SEMESTER-II

COURSE 4: STATISTICAL METHODS AND PROBABILITY DISTRIBUTION

Theory   Credits: 3   3 hrs/week

Course Objective: The purpose is to familiarise the students about the basic concepts required for artificial intelligence and Machine learning.

Course Outcomes: **After successfully completing this course, the students will acquire:**
CO1: know about correlation and regression techniques, the two very powerful tools in statistics,

CO2: study concept of coefficient of determination and inference on partial and multiple correlation and regression coefficients.

CO3: knowledge of important discrete distributions such as Binomial, Poisson, Geometric, Negative Binomial and Hyper geometric and their interrelations if any,

CO4:knowledge of important continuous distributions such as Uniform, Normal, Exponential and Gamma and relations with some other distributions,

CO5: basic knowledge of complete enumeration and sample, sampling frame, sampling distribution, sampling and non-sampling errors, principal steps in sample surveys, limitations of sampling etc.,

Unit I
Correlation Analysis
Meaning Measures of Correlation- Scatter diagram, Karl Pearson's and Spearman's rank correlation. Calculation of the correlation coefficient for bi-variate frequency distribution Multiple and Partial correlation(3 variables only)

Unit II
Curve fitting and Regression Analysis:
Principle of least squares, fitting of straight line, second degree polynomial or parabola, power and exponential curves**. Regression:** Introduction, Linear Regression- Regression coefficients and its properties, Angle between two lines of regression. Standard error of estimate (residual variance), Explained and Unexplained variation, coefficient of determination. Multiple Linear Regression(3 variables only) and Logistic Regression.

Unit III Discrete Probability Distributions:

Uniform, Bernoulli, Binomial, Poisson, Geometric, Negative Binomial and Hyper-geometric distributions along with their characteristic properties, applications and limiting/approximation cases.

Unit IV
Continuous probability distributions: Normal, Exponential, Uniform, Beta, Gamma, distributions along with their characteristic properties, applications and limiting/approximation cases.

Unit V
Basic concepts: population and sample, census and sample survey, sampling frame, sampling distribution, standard error, sampling design, sampling and non-sampling errors, sample surveys, principles of sample survey, principal steps in sample survey, limitations of sampling, Sample survey versus complete enumeration survey. Types of sampling - Simple random sampling, stratified sampling, systematic sampling, and cluster sampling (only concept)

Note: without proofs of named theorems and more importance to applications

Text Book(Unit I to IV):   Fundamentals of Mathematical Statistics, 12th Edition, 10th September 2020, S. C. Gupta and V. K. Kapoor, Sultan Chand & Sons, New Delhi.

Text Book(Unit V)   :   Fundamentals of Applied Statistics, 4th Edition, 1stJanuary 2014,(ISBN-10 : 8180547051)S. C. Gupta and V. K. Kapoor, Sultan Chand & Sons, New Delhi.

Recommended References books:

1.   Mathematical Statistics with Applications, 2009, K.M.Ramachandran and Chris P.Tsokos Academic Press(Elsevier), Haryana .
2.   Probability and Statistics,Volume I, D.Biswas, New central book Agency (P) Ltd,   New Delhi.
3.   An outline of Statistical theory, Volume Two,3rd Edition,2010(with corrections) A.M.Goon,M.K. Gupta, B.Dasgupta ,The World Press Pvt.Ltd., Kolakota.
4.   Sanjay Arora and BansiLal:. New Mathematical Statistics, SatyaPrakashan ,   New Delhi.

Websites of Interest: **http://onlinestatbook.com/rvls/index.html**

Co-Curricular Activities in the class:

1. Pictionary
2. Case Studies on topics in field of statistics
3. Snap test and Open Book test
4. Architectural – To be build the procedures
5. Extempore – Random concept to students
6. Interactive Sessions
7. Teaching through real world examples

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COURSE 4: STATISTICAL METHODS AND PROBABILITY DISTRIBUTION

Practical   Credits: 1   2 hrs/week

Course Objective:

This course enables students to gain hands-on practical experience of SPSS for analysing data.

CO.NO	Upon successful completion of this course, students should have the knowledge and skills to:	POS
CO1	Apply the various statistical methods for real life problems	PO2
CO2	Analyze the uni-variate and bivariate data using statistical techniques.	PO2

List of Practicals using SPSS

1. Diagrams & Graphs- Bar, Pie , Histogram, frequency polygon, and Ogive curves
2. Computation of measures of central tendency- Arithmetic Mean, Geometric mean and Harmonic Mean – Grouped Data.
3. Computation of measures of central tendency- Median, Mode and Partition Values - Grouped Data.
4. Computation of measures of Dispersion – Quartile Deviation, Mean Deviation, Standard Deviation, Variance and Coefficient of Variation – Grouped Data.
5. Computation of non-central, central moments, β_1 and β_2 and Sheppard's corrections for grouped data.
6. Computation of Karl Pearson's coefficients, Bowley's coefficients of Skewness and coefficients of Skewness based on moments – Grouped Data
7. Computation of correlation coefficient and regression lines for (i) ungrouped data (ii) grouped bivariate data
8. Construction regression line equations for (i) ungrouped data (ii) grouped bi-variate data.

Note: Training shall be in SPSS and derive the results. The SPSS output shall be exported to MS word for writing inference.

Reference Manual: Practical Manual -Prepared by the Department Faculty Members

Websites of Interest: http://www.statsci.org/datasets.html

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