



One-Way ANOVA analysis on global surface temperatures over the years

This dataset contains global surface temperatures recorded each month of every year from 1880 up to 2023. We will analyze the surface temperatures over the recorded time period grouped every 28-29 years.

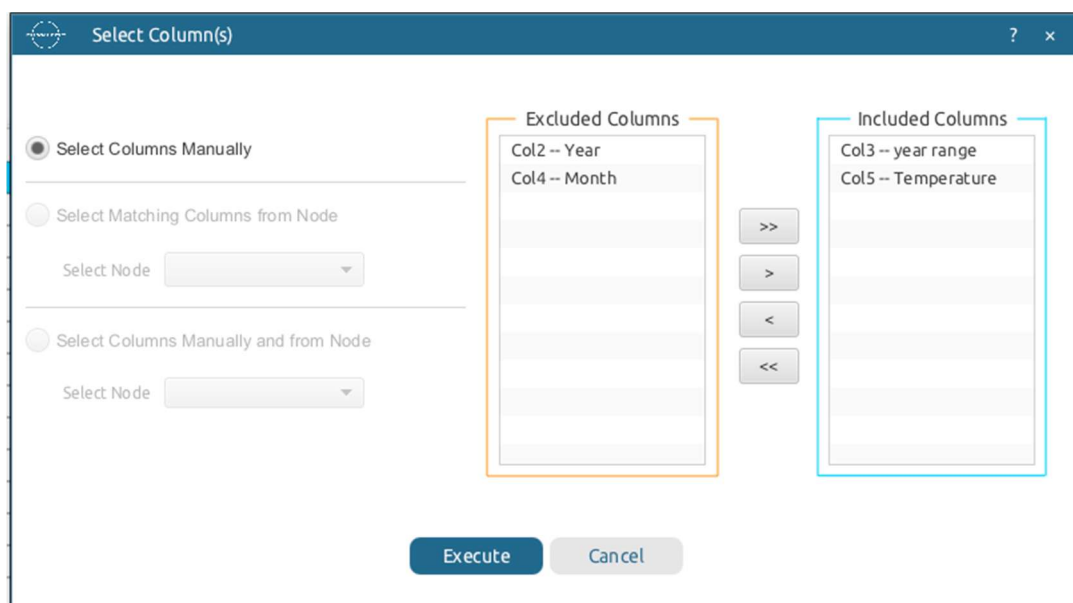
The variables examined are Temperature as a dependent variable and Year Range as factor. The dataset is modified to be used for One-Way ANOVA

Isalos version used: 2.1.5

Dataset: <https://www.kaggle.com/datasets/sujaykapadnis/global-surface-temperatures>

Step 1: Data preparation

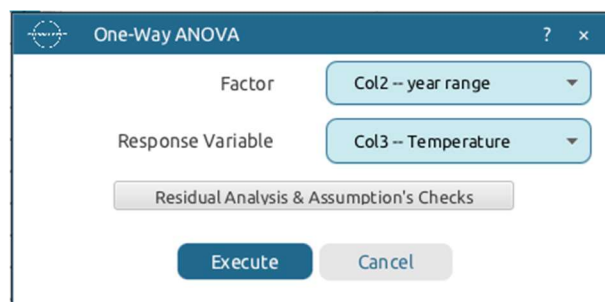
Import dataset and rename the tab to “Data”. Go to Data Transformation → Data Manipulation → Select Column(s), transfer “Col3 – year range”, “Col5 -- Temperature” to the “Included Columns” and click “Execute”



	Col1	Col2 (S)	Col3 (D)
User Header	User Row ID	year range	Temperature
1		1880-1908	-0.19
2		1880-1908	-0.25
3		1880-1908	-0.09
4		1880-1908	-0.17
5		1880-1908	-0.1
6		1880-1908	-0.21
7		1880-1908	-0.18
8		1880-1908	-0.11
9		1880-1908	-0.15
10		1880-1908	-0.24
11		1880-1908	-0.22
12		1880-1908	-0.18
13		1880-1908	-0.2
14		1880-1908	-0.15
15		1880-1908	0.03
16		1880-1908	0.05
17		1880-1908	0.05
18		1880-1908	-0.19
19		1880-1908	0.0
20		1880-1908	-0.04
21		1880-1908	-0.16
22		1880-1908	-0.22

Step 2a: One-Way ANOVA

Create a new tab named “ANOVA” and import the spreadsheet from the “Data” tab. To perform the analysis, go to Statistics → Analysis of (Co)Variance → One-Way ANOVA and select “year range” as Factor and “Temperature” as Response Variable.



