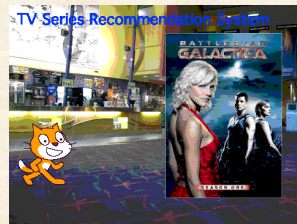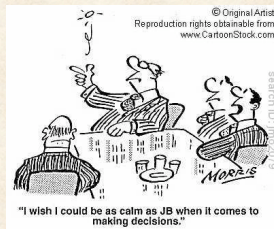UNIVERSITY of WISCONSIN–MADISON
Computer Sciences Department

CS 202: Introduction to Computation   Professor Andrea Arpaci-Dusseau
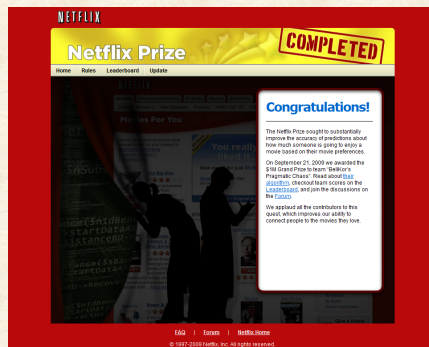
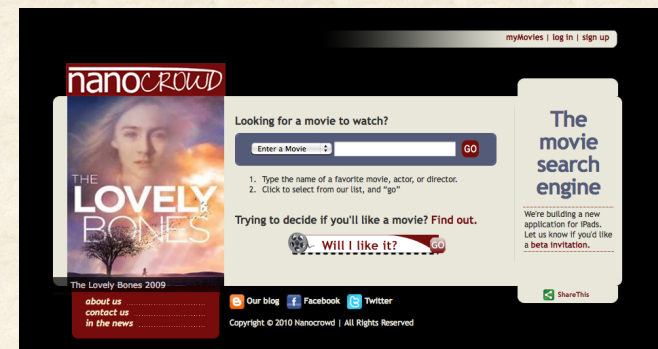## How can computation...
help you make decisions?

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"I wish I could be as calm as JB when it comes to making decisions."

TV Series Recommendation System

TV Series Recommendation

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

Netflix Prize

NETFLIX
Netflix Prize   **COMPLETED**
Home   Rules   Leaderboard   Update

Congratulations!

The Netflix Prize sought to substantially improve the accuracy of predictions about how much someone is going to enjoy a movie based on their movie preferences.

On September 21, 2009 we awarded the $1M Grand Prize to team "BellKor's Pragmatic Chaos". Read about their algorithm, check out team scores on the Leaderboard, and join the discussions on the Forum.

We applaud all the contributors to this quest, which improves our ability to connect people to the movies they love.

FAQ | Forum | Netflix Home
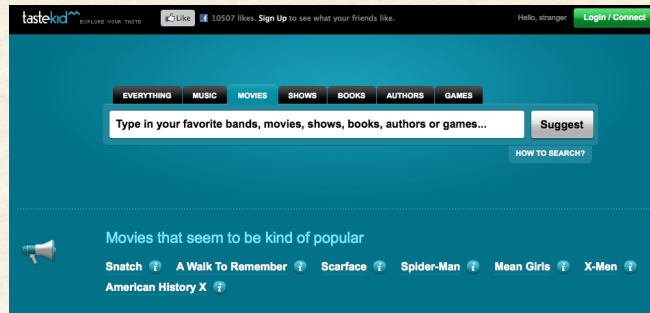© 1997-2009 Netflix, Inc. All rights reserved.

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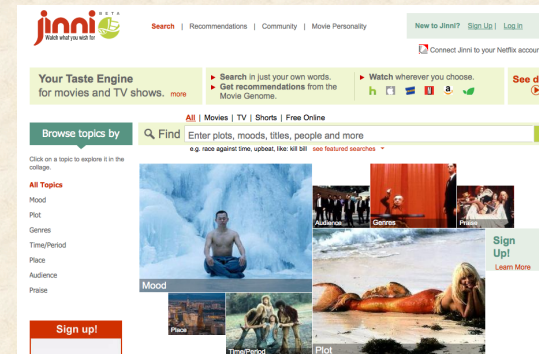Reading on course syllabus page "If You Liked..."

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www.nanocrowd.com

nanoCROWD   myMovies | log in | sign up

THE LOVELY BONES

The Lovely Bones 2009

Looking for a movie to watch?

