Choice Set Misspecification in Reward Inference

By **Rachel Freedman**, Rohin Shah and Anca Dragan
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Choice Set Misspecification Example: Goal Bias Misspecification Landscape

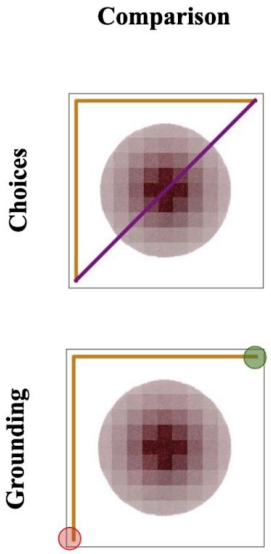
Choice Set Misspecification

Example: Goal Bias

Misspecification Landscape

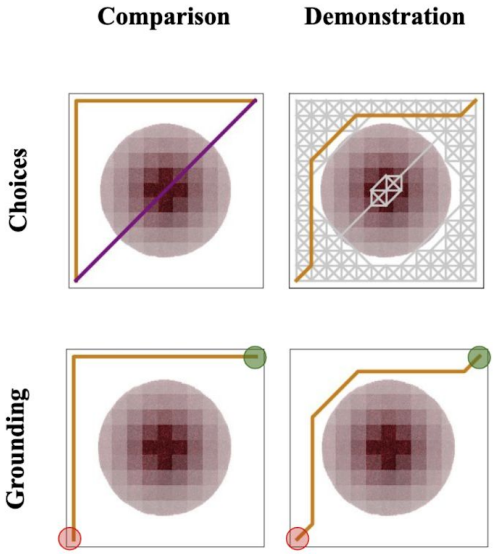
Reward Learning from Feedback

Reward Learning from Feedback



From *Reward-rational (implicit) choice: A unifying formalism for reward learning* by Hong Jun Jeon, Smitha Milli and Anca Dragan

Reward Learning from Feedback



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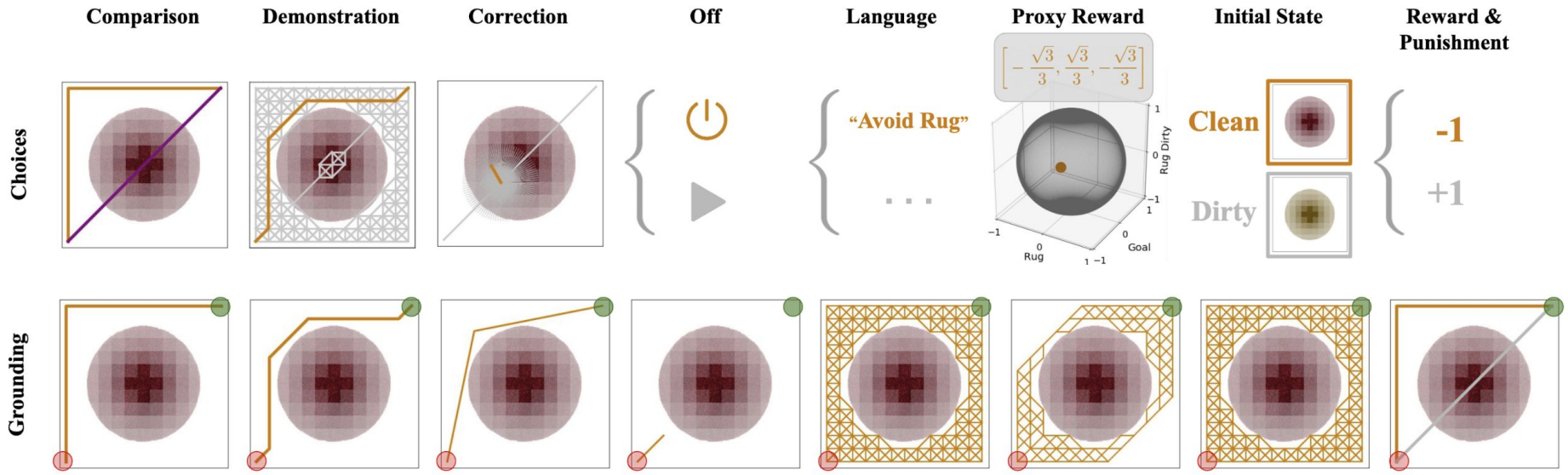

