Models and Simulations in Epistemology and Philosophy of Science

Course Mechanics

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Course Website:	http://www.mayowilson.org/Models.htm

Course Description

Recently, models and computer simulations have become important tools in epistemology and philosophy of science. For example, epistemologists have employed computer simulations to investigate (1) how an individual ought to revise her beliefs in light of what others tell her, (2) how she should change her opinions upon learning a reliable friend (or colleague) disagrees with her, (3) how certain she ought to be of a proposition before asserting it to others, and a variety of other questions. Similarly, philosophers of science have employed formal models to study (1') how often scientists ought to publish, (2') how credit ought to be allocated for discoveries, (3') whether scientific communities ought to embrace diverse research methodologies, and more. This course is an introduction to the various issues in epistemology and philosophy of science that are currently employing formal models and computer simulations. Questions (2) and (3') above will be the central focus of the course, but related issues will also be discussed.

The course is "practice-based" in the following sense. In addition to discussing contemporary philosophical papers, students will construct and analyze the types of models that are employed regularly in philosophical debates. To this end, students will learn how to program in NetLogo, a programming language designed for the construction of agent-based models (ABMs). No previous programming experience is required.

Course Goals

The course has three central goals. First, by the end of the semester, students should be able to explain the central questions in epistemology and philosophy of science that are being addressed with computer models, and they should be able to identify new questions that have not yet been asked. Second, students will learn to implement a formal model in NetLogo that addresses one such new question. Finally, students ought to be able to discuss the strengths and weaknesses of various models used to address philosophical questions.

Requirements

The central requirement is to design and implement an ABM with the purpose of addressing a question of current interest in either epistemology or philosophy of science. Students will write a final paper that (i) describes the question that model is intended to answer and (ii) the results they obtained from computer simulations of said model. Each student must submit a detailed proposal (about three pages) of his or her final project after two months. Further details about the proposal and final project can be found on the course website.

There will also be programming assignments due every week for the first six weeks of the course. One cannot learn to program without practicing regularly. The weekly assignments are designed to help you practice the skills and employ the concepts taught in class.

Grading

Your final grade will be calculated via a weighted average using the following weights:

- Final Paper/Project ($\sim$ 10 pages) - 50 %
- Project Proposal ($\sim$ 3 pages) - 20 %
- Weekly Programming Assignments - 30%

Turning in Assignments

Beginning in the third week, programming assignments are due at the beginning of each class. To submit an assignment, follow the procedure described

in the document called "Instructions for Assignment Submission" on the website. Doing so will ensure that I can easily find your programs if they go missing, and more importantly, it ensures that I can evaluate your work and return it with feedback in a quick and orderly fashion.

Reading Schedule

14/4 - Standards of Individual Rationality
Required Readings:

- Sections 1-4 and 6.1-6.2 of Michael Strevens. Notes on bayesian confirmation theory. 2006. URL `http://www.nyu.edu/classes/strevens/BCT/BCT.pdf`
- Chapter 1 of Kevin T Kelly. *The logic of reliable inquiry*. Oxford University Press, New York, 1996

21/4 - No Class

Disagreement

28/4 - Introduction to Peer Disagreement
Required Readings:

- Richard Feldman. Reasonable religious disagreements. In A Goldman and D. Whitcomb, editors, *Social Epistemology: Essential Readings*, pages 137—158. Oxford University Press, 2011
- Roger White. Epistemic permissiveness. *Philosophical perspectives*, 19 (1):445–459, 2005
- Thomas Kelly. Peer disagreement and higher order evidence. In A Goldman and D. Whitcomb, editors, *Social epistemology: Essential readings*, pages 183–217. Oxford University Press, 2011

5/5 - Is Rational Disagreement Possible?
Required Readings:

- Keith Lehrer. When rational disagreement is impossible. *Nous*, 10(3): 327–332, 1976. URL `http://www.jstor.org/stable/2214612`
- Robert J. Aumann. Agreeing to disagree. *The annals of statistics*, 4 (6):12361239, 1976. URL `http://www.jstor.org/stable/2958591`

Recommended:

