5 classes in all:
  - Reconstruction and solving the puzzle using various cues
    - Surface information (Fernand Cohen)

    - Surface Markings (Fernand Cohen)
    - Local Surface alignment, sherds breakage boundaries (lines or curves) (Ko Nishino)
    - Texture and color information (Ali Shokoufandeh)
- Sorting and digital libraries (Ali Shokoufandeh)
- The expert opinion (Fernand Cohen)
    - Using prior expert information in speeding up the stitching process