Tools for Formal Epistemology: Doxastic Logic, Probability, and Default Logic
– ESSLLI 2023 –

Lecture 5 – Peer Disagreement c'd

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1 Quick recap

1.1 Peer disagreement debate

- Main views:
  - Conciliatory views: Back off from your belief that X!
  - Steadfast views: You can stick to your belief

1.2 Higher-order disagreements

- Conciliatory views seem intuitive, but
- run into trouble in scenarios involving *higher-order disagreements*:

(1) disagreements over the peerhood status of an apparent epistemic peer (Mulligan 2015)

(2) disagreements over conciliatory views themselves (Elga 2010)

1.3 Disagreement over peerhood status

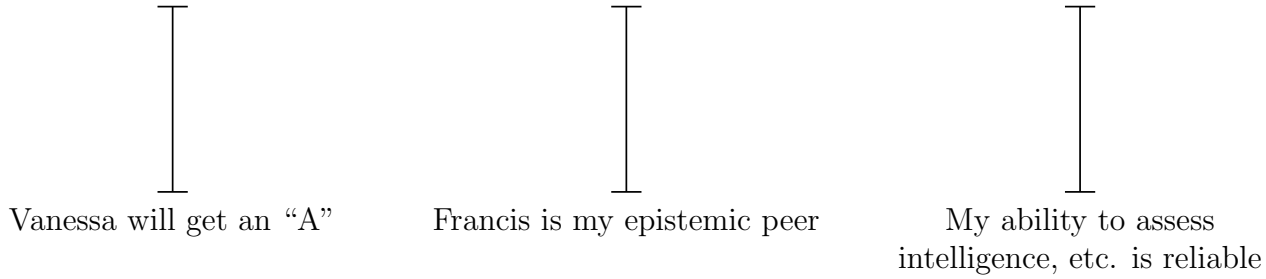
- **Disagreement over peerhood**. I disagree with my friend Francis about the truth of some proposition X. I believe that X is true and Francis believes that X is false. Since I regard Francis as my epistemic peer with respect to X, I revise my confidence in X downward... I subsequently hear something distressing from another friend, Richard, though: He believes that I erred when I judged Francis to be my epistemic peer. In Richard's opinion, Francis is not my epistemic peer. This is problematic because I... [am convinced] that Richard is my epistemic peer with respect to assessments of epistemic peerhood. (Mulligan 2015)

  The case is said to exhibit two paradoxes. Here's the first:

  - Instantiate X with V = Vanessa will get an "A" on the philosophy exam (notice that V depends on my ability to judge exposure to evidence, intelligence, and freedom from bias)

  (a) On the one hand, CVs recommend that I lose confidence in *Francis is my peer*, and that I restore my initial confidence in V;

(b) on the other, it seems that I must lose confidence in my *ability* to assess exposure to evidence, intelligence, and freedom from bias, and that I shouldn't restore my initial confidence in V.



- **Self-proclaimed epistemic inferior**. How do I adjust my beliefs if someone I take to be an epistemic peer (say, Jimmy) is convinced that they aren't?
  (a) CVs recommend lowering confidence in *Jimmy is my peer*;
  (b) but once confidence is lowered, Jimmy's opinion shouldn't count.

1.4 Disagreement over conciliatory views

- **Double Disagreement**. I consider myself an able philosopher with special interests in metaphysics and social epistemology. I've reasoned very carefully about the vexed topic of free will, coming to the conclusion that free will exists. I've also spent a fair amount of time thinking about the issues surrounding peer disagreement, coming to the conclusion that conciliatory views are correct, and that one has to give up one's well-reasoned opinion when faced with a disagreeing peer. Then I discover that my friend metaphysician Milo disagrees with me about the existence of free will, while my friend epistemologist Evelyn disagrees with me about conciliationism.
  (a) CVs recommend lowering confidence in *Free will exists*;
  (b) CVs also recommend lowering confidence CVs and, thereby, indirectly not lowering confidence in *Free will exists*.

1.5 Next step

- Express conciliationism in default logic..