- Morris H. DeGroot. Reaching a consensus. *Journal of the American Statistical Association*, 69(345):118–121, 1974

- Giacamo Bonanno and Klaus Nehring. Agreeing to disagree: a survey. In *Invited Lecture at the Workshop on Bounded Rationality and Economic Modeling*, 1997. URL `http://old.econ.ucdavis.edu/faculty/bonanno/PDF/agree.pdf`

12/5 - Agent-Based Models (ABMs) of Peer Disagreement
Required Readings:

- Igor Douven. Simulating peer disagreements. *Studies in History and Philosophy of Science Part A*, 41(2):148–157, 2010

- Benjamin Golub and Matthew O. Jackson. Naive learning in social networks and the wisdom of crowds. *American Economic Journal: Microeconomics*, pages 112–149, 2010. URL `http://www.jstor.org/stable/25760379`

Note: The paper by Golub and Jackson is very challenging, especially if you do not have a mathematical background. Try your best.

Diversity

19/5 - Individual vs. Group Rationality and Reward Schemes in Science
Require Readings:

- Thomas S. Kuhn. Objectivity, value judgment, and theory choice. In *The Essential Tension*. 1977

- Philip Kitcher. The division of cognitive labor. *The Journal of Philosophy*, 87(1):5—22, 1990

Recommended:

- Michael Strevens. The role of the priority rule in science. *The Journal of philosophy*, 100(2):55—79, 2003

26/5 - Methodological Pluralism and Standpoint Theory.
Required Readings:

- A. Wylie. Standpoint matters. *Presidential Address of the American Philosophy Association*, 86th, 2012

- Helen E. Longino. Theoretical pluralism and the scientific study of behavior. In *Scientific pluralism.*, pages 102–131. University of Minnesota Press, Minneapolis, 2006

2/6 - ABMs of Diversity in Research Methodology
Required Readings:

- Luo Hong and Scott E. Page. Groups of diverse problem solvers can outperform groups of high-ability problem solvers. *Proceedings of the National Academy of Sciences of the United States of America*, 101 (46):16385—16389, 2004
- Michael Weisberg and Ryan Muldoon. Epistemic landscapes and the division of cognitive labor. *Philosophy of Science*, 76(2):225—252, April 2009

9/6 - No Class

16/6 - ABMs of Communication in Science
Required Readings:

- Kevin J. Zollman. The epistemic benefit of transient diversity. *Erkenntnis*, 72(1):17—35, 2010
- C. Mayo-Wilson, Kevin J. Zollman, and David Danks. The independence thesis: When individual and social epistemology diverge. *Philosophy of Science*, 78(4):653—677, 2011

Testimony

23/6 - Reductionism and Non-Reductionism in Testimony
Required Readings:

- Jennifer Lackey. Testimony: Acquiring knowledge from others. In A Goldman and D. Whitcomb, editors, *Social Epistemology: Essential Readings*, pages 314—337. Oxford University Press, 2011
- C.A.J. Coady. Testimony and observation. *American Philosophical Quarterly*, 10(2):149—155, 1973
- Elizabeth M. Fricker. Second-hand knowledge. *Philosophy and Phenomenological Research*, 73(3):592—618, 2006

30/6: ABMs and Testimony
Recommended Readings:

- Zollman. "A Systems-Oriented Approach to the Problem of Testimony." Working Paper.

- C. Mayo-Wilson. The reliability of testimonial norms in scientific communities. *Synthese*, 2013. doi: 10.1007/s11229-013-0320-2.

7/7: Argumentation
Required Readings:

- Chapters 1, 2, and 13 of Gregor Betz. *Debate Dynamics: How Controversy Improves Our Beliefs.* Synthese Library. 2012
- Mayo-Wilson. "Network Structure and the Speed of Discovery." Working Paper.

29/7: **Final Project Due.**

References

Robert J. Aumann. Agreeing to disagree. *The annals of statistics*, 4(6): 12361239, 1976. URL `http://www.jstor.org/stable/2958591`.

Gregor Betz. *Debate Dynamics: How Controversy Improves Our Beliefs.* Synthese Library. 2012.

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