How can computation help you make decisions?

TV Series Recommendation

Imagine: You’re bored and need a recommendation for a TV series to start watching.

Netflix Prize

$1 million prize awarded in 2009
training set included 100 million ratings for 480,000 users and 18,000 movies
Reading on course syllabus page “If You Liked…”

www.nanocrowd.com

Looking for a movie to watch?

Type the name of a favorite movie, actor, or director.

Click to select your favorite genres. Then “go”.

Trying to decide if you’ll like a movie? Find out.
How does this program work?

Flowcharts and Decision Trees: Informal

Flowchart:
- Visual representation of steps of algorithm
- Summarizes how algorithm behaves given specific answers

Decision Tree:
- Flowchart with no actions, just questions
- Shows final decision based on previous answers

Boxes: Represent states (or actions)
Arrows (or edges): Show transitions (or decisions) between states
### Decision Trees

**Boxes/Nodes:** Ask different questions  
Root node: Initial state  
Leaf nodes: Final decision or result  

**Edges/Arrow:** Labeled with different answers  
Arrive at later "internal" nodes depending upon previous answers  
Different branches can have different # possible answers, depth  

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### Can we recreate TV decision tree?

**Initial State:**  
Drama or Comedy or Not Sure?  

- **Drama:** Sci Fi or Not?  
  - **Y:** Battlestar Galactica  
  - **N:** The Wire  
- **Comedy:** Improv or Scripted?  
  - **Y:** Curb Your Enthusiasm  
  - **N:** The Office  
- **Desperate Housewives**  

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### How to Implement Decision Tree?

**Initial State:**  
Drama or Comedy or Not Sure?  

- **Drama:** Sci Fi or Not?  
- **Comedy:** Improv or Scripted?  
- **Desperate Housewives**  

**When in initial state:**  
- **Ask question...**  
- **If answer is D:** go to state Drama  
- **If answer is C:** go to state Comedy  
- **If answer is N:** go to state Desperate  

**When in state Drama:**  
- **Ask question...**  
- **If answer is Y:** go to state Battlestar Galactica  
- **If answer is N:** go to state The Office
Essential Control Constructs: If then else

How to Use If-Then (Else)

Cat Sprite
- Moves with arrow keys
- Meow when mouse is down
- Weird color when on stage; otherwise orange

Implement the Decision Tree?

Design your own Design Tree?

Challenge: Construct a decision tree with only yes/no questions leading to one tv show.
Find the smallest number of questions to choose between 8 movies.

Some questions are much better than others!
Poor Questions: Need to ask a lot
Very poor if thousands of TV shows to pick from!

Good Questions: Need to ask only very few!
1) Some great yes/no question... 2) Some great yes/no question... 3) Some great yes/no question...
Goal: Find questions that divide choices into two equal-sized groups

Decision Trees Everywhere
Decision trees represent many activities
Choose Your Own Adventure

In paperback book:
• Pages in book represent different states (Nodes)
• Turn to different page for different decisions (Edges)

Cave of Time Decision Tree
Decision Trees: 
Straight-forward to Specify

Easy to implement in many frameworks

Basic format:
- State X:
  - if (decision A) goto state Y
  - if (decision B) goto state Z

Structure web pages to form tree
- Current page is current state
- Click on different links to bring you to different pages

Example: http://editthis.info/choose_your_own_adventure/Paladin

Programming Concepts

General advice
- Divide high-level functionality into logical units (e.g., scenes)
- Use descriptive names (messages)
- Specify initial state (what program looks like when started)
- Incrementally test code as you go
- Make "non-fragile" code

Control flow
- Scripts must be activated to run
  - When flag clicked; When receive message
- Execution within script proceeds sequentially
- forever, repeat, repeat until, if <expr> then <action1> else <action2>

Data Types: Strings (list of characters, words)
- Ask questions: User types string stored in variable "answer"
- String manipulation: letter <> of <string>

Check-Up
Can you draw the corresponding decision tree for these scripts?

Announcements

HW 2 due today before lecture
- Vote on favorites in gallery
- Extra credit for most liked

HW 3 due next week (Monday before lecture)
- Interactive story (see example)
- Movie recommendation systems
- Step-through Scratch code

Wednesday is laptop day