

Introductory comments

FIRST INTERNATIONAL WORKSHOP ON INTERACTIVE CAUSAL LEARNING

Washington DC, June 9 - 11

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Starting with thanks!



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**Desautels Centre for
Integrative Thinking**

Rotman School of Management
University of Toronto



Center for Research in
Economics and Strategy

OLIN BUSINESS SCHOOL AT WASHINGTON UNIVERSITY

Organizers



1st International Workshop on Interactive Causal Learning

- We hope this is the first of many
- It *is* international
- “Interactive” in the sense of interaction with the external world and with other agents
- “Causal” in the sense of ... well, that’s a key question for us!
- “Learning” in the usual sense

Motivation for the conference

What do we have to learn from each other?

Structural models

You wish to model how the grass gets wet:

1. Sometimes it rains
2. The sprinklers turns on on certain days of the week
3. The grass gets wet if and only if (1) or (2) occur

Then, a structural model **M** looks like:

$$r = f_r(U_r)$$

$$s = f_s(d, U_s)$$

$$w = f_w(r, s, U_w)$$

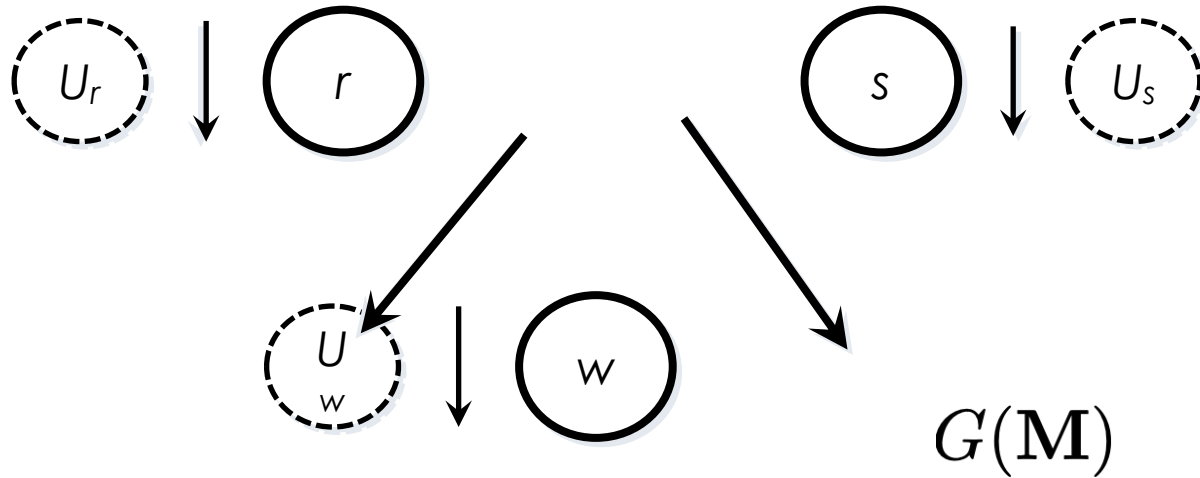


$$V = \{r, s, w\}$$

$$U = \{U_r, U_s, U_w\}$$

\Rightarrow treat V as RVs

Structural models \Rightarrow a corresponding graph



Implication

Variation in r and/or s causes variation in w

BUT

Variation in w does not cause variation

Estimation

Use data to estimate

$$\begin{aligned}\Psi_s &:= E[W | \text{do}(S = s)] \\ &= E[W | S = s, Z]\end{aligned}$$

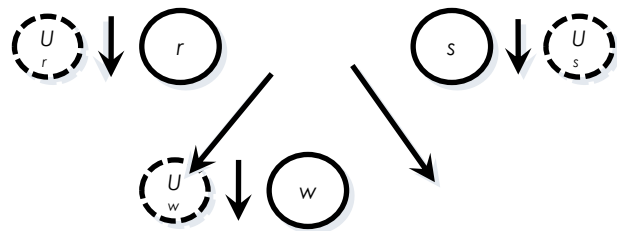
Disciplines already engaged in sprinkler example

