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Subject: Summary of the online workshop entitled “Statistical Techniques for Data Analysis” organized from 22nd Nov to 26th Nov 2021 by the Department of Physics and funded under DST-SERB project entitled “Fluctuations and Correlations: A Hunt to QCD Critical End Point” (File No. CRG//2019/000096) under the Head “Scientific Social Responsibilities”.

Summary of Workshop

First day of the workshop focused on “**Introduction to concepts of probability and distribution functions**” delivered by **Prof. Kajari Mazumadar from TIFR Mumbai**. The lecture started with the basic definitions of probability and statistics. Prof. Mazumadar discussed in detail the characteristics of probability distributions, mean and variance, quantification of uncertainty using probability, Bayesian statistics and Bayes theorem. The talk ended with examples of probability that can be determined by means of repeatable experiments.

The second talk of Prof. Kajari Mazumadar started with the discussion of random errors, measurement of errors and systematic uncertainty. Different distribution functions like binomial, Poisson, chi square and Gaussian were elaborated in detail. Prof. Mazumadar emphasised on Gaussian quantile and various aspects of Gaussian distribution along with central limit theorem.

Third talk (second day) of the workshop was focused on “Data Reduction & Error Analysis” delivered by Dr. Raghunath Sahoo, Associate Professor from IIT Indore. The lecture was concentrated on the definition & types of error, accuracy and precision. Dr. Sahoo discussed in detail about the different types of distribution, variance & standard deviation. For better understanding he gave exquisite examples throughout the lecture.

In the second talk of the second day Dr. Raghunath Sahoo focused on “Estimation of Error & Maximum Likelihood”. This talk was the continuation of his previous lecture on “Data Reduction & Error Analysis”. The lecture was focussed on the Rounding off, Rejection of data, Propagation & Transformation of Errors.

On the third day of the workshop Dr. Raghunath Sahoo explained in detail about the topics like Error Ellipse, Error Matrix, Confidence Interval. He gave brief but distinct insight on fitting techniques like curve fitting, least square fit, linear fit & fitted binned data with suitable examples.

The second talk of day three was delivered by Dr. Aruna Kumar Nayak, Associate Professor at Institute of Physics, Bhubaneswar. The lecture was on “Hypothesis tests, Confidence intervals and limits”. He explained several basic concepts required for understanding of hypothesis tests.

On the fourth day of the workshop, Dr. Aruna Kumar Nayak discussed Monte Carlo methods including generation of random numbers. Some applications of Monte Carlo methods such as approximating integrals were also discussed. The major highlights of this talk were discussion of acceptance/rejection methods, Markov chains, random walks, metropolis algorithm.

On the 5th day of the workshop talk was delivered by Prof. Gagan Mohanty from TIFR, Mumbai and was focused on an interesting topic titled “How to separate red from blue balls in a box?”. The talk stressed upon multivariate analysis, identification of optimum input and output variables, fisher’s linear discriminant, neural networks, weight factor calculation and optimization with appropriate examples.

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