Philosophy 601: Probabilistic Knowledge

Problem Set: 15 September 2015

1 Substantial questions

1. Epistemic vocabulary occurs under many non-doxastic attitude verbs. Arguably, for instance, you can *fear*, *hope*, *want*, or *be happy that* you might have helped someone, or that you probably helped them, or that it is at most .8 likely that you helped them, and so on. Give a theory of our non-doxastic relations to probabilistic contents. For instance, you may want to consider questions such as the following: are there any non-doxastic relations that we can bear only to propositional contents? Are non-doxastic relations to probabilistic contents in some way parasitic on doxastic relations to those contents, or may we have the former without the latter?

2. In §1.2, I argue that probabilistic beliefs are beliefs with probabilistic contents. Does an analogous argument demonstrate that Bayesians should think of the contents of desires as being something like sets of utility functions?[1] If my argument concerning belief did generalize to an argument concerning desire, would that constitute a challenge to the former argument?

3. Study the account of generics defended in LESLIE 2008. Consider the three foundational arguments for probabilistic contents of assertion that I develop in §1.4. In light of recent literature on generics, should we endorse analogs of these arguments for the conclusion that assertions may constrain not only your full beliefs and probabilistic beliefs, but also other doxastic attitudes, such as the implicit mental states posited by dual process theories? Be sure to consider each of the three foundational arguments on its own merits, and defend your answer for each argument.

4. The property of being *thoroughly probabilistic* is defined for contents of sentences in chapter 1. Extend this definition so that it applies to contents of *subsentential* expressions.

5. After developing a more precise theory of how assertions with probabilistic contents may be used to update a probabilistic context set (cf. STALNAKER 1978 for relevant background), explain how an advocate of two-dimensionalism might generalize the notion of the "diagonal content" of an assertion, if asserted contents are not sets of possible worlds and hence are not the sorts of objects that appear as rows in traditional two-dimensionalist matrices (cf. §7.2 for relevant discussion).

6. Is it correct to understand the projection behavior of presuppositional content (cf. KARTTUNEN 1973, GEURTS 1999) as partly *constitutive* of the notion of presuppositional content, so that the connection between projection and presupposition is in some sense conceptual or analytic? Should we endorse the analogous claim concerning elements of the test battery for probabilistic content developed in §1.6?

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1. Thanks to Seth Yalcin for raising this question in his Rutgers Semantics Workshop commentary on Moss 2015a.

7. In defending the claim that probabilistic beliefs are beliefs with probabilistic contents in §1.2, I argue that probabilistic beliefs are simple attitudes with complex contents, rather than complex attitudes with simple contents. In addition to reasons for adopting some particular one of these views, are there reasons for adopting at least one of them? Why not have complex attitudes with complex contents?[2]

    In brainstorming about this question, you may find it helpful to consider whether complex attitudes with complex contents could be useful in the representation of beliefs expressed using nested modals. Be sure to consider beliefs expressed with at least three nested modals, in addition to beliefs expressed with double modals. Connect your discussion with the theory of nested epistemic modals developed in chapter 2.

8. Epistemic vocabulary also occurs in the scope of many factive expressions other than attitude verbs. Arguably, for instance, you can hold your fire *unless* there might be snipers, open fire *because* there are probably snipers, fire *until* there couldn't be snipers, at which point it *stops* being the case that there are probably snipers. As it appears in these contexts, can epistemic vocabulary be used to assert thoroughly probabilistic contents? For example, can probabilistic contents stand in causal relations?

9. Study the challenge for the belief-transfer model in Torre 2010, and comment on whether it constitutes a problem for the model of probabilistic assertion that I defend in chapter 1 (cf. especially §1.8).

10. Suggest some generalizations about what sorts of contents we use 'something' to quantify over in natural language. For example, 'there is something I expect that you don't, namely to get out of here soon' sounds odd when we both expect that I will get out of here soon and that you won't, whereas 'there is something I believe that you don't, namely that I will probably get out of here soon' sounds okay when I have high credence that I will get out of here soon and you have low credence that I will get out of here soon. Can our intuitions about the domains of these sorts of natural language quantifiers support the conclusion that probabilistic beliefs are beliefs with probabilistic contents?

    Along similar lines, does the felicity of sentences such as 'he believes everything I say' support the conclusion that the contents of beliefs can be the contents of assertion?

