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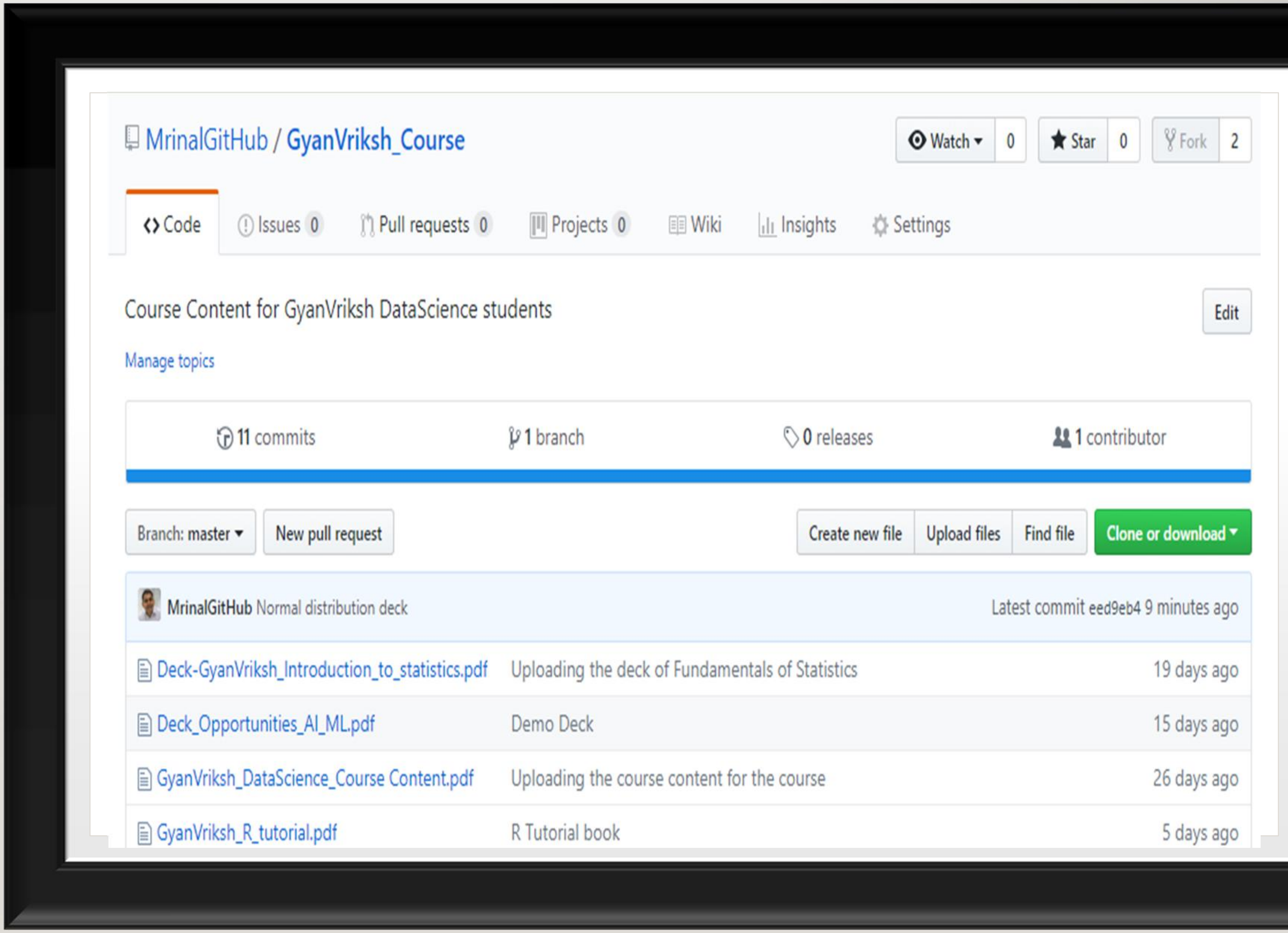


