Machine Learning applied to Planetary Sciences

PTYS 595B/495B

Leon Palafox
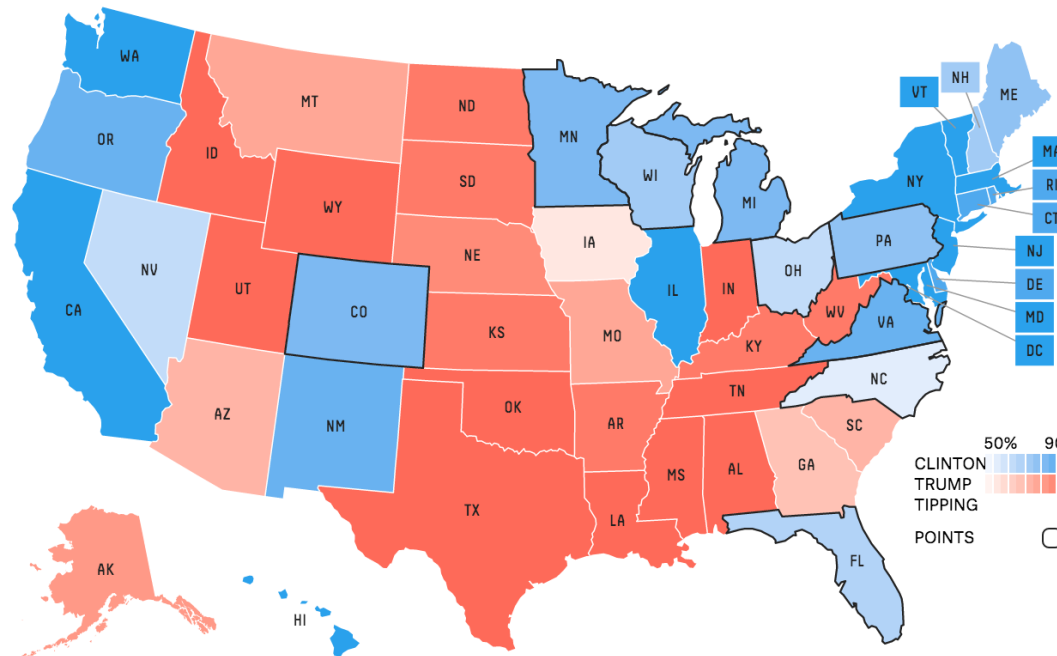
https://leonpalafox.github.io/MLClass/

Probability of an event happening

P = 1/12

Probability has different connotations in different events.

Chance of winning

Hillary Clinton **75.8%** Donald Trump **24.2%**

http://projects.fivethirtyeight.com/2016-election-forecast

Probability Distributions

- What is a probability?
  - Is a measure of uncertainty (or certainty) for an event.
- In Machine Learning we often deal with uncertain scenarios.
  - The world is uncertain.
- We have two kinds of Probability:
  - Frequentist
  - Bayesian

Frequentist Probability

- We can create as many scenarios as we want:
  - Bootstrapping
- Dice example
- Soccer Matches (maybe)
- Factory quality control (6 Sigma)
  - 6 Standard deviations.
- Is often misused.

Bayesian Probability

- We can't really create as many scenarios as we want.
  - Plane crashes
  - Presidential Elections
  - Medical diagnosis
- Here, it represents a degree of belief in a certain event.
- People don't use it enough.