11. Determine the appropriate extension of the test battery for non-propositional content developed in §1.6. In particular, consider whether the test battery also applies to predicates of personal taste, expressions of aesthetic and moral value, indexicals that might be used in sentences with *de se* contents, expressions such as 'it is sad / depressing / frustrating that...', and subjunctive conditionals that might be used to directly constrain your *imaging function* in the way that thoroughly probabilistic contents constrain your credences (cf. §1 of Swanson 2015 for further discussion).

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2. Thanks to Ivan Soll for raising this question in a department colloquium at University of Wisconsin, Madison.

Are there important differences in our uses of these expressions that the test battery should reflect? For example, when it is common ground that different conversational participants are in different time zones, we do not intuitively hear them as disagreeing when one speaker asserts 'it is 3:00' and another asserts its negation, whereas when it is common ground that different conversational participants have different evidence, we may intuitively hear them as disagreeing when one speaker asserts 'it is probably raining' and another asserts its negation. How does this contrast extend to other vocabulary?

12. As discussed in §1.7, it is not straightforward to define probability spaces over alternatives to unstructured contents of assertion: "sets of metaphysically possible worlds can form an algebra, a collection of sets that is closed under finite operations of complement and union. The contents of probabilistic beliefs may therefore be sets of probability spaces, which are objects that assign probabilities to elements of algebras. By contrast, if propositions are structured entities, interpreted logical forms, or cognitive event types, then they are not sets of anything. They are not the sort of object on which a probability measure is well-defined" (20).

    Develop some suggestions for extending some alternative theory of propositional contents to a theory of probabilistic contents, e.g. by defining some formal object relevantly similar to a probability space on some formal object relevantly similar to an algebra of propositions.

13. In chapter 2, I give a semantics for nested epistemic vocabulary, such as the nested modals in 'it might be the case that it is probably raining'. In light of this semantics, develop a theory of epistemic vocabulary embedded under verbs that are typically interpreted as denoting *hedged* doxastic attitudes. For instance, intuitively, it could be the case that I *doubt* that it is probably raining, that I *suspect* that it is probably raining, that I *wonder* whether it is probably raining, and so on. What can we say about these sorts of attitudes to probabilistic contents?

14. The theory of assertion developed in Stalnaker 1978 has the following two nice features: (a) the same sort of object represents both what is common ground and what each member of the conversation believes, namely a set of worlds, and (b) we represent the updating of the common ground by intersecting this object with the content of an assertion, i.e. replacing this object with the set of worlds contained both in the context set and in the asserted content. In order to accept both (a) and (b), it is necessary that the content of an assertion is the same sort of object that represents what each member of the conversation believes.

    This necessary condition does not hold on the probabilistic theory of assertion that I defend. According to the simplest version of my theory, the content of an assertion is a set of probability spaces, and what you believe is represented by a single probability space. Hence we are forced to choose between models of the common ground that satisfy (a) and (b) above. To spell it out: either we preserve (a) and model the common ground by a single probability space, or we preserve (b) and model the common ground by a set of probability spaces.

In §2.5, I implicate that I prefer to preserve (b) rather than (a). Develop an alternative theory of probabilistic assertion that preserves (a) instead. Compare and contrast it with my theory of probabilistic assertion. What general conclusions can we draw from this comparison? Are the relative costs and benefits of your theory and my theory essential to any theory that preserves (a) or (b), respectively?

15. In a context that is decisive with respect to the propositional content of a simple sentence, are nested modal constructions embedding that sentence always equivalent to the outer-most modal? The inner-most modal? Or neither? For example, in a context that is decisive with respect to the proposition that it is raining, does 'it might be the case that it might be the case that it is raining' entail 'it might be the case that it is raining' according to the semantics defended in chapter 2?

16. Extend the central argument of YALCIN 2007 to an objection to some antecedently plausible contextualist semantics for the indicative conditional.

17. Provide natural language examples illustrating that sentences beginning with 'it is probably not the case that' and 'it is not probably the case that' can have readings on which their contents are not complementary.

18. The Probabilistic Content View of perceptual experience described in §4.3 is a natural fit with the two central theses of the book manuscript (cf. §1.1), compared with any alternative view of experience mentioned in §4.3. Is there any stronger dialectical relation between these several claims? Without necessarily addressing the question of whether the probabilistic content view is correct, answer the hypothetical question: if the probabilistic content view turned out to be untenable, how might that cast doubt on my central theses or on my arguments for those theses?

19. As I outline arguments for the Probabilistic Content View in §4.4, I identify three sorts of content that figure in current Bayesian theories of multisensory object perception. Which of these most deserves to be identified as the content of your perceptual experience? In defending your answer, please give more detailed consideration to the views defended in ROTHKOPF et al. 2010 and in KNILL & POUGET 2004, explaining why one or both of these views is misguided.

