

INFO-2301

Quantitative Reasoning

Prof. Michael Paul

Spring 2019

MWF 10-10:50am

MUEN E113

Prediction

- Theme of this class: **prediction**
- **Predict** = guess the value(s) of unknown variable(s)
 - (not necessarily prediction of future... a.k.a. *forecasting*)
- Prediction is a key component of data science
 - The *science* of data science
 - Requires understanding *uncertainty* and *probability*

what should I |

do

say

call

q w e r t y u i o p

a s d f g h j k l




⬆ z x c v b n m ⬅

123





space










return

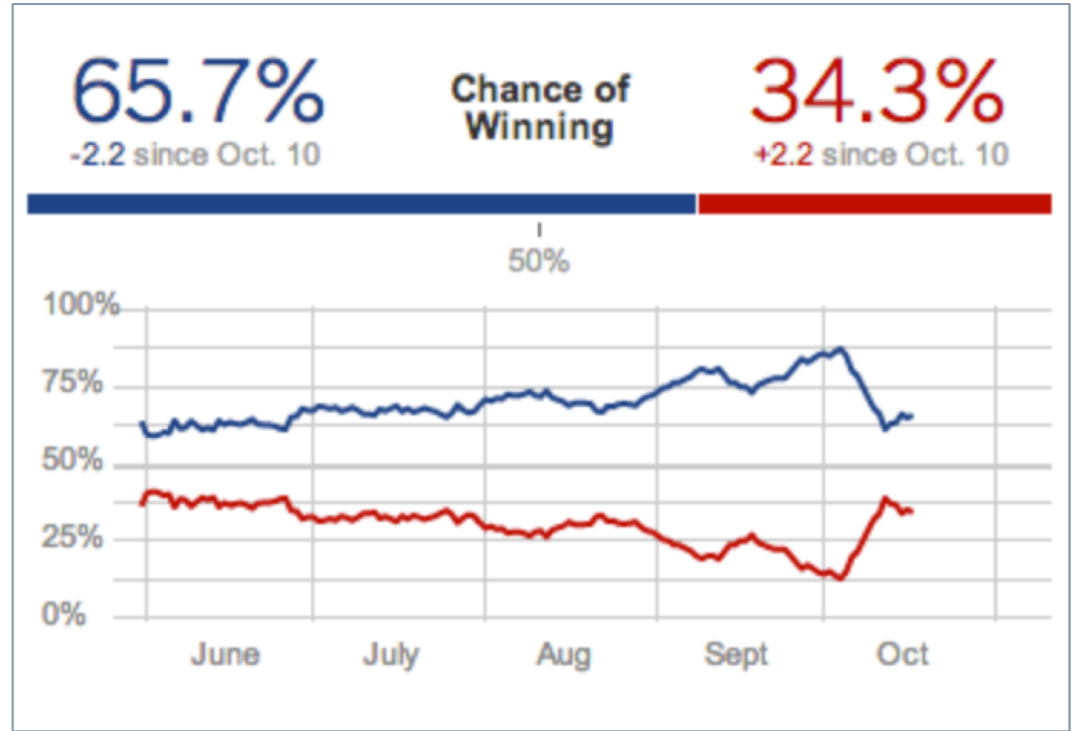
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- Individual events may be uncertain, while long-term patterns are stable
- Managing *risk*:
 - Casinos can expect to win more than they lose
 - Same with insurance companies
 - But more complicated, because the probabilities aren't fixed like in a game

Topics

- Discrete mathematics / data structures
 - Data types and operations
 - Counting and combinations
- Probability
 - Key formulas and concepts
 - Common distributions (e.g., bell curves)

These two areas are closely related!

We will explore these concepts through programming.

Programming

- Python 3, Jupyter notebooks
- Helpful to take INFO-2201 previously/concurrently

- You'll learn how to:
 - Calculate statistics in Python
 - Run simulations
 - Calculate probabilities and make predictions

- Also: how do computers do randomness?

Programming

- We will often do programming in class
- **You should bring your laptop each day unless I tell you**
- If you need to borrow a laptop for this class, contact me

Books

- No required textbook
- Will share readings from various sources
- Free electronic text:
 - Diez, Barr, Çetinkaya-Rundel (2015) OpenIntro Statistics, 3rd Edition

Canvas

- We will use Canvas for the course website
- Check for readings, assignments, slides, etc.
- Discussion board: ask questions, share resources

Communication

- Contacting Prof. Paul:
 - Email: mpaul@colorado.edu (include 2301 in subject)
- Office hours:
 - Wednesdays, 2:15-4:45pm, TLC 266
 - By appointment if the Wednesdays time doesn't work

Grading

- 5% - Attendance (will be randomly checked)
- 10% - Quizzes (will be announced)
- 20% - Midterm Exam
- 25% - Final Exam
- 40% - Homework (mix of math and programming)

Attendance

- Will be checked occasionally on random days
- If you need to miss class, notify Prof. Paul *before* class

Introductions

- Your full name, and what you would like me to call you
- Your major and year

Puzzle

You are a prisoner sentenced to death. The Emperor offers you a chance to live by playing a simple game. He gives you 50 black marbles, 50 white marbles and 2 empty bowls. He then says, "Divide these 100 marbles into these 2 bowls. You can divide them any way you like as long as you use all the marbles. Then I will blindfold you and mix the bowls around. You then can choose one bowl and remove ONE marble. If the marble is WHITE you will live, but if the marble is BLACK... you will die."

How do you divide the marbles up so that you have the greatest probability of choosing a WHITE marble?

From: <https://www.braingle.com/Probability.html>

Puzzle 2

Henry has been caught stealing cattle, and is brought into town for justice. The law calls for two shots to be taken at Henry from close range. To make things a little better for Henry, the judge tells him she will place two bullets into a six-chambered revolver in *consecutive order*. She will spin the chamber, close it, and take one shot. If Henry is still alive, she will then either take another shot, or spin the chamber again before shooting.

The first shot was blank. The judge asks, "Do you want me to pull the trigger again, or should I spin the chamber a second time before pulling the trigger?"

What should Henry choose?