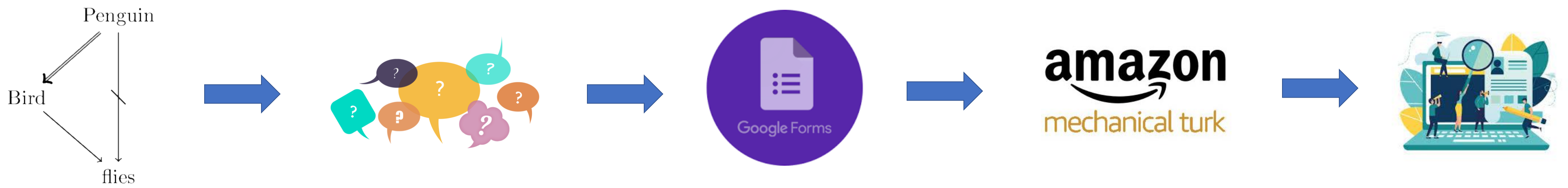# Cognitive Defeasible Reasoning

In the AI community, human reasoning has been likened to forms of defeasible reasoning. The extent, however, to which these compare is not well-documented.

RQ: To what extent do the theoretical models of defeasible reasoning, belief revision and belief update correspond with human reasoning?

In his work, Clayton investigated the KLM[1] defeasible reasoning approach. Claire investigated the AGM[2] belief revision approach and Paul investigated the KM[3] belief update approach.


Defeasible Reasoning

A reasoning agent may make an inference based on the information at hand, however, that inference is not absolute. When presented with additional information, the original inference can be strengthened or withdrawn.

