Prolog Example Problems
and
Groupwork relevance to getting a job

Michelle Strout

THE UNIVERSITY
OF ARIZONA

Plan

- **Announcements**
  - LA2 has been posted

- **Last time**
  - Starting LA2
  - More Prolog functionality
  - Example Prolog problems

- **Today**
  - Man, Wolf, Goat, Cheese problem
  - Knapsack problem
  - Getting a job, how is groupwork relevant?

Problem-solving in Prolog
Note: Answers to these will not be posted in these slides. Posting the answers in piazza is encouraged and will be rewarded with extra credit points.

Remember: Prolog is *declarative*.

Instead of thinking about *how* to find a solution, we need to think about *what* a solution looks like.

And then we let Prolog do the rest.

Other reminders

- Everything is unification (i.e. pattern matching).
- You do not have to specify when predicates should fail. You only need to specify what makes them true.

Man-Wolf-Goat-Cabbage

Problem Definition

A man has a wolf, a goat, and a cabbage. He also has a boat that can carry at most himself and one of his items at a time. He and all his items are on the west side of a river, and he needs to get them all over to the east side of the river. However, if at any point he leaves the wolf and the goat together unsupervised, the wolf will eat the goat. Similarly, if he ever leaves the goat and the cabbage together unsupervised, the goat will eat the cabbage. How can he get everyone safely across the river?

What does a solution to this problem look like?

The Knapsack Problem

Problem Definition

We start with a list of items, each with a *weight* and a *value*. We also have a knapsack that has a specific *weight limit*. The problem is to determine *the subset of items* that we can carry in the knapsack (without exceeding the weight limit) that will *maximize the total value.*

Example.

Here we see an example of the 0-1 knapsack problem, which means that each item can either be in (1) or out (0).

Let's say the knapsack can hold up to 5 kg, and we can choose from the following items:

- rock (w = 2 kg, v = $2)
- book (w = 1 kg, v = $4)
- diamond (w = 5 kg, v = $5)
- sandwich (w = 3 kg, v = $3)

The Decision Version

We start with a list of items, each with a *weight* and a *value*. We also have a knapsack that has a specific *weight limit*. The problem is to determine *if a subset of items exists* that fits within the weight limit and also has a total value that is greater than or equal to some threshold *V*.

What does a solution to this problem look like?

Getting a Job and Group Work

- **TopHat questions and discussion about Group Work**

- **Last time**
  - Starting LA2
  - More Prolog functionality
  - Example Prolog problems

- **Today**
  - Man, Wolf, Goat, Cheese problem
  - Knapsack problem
  - Getting a job, how is groupwork relevant?

Group Work as a proxy for Teamwork

- TopHat questions and discussion about Group Work

- How things work in industry
  - Working in a team is the norm
    - Code reviewing skills are needed (giving and receiving feedback)
    - Everyone is expected to contribute to breaking down tasks and matching them with team members
    - Integration and testing is used to ensure components work together
  - Dealing with ambiguity and conflict resolution
    - Negotiating trade-offs (e.g., performance vs. maintainability)
    - Resolving disagreements over implementation details
    - Handling uneven contributions from teammates
  - Cross-functional collaboration
  - Agile & Project Management Practices

Getting a Job and Group Work

- **Group Work relevance to interviewing**
  - Behavioral questions about collaboration, conflict resolution, and teamwork
    - Groupwork can provide concrete examples for you to share
  - Communication skills
    - explain your thought process, review others' code, and engage in design discussions
    - Talk about a time you received or gave constructive feedback, how did the conversation go, and what was the result of that interaction?
  - Understanding how a project is managed
    - Version control and other collaboration tools used
    - How was work divided amongst group members?
    - How was work incorporated and tested?