Econometrics
Structural causal
models

$$r = f_r(U_r)$$

$$s = f_s(d, U_s)$$

$$w = f_w(r, s, U_w)$$



Structural causal
models
Philosophy

$$\Psi_s := E[W | \text{do}(S = s)]$$

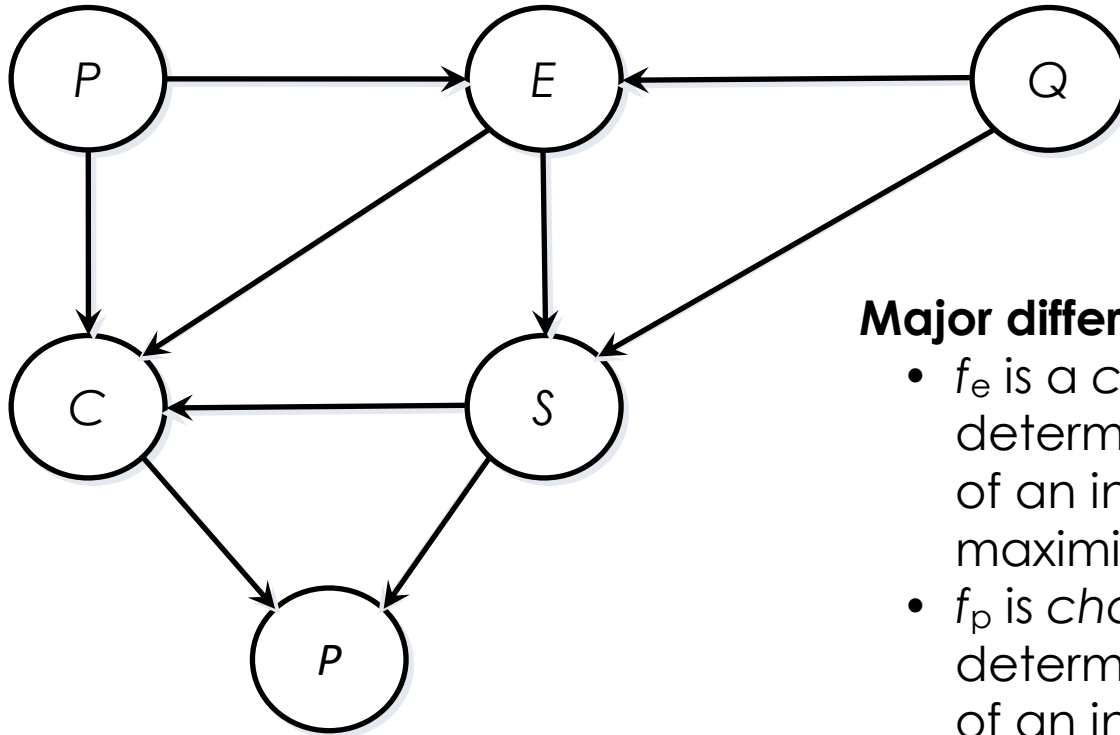
Structural causal
models
Machine learning

Now, let's change the example

An economist considers how incentives motivate worker effort:

1. Owner determines the incentive *policy*
2. An input has a certain *quality* level
3. The worker chooses an *effort* level
4. *Sales* are determined by effort and quality
5. Worker *compensation* is determined by sales, policy, effort
6. Owner *profit* is sales net of compensation
7. Only the worker observes effort and quality