Extent of correspondence:
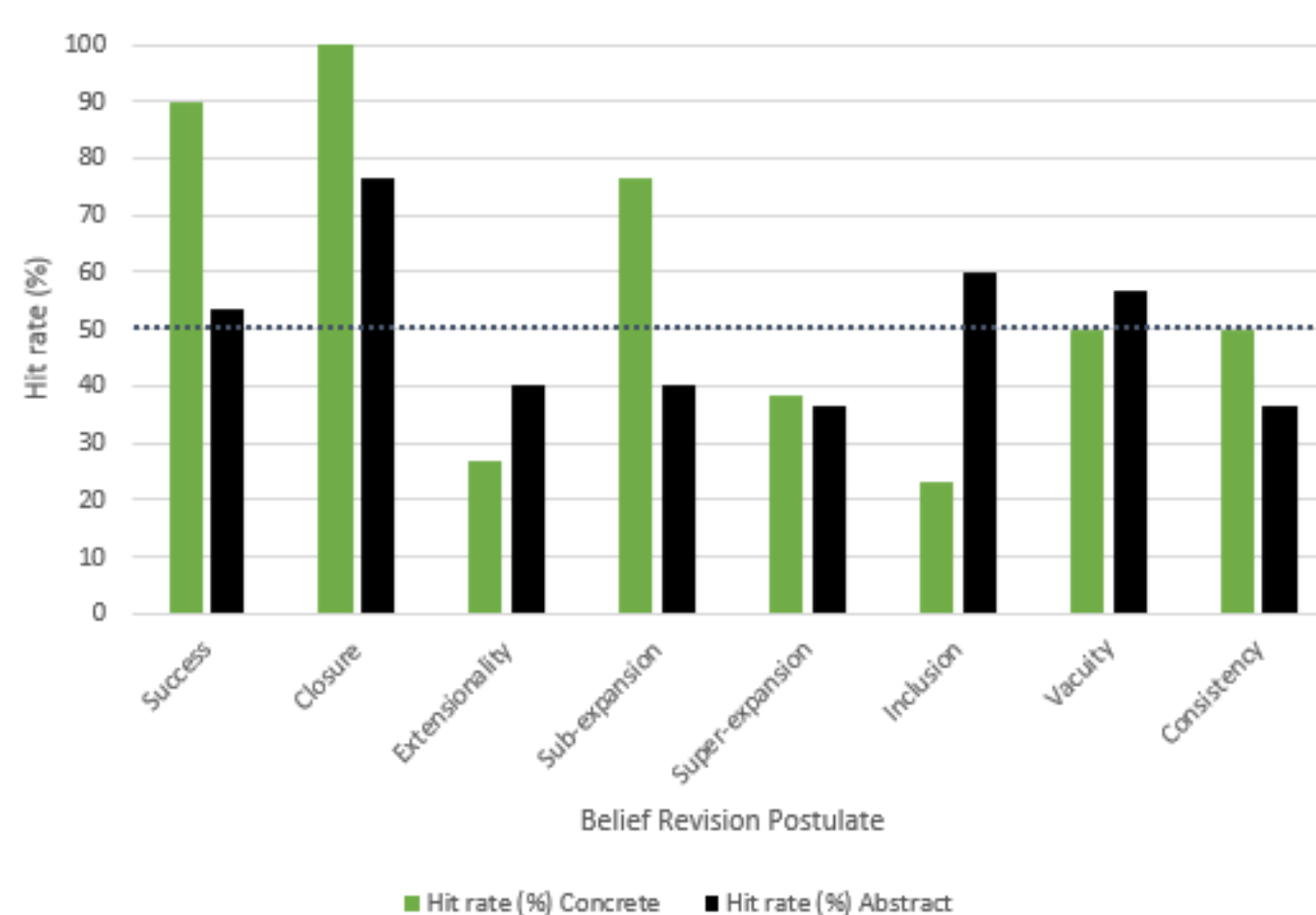Or, Transitivity, Prototypical