PLOTTER v0.4

18 August 2024

1. Introduction

Plotter is a visualization and interpolation software. **Plotter v0.4** has an updated tab with interpolation and 3D visualization capabilities. You can download Plotter.exe from the website *https://optimusgeo.com/resources/*. This version has the following features,

1. common equations encountered in primary and secondary schools,
2. data (numbers) provided directly in the input tabs of the app, and
3. data imported from spreadsheet files (*.csv, .xlsx*)
4. Interpolates imported spreadsheet data and plots on both 2D and 3D planes.

2. User Interface

The app user interface is simple as shown in Figure 1 below.

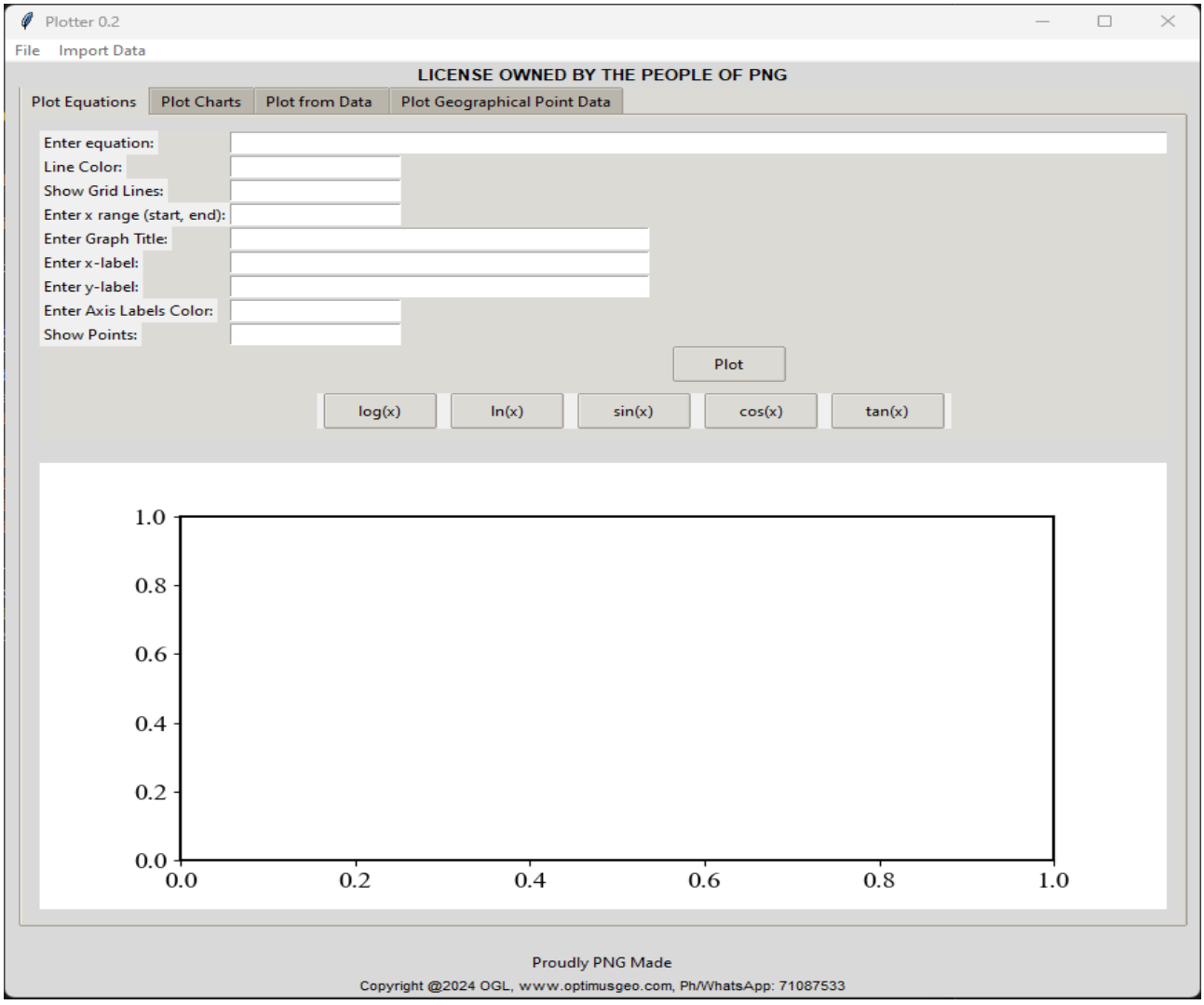


Figure 1. Graphical user interface of Plotter 02 with four (4) main data entry tabs, a plotting canvas and two menu items called "File" and "Import Data".

