**Part 1. Exploratory Analysis**

1. **Basic Statistical Notions:**
   1. Population
   2. Sample
   3. Types of data: discrete, continuous, categorical
   4. Mean (Descriptive statistics)
   5. Variance (Descriptive statistics)
2. **Mean (Measures of central tendency):**
   1. *Type of Means* 
      1. [Arithmetic Mean (AM)](https://en.wikipedia.org/wiki/Mean#Arithmetic_mean_(AM))
      2. Geometric Mean (GM)
      3. [Harmonic mean (HM)](https://en.wikipedia.org/wiki/Mean#Harmonic_mean_(HM))
   2. *Mean Derivatives*:
      1. Mode
      2. Median
      3. Relation of Mean, Mode and Median.
3. **Outliers and visualization**
   1. Outliers
   2. Quartiles, percentiles
   3. Box-and-whisky plot
4. **Variance (Measures of deviation)**
   1. Variance deviation (R)
   2. Standard deviation
   3. Variance indicators:
      1. Oscillator ratio
      2. Average linear deviation
      3. Variance ratio
5. **Impact of Grouping Towards Mean and Variance**
6. **Correlation and dependence of variables**
   1. Covariance
   2. Correlation
   3. Application of Covariance and Correlation

**Part 2 Probability and Distributions**

1. **Law of large numbers:**
   1. Chebyshev’s Theorem (Expected Value vs. Mean)
   2. Bernoulli’s Theorem (Probability vs. Frequentist Probability)
   3. Main features of distributions:
      1. Stationary process
      2. Stability
      3. Limited variance
2. **Expected value and variance**
3. **Distributions:**
   1. *Normal distribution*
      1. Major parameters (arithmetic mean (µ), standard deviation (σ) )
      2. Central limit theorem (CLT)
      3. Three-sigma rule
      4. Measures of estimation of actual/theoretical and normal distributions (skewness, kurtosis)
      5. [Standard normal deviate](https://en.wikipedia.org/wiki/Standard_normal_deviate)
   2. *Other distributions:* (<https://www.analyticsvidhya.com/blog/2017/09/6-probability-distributions-data-science/>)
      1. Exponential Distribution
      2. Poisson Distribution
      3. Binomial Distribution
      4. Log-normal distribution

**Part 3 Inferential statistics**

**1.      Sampling Theory**

**2.      Population vs. Sampling**

**3.      Sample to estimate Population measures – BLUE principles**

**4.      Confidence intervals for Mean (big and small samples)**

**5.      Confidence intervals for Variance (big and small samples)**

**6.      Hypothesis testing**:

6.1. Type of hypothesis

6.2. Approaches to perform testing (standard, P-value)

6.3. Statistical test

6.4. Standardized test statistic

6.5. Degree of freedom

6.6. Hypothesis tests (one and two tailed tests)

6.7. Significance level

6.8. Decision rule. Type 1 and Type 2 errors. Confusion matrix.

6.9. Hypothesis test of Population Mean (Variance)

**7. Applied example of inferential statistics**