They share the same rules

- Both Bayesian and Frequentists share the same set of formal rules.
  - Math
  - Laws
  - Theorems.
- Is easy to mix them up.
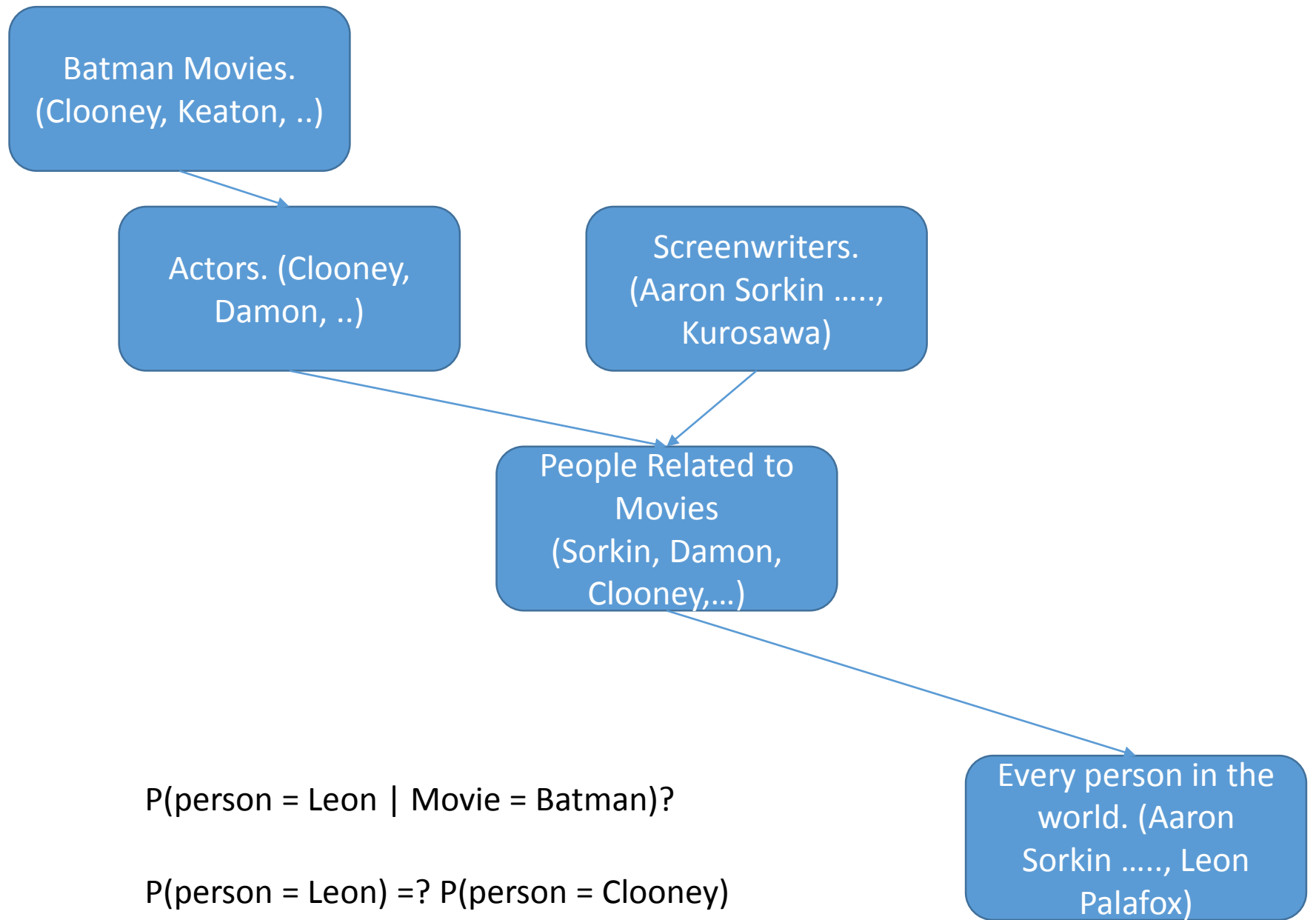 - Beware of the P-values!!!!!!!

Random Sampling

- TV Shows
    - Enterprise, Spock, Picard, Wesley
    - Lannister, Stark, Theon, Westeros
    - House, Doctor, Vicodin
- Movies
    - Clooney, Damon, Heist
    - Damon, Mars, NASA
    - Damon, Robin Williams, MIT

- Each movie is a probability distribution, each domain is a probability distribution.

Is turtles all the way down!!

Batman Movies. (Clooney, Keaton, ..)

Actors. (Clooney, Damon, ..)

Screenwriters. (Aaron Sorkin ….., Kurosawa)

People Related to Movies (Sorkin, Damon, Clooney,…)

Every person in the world. (Aaron Sorkin ….., Leon Palafox)

P(person = Leon | Movie = Batman)?

P(person = Leon) =? P(person = Clooney)

Fruit examples (Bishop's)