3. Data Entry Tabs

As shown in Figure 1, there are 4 main tabs with respect to the types of graphs generated:

1. ***Plot Equations tab,***
2. ***Plot Charts tab,***
3. ***Plot from Data tab, and***
4. ***Geographical Point Data.***

3.1. Plot Equations: steps to creating plots

There are two main ways that you can use to create plots:

1. Polynomial functions (e.g. $x^5 - 5x^4 + 3x^3 - x^2 + x - 4$)
2. Other special functions (*log(x), ln(x), sin(x), cos(x), tan(x)*)

Steps to plot polynomial functions:

1. Enter the equation (e.g. $3x^2 + x - 4$ can be entered as 3*x**2+x-4)
2. Enter all the plot properties (color, grid line, labels, etc.)
3. Note that some of the color that you can use are provided in the Appendix section of this document.
4. Enter start and end values of x (e.g. if x values are -3,-2,-1,0,1,2,3,4,5; then you need to enter this as -3,5.
5. Push the "Plot" button and the polynomial function will be plotted.

Steps to plot the other special functions:

1. No need to enter any equation here. Just enter the rest of the information then select the special function of your choice and the graph will be generated.

Example 1: Plotting the equation $y = 2x^2+2x-5$

- Simply enter all the required information, then clock the 'Plot' button.
- Note that the power symbol is written using two stars (**) e.g. x**2.
- Note that the multiplication sign is written using one star (*), e.g. 2*x

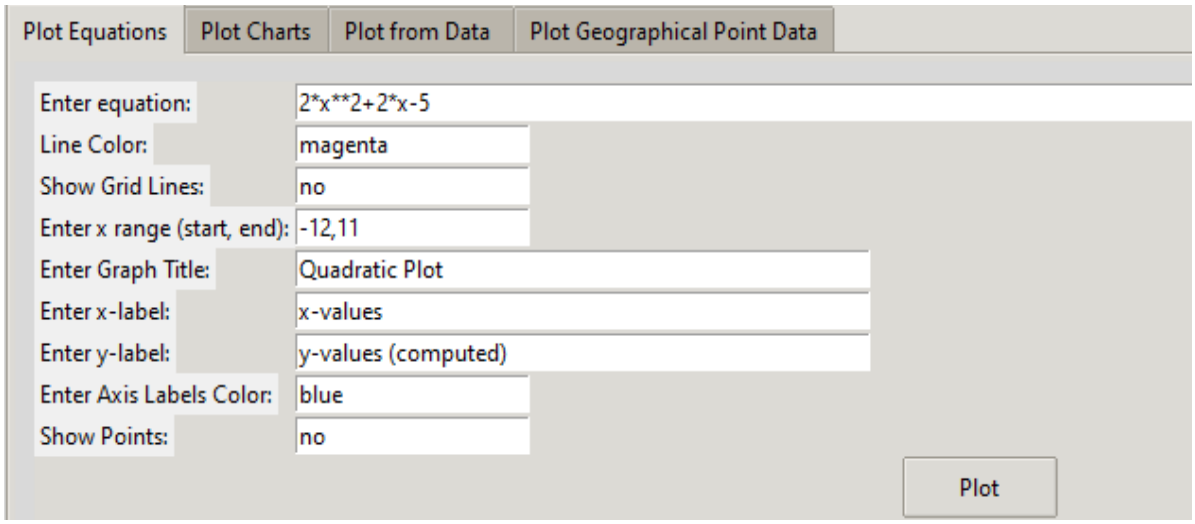


Figure 2. Using the Plot Equations tab: providing inputs for the plot $y = 2x^2+2x-5$.

The above inputs generates a graph as shown in Figure 3.