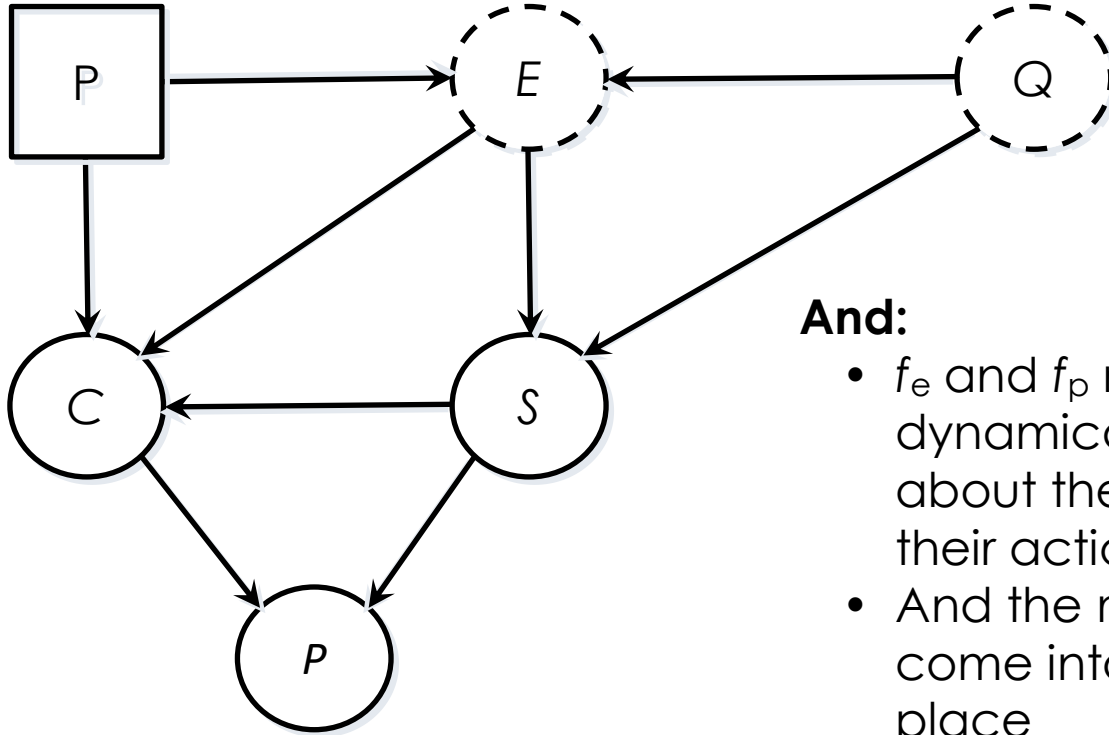
The economist-eye view



Major differences from wet grass:

- f_e is a choice variable determined by the strategy of an intentional agent maximizing expected C
- f_p is choice variable determined by the strategy of an intentional agent maximizing expected P

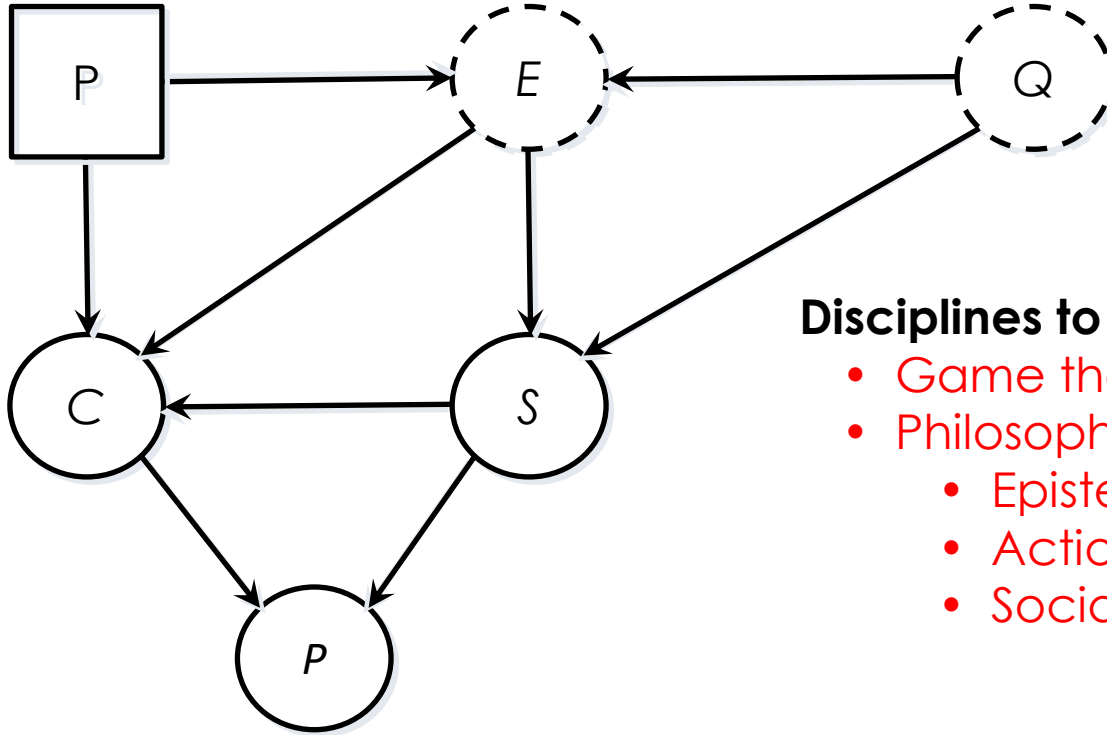
The manager-eye view



And:

- f_e and f_p may be changing dynamically as the agents *learn* about the consequences of their actions
- And the manager causes P to come into being in the first place

The manager-eye view



Disciplines to contribute

- Game theory
- Philosophy
 - Epistemology
 - Action theory
 - Social ontology

The preliminary plan

- This year: take a deep breath and listen for new ideas
 - Next year: develop interdisciplinary research proposals
 - Then: put together a concrete research agenda and fund it
-
- Saturday panel discussion - what was interesting, where to go?

Administrative details

- Plan to attend today's lunch and dinner
- Talks will be rudely interrupted at the 30 minute mark
- Tonight's dinner event - busses & exhibit
- Reimbursement information will be sent following workshop

Let's do it!