2 Preliminaries

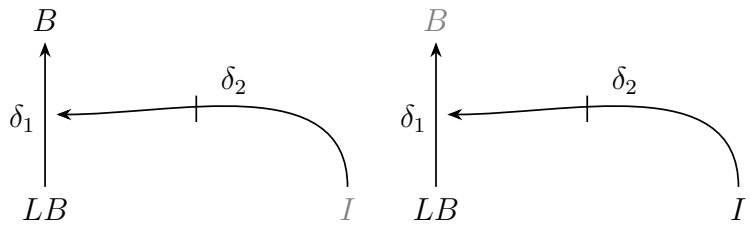
2.1 (Purely) exclusionary default theories

- A (purely) exclusionary default theory is a pair $\langle \mathcal{W}, \mathcal{D} \rangle$ where:
  $\mathcal{W}$ is a set of propositional formulas, and
  $\mathcal{D}$ is a set of default rules.
- Default rules can be of two types:
  - Ordinary defaults of the form $X \to Y$
  - *Exclusionary defaults* of the form $X \to Out(d)$

2.2 Example (Blue lights)

- $\Delta_1 = \langle \mathcal{W}, \mathcal{D} \rangle$ where
  $\mathcal{W} = \{LB\}$
  $\mathcal{D} = \{\delta_1, \delta_2\}$
  - $\delta_1 = LB \to B$
  - $\delta_2 = I \to Out(d_1)$
- $\Delta_2 = \langle \mathcal{W}', \mathcal{D} \rangle$ where
  $\mathcal{W}' = \mathcal{W} \cup \{I\}$
  (LB = Looks blue; B = Is blue;
  I = Illuminated by blue lights)

2.3 Inference graphs



2.4 Stable' scenarios

- A scenario $\mathcal{S}$ based on $\langle \mathcal{W}, \mathcal{D} \rangle$ is stable$'$ just in case:

$$\begin{aligned} \mathcal{S} \;=\; \{\delta \in \mathcal{D} :\; & \delta \in Triggered_{\langle \mathcal{W},\mathcal{D}\rangle}(\mathcal{S}), \\ & \delta \notin Conflicted_{\langle \mathcal{W},\mathcal{D}\rangle}(\mathcal{S}), \\ & \delta \notin Excluded_{\langle \mathcal{W},\mathcal{D}\rangle}(\mathcal{S})\}. \end{aligned}$$

- We are going to ignore self-triggering chains.

2.5 Interpretation

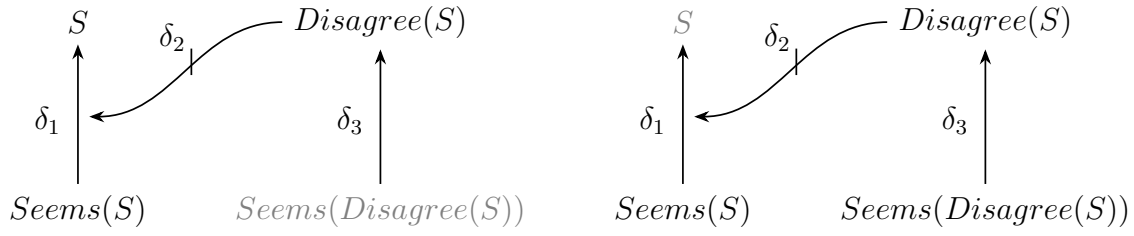
- Default logic as an ideal reasoner:
  $\Delta \mid\!\sim X$ just in case it's rational to believe that X in the scenario Δ represents

3 Capturing conciliatonism in default logic

3.1 Core idea

- Default rules as *defeasible reasoning policies* (Doyle)
- New predicate $Seems(\cdot)$:
  - $Seems(X)$ = you've reasoned to the best of your ability, coming to the conclusion that X as a result
- *Significance of first-order reasoning* schema:
  $\delta(X) = Seems(X) \rightarrow X$
- Another predicate $Disagree(\cdot)$:
  - $Disagree(X)$ = you're in genuine disagreement over X
- *Significance of disagreement* schema:
  $\delta'(X) = Disagree(X) \rightarrow Out(\delta(X))$

