

The background of the slide is a dark, starry space. Two large, glowing blue spheres are positioned in the center. The sphere on the right is larger and more prominent, while the one on the left is smaller and partially obscured by it. Both spheres have a textured, grainy surface and a bright white highlight on their upper-left edges, giving them a three-dimensional appearance. The text is centered over these spheres.

Lecture 9

Introduction to Statistics in Python

The background of the slide features a dark, star-filled space. Two large, glowing blue spheres are positioned in the center-right. The sphere in the foreground is smaller and has a bright, white-yellow center, giving it a halo effect. The sphere behind it is larger and has a more uniform blue glow. The text 'Workshop 3 Review' is centered over the space between the two spheres.

Workshop 3 Review

Review: What have you learned so far?

- How to do simple math and algebra
- How to write functions and loops
- How to work with data



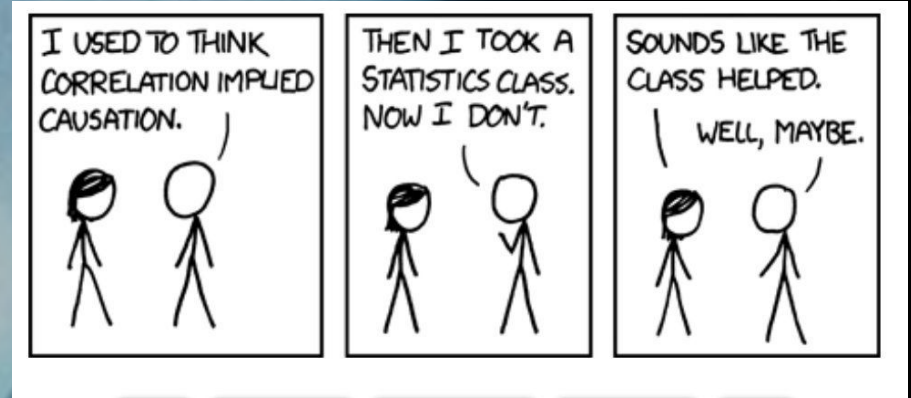
What's Next...



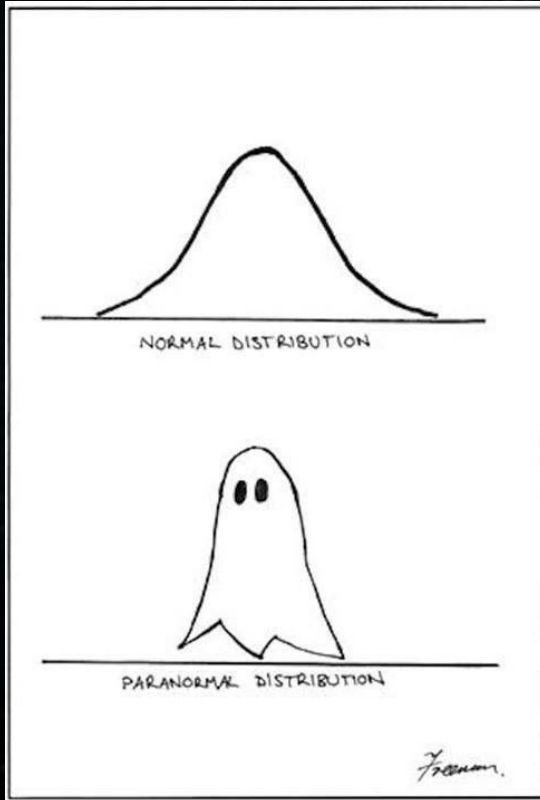
- Now that we can import and manipulate data
 - We need to be able to analyze and interpret it
- To do that we use statistics
 - Luckily, this is something python is built for

Pre-made and Easy: Mean and standard deviation

- Numpy has made this part easy for you
- No need to memorize any formulas
- Mean = `np.mean()`
- Standard Deviation = `np.std()`



What else can numpy do for you?



Different pre-made numpy functions:

- Maximum = `np.max()`
- Minimum = `np.min()`
- Median = `np.median()`
- More found at <https://numpy.org/doc/stable/reference/routines.statistics.html>

Let us Introduce You to Scipy

- Another new python package (numpy, pandas, etc.)
- Used for statistics and data modeling
- Will be your best friend when you need to start fitting data to specific models



SciPy

Randomness in Python

- As we have already seen, python has a lot of built in functions to simulate randomness
 - Example: `np.random.rand()`
- We also have access to functions that create random distributions of particular shapes (gaussian, poissonian, etc.)
- As we will see today, generating these data sets can be a very useful way to solve problems



Monte Carlo Techniques

- Computational techniques that use random sampling to obtain a result
- The more samples the better the final estimate will be
- Ex: Molecular Modeling, galaxy evolution modeling



The background of the slide is a dark, star-filled space. A prominent, dark, dusty band, resembling the Milky Way, stretches diagonally from the top-left towards the bottom-right. Two glowing, translucent blue spheres are positioned in the center-right area. The larger sphere is in the background, and a smaller sphere is in the foreground, partially overlapping the larger one. The text "Coding Demo Time" is centered over the space between the two spheres.

Coding Demo Time