Syllabus: FUNDAMENTALS OF STATISTICS AND PROBABILITY

Course Description:

4-DAY VIRTUAL WORKSHOP VIA ZOOM. Understanding statistics is essential to understand research in the social and behavioral sciences. In this course you will learn the basics of statistics; not just how to calculate them, but also how to evaluate them. This course will also prepare you for the next course in the specialization - the course Inferential Statistics.

The first part of the course is concerned with the basics of probability: calculating probabilities, probability distributions and sampling distributions. You need to know about these things in order to understand how inferential statistics work.

In the second part of the course we will discuss methods of descriptive statistics. You will learn what cases and variables are and how you can compute measures of central tendency (mean, median and mode) and dispersion (standard deviation and variance). Next, an introduction to methods of inferential statistics - methods that help us decide whether the patterns we see in our data are strong enough to draw conclusions about the underlying population we are interested in. We will discuss confidence intervals and significance tests.

On the final part of the course, we discuss how to assess relationships between variables, and we introduce the concepts correlation and regression.

You will not only learn about all these statistical concepts, you will also be trained to calculate and generate these statistics yourself using freely available statistical software.

Learning outcomes:

*Learn how to choose the right statistical test that will help in explaining a phenomena.

*Learn how probability works.

*Learn statistical hypothesis testing works.

*Learn how to run statistical analysis using user-friendly freeware such as JASP and JAMOVI.

Course Outline:

Probability

- Randomness
- Probability
- Sample space, event, probability of event and tree diagram
- Quantifying probabilities with tree diagram
- Basic set-theoretic concepts
- Practice with sets
- Joint and marginal probabilities

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- Conditional probability
- Independence between random events
- More conditional probability, decision trees and Bayes' Law

Probability Distributions

- Random variables and probability distributions
- Cumulative probability distributions
- The mean of a random variable
- Variance of a random variable
- Functional form of the normal distribution
- The normal distribution: probability calculations
- The standard normal distribution
- The binomial distribution

Sampling Distributions

- Sample and population
- Sampling
- The sampling distribution
- The central limit theorem
- Three distributions
- Sampling distribution proportion

Confidence Intervals

- Statistical inference
- CI for mean with known population
- CI for mean with unknown population
- CI for proportion
- Confidence levels
- Choosing the sample size

Exploring Data

- Cases, variables and levels of measurement
- Data matrix and frequency table
- Graphs and shapes of distributions
- Mode, median and mean
- Range, interquartile range and box plot
- Variance and standard deviation
- Z-scores

Significance Tests

- Hypotheses
- Test about proportion
- Test about mean
- Step-by-step plan
- Significance test and confidence interval

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- Type I and Type II errors

Correlation and Regression

- Crosstabs and scatterplots
- Pearson's r
- Regression - Finding the line
- Regression - Describing the line
- Regression - How good is the line?
- Correlation is not causation

THE SPEAKER:

JEROME L. BUHAY

- Researcher/Statistician/Consultant
- Professor at De La Salle University – Dasmariñas
- PhD in Mathematics Education (Ongoing)
- PhD in Statistics (with earned units)
- Master of Arts in Mathematics
- BS in Applied Mathematics maj. In Statistics

REQUIRED SOFTWARE FOR THIS WORKSHOP:

- **Zoom**
- **Jasp (Freeware Statistical Software)**
- **JAMOVI (Freeware Statistical Software)**
- **Gmail account for Google Classroom**

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