3.2 Example (Mental math)



- $\Delta_3 = \langle \mathcal{W}, \mathcal{D} \rangle$ where
  $\mathcal{W} = \{Seems(S)\}$
  $\mathcal{D} = \{\delta_1, \delta_2, \delta_3\}$
  - $\delta_1 = Seems(S) \rightarrow S$
  - $\delta_2 = Disagree(S) \rightarrow Out(d_1)$

- $\delta_3 = Seems(Disagree(S)) \rightarrow Disagree(S)$

- $\Delta_4 = \langle \mathcal{W}', \mathcal{D} \rangle$ where
  $\mathcal{W}' = \mathcal{W} \cup \{Seems(Disagree(S))\}$
  (S = my share of the bill is \$43)

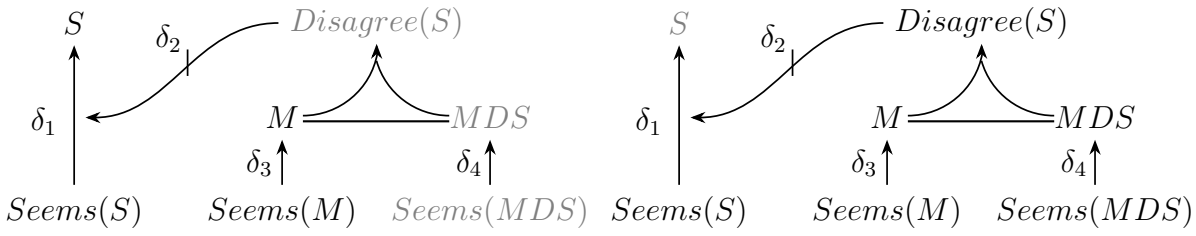
3.3 Elaborating the example

- Given our goals, it pays being more *explicit* about the reasoning leading to $Disagree(X)$

  Sufficient conditions for a significant disagreement:
  $PersonPeer \wedge PersonDisagreesOverX \supset Disagree(X)$

- $\Delta_5 = \langle \mathcal{W}, \mathcal{D} \rangle$ where
  $\mathcal{W} = \{Seems(S), Seems(M), [M \wedge MDS] \supset Disagree(S)\}$
  $\mathcal{D} = \{\delta_1, \delta_2, \delta_3, \delta_4\}$
  - $\delta_1 = Seems(S) \rightarrow S$
  - $\delta_2 = Disagree(S) \rightarrow Out(d_1)$
  - $\delta_3 = Seems(M) \rightarrow M$
  - $\delta_4 = Seems(MDS) \rightarrow MDS$

- $\Delta_6 = \langle \mathcal{W}', \mathcal{D} \rangle$ where
  $\mathcal{W} = \mathcal{W}' \cup \{Seems(MDS)\}$
  (S = my share is \$43; M = Megan is my peer;
  MDS = Megan doesn't think that my share is \$43)



Δ_5 (before disclosure) on the left; Δ_6 on the right

- And we're done!

4 Back to the paradoxes of epistemic peerhood

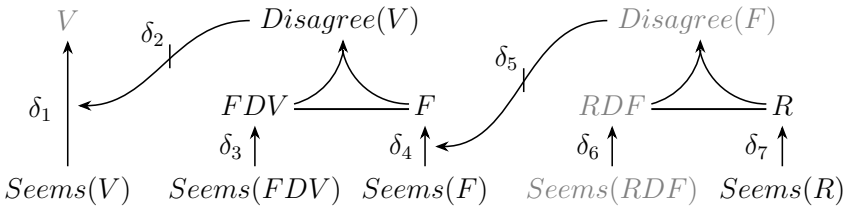
4.1 Disagreement over peerhood (again)

- I disagree with my friend Francis about the truth of some proposition X. I believe that X is true and Francis believes that X is false. Since I regard Francis as my epistemic peer with respect to X, I revise my confidence in X downward... I subsequently hear something distressing from another friend, Richard, though: He believes that I erred when I judged Francis to be my epistemic peer. In Richard's opinion, Francis is

