INTA 4742, 6742, CX4232, CSE 6742

Spring 2019

MODELING, SIMULATION, AND MILITARY GAMING

Prof. Mariel Borowitz

Guest Participants: Prof. Thom McLean, Prof. Michael D. Salomone

TA: Quintin Gaddy

3.0 Credits
Spring 2019
Wednesday 3:00pm-5:45pm
Habersham G-17

Overview

Computer modeling and simulation offers a unique perspective on events because of the ability to hold some variables constant and change others, and run a scenario repeatedly searching for underlying themes. This facilitates an understanding of the cumulative impact of seemingly minor events on grand outcomes. Computer simulation has been used as an analytical tool in the natural sciences, business, commerce, government and to a lesser extent politics.

This course focuses on the creation and application of computer simulations to model strategic international events concerning warfare. The course is intended to bring together computing and international affairs students with the objective of developing the ability to both create wargame simulations and use them to analyze strategic events. The course is project-based, requiring computing and international affairs students to work together in multidisciplinary teams to analyze specific questions utilizing computer-based modeling and simulation tools (largely, but not exclusively "NetLogo"). The students will collaboratively define and evaluate specific questions in international events, formulate hypothesis concerning the resolution of these questions, develop modeling and simulation software to aid in an analysis, and apply the tools to test hypotheses and formulate conclusions from this investigation.

The learning objectives will be accomplished in the context of a specific wargame scenario. For example, a team interested in World War I might focus on the German Schlieffen Plan. This was Germany's plan for the invasion of France through Belguim and Luxembourg in 1914, at the beginning of the Great War, that subsequently was halted at the First Battle of the Marne, six weeks after the war began. There has been 100 years of debate over the reasons that the plan failed, and this debate continues among scholars today. Through computer simulation the group would replicate the plan (or some portion of the plan) and test a particular explanation given for the plan's failure. By manipulating the changes made

by the German General Staff between 1905 when the plan was completed, and 1914 when it was employed, the group would provide insight into why the plan failed. Alternatively, student teams could analyze battles from antiquity, the gunpowder age, or the 20th Century. It may also include potential future scenarios, such as the use of anti-satellite weapons in future conflict. Simulations from previous classes included Gaugamela (Alexander the Great vs Darius), Zama (Scipio vs Hannibal), Cannae (Hannibal vs Roman Legions), Bunker Hill, Gettysburg, Tarawa, and the US Marines' retreat from the Chosin Reservoir (Korean War).

***Learning Objectives**:*

The learning objectives for this course include:

- Demonstrate the ability to formulate specific study questions concerning international events, and formulate hypothesis that can be tested through experimentation with computer simulation tools.
- Develop an understanding of the capabilities and limitations of modern modeling and simulation techniques as applied to the analysis of strategic international events.
- Demonstrate an understanding of accepted methodologies and practices concerning the creation and use of computer simulations to study international events to derive reasoned and justifiable conclusions.
- Demonstrate an understanding of the underlying models, abstractions, and software realizations used in modern wargame simulations.
- Demonstrate an understanding of the basic software architecture and elements of modern wargame simulations.
- Demonstrate the ability to communicate complex concepts to multidisciplinary teams including students from computing and international affairs backgrounds.
- Demonstrate the ability to understand and incorporate concepts from a different discipline and integrate them in the development and use of wargame simulations.
- Demonstrate the ability to collect and incorporate data from historical and other records for use in wargame simulation tools.
- Students will be proficient in basic mathematical skills and be able to formulate problems in international affairs mathematically if appropriate. Use software, process and analyze information, quantitative and qualitative methods.

Course Text

There are no required texts for this course, but readings will sometimes be assigned. These may include book chapters, journal articles, government and industry reports, and newspaper articles. These additional readings will be listed on the course website at least one week in advance of the class for which they should be read, and/ or can be found online through the Georgia Tech library.

Schedule

Much of the work for this course is done within the teams, with the use of the skills and expertise of each member. While lectures will provide some initial guidance, significant effort is required to find and consult relevant sources for historical analysis and data collection as well as model building techniques. Much of the course will be spent having teams present their progress and current issues, with classmates and professors providing constructive criticism, feedback, and guidance. Focused lectures on issues of particular relevance to the team projects may be added as the semester goes on. The following provides a loose guide to the schedule for the semester. Note that the schedule is subject to change.

Week	**Date**	**Topic**
1	Jan. 9	Introduction to Modeling and Simulation
2	Jan. 16	Military History, Strategy, and Tactics
3	Jan. 23	Military Modeling and Simulation/ Intro to NetLogo
4	Jan. 30	Developing a Research Question/ Group Formation
5	Feb. 6	Interim Presentations: Battle History and Research Question
6	Feb. 13	Group Work Day
7	Feb. 20	Interim Presentations: Conceptual Model
8	Feb. 27	Interim Presentations: Initial Model/ Model Elements
9	March 6	Interim Presentations: Model Progress
10	March 13	Interim Presentations: Full Model
11	March 20	*Spring Break*
12	March 27	Interim Presentations: Preliminary Analysis
13	April 3	Interim Presentations: Analysis and Conclusions
14	April 10	Dress Rehearsal
15	April 17	Hot Wash (Final Presentations and Peer Reviews)

Grading

The primary output for this course is a final presentation, which includes the results of your historical research, model development, and analysis. Student grades will be largely dependent on the quality of this final product. Grades will also be affected by the quality of interim presentations and short assignments that are assigned throughout the semester, taking into account preparedness for these presentations and overall quality. Individual effort within each team will be taken into account using peer evaluations. Individual

participation and contributions to the course as a whole, including preparedness for lecture, engagement in class discussions, and provision of constructive feedback to other teams, will also affect studetns' final grades.

Course Participation – 10%

Contribution to Team – 20%

Interim Presentations and Short Assignments – 20%

Final Presentation/ Product – 50%

Please remember that all students in this seminar begin with an "A", but failure to follow and excel in the above stated criteria will adversely impact your final grade. Attendance at all seminars is mandatory. If you must miss a class for any reason, please provide the TA and professors with the appropriate information ahead of time. Excuses will be judged on a case-by-case basis.

Graduate Teaching Assistant

quintin.gaddy@gatech.edu *He is your point of contact for all administrative issues relating to the course. Office Hours are immediately before or after the seminar, or by appointment.*

Contact Information

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