Causal Cognition Reading List

Autumn Semester 2020
Neil Bramley

1. Introduction

Topics Covered:

- Aims and structure of course; introduction to causality in psychology and philosophy

Required Readings:

Sloman, S. A. (2005). *Causal Models: How people think about the world and its alternatives*, Oxford University Press. Chapters 1-3 (pp. 3—33, **copy on Learn**).

Pearl, J. (2018). *The Book of Why: The new science of cause and effect*, Basic Books. Chapter 1 (pp. 1-22, **copy on Learn**).

Additional Readings:

Chater, N. & Oaksford, M. (2012). Normative systems: Logic, probability, and rational choice. In K. J. Holyoak & R. G. Morrison (Eds.), *The Oxford Handbook of Thinking and Reasoning,* Chapter 2 (pp. 11-21). Link *(A primer on Bayesian rationality)*

2. The birth of Causal Model Theory

Topics Covered:

- From associative accounts of learning and representation to casual model based accounts

Required Readings:

Holyoak, K. J., & Cheng, P. W. (2011). Causal learning and inference as a rational process: The new synthesis. *Annual Review of Psychology*, *62*, 135–163. Link (*first 15 pages only, up to Dynamic Models)*

Sloman, S. (2005). *Causal Models: How people think about the world and its alternatives*, Oxford University Press. Chapters 4: *Causal Models* (pp. 36—51).

Additional Readings:

Buehner, M. J., Cheng, P. W., & Clifford, D. (2003). From Covariation to Causation: A Test of the Assumption of Causal Power. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *29*(6), 1119–1140. Link

Griffiths, T. L., & Tenenbaum, J. B. (2009). Theory-based causal induction. *Psychological Review*, *116*(4), 661. Link

3. The ladder of causation

Topics Covered:

- The logic of intervention
- Counterfactuals

Required Readings:

Sloman, S. A. (2005). *Causal Models: How people think about the world and its alternatives*, Oxford University Press. Chapters 5: *Observation Versus Action* (pp. 52-66).

Lagnado, D. A. & Sloman (2002). Learning causal structure. *Proceedings of the 24th Annual Meeting of the Cognitive Science Society*. Austin, TX. Link

Additional Readings:

Pearl, J. (2018). *The Book of Why: The new science of cause and effect*, Basic Books. Chapter 2: *The ladder of causation* (pp. 23-52)

Sloman. S. A. & Lagnado, D. A. (2005). Do we "do"? *Cognitive Science*, 29, 5–39. Link

Lagnado, D. A., Waldmann, M. R., Hagmayer, Y., & Sloman, S. A. (2007). Beyond covariation: Cues to causal structure. In Gopnik, A. And Schulz, L. (Eds.) *Causal learning: Psychology, philosophy, and computation*, (pp. 154-172). Link

4. Active causal learning

Topics Covered:

- Causal learning as active learning, choosing informative interventions

Required Readings:

Coenen, A., Ruggeri, A., Bramley, N. R., & Gureckis, T. M. (2019). Testing one or multiple: How beliefs about sparsity affect causal experimentation. *Journal of Experimental Psychology: Learning, Memory, and Cognition*.

Coenen, A., Rehder, B. E., & Gureckis, T. M. (2015). Strategies to intervene on causal systems are adaptively selected. *Cognitive Psychology*, *79*, 102–133. Link

Additional Readings:

Bramley, N. R., Lagnado, D. A., & Speekenbrink, M. (2015). Conservative Forgetful Scholars: How People Learn Causal Structure Through Sequences of Interventions. *Journal of Experimental Psychology: Learning, Memory & Cognition*, *41*(3), 708–731. Link

Steyvers, M., Tenenbaum, J. B., Wagenmakers, E.-J., & Blum, B. (2003). Inferring causal networks from observations and interventions. *Cognitive Science*, *27*(3), 453–489. Link

5. Causal cognition in development

Topics Covered:

- Using causal model theory to understand children's learning and play.