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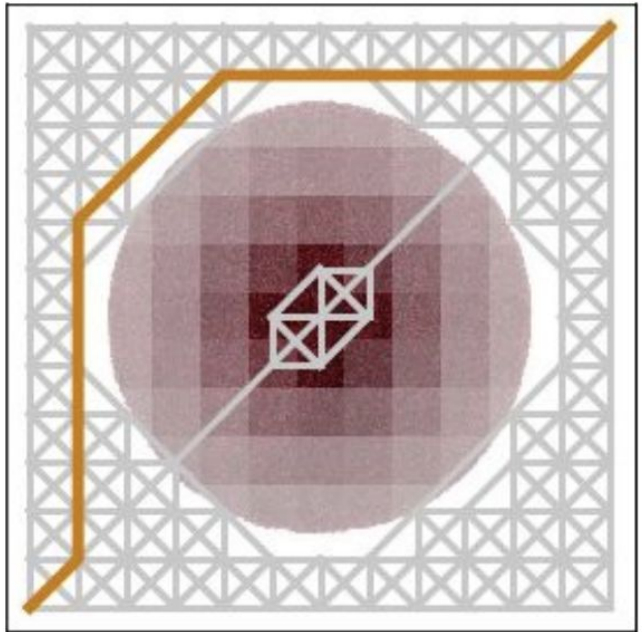

feedback

choice set

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Misspecification Landscape

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Choice Set Misspecification

Example: Goal Bias

Misspecification Landscape

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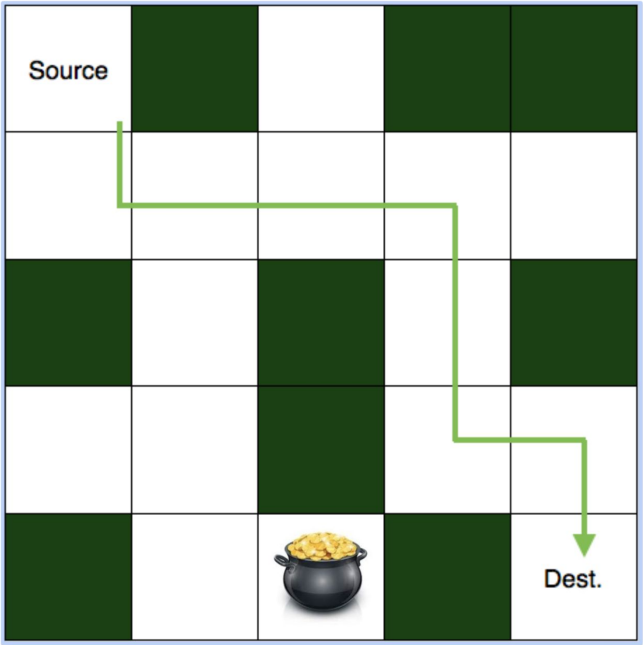