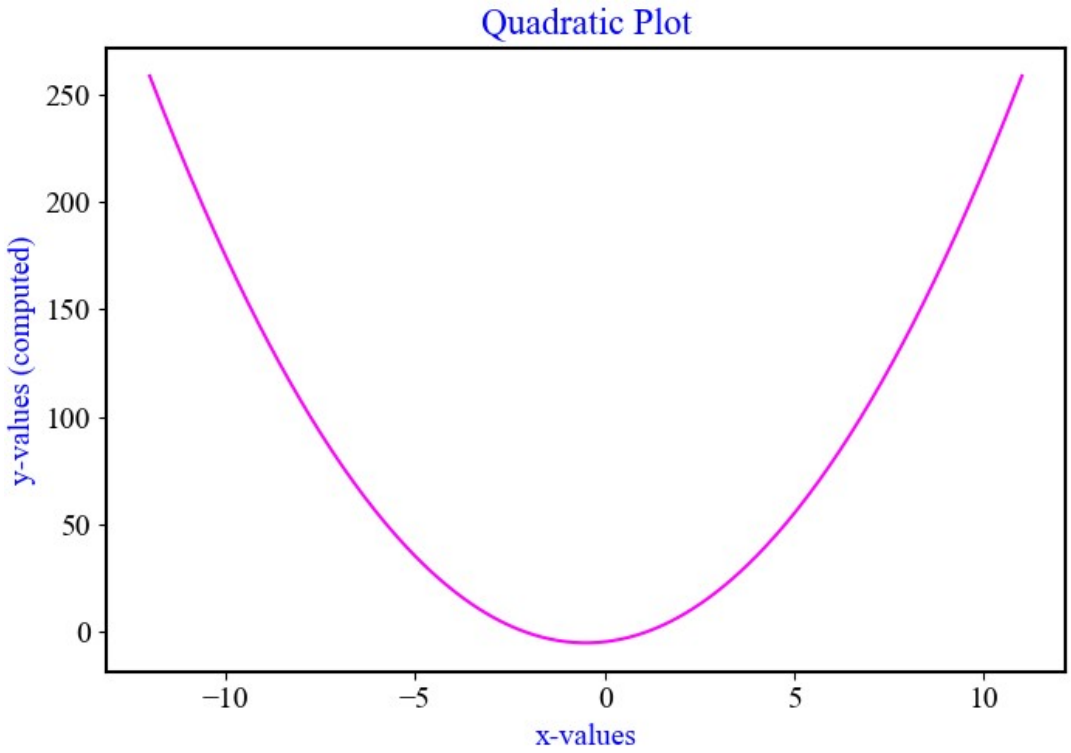


Figure 3. Plot generated from the inputs shown in Figure 1.

Example 2: Plotting the equation y = sin(x)

- To plot *y = sin(x)*, you can enter the inputs then click the *sin(x)* button.
- For this example, we will just use the same inputs as in Figure 2, and change only 3 inputs: (a) the title to "*Sin(x) Plot*", (b) the axis color to *indigo*, and the (c) Show Points to *yes.*

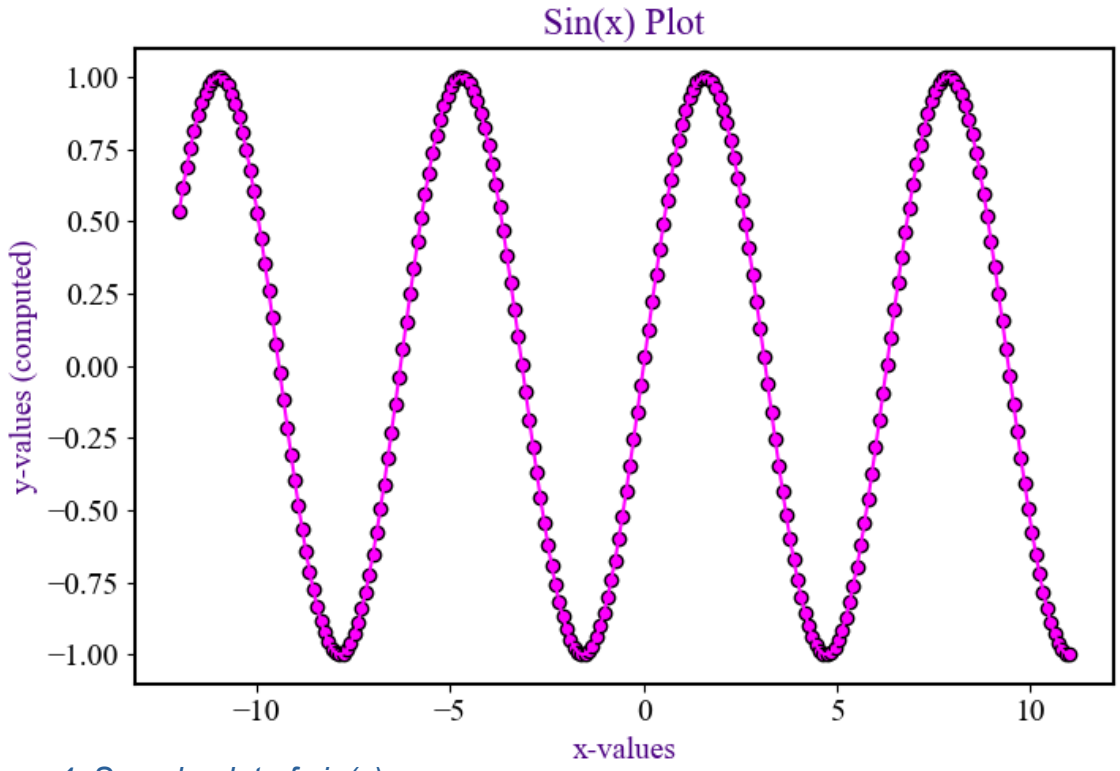


Figure 4. Sample plot of sin(x).