Required Readings:

Gopnik, A., Glymour, C., Sobel, D. M., Schulz, L. E., Kushnir, T., & Danks, D. (2004). A theory of causal learning in children: causal maps and Bayes nets. *Psychological Review*, *111*(1), 3. Link

McCormack, T., Bramley, N. R., Frosch, C. A., Patrick, F., & Lagnado, D. A. (2016). Children's use of interventions to learn causal structure. *Journal of Experimental Child Psychology*, *141*, 1–22. Link

Additional Readings:

Sobel, D. M., & Kushnir, T. (2006). The importance of decision making in causal learning from interventions. *Memory & Cognition*, *34*(2), 411–419. Link

6. The role of time (part I)

Topics Covered:

- Order and delay sensitivity.
- Temporal cues to causation.
- Dynamic Bayesian Networks and Continuous Time Delay networks

Required Readings:

Lagnado, D. A., & Sloman, S. A. (2006). Time as a guide to cause. *Journal of Experimental Psychology: Learning, Memory & Cognition*, 32, 451-460. Link

Rottman & Keil (2012) Causal structure learning over time: Observations and interventions. *Cognitive Psychology*, 64(1–2), 93–125.

Additional Readings:

Bramley, N. R., Gerstenberg, T., Mayrhofer, R., & Lagnado, D. A. (2018). Time in Causal Structure Learning. *Journal of Experimental Psychology: Learning Memory and Cognition*. Link

7. The role of time (part II)

Topics Covered:

- Intervening in time
- Causal learning with continuous variables and in continuous dynamic systems

Required Readings:

Bramley, N. R., Gerstenberg, T., Mayrhofer, R., & Lagnado, D. A. Intervening in Time. In Kleinberg, S. (Ed.) *Time and Causality Across the Sciences*. Cambridge University Press (Chapter 6, pp. 86-115) Link

Additional Readings:

Bramley, N. R., Gerstenberg, T., Tenenbaum, J. B., & Gureckis, T. M. (2018). Intuitive experimentation in the physical world. *Cognitive Psychology*, *105*(May), 9–38. Link

Bramley, N. R., Mayrhofer, R., Gerstenberg, T., & Lagnado, D. A. (2017). Causal learning from interventions and dynamics in continuous time. *Proceedings of the 39th Annual Meeting of the Cognitive Science Society*, *1*, 150–155. Link

8. Causal Theories

Topics Covered:

- How our causal priors shape our inferences
- Hierarchical priors or intuitive theories
- Learning to learn

Required Readings:

Kemp, C., Goodman, N. D., & Tenenbaum, J. B. (2010). Learning to Learn Causal Models. *Cognitive Science*, *34*, 1185–1243. Link

Additional Readings:

Gerstenberg, T., & Tenenbaum, J. B. (2017). Intuitive theories. *Oxford handbook of causal reasoning*, 515-548. Link

Griffiths, T. L., & Tenenbaum, J. B. (2009). Theory-based causal induction. *Psychological Review*, *116*(4), 661–716. Link

Lu, H., Yuille, A. L., Liljeholm, M., Cheng, P. W., & Holyoak, K. J. (2008). Bayesian generic priors for causal learning. *Psychological Review*, *115*(4), 955–984. Link

9. Causal Responsibility (and causal perception)

Topics Covered:

- How we praise and blame each other
- How causal beliefs shape and sometimes mislead perception

Required Readings:

Lagnado, D. A., Gerstenberg, T., & Zultan, R. (2013). Causal Responsibility and Counterfactuals. *Cognitive Science*, *37*(6), 1036–1073. Link

Additional Readings:

Gerstenberg, T., & Lagnado, D. A. (2010). Spreading the blame: The allocation of responsibility amongst multiple agents. *Cognition*, *115*(1), 166-171. Link

Buehner, M. J., & Humphreys, G. R. (2009). Causal binding of actions to their effects. *Psychological Science*, *20*(10), 1221-1228. Link

Bechlivanidis, C., & Lagnado, D. A. (2016). Time reordered: Causal perception guides the interpretation of temporal order. *Cognition*, *146*, 58-66. Link