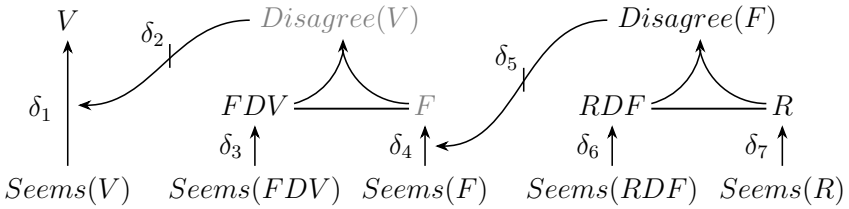
not my epistemic peer. This is problematic because I... [am convinced] that Richard is my epistemic peer with respect to assessments of epistemic peerhood. (Mulligan 2015)

4.2 Expressed formally..

(V = Vannessa will get an "A"; F = Francis peer
R = Richard peer; FDV = Francis disagrees re V
RDF = Richard disagrees re F)



Before disclosure of the higher-order disagreement w. Richard



After disclosure

4.3 Response to the paradox

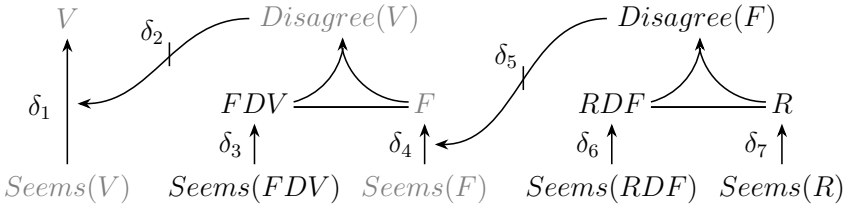
- The model suggests that CVs recommend restoring initial confidence
- Why did it seem that I shouldn't restore it? Mulligan (p. 70):
  "[With Richard's announcement] I have discovered that I committed two (connected) errors, the first being my judgment that Francis was my epistemic peer, and the second being my downward revision in my confidence in V."
- But no! I haven't discovered that I've made an error at all!
  It's just that I can't rely on my first-order reasoning.
  More information has to come in before I lower confidence in my ability.

4.4 A paradoxical case in the vicinity?

- Is there a case in the vicinity where I **do** discover the error?
  Two things to say in response:

  1. It's hard to flesh out the details, supporting the needed intuitions.
  2. Even if there's a case, the model can account for both intuitions.

- Consider the Twinessa case.



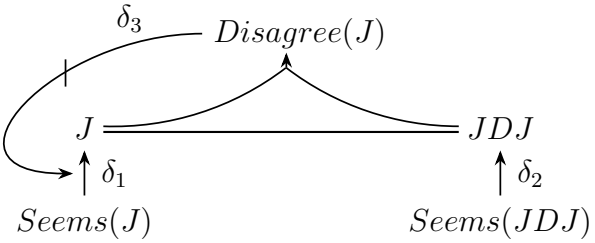
After I discover the error and lose confidence in my ability

4.5 Second paradox (skip)

- This one has to do with the reasoning about Richard
- .. and it gets resolved in a similar way

4.6 Self-proclaimed epistemic inferior

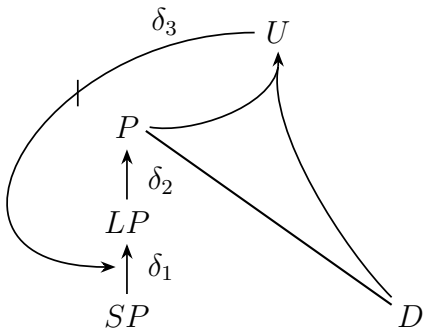
- How do you adjust your beliefs if someone you take to be an epistemic peer (say, Jimmy) is convinced that they aren't?
- Mulligan: this reveals an impossible tension in conciliatory views.