Enter a Movie   [   ]   GO

1. Type the name of a favorite movie, actor, or director.
2. Click to select from our list, and "go"

Trying to decide if you'll like a movie? Find out.

Will I like it?   GO

The movie search engine

We're building a new application for iPads. Let us know if you'd like a beta invitation.

ShareThis

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Our blog   Facebook   Twitter

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www.tastekid.com

www.jinni.com

How does this program work?

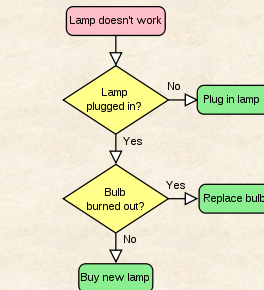
TV Series Recommendation System

Flowcharts and Decision Trees: Informal

Flowchart:

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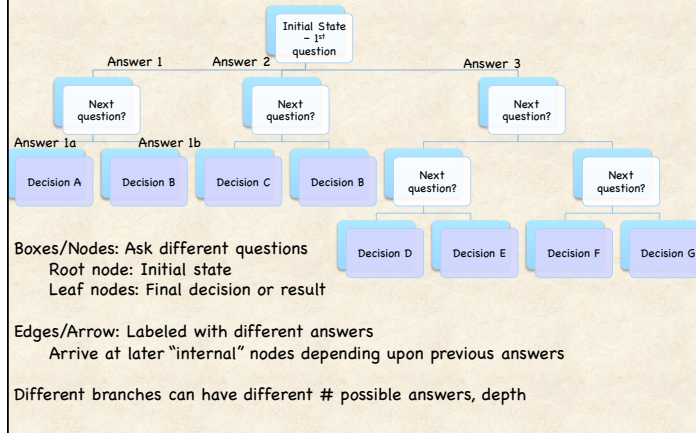
Decision Tree:

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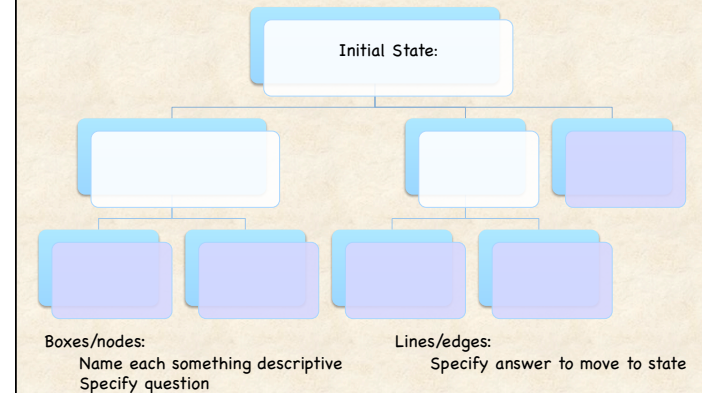- Shows final decision based on previous answers

Boxes: Represent states (or actions)

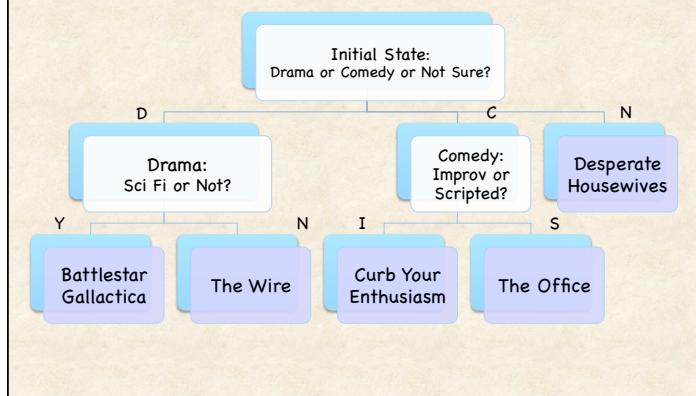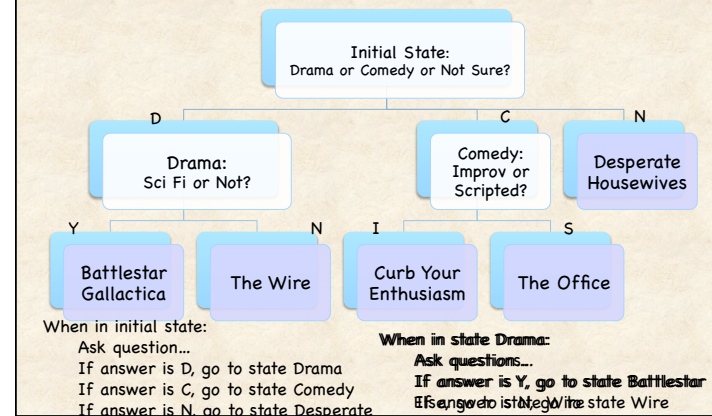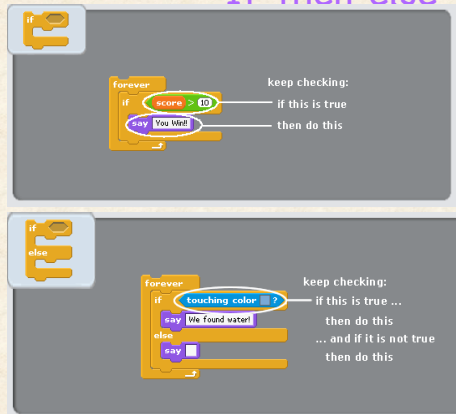Arrows (or edges): Show transitions (or decisions) between states