3.2. Plot Charts: steps to creating charts

The data entry canvas for the “Plot Chart” tab looks like Figure 5.

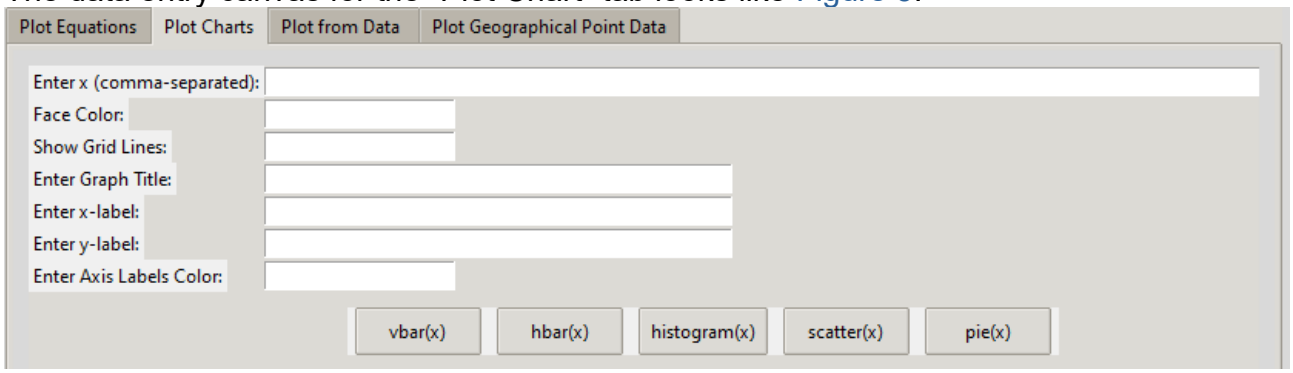


Figure 5. Data entry canvas for the “Plot Chart” tab.

Steps to plot charts

1. Manually enter the data (comma separated numbers, e.g. *-5, 0, 4.5, 12*)
2. Fill in the rest of the information
3. Click the button of the chart you want to generate.

Example 2: Generate a bar chart using the vbar(x) function.

- Enter some random values as shown in Figure 6 and click ‘*vbar(x)*’ button.

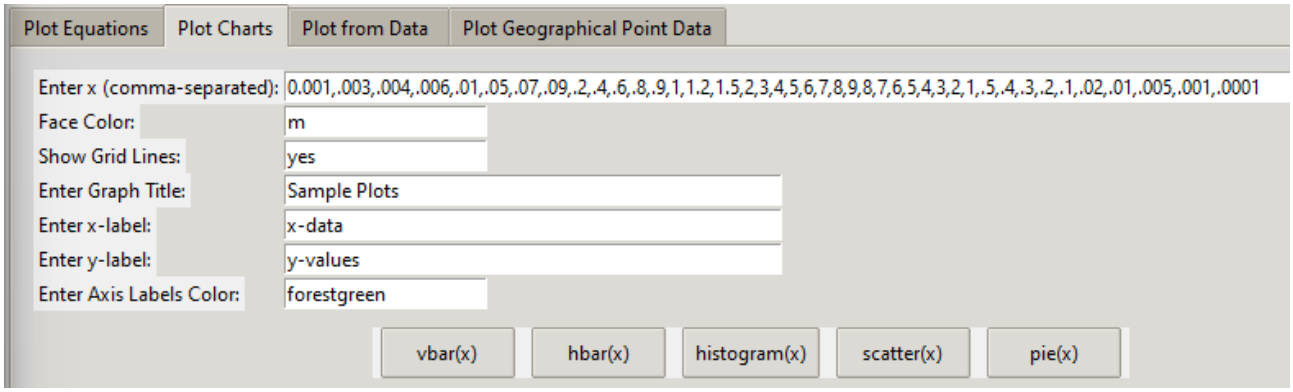


Figure 6. Sample inputs to generate charts.

