

# CS26210: The AI Toolbox Part 2

reasoning in an uncertain world

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# Basics

- Me for a couple of lectures
  - Knowledge Representation
  - Introduction to Logic
- Elio for about 10
  - Fuzzy Logic
  - Probabilistic Reasoning
- Back to me for the last section
  - Predicate Logic
  - Prolog

# Basics

- Assessment by in-class test and assignments:
  - 1<sup>st</sup> assignment on fuzzy logic 15%
  - 2<sup>nd</sup> in-class test on set theory, probability etc... 15%
  - 3<sup>rd</sup> assignment on Bayesian networks 20%
  - 4<sup>th</sup> Programming in Prolog 50%
- Try to think through things you are taught in context of systems you might come across
- Ask questions, look things up, read R+N

# Knowledge Representation (1)

- How to represent information about real problems such that:
  - Sufficient information is captured
  - Information is in a format that allows useful manipulation of it to be done by the computer
- You will have seen some examples already in CS26110 and other places...
  - Genetic algorithms? Neural networks? Decision trees?

# Knowledge Representation (2)

- Why does it matter?
  - Different representations are good for different things
  - Capturing the “right” information is not trivial
  - Attempting to capture too much can be disastrous
- This module is concerned with “High level” symbolic representations
  - Physical symbol system hypothesis
  - Enough to do useful reasoning (symbols, expressions and processes)

# Knowledge Representation (3)

- Syntax
  - Attempting to capture too much can be disastrous
- Semantics
  - Enough to do useful reasoning (symbols, expressions and processes)
- Suitable syntax and semantics provide a framework within which to solve problems using automated reasoning **if they are “appropriate”**
- This is why knowledge representation matters

# Knowledge Representation (4)

- “Appropriate” for what?
  - The domain that we are working in
  - The problem that we want to solve
- Some representations are better than others for different domains and different problems
- Their associated symbols, expressions and processes may
  - Capture more “appropriate” information
  - Allow faster computation of relationships
  - Use less memory to represent particular situations
  - Be faster to sort etc...
- This is called “bias”

# Knowledge Representation (5)

- Questions to ask when attacking a problem:
  - What precisely is the problem I want to solve?
  - What information is pertinent?
  - What level of representation will be useful?
  - What are the symbols likely to be?
  - What operations on those symbols are needed?
- The result of answering these questions:
  - Select a syntactical and semantic framework in which to tackle the problem



# Things to do...

- Go and read some stuff about this
- Think about how this might relate to problems you are familiar with
- Come back tomorrow for a very quick introduction to logic