One-Way ANOVA

Factor: Col2 -- year range

Response Variable: Col3 -- Temperature

Residual Analysis & Assumption's Checks

Execute Cancel

Step 2b: Residual Analysis & Assumption's Checks

Click on Residual Analysis & Assumption's Checks and check the Anderson-Darling Test box under “Statistical Tests”, Normal Q-Q Plots and Histogram of Residuals boxes under “Plots”. Check the Levene's Test box under “Statistical Tests” and Residuals vs Fitted Values box under “Plots”. Click Save and then Execute.

Normality of Residuals

Statistical Tests

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

Plots

☒ Normal Q-Q Plots
 ☒ Histogram of Residuals
 ☐ Density Plot of Residuals

Homogeneity of Variance (Homoscedasticity)

Statistical Tests

☒ Levene's Test
 ☐ Brown-Forsythe Test
 ☐ Bartlett's Test (for normal data)

Plots

☒ Residuals vs Fitted Values
 ☐ Residuals vs Dependent Variable
 ☐ Boxplots by Group
 ☐ Violin Plot by Group

Residual Diagnostics

Plots

☐ Residuals vs Observation Order

Model Adequacy

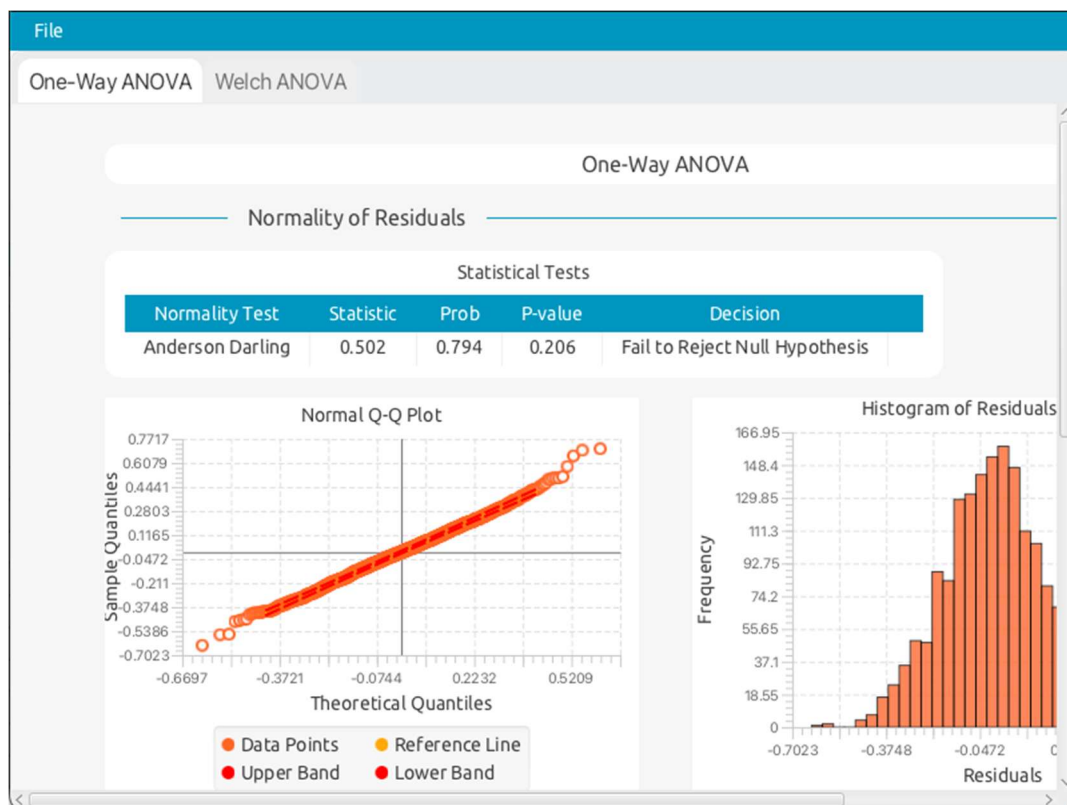
Plots

☐ Residuals vs Fitted values
 ☐ Residuals vs Each Factors

Save

Cancel

A window with the tests results and requested plots appears:

