Introduction to the

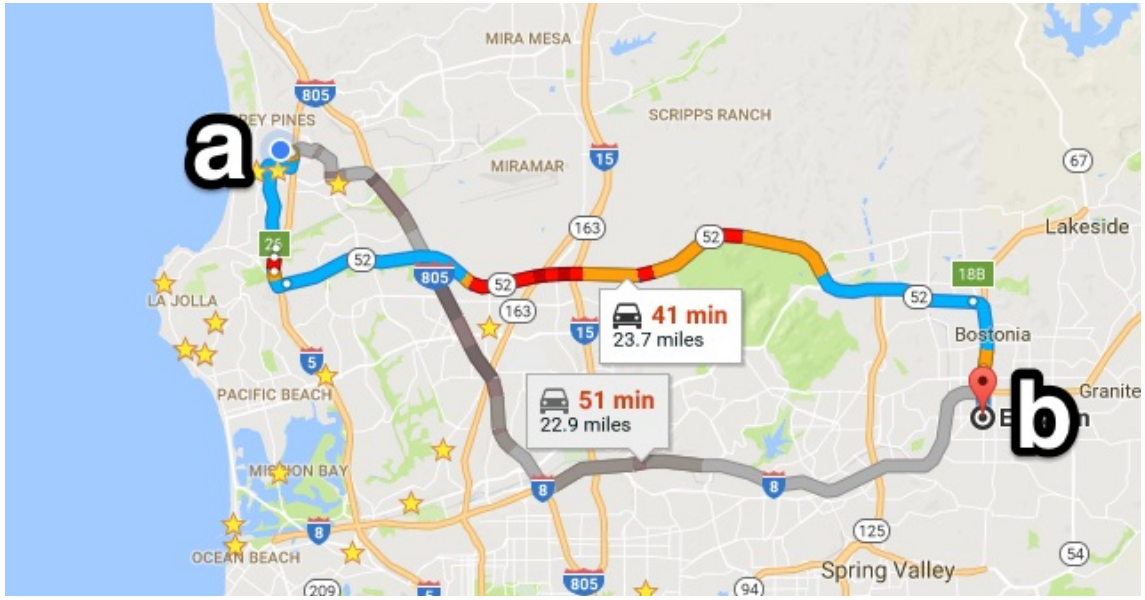
Introduction to Probability and Statistics

Probability

Statistics

Why should you care about prob&stat?
I

- Navigation software:
  - **Certainty**: Find the shortest route from a to b.
  - **Uncertainty**: Find the fastest route from from a to b.



Why should you care about prob&stat? II

- Search Engine:
  - **Certainty**: Find **all** web pages that contain the words "Trump","Hillary" and "debate"
  - **Uncertainty**: Find the 10 **most relevant** pages for the query "Trump, Hillary debate"

Why should you care about prob&stat? III

- Insurance Company:
  - **Certainty**: If a person with life insurance dies, the insurance company has to pay the family $X
  - **Uncertainty**: What is the minimal life insurance premium such that the probability that the life insurance company will be bankrupt in 10 years is smaller than 1% ?

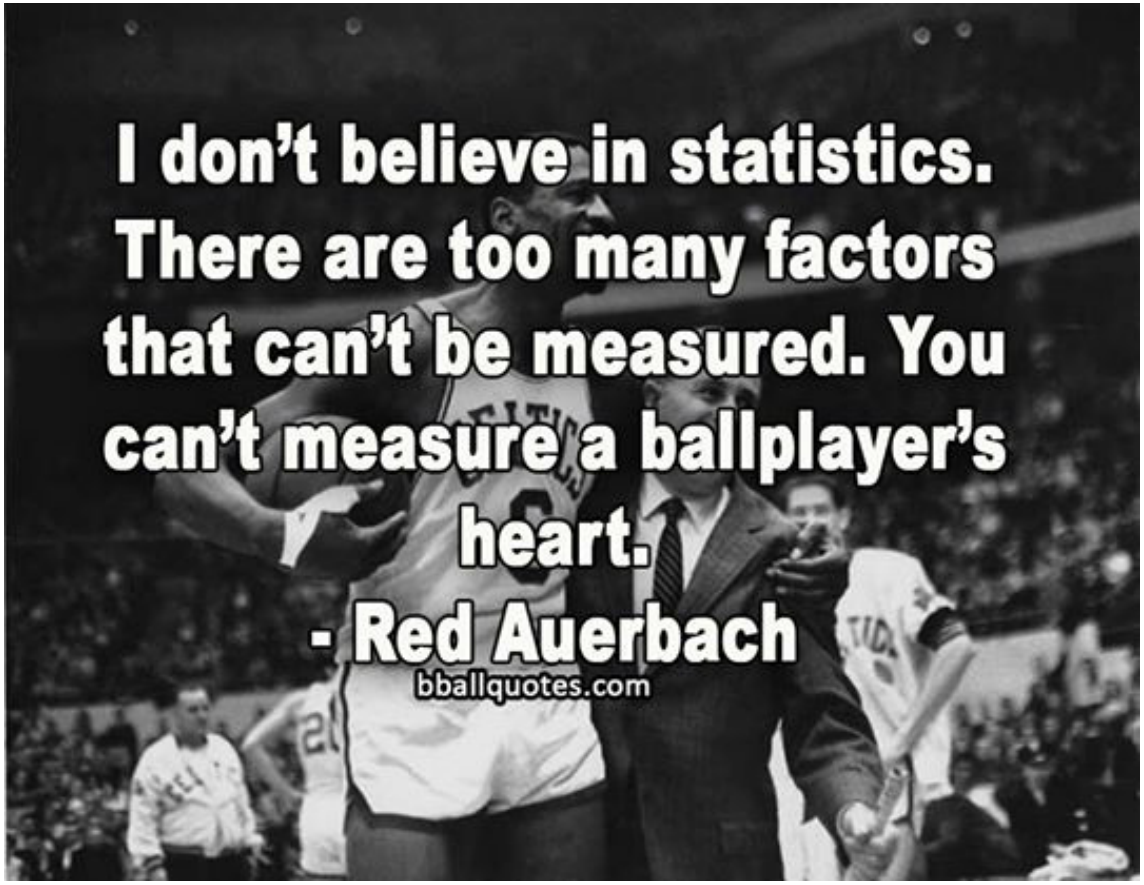
What will you learn in this course?

