Comments on Presting's "Computability and Newcomb's Problem"

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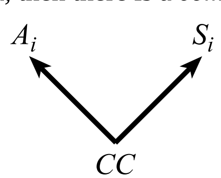
Newcomb's Problem I

- What's *essential* to Newcomb's problem?
  1. You must choose between *two particular acts*: A_1 = you take just the opaque box; A_2 = you take both boxes, where the two states of nature are: S_1 = there's $1M in the opaque box, S_2 = there's $0 in the opaque box.
  2. Your choice of A_i is *causally irrelevant* to S_i, since the contents of the opaque box (S_i) are determined *before* you choose A_i.
  3. A_2 *dominates* A_1. That is, $(\forall i)[u(S_i \,\&\, A_2) > u(S_i \,\&\, A_1)]$. Here, u is your utility function over outcomes (assume u is *linear in $*, for simplicity).
  4. The *evidential* expected utility of A_1 is greater than the *evidential* expected utility of A_2: $\sum_i \Pr(S_i/A_1) \cdot u(A_1 \,\&\, S_i) > \sum_i \Pr(S_i/A_2) \cdot u(A_2 \,\&\, S_i)$.[a]
- Note: (2) and (3) entail that the Principle of Dominance (POD) applies and prescribes act A_2 as the rational act. If (2) fails, then (POD) *need not apply*.
- So, (PMEU) and (POD) seem to come into conflict in Newcomb's problem.

[a] I follow Joyce in writing *evidential* probability as $\Pr(\cdot/\cdot)$ and *causal* probability as $\Pr(\cdot\backslash\cdot)$.

Newcomb's Problem II

- Note: (1)–(4) entail that your act *confirms* the salient state of nature (but is *causally irrelevant* to it). That is, A_i is *merely symptomatic* of S_i.
- What is *inessential* to Newcomb's Problem?
  1. A_i *verifies* S_i (*i.e.*, *perfect* evidential correlation between A_i and S_i). This is *not* part of the original statement of NP, *and* it is inessential to it.
  2. That there is a predictor of your choice whose reliability (and money placing habits) sets-up the evidential correlation between the A_i and the S_i. This *is* part of the original statement of NP, *but* it is inessential to it.
- What's crucial here is the *causal structure* of the problem. Presumably (a la Reichenbach), if (1)–(4) hold, then there is a *common cause* CC of A_i and S_i.

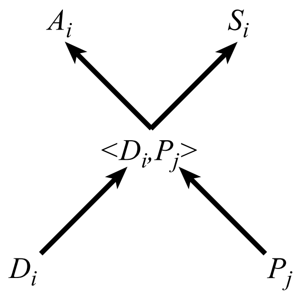


Presting's Problem I

- In Presting's Problem, you must choose a *decision algorithm* D_i, and your "opponent" (the predictor) must choose a *prediction algorithm* P_j.
- The pair $\langle D_i, P_j\rangle$ then *determines* which act A_i is performed (*if any*!), and which state of nature S_i obtains, where the states and acts are as above, in NP.
  - $\langle D_i, P_j\rangle$ does not halt. [no outcome, $0?]
  - $\langle D_i, P_j\rangle$ halts, P_j predicts that D_i recommends A_1, D_i recommends A_1. [$S_1 \,\&\, A_1$]
  - $\langle D_i, P_j\rangle$ halts, P_j predicts that D_i recommends A_1, D_i recommends A_2. [$S_1 \,\&\, A_2$]
  - $\langle D_i, P_j\rangle$ halts, P_j predicts that D_i recommends A_2, D_i recommends A_1. [$S_2 \,\&\, A_1$]
  - $\langle D_i, P_j\rangle$ halts, P_j predicts that D_i recommends A_2, D_i recommends A_2. [$S_2 \,\&\, A_2$]
- Both "players" have common knowledge of the set-up of the "game", and also common knowledge of each other's rationality, *etc.*
- This is a *rule-consequentialist* version of the problem. Instead of choosing between *two acts*, we are choosing between $\aleph_0$ *decision rules* (*algorithms*).

Presting's Problem II

- Presting: there is no effective (general) way of determining the salient *utilities* $u(D_i \,\&\, P_j)$, since there is no effective way to determine if $\langle D_i, P_j \rangle$ halts.
- Questions: What are the evidential *probabilities* $\Pr(P_j/D_i)$? Are the P_j and the D_i evidentially *correlated*? Note: assigning *equal* conditional probabilities to the P_j would violate countable additivity. We need a Pr-*model* here!
- And, how can this be a Newcomb Problem? Its causal structure seems to be:



- In Presting's Problem, your choice of decision algorithm D_i is *prior* to the determination of the state S_i.
- Moreover, it appears that your choice of D_i may be *causally positive* for S_i.
- Recall that in the NP, your choice of *act* A_i is *after* the salient state S_i is determined.

Presting's Problem III

- This does seem to be an (effectively) unsolvable problem in the *general* case.
- But, consider the following pair of *constant* (hence, *trivial*) *decision algorithms*: D_1 = take only the opaque box, and D_2 = take both boxes.
- Assuming that all prediction algorithms P_j can determine the behavior of *constant* (trivial) decision algorithms like these, we will have the following:

$$(\forall j)[u(P_j \,\&\, D_1) > u(P_j \,\&\, D_2)] \text{ (since \$1M > \$1K)}$$

- In other words, D_1 *dominates* D_2. It seems quite clear that D_1 is to be *strictly preferred* to D_2 as a decision algorithm in Presting's Problem.[a]
- While the two-box *act* is dominant over the one-box *act* in NP, the one-box (constant) *rule* is dominant over the two-box *rule* in Presting's Problem!

[a] Does (PDOM) *apply* here? After all, it seems that the D_i are *not* causally irrelevant to the S_i. This is true, but D_1 seems *causally positive* for S_1, which makes the preference $D_1 \succ D_2$ *even more clear*!