STATISTICAL LEARNING FOR RELIABILITY ANALYSIS

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PRE-REQUISITES : This course requires that the students are familiar with high-school level linear algebra, calculus, probability and statistics.
INTENDED AUDIENCE : The course is of interdisciplinary nature and students from CSE, IT, EE, ECE, CE, ME, etc. can take this course.
INDUSTRY SUPPORT : All IT companies, in general.

COURSE OUTLINE :

Statistical Learning (SL) is the science of analyzing data to convert information to useful knowledge. This knowledge could help us understand our world better, and in many contexts enable us to make better decisions. While this is the broad and grand objective, there is a huge demand to solve many problems with computationally intelligent techniques, such ML, DL, AI and SL. This course seeks to present the participants a wide range of statistical learning approaches related to data sampling, hypothesis testing, statistical inference with both parametric and non-parametric methods, dealing data with one or more population, variance analysis, t-testing, likelihood estimation, etc.

ABOUT INSTRUCTOR :

Prof. Monalisa Sarma received her Ph.D. degree in Computer Science & Engineering from Indian Institute of Technology Kharagpur, India. She holds M.S. (by research) and B. Tech. degrees both in Computer Science & Engineering from Indian Institute of Technology Kharagpur, India, and North Hill University, India, respectively. Presently, she is an Assistant Professor, Subir Chowdhuri School of Quality and Reliability, India Institute of Technology Kharagpur. Prior to joining Indian Institute of Technology Kharagpur, she was working in the Department of Computer Science & Engineering, Indian Institute of Technology Indore and Siemens Research and Devolvement, Bangalore, India. Her current research includes human reliability, big data security, biometric-based cryptography, etc.

COURSE PLAN :

Week 1: Introduction to reliability, reliability estimation, concept of statistical learning, advanced techniques to reliability analysis.
Week 2: Probability distribution techniques: discrete and continuous probability distributions and their applications to reliability estimation modeling.
Week 3: Sampling distribution techniques and their different applications for reliability prediction.
Week 4: Statistical inference technique-I (Parametric-based approaches: Hypothesis testing, Confidence interval estimation).
Week 5: Case studies for reliability analysis with parametric-based approaches.
Week 6: Statistical inference techniques-II (Non-parametric-based approaches: Correlation analysis, Relation analysis, Regression analysis).
Week 7: Case studies for reliability analysis with non-parametric□based approaches
Week 8: Statistical learning with single population, pair t-tests techniques. Illustration with applications to reliability analysis.
Week 9: Statistical learning with more than one population, ANOVA techniques. Illustration with applications to reliability analysis.
Week 10: Maximum likelihood estimation techniques. Illustration with applications to reliability analysis.
Week 11: Statistical method of data classification. Illustration with applications to reliability analysis.
Week 12: Entropy and its applications to statistical learning. Illustration with applications to reliability analysis.