- Consider $\mathcal{W} = \langle \mathcal{W}, \mathcal{D} \rangle$ where
  $\mathcal{W} = \{Seems(J), Seems(JDJ)\}$
  $\mathcal{D} = \{\delta_1, \delta_2, \delta_3\}$
  - $\delta_1 = Seems(J) \rightarrow J$
  - $\delta_2 = Seems(JDJ) \rightarrow JDJ$
  - $\delta_3 = Disagree(J) \rightarrow Out(d_1)$

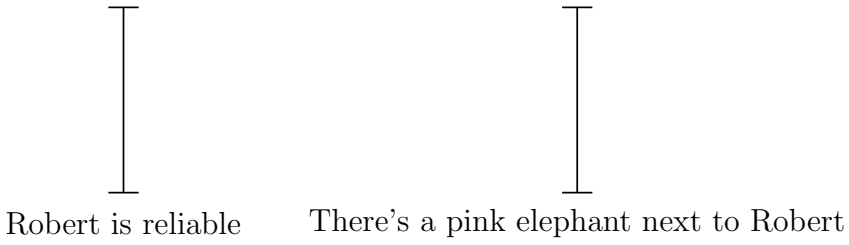
  (J = Jimmy peer; JDJ = Jimmy disagrees about J)

- The above move doesn't work here.. So we need something else..
- For starters, consider Pollock's (1995) **Pink Elephant** scenario

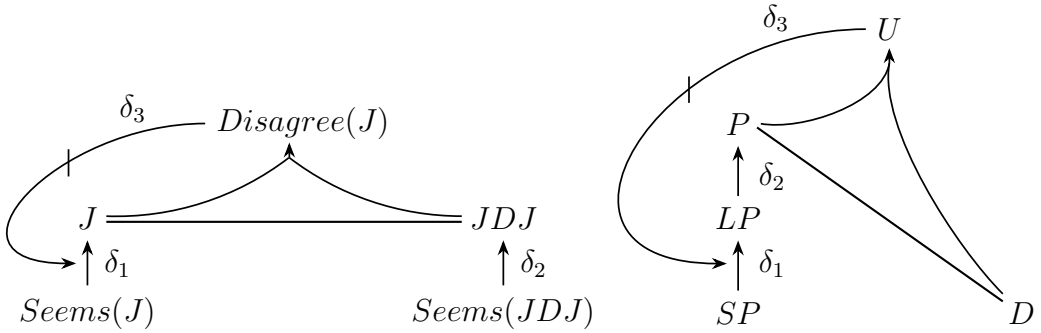


- $\mathcal{W} = \langle \mathcal{W}, \mathcal{D} \rangle$ where
  $\mathcal{W} = \{SP, D, [D \wedge P] \supset U\}$
  $\mathcal{D} = \{\delta_1, \delta_2, \delta_3\}$
  - $\delta_1 = SP \rightarrow LP$
  - $\delta_2 = LP \rightarrow P$
  - $\delta_3 = U \rightarrow Out(d_1)$

  (SP = Says elephant looks pink; LP = elephant looks pink; P = elephant is pink D = has Pink Elephant Disorder; U = becomes unreliable)
- Applying Mulligan's line of thought here results in an impossible tension

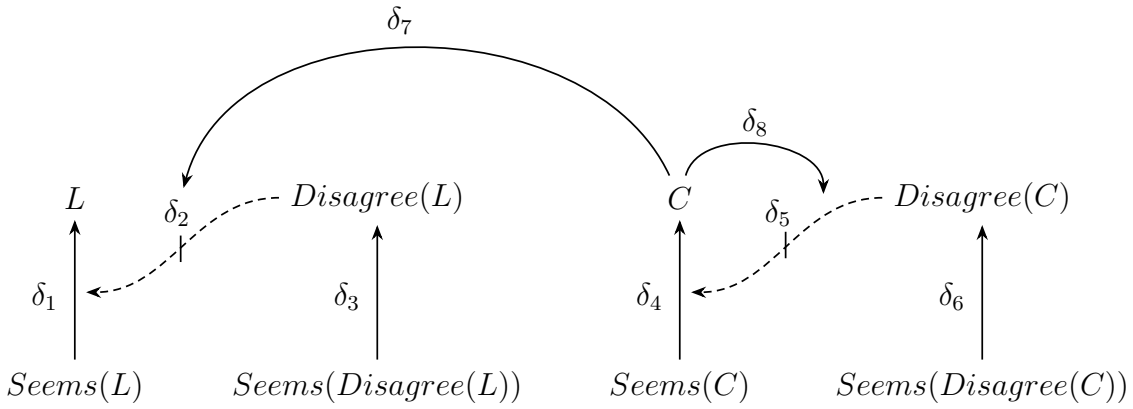


- Takeaway: The problem is not with CVs, but with the way of thinking
- How are we to think about the cases then? Well..



