



The purpose of this research paper is to provide a comprehensive, step-by-step guide for conducting **Descriptive Statistics** using the Isalos Analytics Platform. Descriptive statistics are the first step in any data analysis, providing a clear summary of the main characteristics of a dataset before more advanced statistical methods are applied. They help users understand the distribution, central tendency, and variability of the data, as well as identify potential outliers or unusual observations.

This guide demonstrates how to compute and interpret commonly used descriptive statistics, including measures of central tendency (such as the mean and median), measures of dispersion (such as the standard deviation and range), and graphical summaries, including histograms, boxplots, and Q-Q plots. These techniques provide valuable insights into the structure and quality of the data, helping researchers assess data distribution, detect anomalies, and verify assumptions for subsequent statistical analyses.

Isalos version used: 2.1.5

The dataset used in this analysis is the **CalCOFI (California Cooperative Oceanic Fisheries Investigations) reduced Dataset**, available on Kaggle.

Source: [CalCOFI](#)

This dataset simulates real-world oceanographic records and includes cast-level information such as bottle count, cast count, depth measurements, temperature, and salinity. It is designed to support environmental monitoring and ecological research.

For the purposes of this Repeated Measures ANOVA analysis, variables are classified as follows:

- **Dependent Variables (Responses):**

- *T_degC* — Temperature in degrees Celsius [or](#)
- *Salnty* — Salinity in practical salinity units

These are continuous outcome measures to be analyzed simultaneously across depths.

- **Within-Subject Factor:**

- *Depthm* — Depth in meters (e.g., 0, 10, 20, 30, 50, 75 m)

This categorical variable represents the repeated-measures condition across which each cast is measured.

- **Between-Subject Factor:**

- *Cst_Cnt* — Cast count (e.g., 1 through 6)

This categorical variable represents independent groups whose multivariate effect on the oceanographic outcomes is of primary interest.

Step 1: Import Data from file

Firstly, launch the Isalos Analytics Platform (version 2.1.2). Then, in the left spreadsheet panel, create a new tab by clicking [File](#) and choose [Open](#) to load the CalCOFI dataset (or simply copy-paste the data from your spreadsheet).

Btl_Cnt	Cst_Cnt	Depthm	T_degC	Salnty
1	1	0	10.5	33.44
2	1	10	10.46	33.437
3	1	20	10.45	33.421
4	1	30	10.45	33.431
5	1	50	10.24	33.424
6	1	75	9.86	33.494
7	1	100	9.67	33.58
8	2	0	10.1	32.95
9	2	10	9.89	32.94
10	2	20	9.75	32.939
11	2	30	9.52	33.013
12	2	50	9.04	33.272
13	2	75	8.83	33.488
14	2	100	8.26	33.631
15	3	0	10.2	32.63
16	3	10	10.05	32.66

Step 2: Access the descriptive statistics function

Navigate to the descriptive analysis module through the main menu by choosing the following path:

Statistics → Basic Statistics → Descriptive Statistics

Then, you will see the descriptive statistics configuration window:

Descriptive Statistics
 ? ×

Select Type Sample

1. Sample Size & Counts

☐ Size/Count (n)
 ☐ Frequency
 ☐ Sum (Σ)
 ☐ Sum of Squares (SS)

2. Central Tendency

☐ Mean ($\bar{x}$)
 ☐ Median ($\tilde{x}$)
 ☐ Mode
 ☐ Midrange (MR)

3. Dispersion / Spread

☐ Standard Deviation (s)
 ☐ Variance (s^2)
 ☐ Range (R)
 ☐ Mean Absolute Deviation (MAD)
 ☐ Minimum (min)
 ☐ Maximum (max)

4. Quartiles, UQR & Outliers

Method: ☐ Inclusive ☐ Exclusive
 ☐ Quartiles (Q1, Q2, Q3)
 ☐ Interquartile Range (IQR)
 ☐ Outliers

5. Relative / Advanced Measures

☐ Coefficient of Variation (CV)
 ☐ Relative Standard Deviation (RSD)
 ☐ Root Mean Square (RMS)
 ☐ Standard Error of the Mean (SE $\bar{x}$)

6. Distribution Shape

☐ Skewness (γ_1)
 ☐ Kurtosis (β_2)
 ☐ Kurtosis Excess (α_2)

7. Normality Tests

☐ Shapiro-Wilk
 ☐ Kolmogorov-Smirnov
 ☐ Anderson-Darling

8. Plots

☐ Q-Q Plot
 ☐ Histogram
 ☐ Box Plot
 ☐ Violin Plot

Execute

Cancel

Step 3: Configure parameters

In the descriptive statistics window, set the following parameters:

1. Sample Size & Counts
 - a. Size / Count (n)
 - b. Frequency
 - c. Sum
 - d. Sum of Squares
2. Central Tendency
 - a. Mean
 - b. Median
 - c. Mode
 - d. Midrange

3. Dispersion / Spread
 - a. Standard Deviation
 - b. Variance
 - c. Range
 - d. Mean Absolute Deviation
 - e. Minimum
 - f. Maximum

4. Quartiles, UQE & Outliers
 - a. Quartiles (Q1,Q2,Q3)
 - b. Interquartile Range (IQR)
 - c. Outliers

5. Relative / Advanced Measures
 - a. Coefficient of Variation
 - b. Relative Standard Deviation
 - c. Root Mean Square
 - d. Standard Error of the Mean

6. Distribution Shape
 - a. Skewness
 - b. Kurtosis
 - c. Kurtosis excess

7. Normality Tests
 - a. Shapiro-Wilk
 - b. Kolmogorov-Smirnov
 - c. Anderson-Darling

8. Plots
 - a. Q-Q Plot
 - b. Histogram
 - c. Box Plot
 - d. Violin Plot

The above preview will display the multivariate model as shown below:

Descriptive Statistics

Select Type: **Sample**

- Sample Size & Counts**
 - ☒ Size/Count (n)
 - ☒ Frequency
 - ☒ Sum (Σ)
 - ☒ Sum of Squares (SS)
- Central Tendency**
 - ☒ Mean ($\bar{x}$)
 - ☒ Median ($\tilde{x}$)
 - ☒ Mode
 - ☒ Midrange (MR)
- Dispersion / Spread**
 - ☒ Standard Deviation (s)
 - ☒ Variance (s^2)
 - ☒ Range (R)
 - ☒ Mean Absolute Deviation (MAD)
 - ☒ Minimum (min)
 - ☒ Maximum (max)
- Quartiles, UQR & Outliers**

Method: ☒ Inclusive ☒ Exclusive

 - ☒ Quartiles (Q1, Q2, Q3)
 - ☒ Interquartile Range (IQR)
 - ☒ Outliers
- Relative / Advanced Measures**
 - ☒ Coefficient of Variation (CV)
 - ☒ Relative Standard Deviation (RSD)
 - ☒ Root Mean Square (RMS)
 - ☒ Standard Error of the Mean ($SE\bar{x}$)
- Distribution Shape**
 - ☒ Skewness (γ_1)
 - ☒ Kurtosis (β_2)
 - ☒ Kurtosis Excess (α_2)
- Normality Tests**
 - ☒ Shapiro-Wilk
 - ☒ Kolmogorov-Smirnov
 - ☒ Anderson-Darling
- Plots**
 - ☒ Q-Q Plot
 - ☒ Histogram
 - ☒ Box Plot
 - ☒ Violin Plot

Distribution: **Normal**

Execute **Cancel**

After configuring all parameters:

- * Review all selections to ensure accuracy.
- * Click the **Execute** button to run the descriptive analysis.
- * Wait for the computation to complete (processing time depends on dataset size and the number of dependent variables).

Step 4: Results

The analysis results will be displayed in the right spreadsheet panel. The output typically includes the following components:

Factors	Size/Count	Sum	Sum of Squares	Mean	Median	Mode	Mid Range	Standard Deviation	Variance	Range
Btl_Cnt	70.0	2485.0	28577.5	35.5	35.5	None	35.5	20.3510851	414.1666667	69.0

Mean Absolute Deviation	Minimum	Maximum	Quartiles - Inclusive	Quartiles - Exclusive	Interquartile Range - Inclusive	Interquartile Range - Exclusive
17.5	1.0	70.0	Q1: 18.250000, Q2: 35.500000, Q3: 53.750000	Q1: 17.750000, Q2: 35.500000, Q3: 53.750000	34.5	35.5

Anderson-Darling: A ²	Anderson-Darling: p-value	Anderson-Darling: Prob	Anderson-Darling: Decision	Kolmogorov-Smirnov: D	Kolmogorov-Smirnov: p-value	Kolmogorov-Smirnov: Prob	Kolmogorov-Smirnov: Decision
0.0626790	0.9299943	0.0700057	Fail to Reject Null Hypothesis	0.7530347	0.0477094	0.9522906	Reject Null Hypothesis

Coefficient Of Variation	Relative Standard Deviation	Root Mean Square	Standard Error Of Mean	Skewness	Kurtosis	Kurtosis Excess	Shapiro-Wilk: W	Shapiro-Wilk: p-value	Shapiro-Wilk: Prob	Shapiro-Wilk: Decision
0.5732700	57.3270004	40.847277	2.4324199	0E-7	1.8000000	-1.2000000	0.9550122	0.0133838	0.9866162	Reject Null Hypothesis