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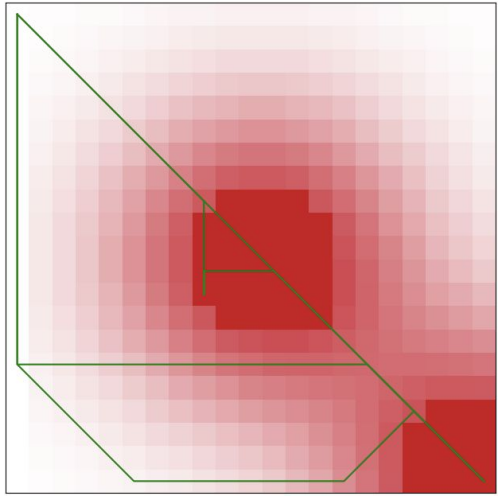
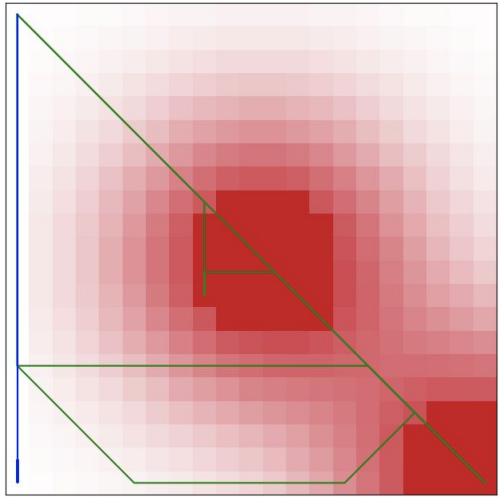
Example: Goal Bias



human
choice set



agent
choice set

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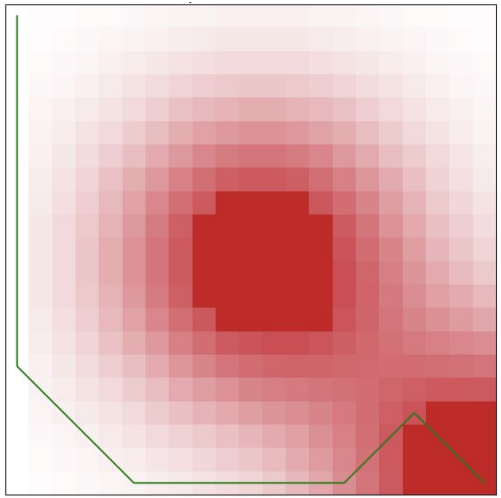
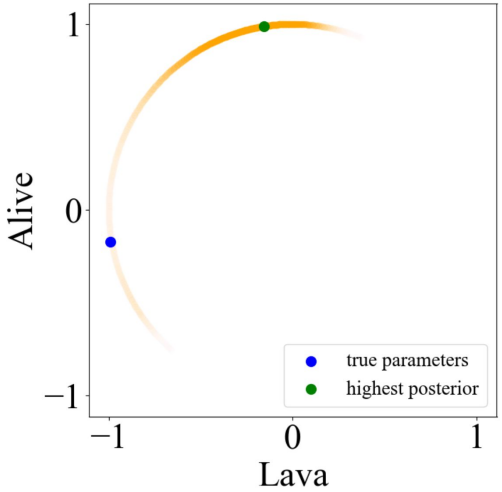
Example: Goal Bias



human
feedback

inference:

$$\mathbb{P}(r \mid c^*) = \frac{1}{Z} \cdot \frac{\exp(\beta \cdot r(\psi(c^*)))}{\sum_{c \in \mathcal{C}} \exp(\beta \cdot r(\psi(c)))} \cdot \mathbb{P}(r)$$