- Complication: no stable/proper scenarios based on either theory
- (This was actually one of the three complications we discussed)
- Fortunately, there's **formal argumentation theory** (Dung, 1995).

4.7 On the problem of self-defeat



(L = We have libertarian free will; C = conciliationism is true)

- This problem is more complicated
- The model can be used to respond to it, but the argument is rather complex..
- See (Knoks, 2021/2023) if you're interested.

5 Main takeaways

- Thinking about peer disagreement and the conciliatory views drawing on default logic is useful.
- It shows that the alleged paradoxes of epistemic peerhood do not cause trouble for (certain) conciliatory views.
- Also, it can be used to respond to the self-defeat problem.

5.1 Open questions

- **Disagreement over scrutability of peerhood**. I am confident that peerhood is scrutable, that is, I think that if someone is my epistemic peer, I can usually figure it out. I consider Yusuke to be a peer regarding peerhood. One day, I discovers that Yusuke disagrees about the scrutability of peerhood. Yusuke says, "Perhaps there are peers, but we are really bad at figuring out who is or who isn't a peer. Whether someone has just as much evidence as you and is just as competent at evaluating evidence as you is really complicated. Given our cognitive limitations, peerhood is inscrutable. That is to say, we cannot rationally believe that someone is our peer."
  (Adapted from Anonymous)
- Is there a neat way to make justification and defeat continuous?
- Other problems for conciliatory views..

6 Pointers to the literature

6.1 Default logic

- Horty J. (2012) *Reasons as Defaults*. Oxford University Press.
- Reiter R. (1980) 'A logic for default reasoning'. In: *Artificial Intelligence*.

6.2 Logics for defeasible reasoning

- Makinson D. (2005) *Bridges from Classical to Nonmonotonic Logic*. College Publications.

6.3 Peer disagreement

- Christensen D. (2007) 'The epistemology of disagreement'. In: *Philosophy Compass*.
- Frances B. & Matheson J. (2018) 'Disagreement'. In: *Stanford Encyclopedia of Philosophy*.
- Matheson J. (2015) *The Epistemic Significance of Disagreement*. Palgrave Macmillan.

6.4 Peer disagreement and defeasible logic

- Knoks A. (2022) 'Conciliatory views, higher-order disagreements, and defeasible logic'. In: *Synthese*.
- Knoks A. (2021/23) 'Conciliatory reasoning, self-defeat, and abstract argumentation' (2021/23). In: *Review of Symbolic Logic*.

6.5 Bayesian epistemology

- Bradley D. (2015) *A critical introduction to formal epistemology*. Bloomsbury.

6.6 For anything else

- You can always ask me or Eric..

Tools for Formal Epistemology: Doxastic Logic, Probability and Default Logic Further Reading

J. Weisberg Formal Epistemology, Stanford Encyclopedia of Philosophy, 2021

1 Logics of belief

M. Caie, Doxastic Logic, Open Handbook of Formal Epistemology, 2019

E. Pacuit, Dynamic Epistemic Logic I (and II), Philosophy Compass, 8(9), pp. 798 - 814, 2013

E. Pacuit, Neighborhood Semantics for Modal Logic, Springer, 2017

R. Stalnaker, On Logics of Knowledge and Belief, Philosophical Studies, 128(1), pp. 169-199, 2006

Y. Ding, On the logic of belief and propositional quantification. Journal of Philosophical Logic, 50:1143-1198, 2021.

2 Bayesian epistemology

H. Lin, Bayesian Epistemology, Stanford Encyclopedia of Philosophy, 2022.

M. Titelbaum, Fundamentals of Bayesian Epistemology, Volume 1 and Volume 2, Oxford University Press, 2022.

J. Weisberg, Varieties of Bayesianism, Handbook of the History of Logic, vol. 10, 2011

3 Stability Theory of Belief

H. Leitgeb, The Stability of Belief: How Rational Belief Coheres with Probability, Oxford University Press, 2017

4 Updating probabilities

S. Huttegger, The Probabilistic Foundations of Rational Learning, Cambridge University Press, 2017