Course Content for GyanVriksh DataScience students

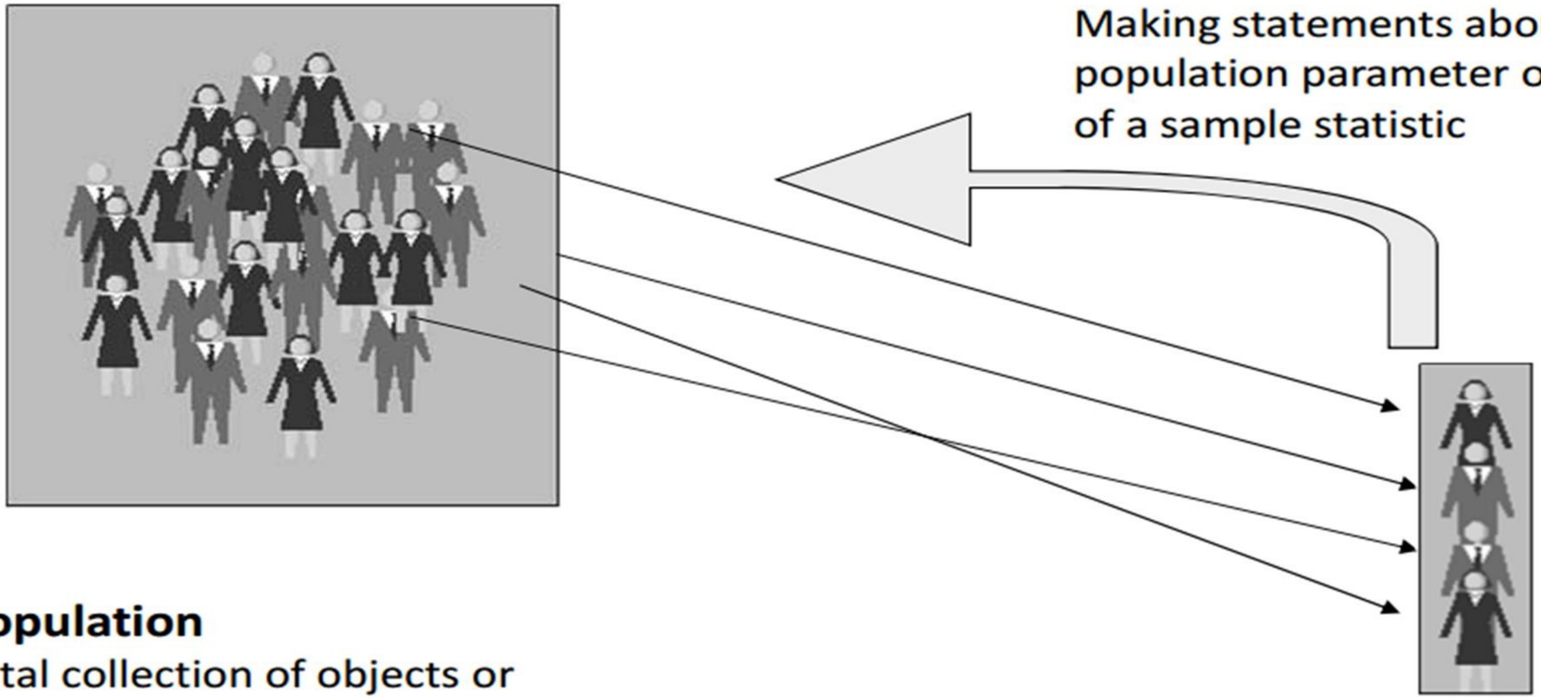
MrinalGitHub Normal distribution deck — Latest commit eed9eb4 9 minutes ago

Deck-GyanVriksh_Introduction_to_statistics.pdf	Uploading the deck of Fundamentals of Statistics	19 days ago
Deck_Opportunities_AI_ML.pdf	Demo Deck	15 days ago
GyanVriksh_DataScience_Course Content.pdf	Uploading the course content for the course	26 days ago
GyanVriksh_R_tutorial.pdf	R Tutorial book	5 days ago

Learning objectives

- What is statistical inference?
- How to (and how not to) choose a sample?
- What are sample statistics and their properties?
- What is the central limit theorem and how is it useful?