reasoning and Presumptive reasoning.
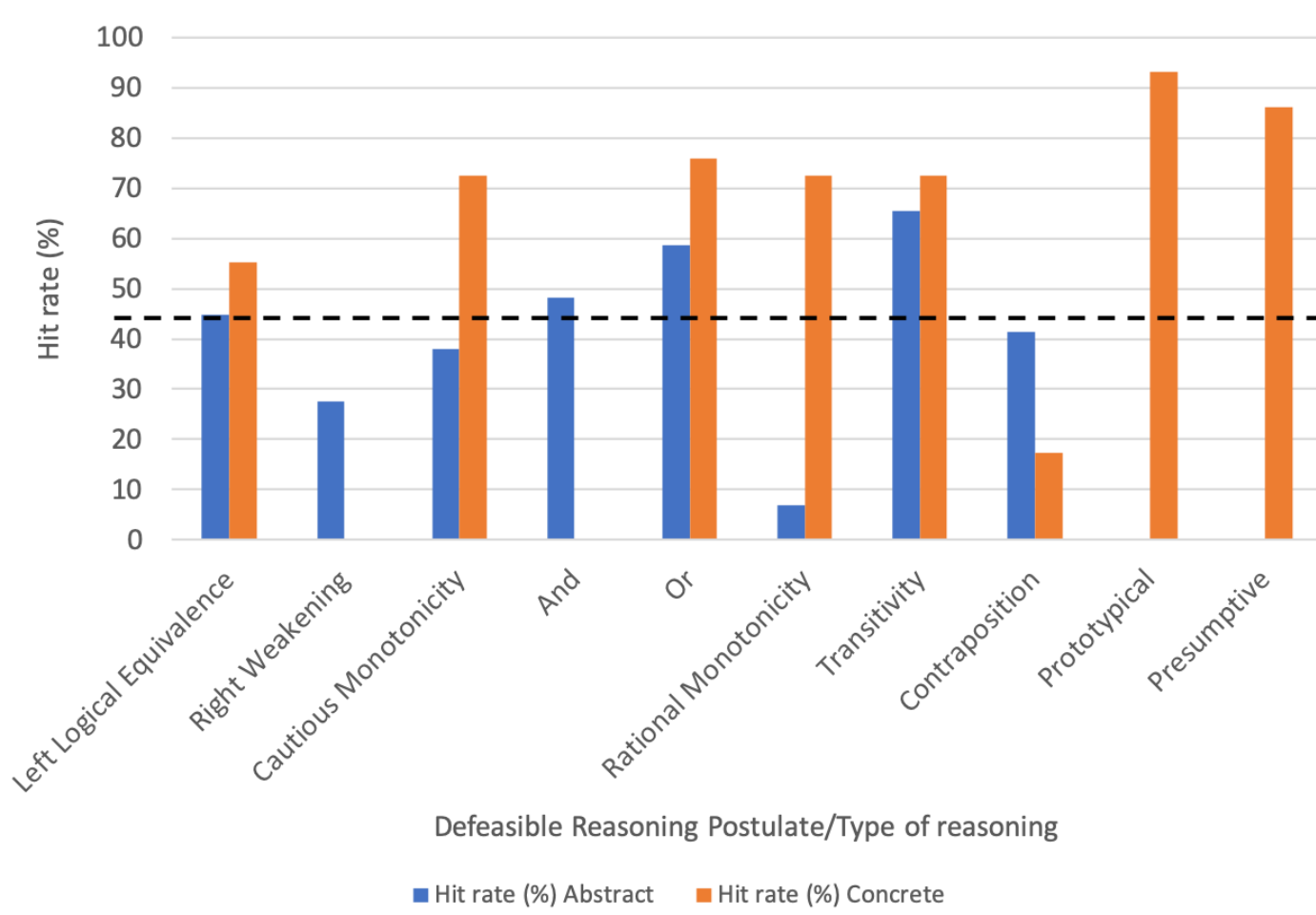
Additional investigation:

Q: **Reasoning style of respondents -** Normative or Descriptive?

A: **Normative**

Belief Revision
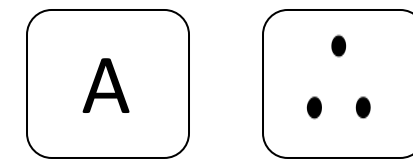
Learning conflicting information indicates flawed prior knowledge, and the agent can retract conclusions made and draw new ones based on what they explicitly know, aiming for minimal change in beliefs.

Extent of correspondence:
3 of the 8 properties: Success, Vacuity and Closure

Additional investigation:

Q: **Reasoning style of respondents -** Normative or Descriptive?

A: **Descriptive**

Belief Update

A variant of belief revision, with the distinction being between learning conflicting information about an unchanging world (belief revision) vs learning conflicting information about new changes in the world (belief update).
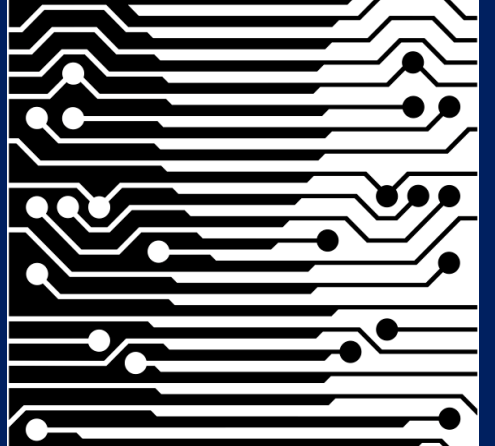
Extent of correspondence:
4 of the 8 properties: U1, U2, U4, and U6
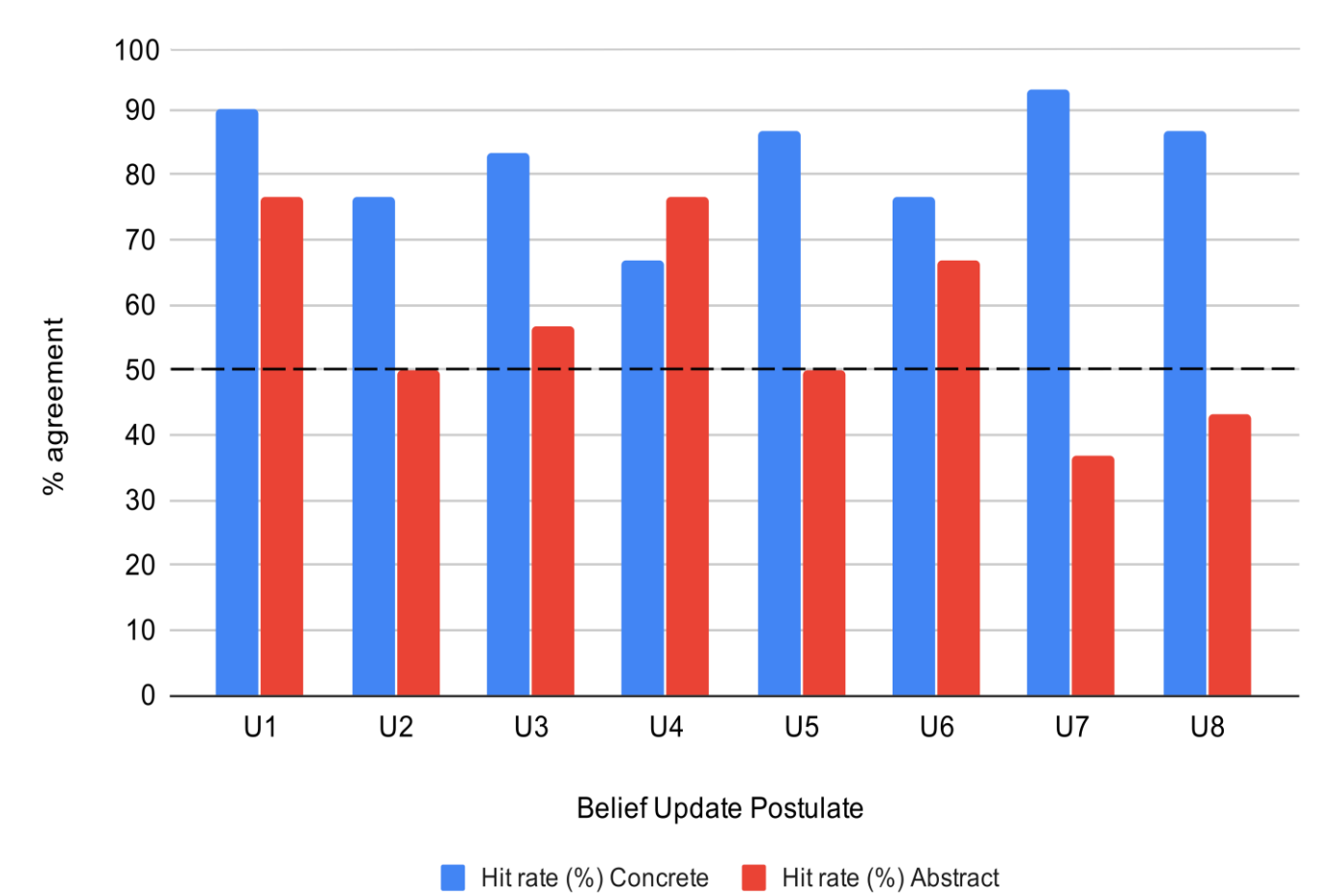
Additional investigation:

Q: **Any counter-examples to the properties?**

A: **Yes (4 found)**

Conclusion:

While the three systems examined are meant to be a better model of human reasoning than propositional logic, the results of this project indicate that they are not yet a perfect fit, with participants failing to reason in accordance with many of the properties of the systems. Future work involving conducting a study with a larger participant pool is necessary to obtain more accurate results.

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References
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[2] Hirofumi Katsuno and Alberto O. Mendelzon. 1991. Propositional knowledge base revision and minimal change. Artificial Intelligence (1991), 263–294.
[3] Hirofumi Katsuno and Alberto O. Mendelzon. 2003. On the Difference between Updating a Knowledge Base and Revising it. Belief Revision 29 (2003), 183.