

Course Outline

Introduction. Data characteristics.

Precision, accuracy, mean, median, variance, standard deviation.
Normal, Binomial, and Poisson distributions

Errors and Uncertainties

Sources of uncertainty
Propagation of uncertainties
Criteria for data rejection

Hypothesis testing and Parameter estimation

Least square methods.
Student's t distribution
 χ^2 test, Kolmogorov-Smirnov test, test for normal distribution.

Analysis of variance (ANOVA)

Correlation and Regression.

Statistics with two variables. Correlation coefficient. Covariance.
Fitting methods. Goodness of fit.

Multivariate Methods

Discriminant analysis
Principal component analysis.
Factor and sensitivity analyses
Cluster analysis

Time Series Analysis

Interpolation. Smoothing. Windows and filters.
Testing for patterns. Autocorrelation.
Fourier analysis. Wavelets.

*Stochastic vs. deterministic dynamical processes

Markov chains. Random walks. White noise. Chaos. Fractals.
Testing for randomness, trends, uniformity, patterns

*Spatially distributed data

Tests for uniformity, randomness, clustering, regularity, and anisotropy.
Graphical display of spatial data
Estimation of 2D fields based on incomplete data

Student presentations