Decision Trees

Initial State – 1st question

Answer 1   Answer 2   Answer 3

Next question?   Next question?   Next question?

Answer 1a   Answer 1b

Decision A   Decision B   Decision C   Decision B   Next question?   Next question?

Decision D   Decision E   Decision F   Decision G

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

Can we recreate TV decision tree?

Initial State:

Boxes/nodes:
    Name each something descriptive
    Specify question

Lines/edges:
    Specify answer to move to state

Can we recreate TV decision tree?

Initial State:
Drama or Comedy or Not Sure?

D   C   N

Drama:
Sci Fi or Not?

Comedy:
Improv or Scripted?

Desperate Housewives

Y   N   I   S

Battlestar Gallactica   The Wire   Curb Your Enthusiasm   The Office

How to Implement Decision Tree?

Initial State:
Drama or Comedy or Not Sure?

D   C   N

Drama:
Sci Fi or Not?

Comedy:
Improv or Scripted?

Desperate Housewives

Y   N   I   S

Battlestar Gallactica   The Wire   Curb Your Enthusiasm   The Office

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 questions...
    If answer is Y, go to state Battlestar
    If answer is N, go to state Wire

3

Essential Control Constructs: If then else

if

forever
if score > 10   keep checking:
           if this is true
say You Win!   then do this

if
else

forever
if touching color ?   keep checking:
            if this is true ...
say We found water!   then do this
else   ... and if it is not true
say   then do this

How to Use If-Then (Else)

Cat Sprite
- Moves with arrow keys

- Meow when mouse is down

- Weird color when on stage; otherwise orange

when right arrow key pressed
point in direction 90
move 20 steps
next costume

when left arrow key pressed
point in direction -90
move 20 steps
next costume

when 🏳 clicked
forever
if mouse down?
play sound meow until done

when 🏳 clicked
forever
if touching edge ?
set color effect to 20
else
set color effect to 0

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!

4

Poor Questions: Need to ask a lot

1) Do you like musicals? 2) Vampires? 3) Shows in real time? 4) Superheros?

5) Mysterious Islands? 6) Patrick Dempsey? 7) Misanthropic medical genuises?

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...

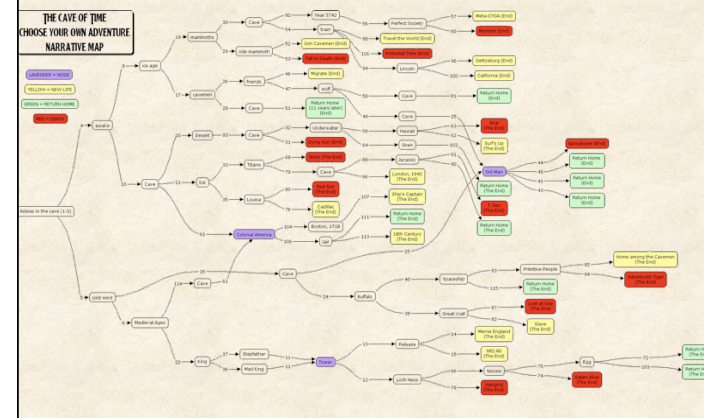Goal: Find questions that divide choices into two equal-sized groups

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 <x> 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