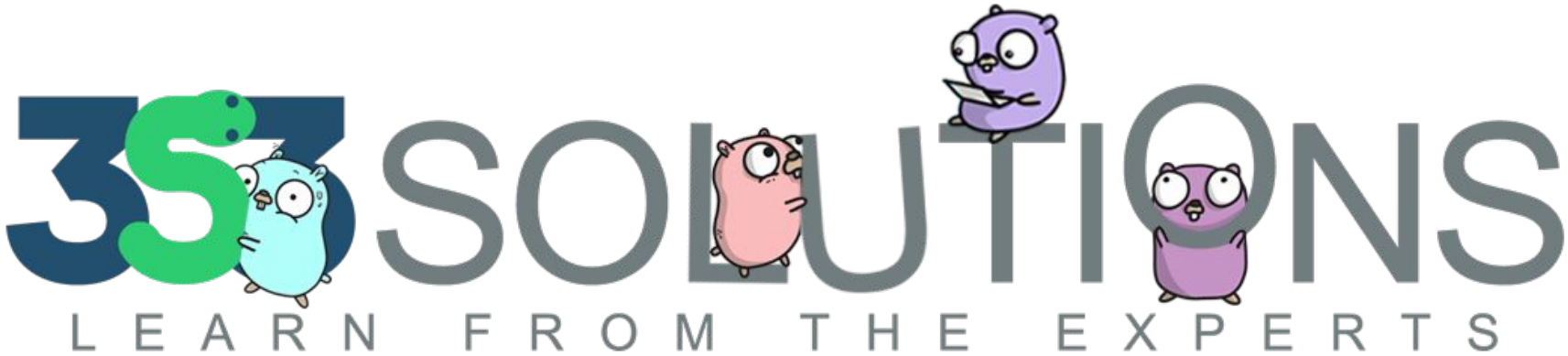
Simulations

For the Mathematically Challenged

Miki Tebeka



$$P(A|B) = \frac{P(B|A)P(A)}{P(B)}$$

$$z = \frac{x - \mu}{\sigma} \qquad \rho_{X,Y} = \frac{cov(X,Y)}{\sigma_X \sigma_Y}$$

$$I(X;Y) = D_{KL}(P_{(X,Y))} || P_X \otimes P_y)$$

If you can write a for-loop, you can do statistics.

Jake Vanderplas

```
import random
```

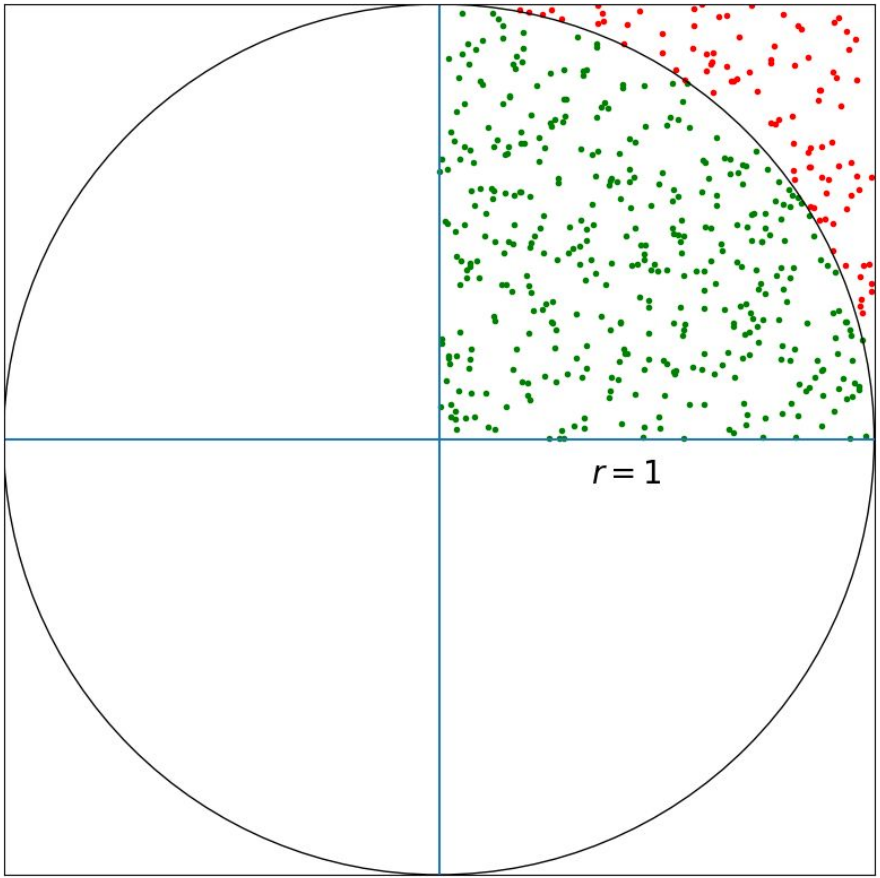
The Base for Changes

- Best Catan Tiles
- Calculating π
- Birthday problem
- Sick or Not?
- Monty Hall problem

CODE

catan.py

π



CODE

pi.py


```
$ time python pi.py
... 99% cpu 1:02.23 total
$ time pypy3 pi.py
... 98% cpu 4.838 total
```

