# Draft Syllabus:
# Causal Inference Using Causal Graphs

Instructor: Adam Glynn
TA: Min Hee Seo
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**Overview and Class Goals**

This short course provides an introduction to the use of causal graphs for large-sample casual inference. After introducing graphical models and their associated properties, we will focus on how these graphs help us to understand and effectively use many standard techniques: regression and matching, instrumental variables, mediation, and impulse responses. The final day will be devoted to techniques I have worked on that are less standard.

**Required Books**

Hernán, Miguel and Robins, James. 2016. *Causal Inference*. http://www.hsph.harvard.edu/faculty/miguel-hernan/causal-inference-book/

Angrist, Joshua and Pischke, Jörn-Steffen. 2009. *Mostly Harmless Econometrics*. (Chapter 4 to be provided)

Gerber, Alan and Green, Donald. *Field Experiments* (Chapters 5 and 6 to be provided)

**Required Articles**

Beck and Katz (2011). "Modeling Dynamics in Time-Series-Cross-Section Political Economy Data." *Annual Review of Political Science*

Glynn and Kashin (2017). "Front-door Difference-in-Differences Estimators." *American Journal of Political Science*

Glynn and Kashin (2018). "Front-door Versus Back-door Adjustment with Unmeasured Confounding: Bias Formulas for Front-door and Hybrid Adjustments with Application to a Job Training Program." *Journal of the American Statistical Association*

Glynn and Ichino (2019). Generalized Nonlinear Difference-in-Difference-in-Differences. *Working Paper*

Imai, Keele, Tingley, Yamamoto (2011), "Unpacking the Black Box of Causality: Learning about Causal Mechanisms from Experimental and Observational Studies." *American Political Science Review*

Sofer, Richardson, Colicino, Schwartz and Tchetgen Tchetgen (2016). "On Negative Outcome Control of Unobserved Confounding as a Generalization of Difference-in-Differences." *Statistical Science*

VanderWeele and Shpitser (2011), "A new criterion for confounder selection." *Biometrics*

# Preliminary Schedule

The "Required Reading" should be read carefully and completed **prior** to the lecture(s) for which it is assigned.

# 1 Nonparametric Causal Inference with Causal Graphs

**Topics Covered**

graphical models and concepts of separation

causal graphical models (causal DAGs and SWIGs)

identification criteria (backdoor, disjunctive)

**Required Reading**

Hernán and Robins Chs. 1-2.3, 3-5.3, 6-8

VanderWeele and Shpitser (2011)

# 2 Causal Graphs with Constant Effects Assumptions

**Topics Covered**

linear SEMs and path analysis

instrumental variables with constant effects

impulse responses in TSCS with constant effects

mediation with constant effects

**Required Reading**

path analysis handout

Angrist and Pischke Ch 4-4.1

Beck and Katz (2011) Sections 1-3

# 3 Relaxing Constant Effects Assumptions

**Topics Covered**

instrumental variables with non-constant effects

impulse responses in TSCS with constant effects

mediation with non-constant effects

**Required Reading**

Re-read Hernán and Robins Chs. 4, 5 - 5.3

Gerber and Green Chs. 5 - 6

Imai et al. (2011)

# 4 Frontdoor and Generalized DiDiD

**Topics Covered**

frontdoor with constant effects

frontdoor with alternative assumptions

nonlinear difference-in-differences, NOC, and NOCNOC

**Required Reading**

Glynn and Kashin (2018)

Glynn and Kashin (2017)

Sofer et al. (2016)

Glynn and Ichino (2019)