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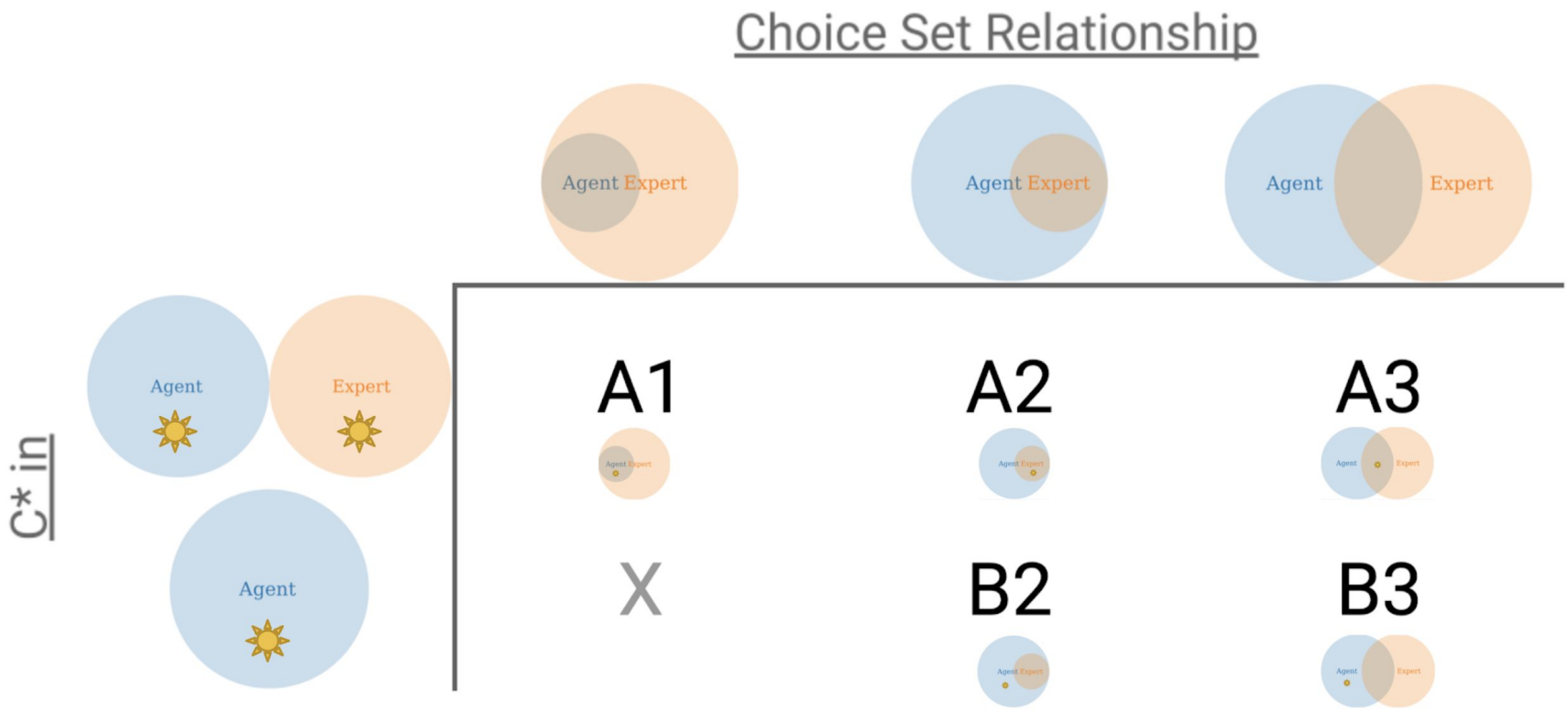
Misspecification Landscape

