Précis of Bayesian Reality
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\[ P(A|B) = \frac{P(B|A) P(A)}{P(B)} \]

-Bayes rule- takes into account conditional probabilities of each aspect of a situation—therefore it can handle prior knowledge
-Human rationality is based on probability rather than logic, and probability can “provide a calculus for rationally updating beliefs”
- Logic and understanding of the mind
  - It is truth preserving and conclusions rest on absolute certainty that premises are true
  - Logic was meant to capture patterns of rational thought, therefore, cognitive science theories grew out of the idea that rational thought may be governed by logic
  - all illogical performance was attributed to misunderstanding to misapplication of rules- not to faulty logic
- Normative models- set standard for optimum performance and it is assumed that humans want to perform well, so deviation from the normative model can be assumed to be limits on cognitive capacities
- Rational Analysis- By incorporating performance data into a normative model framework, it can be used to model or to see what people are actually computing, therefore the normative model is just a component of rational analysis
  - Bayesian analysis is the modeling framework
  - resulting model has no claim for optimality so in a sense this modeling is descriptive
  - not intended to be a theory of psychological processes
  - not evaluating competence on these tasks but simply to understand how the mind may calculate
- Monotonicity (adding parameters can never overturn existing conclusions) is a rule of logic, but in the real world non-monotonicity is common (Frame Problem) but these problems are outside the scope of deductive logic (i.e. inferences)
  - Uncertainty cannot be accounted for in logic models, but probability deals directly with uncertainty
  - With probabilistic approaches, we can now say B is probable if A is true- there is degree for uncertainty
- What appear to be errors can be rationally explained in a Bayesian framework
- Conditional Inference- Bayesian approach invokes probability
  - Conditional Probabilities and degrees of belief are accounted for
  - Bayesian analysis provides a better fit to the asymmetries between the 4 different logical inferences (Fig 2) and BR better explains some of the biases (negative conclusion bias: fig 3 and fig 4)
- Wason’s selection task- to falsify the rule or to confirm- conditional probabilities may explain why it is commonly sought to confirm- what gives us the most information?
- When it is changed to permissive rule-based task, no information gain is needed, which is why people perform better when framework is changed
- Probabilistic Heuristics Model- reasoning about all and some might be similar to other probabilistic quantifiers- we use simple heuristics to make conclusions on unquantifiable probabilities
  - Generate heuristics – produce candidate conclusions
  - Test heuristics- evaluate probability of candidate conclusions
- Empirical results have provided support for the PHM and it is able to describe the data of syllogisms and when people tend to make Invalid conclusions
- Much empirical support has been provided for taking a probabilistic approach to human reasoning and leaves open the question of to what extent the brain can actually be viewed as a probabilistic machine?