The three waves of robotics | Jeremy Wyatt

Vocabulary

sentience	intentions	desires	first order approximation of the truth
structured manipulation	precise control of positions	novelty	out of sync
conversely	to anticipate	reasoning under uncertainty	probabilistic AI
prior beliefs	unrenewable sensing	unstructured mobility	revolution in perception
visual landmarks	a breakthrough in perception	cognition	common sense
novel worlds	Bayesian reasoning	unstructured manipulation	actuators
position control devices	optimization techniques	unstructured environments	unstructured manipulation

1.1 Questions

1. What is a “first order approximation”?
2. What sorts of tasks and activities are difficult to automate?
3. What developments and features characterize the second wave of robotics?
4. What is probabilistic AI and why is Bayes and his mathematical work so important to the current and future development of AI?
5. What is the difference between *perception* and *cognition* in the context of AI?
6. What examples does he use to illustrate the limitation of second wave robots?
7. What developments and features will characterize the third wave of robotics?
8. In what way is Boris’s functioning different to Justin’s, and what kind of programming makes this possible? What is the connection between Bayes’s probability theorem and this kind of programming?
9. What features characterize **a.** the first wave of robotics; **b.** the second wave; **c.** the third wave?
10. Do you agree with the speaker that “all of the benefits in our society have all arisen from automation”?

Bayesian Inference

$$P(A|B) = \frac{P(B|A)\ P(A)}{P(B)}$$

Bayes’s Theorem

Questions

1. As succinctly and as clearly as you can, explain the problem posed in the video that we can use Bayes's Theorem to solve.
2. What are the three types of probability mentioned in the video?
3. Why is one of these forms of probability not reversible?
4. Do you feel the implications of Bayes's theorem are counterintuitive?
5. What is the relevance of Bayesian probability/inference to deep and unstructured learning?

Problem A

In a particular pain clinic, 10% of patients are prescribed narcotic pain killers. Overall, five percent of the clinic's patients are addicted to narcotics (including pain killers and illegal substances). Out of all the people prescribed pain pills, 8% are addicts. *If a patient is an addict, what is the probability that they will be prescribed pain pills?*

Problem B

It's a typically hot morning in June in Durham. You look outside and see some dark clouds rolling in. Is it going to rain?

Historically, there is a 30% chance of rain on any given day in June. Furthermore, on days when it does in fact rain, 95% of the time there are dark clouds that roll in during the morning. But, on days when it does not rain, 25% of the time there are dark clouds that roll in during the morning.

Given that there are dark clouds rolling in, what is the chance that it will rain?