CS/POL 391 Introduction to Models

Fall 2018 (TENTATIVE)

M, W 8:30-10:00: Auditorium A Angell Hall

Professor: Scott E Page (scottepage@gmail.com)

Office Hours: T: 2-3, W: 10-11, + Extra

7th Floor Weiser Hall (Complex Systems)

Course Materials: Readings will be available on CANVAS. Students are responsible for all material in the lecture notes and all assigned readings unless informed otherwise. Optional assigned readings add context and depth. Most of the material comes from four books: *Model Thinking*. *Complex Adaptive Social Systems*, (John Miller and Scott Page) *The Difference*, *Diversity and Complexity*, and *The Diversity Bonus*. As background, you may wish to purchase *An Introduction to Modeling in the Social Sciences*, Charles Lave and James March, 1993.

Course Description: We study the science, art, and practice of modeling. Models help us to understand the logic of phenomena, to explain, communicate, predict, act, design, and explore. We focus on models relevant to political, economic, and social systems but we will venture into other disciplines. The models we study apply to a diverse array of types of actors ranging from individuals, to groups, to organizations, and nations. Understanding, interpreting, and applying these models requires a willingness to grasp abstractions, to interpret diagrams, and to perform algebraic manipulations of equation based models.

Classroom Environment: People differ in their goals for this course. Many see the material in this course as central to their intellectual development. Others take this course in order to satisfy college requirements. Students with special circumstances, concerns, or challenges should speak with the professor or their graduate student instructor at their earliest convenience. Some of the models that we cover touch on sensitive issues. The classroom environment should be conducive to open and free communication. Give others the benefit of the doubt when interpreting comments and when inferring intent.

Course Requirements: Coursework consists of a **models notebook**, **short assignments**, a **(group) chapter(s) analysis** and **exams**. The models notebook is described on CANVAS. Following each lecture there will be a short assignment. These are due *by the start of lecture one week following the day assigned.*

Grades: Final grades will be determined on a hundred and seventy-five point scale as follows: short assignments (45 points), models notebook (30 points), midterm (50 points), and final (50 points).

Course Outline:

W Sep 6: Why Model?

Introduction to course

M Sep 11: The Intersection of Our Independent Lies

Condorcet Jury Theorem

W Sep 13: The Wisdom of Crowds

Diversity Prediction Theorem, Crowds Beat Averages Law

M Sep 18: Cases: The Netflix Prize and The Federal Reserve

Application of Diversity Prediction Theorem, Ensemble Learning

Turn in Models Notebook For First Two Lectures

W Sep 20: Linear Models and Log Linear Models + Fermi Method

Linear models, linear regression models, and fitting nonlinear with linear

M Sep 25: Markov Models

Markov models and history dependence

W Sep 27: Diminishing Returns & Growth Models

Diminishing Returns, Solow's Growth Model, and Innovation

M Oct 2: Standing Ovations and the Bass Model

Standing ovation problem, contagion, diffusion, and the Bass Model

W Oct 4: Percolation, Tipping Points, and Phase Transitions

Percolation Models, introduction to networks, and tipping points

M Oct 9: Coordination and Culture The Ketchup Question

Pure coordination games and applications to cultural differences

W Oct 11: Schelling's Segregation Model: The Big Sort

Models of segregation and distinguishing sorting from conformity

M Oct 16: No Class: Fall Break

W Oct 18: Distributions: Normal and Long Tailed

Normal, LogNormal, and Power Law Distributions

M Oct 23: Random Walks

Random Walks, The Success Equation, and Streaks

W Oct 25: In Class Midterm Examination (bring a pencil)

M Oct 30: Networks

Small worlds, weak ties, and the Friendship Paradox

W Nov 1: Modeling Behavior: Decisions

Decision Theory and Value of Information

M Nov 6: Modeling Behavior: Games

Rational Actor Model, Auctions, Revenue Equivalence Theorem

W Nov 8: The Voter Model and Lyapunov Functions

Wolfram's Four Classes, The Voter Model, The Game of Life, and Lyaponuv Functions

M Nov 13: Spatial Models

Hotelling's Model, Lancaster's Hedonic Model, Down's Model

W Nov 15: Zero Sum Games & Colonel Blotto

Zero and Constant Sum Games and Colonel Blotto Game

M Nov 20: Cooperation and Collective Action

Prisoners' Dilemma, Public Goods, Congestion, and Resource Extraction

W Nov 22: Open Discussion: Q & A

Not mandatory

M Nov 27: Power: Shapley Value and Myerson Value

Marginal Contributions and Games on Networks

W Nov 29: Search and Learning

Weitzman's Search Model, Replicator Dynamics, Genetic Algorithms, Learning

M Dec 4: Rugged Landscapes and Diverse Perspectives

NK Model, Simulated Annealing.

W Dec 6: Toolboxes and Problem Solving

IPossum Model, Diversity Trumps Ability.

M Dec 11: Many to One: Inequality

Piketty, Stiglitz, Assortative Mating.

W Dec 20: Final Exam: 8:00-10:00

The extent to which exam will be cumulative depends upon midterm performance.