20. Identify some meaningful contrast between how I develop some argument(s) for probabilistic knowledge in the context of an "expressivist" theory of epistemic vocabulary (cf. §5.4) and how these arguments would be developed given some particular relativist theory and/or how they would have to be developed given any relativist theory of epistemic vocabulary.

21. Catalog several strategies for the relativist about epistemic vocabulary to meet the challenge articulated in §5.5. Which strategies are at least viable, and which are the most compelling?

22. Answer the open question about relative truth posed at the end of §5.6.

23. Compare and contrast various instances of the failure of constructive dilemma arguments, including arguments containing epistemic vocabulary, deontic vocabulary, modal subordination, and adverbs of quantification. How should we go about developing a unified theory of the behavior of these constructions?

24. The argument from inconsistency in §6.2 begins with the observation that (1) entails (2):

    (1)   that it is .6 likely that Smith smokes

    (2)   that it is .6 likely that Smith smokes and it might not be .6 likely that Smith smokes

    The content of (1) on its intended reading is heretical. Does the analogous entailment hold for every sentence with a heretical content? And conversely, does the analogous entailment hold for any sentence with a pious content? Be sure to precisely define the relevant notion of 'analogous entailment' in defending your answers to these questions.

25. Catalog the natural readings of the argument from fallibility in §6.3. Identify which readings are valid and which are invalid, and identify at least one valid reading of the argument that I do not discuss in §6.3 as it stands.

26. Identify some substantial similarities between my answer to the argument from inconsistency and my answer to the argument from disjunction. In light of these similarities, explain why these arguments are nevertheless essentially distinct.

27. §6.10 emphasizes that many instances of existential instantiation are invalid when they embed epistemic vocabulary. In light of this result, explain why some general principle of knowledge closure does in fact entail the second premise of the argument from fallibility, namely the particular claim that if Jones cannot rule out that Smith doesn't smoke, then Jones does not know that it is .6 likely that Smith smokes.

28. Articulate a more precise formal understanding of the informal claim that "the propositional closure of a content is the proposition believed by any god who believes that content," and give a more precise formal proof of this claim.

29. Propose your own skeptical argument for probabilistic knowledge, i.e. some challenge that is not equivalent to any natural reading of an argument considered in chapter 6 as it currently stands.

30. Consider the discussion of interest-relative invariantism in §6.6. Does the principle of Relevant Practical Coherence articulated in Weatherson 2011 entail that Brown does not know that the miners are equally likely to be in Shaft A or Shaft B in the second case discussed in that section, where Brown is not deciding about where to deliver lunches but about which shaft to flood?

31. At the end of §6.7, I say that "the heretical contents of ordinary language sentences are challenged by arguments with a small number of disjuncts." Articulate some interesting substantive result about the number of disjuncts that are needed to construct an argument from disjunction against heretical contents that satisfy certain constraints.

32. Compare and contrast paraconsistent logics with the appropriate logic for sentences containing epistemic vocabulary, in light of the intuitions discussed at the end of chapter 6.

33. Intuitively, I might *be willing to bet*, or *happily pay money to make it the case* that I am less than .5 likely to have cancer. There is at least some superficial sense in which one could execute standard decision theory where the relevant outcomes and/or states are probabilistic contents. For instance, how much I value the outcome of some cancer treatment might depend on how likely it is that I am less than .5 likely to have cancer in that outcome, and the expected value of getting some cancer treatment might depend on how likely I think it is that I am less than .5 likely to have cancer. What happens when probabilistic contents are used in standard decision theory? Is there any advantage to using probabilistic contents, any result that we may derive with them but not without them?

    It may be useful to begin by considering the following question: is it possible for the payoff of a bet to depend on a probabilistic content, e.g. can you construct a bet that has a huge negative return for you if and only if it is not probably raining? How does the discussion of hyperintensionality in chapter 7 bear on your answers to these questions?

34. Can we use probabilistic knowledge to articulate some useful charitable understanding of the recently defended but controversial claim that "knowledge can come in degrees"?

35. Do you think that there is a case to be made for interpreting WILLIAMSON 2000 as defending something like the propositional knowledge norm for decisions described in §9.3?

36. In §9.3, I use some elements of the §1.6 test battery for thoroughly probabilistic content in order to argue against the Stanley and Hawthorne claim that we act on full beliefs about evidential probabilities. To what extent can the embedding argument developed in YALCIN 2007 be used for this purpose? Construct an application of this element of the test battery, or argue that no such application can be constructed.