Statistical Inference



Statistical Inference
Making statements about a population parameter on the basis of a sample statistic

Population
Total collection of objects or people to be studied (or set of all information of interest to the decision maker)

Sample
Subset of a population

Typical Pitfalls in Sampling

- Collecting data only from volunteers (voluntary response sample)
  - e.g. online reviews (yelp.com, maps.google.com, tripadvisor.com)
- Picking easily available respondents (convenience sample)
  - e.g. choosing to survey in In-Orbit mall
- A high rate of non-response (more than 70%)
  - e.g. CEO / CIO surveys on some industry trends

Sample statistics and population parameters

- A sample statistic is a characteristic of the sample
- Some sample statistics might be used as a point estimate for a population parameter
- We use different notations to distinguish between the two groups of numbers

Population Parameter		Sample Statistic
μ	Mean	$\bar{x}$
σ^2	Variance	s^2
π	Proportion	p

Selecting a Simple Random Sample (SRS)

- Unbiased: Each unit has equal chance of being chosen in the sample
- Independent: Selection of one unit has no influence on selection of other units
- SRS is a gold standard against which all other samples are measured

Selecting the Sampling Frame

- Sampling frame is simply a list of items from which to draw a sample

- Does the sampling frame represent the population?
  - e.g. Literary Digest vs. George Gallup polls

- The available list may differ from desired list
  - e.g. we don’t have list of customers who did not buy from a store

- Sometimes, no comprehensive sampling frame exists
  - e.g. when forecasting for the future. Thus a comprehensive list of acceptances of credit card offers does not exist yet

Example

- What is the average work experience of all participants of the BA course?

	Sample 1	Sample 2
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
Sample Mean		

Central Limit Theorem (CLT) & the distribution of the sample mean

- The distribution of the sample mean
  - will be normal when the distribution of data in the population is normal
  - will be approximately normal even if the distribution of data in the population is not normal, if the sample size is “fairly large”

