January 28, 2016 **Catrin Campbell-Moore**

Self-Referential Probability

I study languages that can express:

(π) The probability of π is not greater than or equal to $1/2$.

Connection to the liar paradox:

(λ) λ is not true

Seemingly harmless principles like introspection now lead to contradictions.

Why consider such sentences? §1.1.1

These arise in languages that can express:

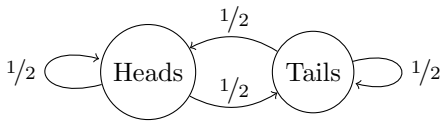
- Georgie is (probabilistically) certain that Dan believes to degree $1/2$ that the coin will land heads.
- Every sentence has probability greater than or equal to 0.

Can give us options for how to deal with cases like promotion:

> Alice will get a promotion just if she does not have a degree of belief greater than or equal to $1/2$ that she'll get it.

Developing a semantics Part I

Use possible world structures to provide the facts about probability. E.g.



Allows for varying extensions of P.

- The obvious definition

  $$w \models_{\mathfrak{M}} \mathsf{P}_{\geqslant r}\ulcorner\varphi\urcorner \iff m_w\{v \mid v \models_{\mathfrak{M}} \varphi\} \geqslant r,$$

  is often not satisfiable. (ch. 2)

Useful technique: Generalise semantics given for the liar paradox.

- Kripkean semantics – Non-classical probabilities.
  - Strong Kleene (ch. 3) – Also obtain an axiomatisation.
  - Supervaluational (ch. 4) – Provides imprecise probabilities.
- Revision theory (ch. 5) – Classical probabilities, but non-terminating sequence of models.

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Rationality Requirements Part II

The accuracy argument (ch. 7) and the Dutch book argument (ch. 8).

I formalise and study proposals by Caie:

Consider how good a credal state would be were the agent to adopt it (i.e. if it were the interpretation of P).

- Leads to unwieldy rationality constraints (§7.2)
  - Non-probabilistic,
  - Non-introspective,
  - Negative,
  - Non-logically-omniscient.

We should instead:

Evaluate a credal state from the initial credal state's perspective.

Different formulations of this allow for the different semantics as developed in part I.