37. What are the most compelling (original or extant) arguments against the pluralist view of practical normativity described in §9.5?

38. Extend the probabilistic knowledge interpretation of the reasonable doubt standard of proof to other standards of proof (e.g. preponderance of the evidence), and/or identify standards for which the interpretation cannot be extended in this way.

39. Is the viability and/or strength of the probabilistic knowledge norm for decisions independent of whether the relevant expected utility is causal or evidential expected utility?

40. Standard decision theory appeals to your value function and your credences in order to calculate the expected utility of an action. There is a sense in which the knowledge norm for decisions replaces the latter of these with something more objective, namely credences that constitute knowledge. Is there a corresponding sense in which the former might also be replaced by something more objective? In other words, is there a norm for decisions that replaces your value function with values that constitute knowledge?

    If this project fails, explore the disanalogy between values and credences that this failure exposes. If the project succeeds, comment on how the resulting theory compares with standard decision theory, using my chapter 9 comparison of standard decision theory and the knowledge norm for decisions as a model.

41. Argue for the claim that when you have a ticket in a large lottery and you do not know the outcome, your belief that your ticket lost the lottery is not justified. Is there any sound argument for this claim that undermines the dialectical role played by the norms for belief and action articulated in chapters 8 and 9? For instance, might someone argue that justification norms of belief and action could entail the attractive consequences of those probabilistic knowledge norms, without endorsing knowledge norms of justification?

42. There is a general trend toward using sets of precise objects to represent your mental states, such as using imprecise credences to represent your uninformed beliefs or partial orderings to represent your incommensurable values. A possible benefit of this trend is that we may thereby gain the resources to adequately represent novel sorts of mental states, as suggested in Moss 2015b: "we could use the mental committee model to represent your values in addition to your credences. For instance, we could identify members of your mental state with combinations of precise credences, subjective risk functions, and value functions. Then your having incommensurable values might be represented by members of your mental state having distinct value functions. Conditional values might be represented by dependencies between the credences and values of your mental committee members."

    In addition to conditional values, could we use the mental committee model to represent novel sorts of knowledge states, namely by ascribing knowledge to some but not all members of your mental committee? To what problems might this model be usefully applied?

43. Is there a significant practical norm according to which you should treat a probabilistic content as a reason just in case your evidential probability function satisfies it, as described at the end of §9.6? Are there reasons to endorse the probabilistic knowledge norm for reasons in §9.3 in addition to this alternative evidential probability norm for reasons, other than the motivation to account for the sense in which you should act only on the basis of contents that you believe?

44. State a precise definition of the notion of practical luck described in §9.5, and compare and contrast this notion with the notion of moral luck as it appears in chapter 3 of Nagel 1979. Is practical luck just as intuitively unacceptable and/or theoretically unavoidable as moral luck? Are these notions of luck independent, and/or is one more fundamental than the other?

45. A substantial question building on literature question (11): can we collect useful armchair evidence for or against the empirical claim that our assessments of agents are clouded by our evaluation of the epistemic policies on which we take them to be acting? In addition to addressing this question, collect some *non-armchair* evidence regarding this claim, and comment on its implications for the dialectic of §9.5.

46. According to Rosen 2003, you may be blameless for acting wrongly if your action is permissible according to some moral standard that might be correct, given what you believe (as long as you have not mismanaged your beliefs). Compare and contrast this thesis with the probabilistic knowledge norm for reasons defended in chapter 9, and discuss whether there is any variant of the latter that is more compelling in virtue of more closely resembling the former in some respect.

47. Levi 1980 develops a decision theory using a notion of "serious possibility" that is constrained by knowledge. Give a clear synopsis of his theory, and compare and contrast it with the knowledge norms for decisions discussed in §9.3.

2 Literature questions

1. Find at least three examples of discussions in which authors clearly presuppose or state that probabillistic beliefs are probabilistic attitudes with propositional contents.

2. Find at least two examples of the sort of dispute discussed in §1.6, concerning whether presuppositions are triggered and locally accommodated, or in fact never triggered at all.

3. Find some naturally occurring example of an epistemic sentence such that you may convincingly argue based on the linguistic context of the sentence (e.g. some third-personal assessment of the sentence) that the sentence has a thoroughly probabilistic content according to some element of the test battery developed in §1.6.

4. Find some naturally occurring example of some nested epistemic vocabulary that has a cumulative interpretation on its most natural reading, and argue that the embedded modal should be interpreted as a genuinely epistemic modal, as opposed to a circumstantial modal (cf. Kratzer 1981).