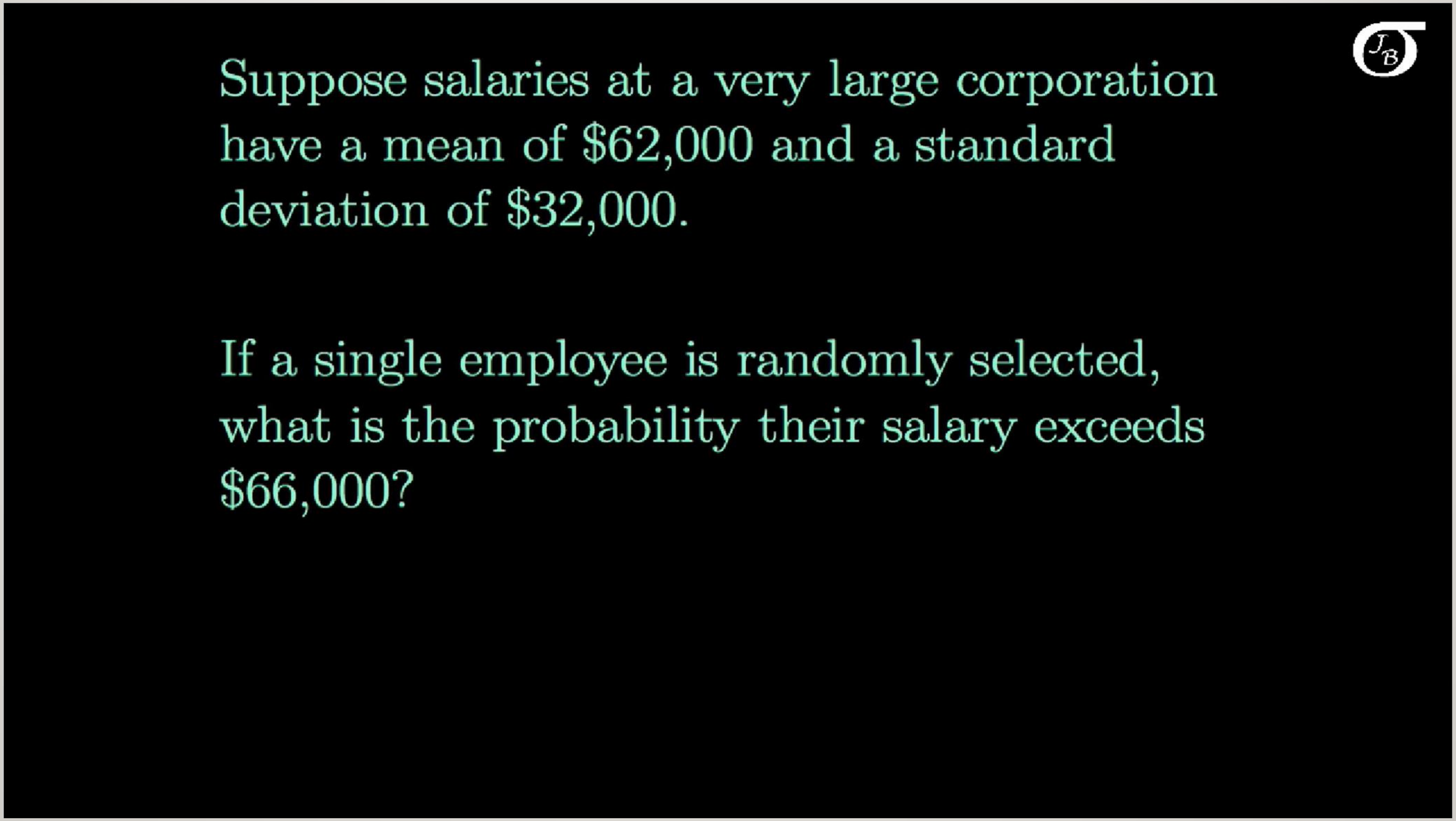
- Mean ($\overline{X}$)= μ (the same as the population mean of the raw data)

- Standard deviation (X)= $\frac{\sigma}{\sqrt{n}}$, where σ is the population standard deviation and n is the sample size
  - This is referred to as Standard Error of the Mean