Proposed Taxonomy



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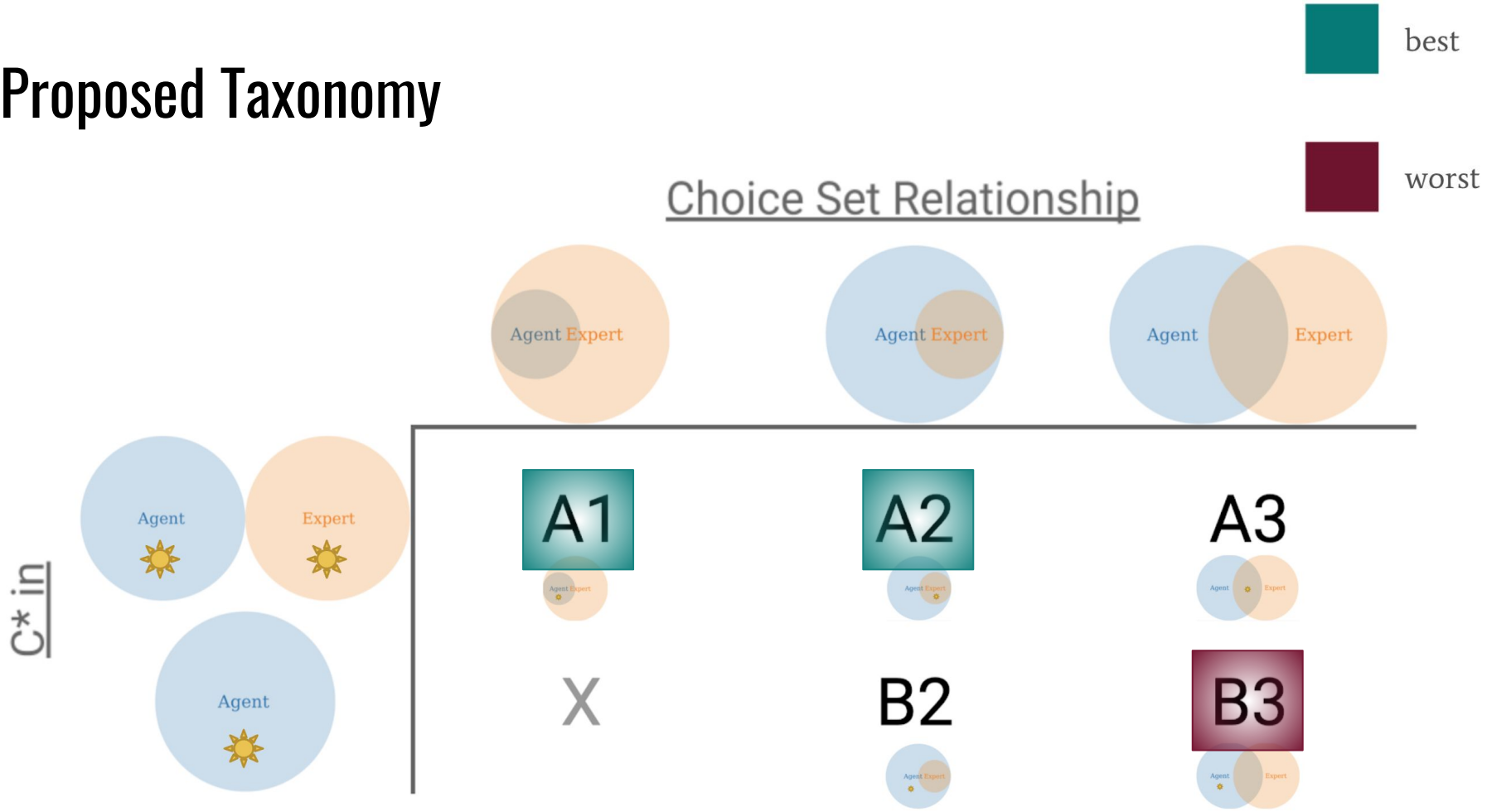

Navigating the Misspecification Landscape

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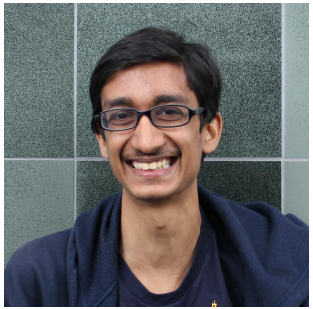
Conclusion

- Reward inference is vulnerable to choice-set misspecification
- This misspecification can be meaningfully classified
- Different classes predictably lead to different types of error
- We can use this to reduce the impact of misspecification

Acknowledgements

Thank you to my coauthors, Rohin Shah and Anca Dragan, and to the rest of CHAI for advice on this work!



Questions?