5. Find an instance of a theory of assertion according to which "when you hear me assert something, you update on the fact that you just heard me utter certain words, or on the fact that certain sounds came out of my mouth, or on the fact that it seemed to you as if you heard certain sounds, or on the fact that you had certain subjective experiences," as discussed in §1.9, and assess whether the belief transfer model is genuinely compatible with that theory.

6. Find a naturally occurring example of evidence that knowledge ascriptions embedding epistemic vocabulary are factive, in the sense explored in chapter 5.

7. Find an example of epistemic vocabulary used in fiction to introduce some probabilistic content concerning the world of the fiction (cf. §5.4 for relevant discussion).

8. Aside from Hawthorne 2005, find an example of someone interpreting Williamson 2000 as defending something like the propositional knowledge norm for decisions described in §9.2.

9. Aside from Hawthorne & Stanley 2008, find an example of someone defending a pluralist view of practical normativity in the context of evaluating knowledge-based norms for action of the sort that Stanley and Hawthorne defend.

10. Through examination of actual court rulings, find examples of cases in which probabilistic knowledge was undermined by the raising of salient possibilities in the context of the courtroom.

11. Aside from Aarnio 2010 and Williamson 2015, find defenses of externalist norms that appeal to the claim that our assessments of agents are clouded by our evaluation of the epistemic policies on which we take them to be acting (cf. §9.5).

12. As explained in §9.8, you cannot *prove* that someone is guilty beyond a reasonable doubt unless they *are* guilty beyond a reasonable doubt. In addition to the relation of proving some content, what other relations are used in the articulation of various evidential standards (e.g. reasonable doubt, clear and convincing evidence, etc.), and what can we conclude from facts about whether these relations are factive?

3 Practice questions

1. Yalcin 2007 argues against a contextualist analysis according to which 'might' quantifies over epistemically possible worlds (cf. Kratzer 1977), namely by noting that sentences such as 'suppose it is raining and it might not be raining' are infelicitous. Explain why this sort of argument cannot be easily extended to challenge a contextualist analysis of 'if' according to which an indicative conditional is true just in case its consequent is true in all epistemically possible worlds where its antecedent is true. In particular, consider infelicitous sentences such as 'suppose that it is raining, that the game has not been cancelled, but that if it is raining then the game has been cancelled' and explain how the contextualist can account for their infelicity.

2. According to the relativist theory explored in chapter 5, 'Jones knows that it is .8 likely that Smith smokes' can be true for me, while it is false for you. Why can't it similarly be the case that 'Jones knows it is .8 likely that Smith smokes' is true for me, while 'Jones knows it is .2 likely that Smith smokes' is true for you?

3. Is every probabilistic content entailed by its *propositional closure* in the sense of §6.4? Does every probabilistic content entail its propositional closure? For each of your answers, either construct a proof of your positive answer or give a counterexample illustrating your negative answer.

4. Consider the argument from disjunction developed in chapter 6. Construct an analogous argument against the heretical content that Jones knows that it is between .2 and .8 likely that Smith smokes. Then construct an analogous argument against the heretical content that Jones knows both that it is probably raining and that it is exactly twice as likely to be raining as it is to be snowing.

5. Identify a heretical content that cannot be challenged by any argument from disjunction with finitely many premises.

6. Describe a context in which the sentence 'it is .6 likely that Smith smokes and it might not be .6 likely that Smith smokes' has a consistent content on at least one reading, explaining why the relevant probabilistic content is consistent (cf. §6.2 for the dialectical importance of this example).

7. Does the sort of argument from inconsistency described in §6.2 fail to challenge knowledge of *any* [thoroughly] probabilistic content, including any pious content as well as any heretical content?

8. Give a precise statement of the general principle of knowledge closure supporting the argument from fallibility outlined in §6.3.

9. Consider the challenge for my chapter 2 semantics addressed in §7.7, namely that we can sometimes validly infer from the negation of a disjunction to the negation of one disjunct. Why can't I simply respond to this challenge by saying that the relevant inferences are indeed valid as uttered in a context that is decisive with respect to members of the partition that we use to interpret the disjunction?

10. Consider the following passage in WILLIAMSON 2000: "sentences about probabilities and actions were omitted from the creature's language...when it is hot, the creature cannot know the probability on its evidence that it is hot. It does not know the premises of the decision-theoretic calculation" (235). It is clear that Williamson is discussing the creature's ability to know propositions about evidential probabilities in this passage. Is it possible that the creature nevertheless has probabilistic knowledge? How is the dialectical point of this passage affected by this possibility? How is it affected by the possibility of creatures that have full beliefs but no credences at all?

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