Activity: http://www.socr.ucla.edu/htmls/SOCR_Experiments.html

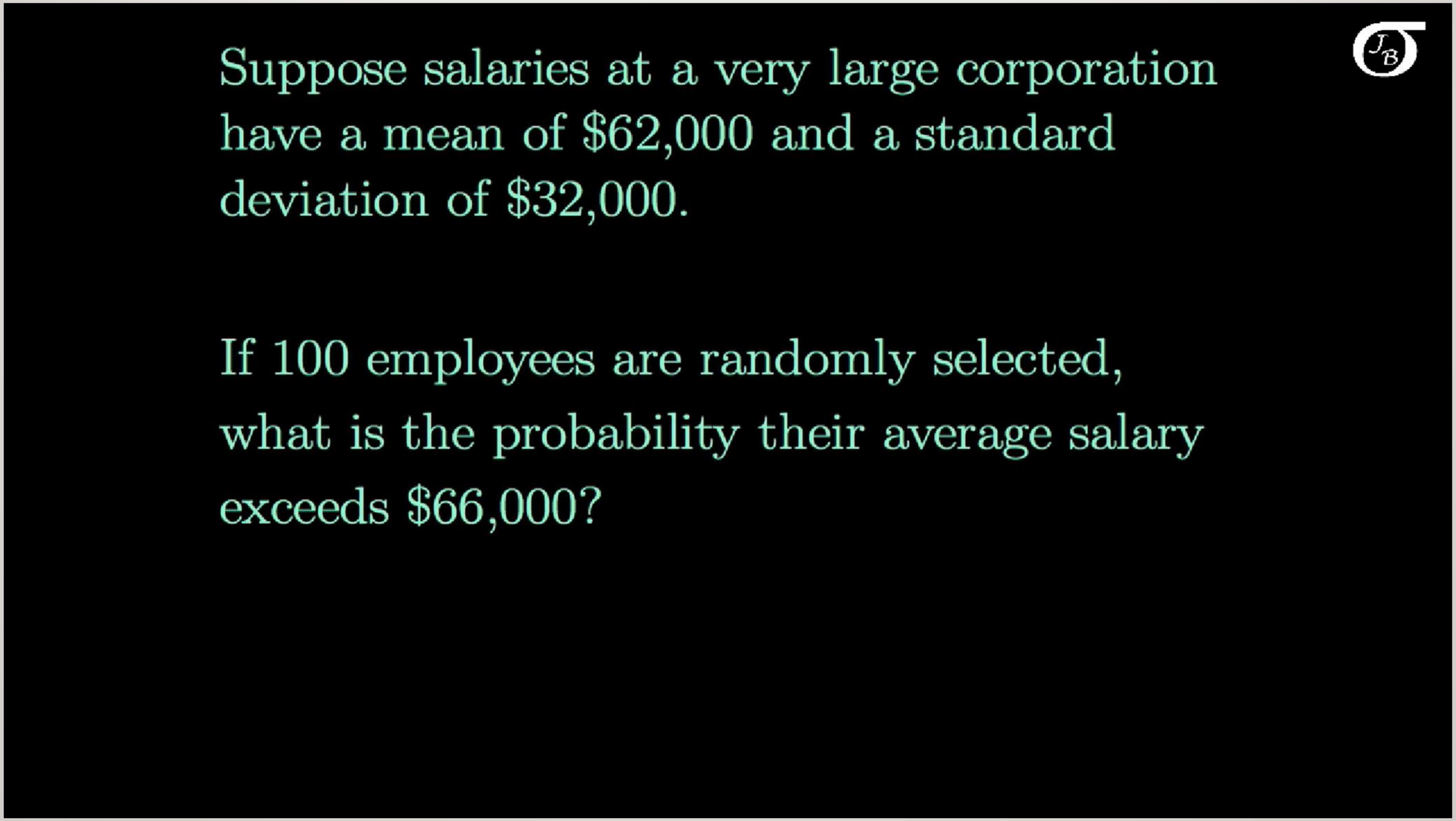
CLT is Valid When...

- Each data point in the sample is independent of the other
- The sample size is large enough



Suppose salaries at a very large corporation have a mean of $62,000 and a standard deviation of $32,000.

If a single employee is randomly selected, what is the probability their salary exceeds $66,000?



Suppose salaries at a very large corporation have a mean of $62,000 and a standard deviation of $32,000.

If 100 employees are randomly selected, what is the probability their average salary exceeds $66,000?

Example and Resource material:

T-table sample link : http://www.itl.nist.gov/div898/handbook/eda/section3/eda3672.htm

Refer page 24:
https://www.saylor.org/site/wp-content/uploads/2012/03/Introductory-Business-Statistics.pdf

mmary of Session

atistical inference is the process of making probabilistic inferences about population rameters based on sample statistics

mple random sample is the gold standard and it requires a sampling frame that present the population and a randomization device

mple statistics are random variables because they vary across samples drawn from the me population. They can be used as point estimates of the population parameter.

entral limit theorem states that, no matter what the population distribution is, the mple mean ($\bar{X}$) is normally distributed with mean (μ) and standard error $\left(\frac{\sigma}{\sqrt{n}}\right)$, proximately