- Navigation and search engine problems are advanced, in this class you will learn the foundations.
- Solve basic problems of reasoning under uncertainty:
- Examples:
  - If you flip a coin 100 times, what is the probability of getting at most 10 "heads" ?
  - What is the probability of getting a "4 of a kind" hand in poker.

Computer science examples

- If you want to hash 1,000,000 elements and can allow more than 5 indirections for only 10 elements, how big does the table need to be?
- Suppose that the expected time between failures for a router is one year. What is the probability that the router will fail during the first month?

Some don't believe in statistics



Many do


Sort On
Clear
45 32 31 22 11 10
25
TurboStats
34
21 20 1
Clear
Hide
GAMES 2
15-29 52% FG
7-13 54% 3P
8-11 73% FT
#03 45 PTS
Stop
HOME
T30
T60
Eastside High
76
FOULS 7 B 1
TOL
1:02
4 Period
15-4 0 1 F
Poss
Westside High
84
TOL 1 D 11
FOULS
F 1 0
VISITOR
JMP
TKC
Clock
GAMES 2
5-7 71% FG
0-0 % 3P
2-2 100% FT
#05 12 PTS
Eastside High
Live
Stats
Shot Chart
Large Chart
Info
Summary
+/-
Events
Scout
BoxScore
Lineups
Game Factors
Westside High
> Mark Grant
25 Gary Adams
> Reggie Jones
> Jake Scott
> Bobby Brown
> Pete Thomas
31 Ken Jones
45 Jason Gamble
22 Donovan Korn
10 Roger Aken
Opponents
Eastside High
Def
Mark Grant
Def
Westside High
Jake Scott
PTS 10 PF 4 +/- -7 Run 5
Bobby Brown
PTS 9 PF 4 +/- 0 Run 7
Reggie Jones
PTS 12 PF 3 +/- -7 Run 7
Pete Thomas
PTS 9 PF 4 +/- 6 Run 2
Mark Grant
PTS 21 PF 3 +/- -4 Run 7
01
15
42
30
03
Ast TO Stl OF Foul Tec Blk Off Def
UA Made P FT P Miss LS
02
12
03
30
05
Nathan Smith
PF 3 +/- 11 Run 1 PTS 18
Ryan Sidney
PF 4 +/- 4 Run 7 PTS 14
Tim Thomas
PF 4 +/- 8 Run 7 PTS 9
Steve Smith
PF 4 +/- 0 Run 2 PTS 10
Martin Mason
PF 3 +/- -1 Run 0 PTS 12
Play..
15 Bobby B... oul
Clear
Other
DPTS
T
T
Plays
03
Post Online
02
Defense
Bench
Add
32 Erik Smith
11 Ryan Long
TEAM
Bench
Add
+ Add Player
01 Kevin Ian
Game Statistics for Eastside High
+ Video
Scout
Lrg Display
Factors
Events
Update
Name GS Min FG-A FG% 3P-A 3P% OR DR REB Ast Stl Blk TO PF Pts Eff NET
03 Mark Grant 1 28.2 8-14 57.1 4-8 50.0 4 0 0 0 2 3 21 17 95.5
25 Gary Adams 21.2 2-7 28.6 1-3 33.3 2 1 0 0 4 5 8 73.6
End Live
< Score >
Games
Save Game

Summary

- Uncertainty is all around us.
- Probability and Statistics provide a rational way to deal with uncertainty.

- Next:
  - What is probability?
  - What is statistics?