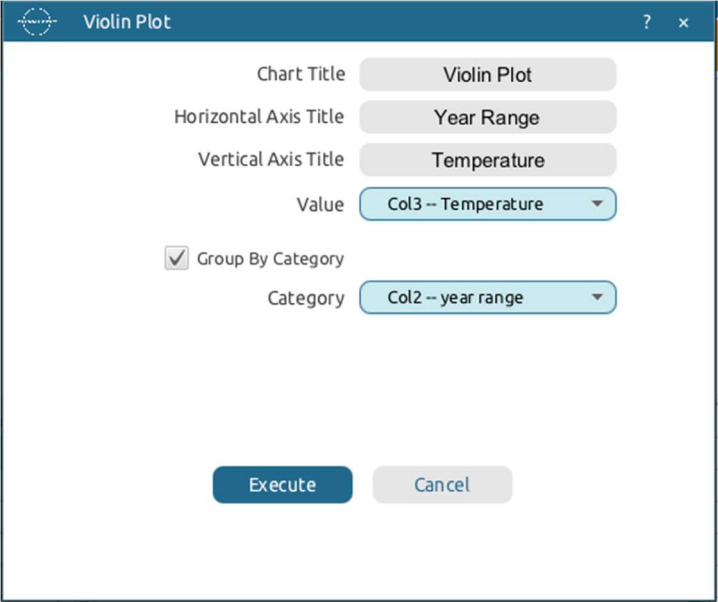


Expand window to view all of the results and plots. Double-clicking on any plot opens it in a new window. The results are shown in the right spreadsheet:

	Col1	Col2 (S)	Col3 (D)	Col4 (D)	Col5 (D)	Col6 (D)	Col7 (D)	Col8 (D)	Col9 (D)	Col10 (D)	Col11 (D)
User Header	User Row ID	ANOVA Method	Statistic	df1	df2	p-value	dfW (Within):	MSB:	MSW:	F-statistic:	p-value:
1		One Way	198.8155173	53.7318072	252.5473245	4.0	1711.0	49.7038793	0.0314037	1582.7373378	0.0
2		Welch	1235.2333731	4.0	849.9091593	0.0					

Step 3: Violin Plot

Create a new tab named “Plot” and import the spreadsheet from the “Data” tab. To make the plot, go to **Plot** → **Distribution & Density Charts** → **Violin Plot** and enter the **Chart Title**, **Horizontal Axis Title**, **Vertical Axis Title**, “Temperature” as **Value**, select **Group By Category** checkbox and select “year range” as **Category**. Click **Execute**

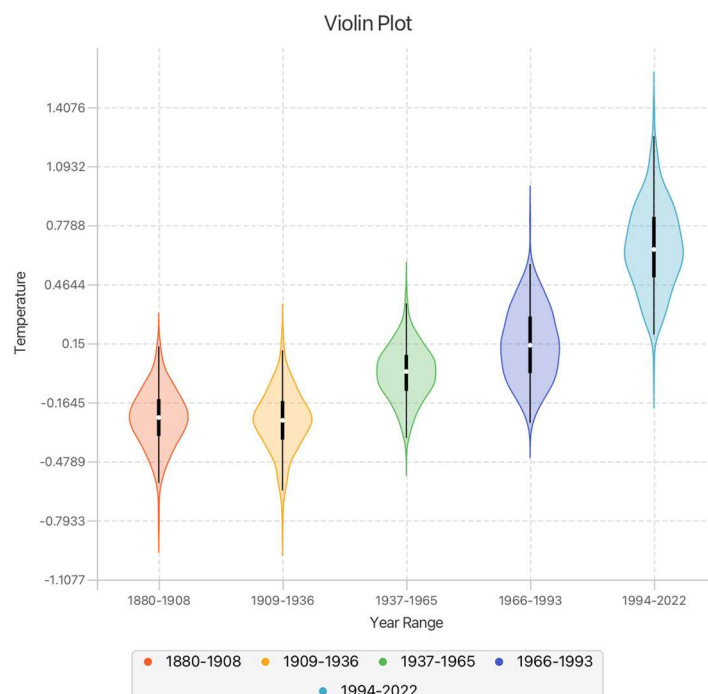


The screenshot shows a configuration window titled "Violin Plot". It contains the following settings:

- Chart Title: Violin Plot
- Horizontal Axis Title: Year Range
- Vertical Axis Title: Temperature
- Value: Col3 -- Temperature
- ☒ Group By Category
- Category: Col2 -- year range

At the bottom are two buttons: "Execute" and "Cancel".

The plot window appears with the following plot:



Final Isalos Workflow:

