Simulating Social Epistemology:
Course Introduction

Models and Simulations in Philosophy
April 6th, 2014

Simulation Skepticism

This is an atypical philosophy class.

- Computer simulations? In Philosophy?
- You might say, "I've read Plato. He was a better-than-fair philosopher. He didn't need a computer."
- How can computer simulations help us answer questions about what knowledge is and what it is rational to believe?
- How can simulations answer any of the core questions in epistemology and philosophy of science?

Simulating Social Epistemology

Thesis: Models and simulations are especially suited for answering questions in social epistemology and about the social structure of science.

Simulating Traditional Epistemology

Note: Models and simulations are employed (and could be employed more) in traditional epistemology and philosophy of science. More on this later . . .

Outline

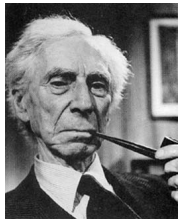
1. Epistemology
   - Traditional/Individualistic
   - Social
   - Why Simulations?
2. Agent-Based Models
3. NetLogo
4. References

Epistemology: Two Questions

Two types of questions in individualistic epistemology:

- What is knowledge, justification, etc.?
- How can I obtain knowledge, justified belief, etc.?

Analysis of Knowledge



Obtaining Knowledge

I thought that book learning . . . having been built up from and enlarged gradually by the opinions of many different people does not draw as near to the truth as the simple reasoning that can be made naturally by a man of good sense concerning what he encounters.

Descartes. *Discourse on Method.*

Obtaining Knowledge

If there were in the world anyone whom one knew with certainty to be capable of finding the greatest and most beneficial things possible, and for this reason the other men fully exerted themselves to help him succeed in his plans, I do not see that they could do a thing for him except to make a donation toward the expense of the experiments he needs and, for the rest, to keep his leisure from being wasted by the importunity of anyone.

Descartes. *Discourse on Method*.

Computer Simulations in Traditional Epistemology

So why are computer simulations relatively rare in traditional, individualistic epistemology?

Here is what I think the typical philosopher would answer. Consider the two main questions.

Epistemology: Two Questions

Question 1: What is knowledge, justification, etc.?

Methodology: Requires conceptual analysis, not simulation.

Epistemology: Two Questions

Question 2: How can I obtain knowledge, justified belief, etc.?

Methodology: Simulations might tell us

- What to believe in situations requiring complex mathematical calculations (e.g., calculating a posterior probability distribution),
- But not about *the norms of rational belief themselves* (e.g., that I ought my degrees of belief by conditionalization).

Epistemology: Two Questions

Disclaimer: I think the methodology discussed above is silly, but my opinion is irrelevant in this case.

Why? It's clear that more tools are needed in social epistemology.

Epistemology: Two Questions

Two types of questions in individualistic epistemology:

- What is knowledge, justification, etc.?
- How can I obtain knowledge, justified belief, etc.?

Social Epistemology: Two Questions

Two types of questions in social epistemology:

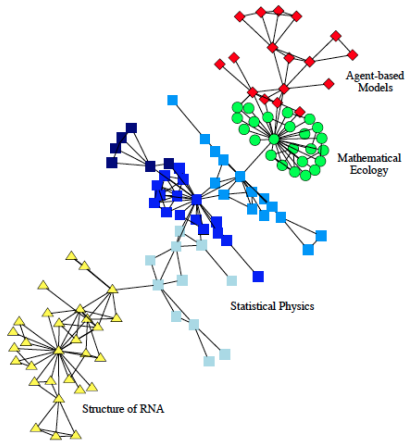
- What is group knowledge, justification, etc.? For that matter, do groups have beliefs, knowledge, etc.?
- How can groups and/or their members collectively obtain true beliefs, justified beliefs, knowledge, etc.?
  - When the group consists of scientists, philosophers call this the study of the social structure of science.

Achieving Group Knowledge

In social epistemology, the second question has a number of different dimensions.

Why? Group members can bear complex and interesting relationships to one another.

Academic Social Networks



Newman [2001]

Achieving Group Knowledge

General Question: How should groups of academics be organized in order to obtain true belief, justified belief, knowledge, etc.?

Component Question: How should academic institutions award credit, prizes, and grants?

See Merton [1957], Kitcher [1990], Kitcher [1995], Strevens [2003b], and Strevens [2003a].

Achieving Group Knowledge

General Question: How should groups of academics be organized in order to obtain true belief, justified belief, knowledge, etc.?

Component Question: How often should journals publish? Are existing review procedures justifiable?

See Zollman [2009] and Lee [2012].

Achieving Group Knowledge

General Question: How should groups be organized in order to obtain true belief, justified belief, knowledge, etc.?

Component Question: Ought group members be encouraged to employ diverse research methodologies and attack a variety of research questions?

See Hong and Page [2001, 2004], Kellert et al. [2006], Mayo-Wilson et al. [2011], Weisberg and Muldoon [2009], and Wylie [2012].

And so on . . .

Why Simulations?

Question: Why are computer simulations especially suited for answering these questions?

Here's my answer . . .

Why Simulations?

- **Premise 1:** Often, we need models to represent the complex
  - Relationships among individuals in a scientific community,
  - Mechanisms by which individuals share information, learn from others, and collaborate.
- **Premise 2:** Understanding how those models evolve over time is necessary to understand which organizational structures hasten and impede discovery.

Why Simulations?

- **Premise 3:** Computer simulations are more-or-less necessary to understanding how these models evolve over time.
- **Therefore**, computer simulations are necessary to understand which organizational structures hasten and impede discovery.
  - This is the social analog of findings rules for rational belief updating.

Outline

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Example abm

Wilensky [1999]

Components of abms

Agent based models (abms) have the following components:

- Agents with properties (e.g., location, preferences, beliefs)
- Environment (e.g. a terrain)
- Initial Conditions for agents and environment
- Rules specifying how agents interact with one another and the environment

ABMs vs. Classical Economic Models

Classic Models	ABMs
Rational, EU Maximizers	Boundedly Rational
Homogeneous agents	Heterogenous Agents
Global Interaction	Local interactions in a network
Equilibria	Dynamics

And many more . . .

Computer Simulations and ABMs

- In the last two decades, philosophers have begun employing ABMs to answer a number of questions in social epistemology and philosophy of science.
- ABMs are harder to analyze mathematically, but that's why we use computer simulations!
- Next week: We'll begin learning how to program ABMs.

Structure of the Course

Structure of the course

- Three Units: Disagreement, Diversity, and Testimony
- Each unit has two parts:
  1. An introduction to a "traditional" problem in epistemology of philosophy of science
  2. Analysis of computer models aimed at answering said question.

Structure of the Course

Structure of each class meeting:

- 1 hour: Lecture/Discussion
- 30 Minutes: Programming in NetLogo

NetLogo

Click on the links below (current as of April 6th, 2013):

- Download NetLogo
- Tutorials
- NetLogo Dictionary

References I

Hong, L. and Page, S. E. (2001). Problem solving by heterogeneous agents. *Journal of Economic Theory*, 97(1):123—163.

Hong, L. and Page, S. E. (2004). 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.

Kellert, S. H., Longino, H. E., and Waters, C. K. (2006). *Scientific pluralism*, volume 19. University of Minnesota Press.

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

Kitcher, P. (1995). *The Advancement of Science: Science Without Legend, Objectivity Without Illusions*. Oxford University Press, USA.

Lee, C. J. (2012). A kuhnian critique of psychometric research on peer review. *Philosophy of Science*, 79(5):859–870.

Mayo-Wilson, C., Zollman, K. J., and Danks, D. (2011). The independence thesis: When individual and social epistemology diverge. *Philosophy of Science*, 78(4):653—677.

References II

Merton, R. K. (1957). Priorities in scientific discovery: a chapter in the sociology of science. *American sociological review*, 22(6):635659.

Newman, M. E. (2001). The structure of scientific collaboration networks. *Proceedings of the National Academy of Sciences*, 98(2):404—409.

Strevens, M. (2003a). Further properties of the priority rule. *manuscript. http://www. strevens. org/research/scistruc/MorePrior. pdf*.

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

Weisberg, M. and Muldoon, R. (2009). Epistemic landscapes and the division of cognitive labor. *Philosophy of Science*, 76(2):225—252.

Wilensky, U. (1999). NetLogo. *Center for Connected Learning and Computer-Based Modeling, Northwestern University. Evanston, IL.*

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

Zollman, K. J. (2009). Optimal publishing strategies. *Episteme*, 6(02):185–199.