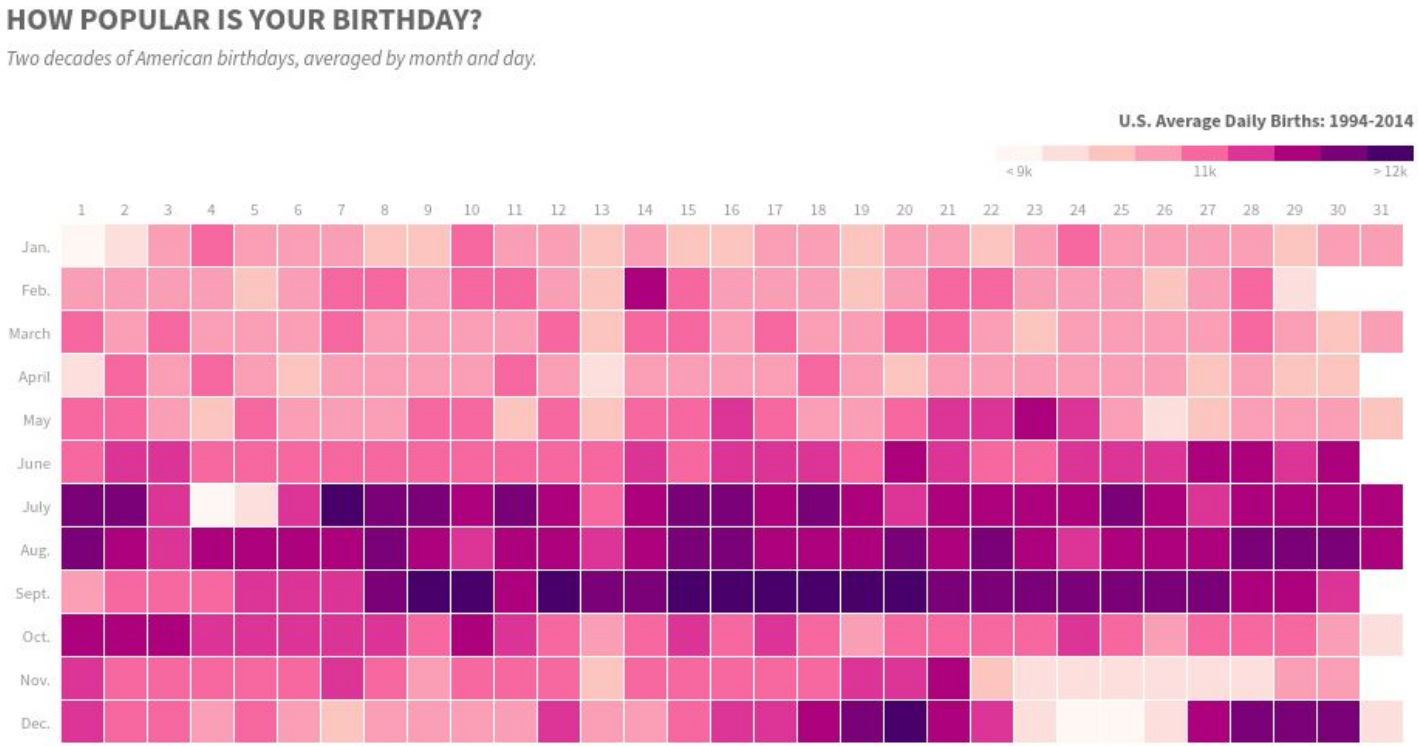
CODE

birthday.py

The chances of a piece of bread falling butter side down is directly proportional to the cost of the carpet.

COROLLARIES TO MISTER MURPHY...

All models are wrong, but some are useful. - George Box



http://thedailyviz.com/2016/09/17/how-common-is-your-birthday-dailyviz/

CODE

birthday_freq.py

The test of a disease presents a rate of **5% false positives**. The disease strikes **1/1000 of the population**. People are tested at random, regardless of whether they are suspected of having the disease. **A patient's test is positive. What is the probability of the patient being stricken with the disease?**

	Predicted Sick	Predicted Healthy
Actual Sick	True Positive	False Negative
Actual Healthy	**False Positive**	True Negative

CODE

sick.py


1
2
3

Monty Hall Problem

wikipedia.org/wiki/Monty_Hall_problem

CODE

monty.py

Learn More

Statistics for Hackers

- Jake Vanderplas

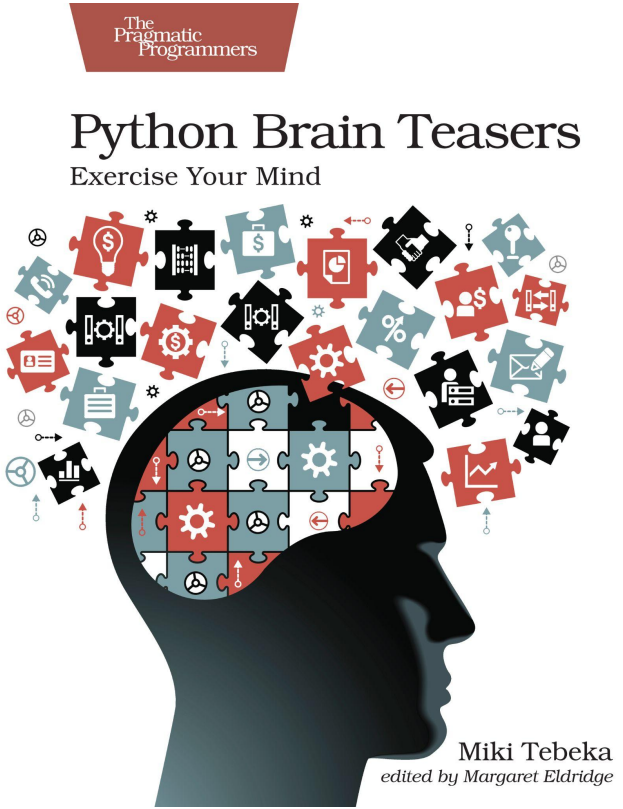
Monte Carlo Simulation

- Wikipedia

SimPy

- Discrete Simulation

Thank You



https://github.com/tebeka/talks/tree/master/pyweb-sim