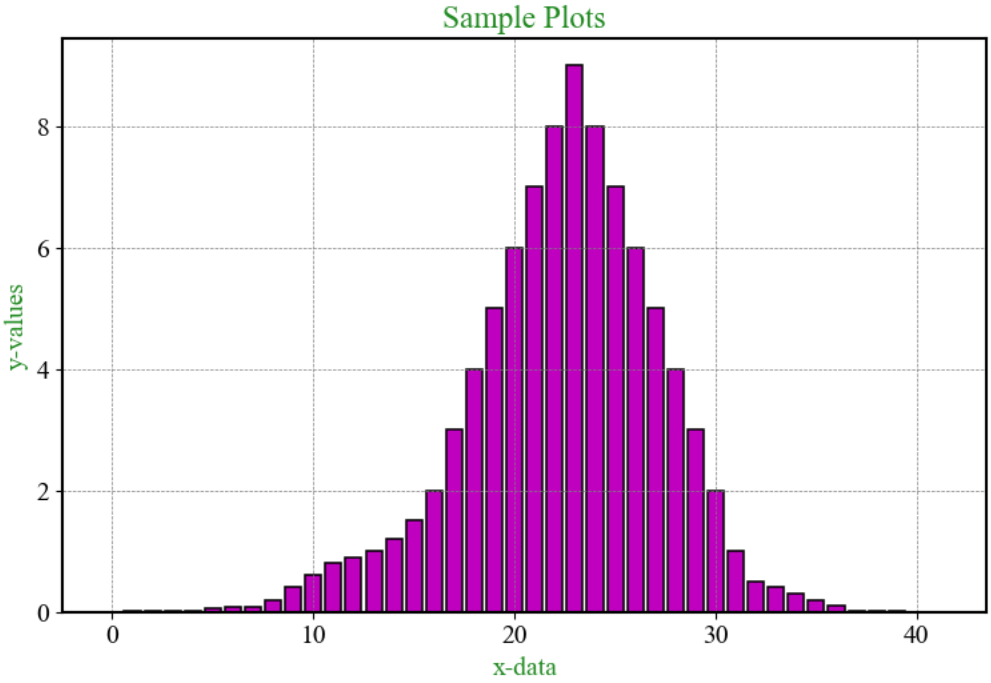


Figure 7. Plot generated using the vbar(x) button from the inputs shown in Figure 6.

3.3. Plot Data: steps to creating plots from imported spreadsheet data

The data entry interface for the Plot Data tab is as shown in Figure 8.

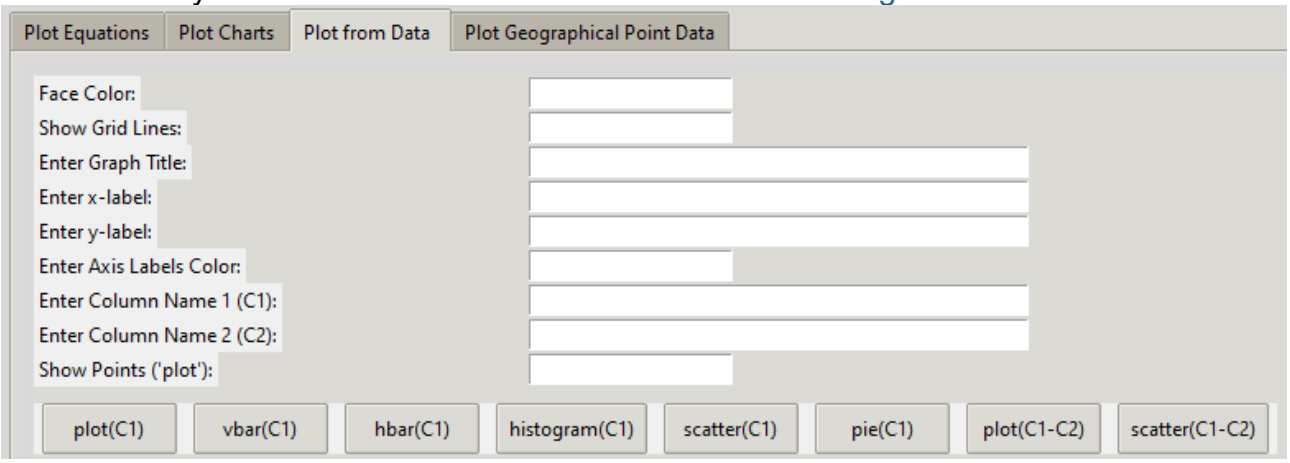


Figure 8. Data entry canvas for the "Plot from Data" tab.

There are 3 main steps to create plots in this tab:

1. Import the data (must be in *.csv* or *.xlsx* spreadsheet),
2. Enter all the required inputs as shown in Figure 8.
3. Select the appropriate chart button of your choice.

There are few important points to consider to successfully generate the plots:

- You need to enter the column names (C1, C2) as exactly as the column name of your spreadsheet file that contains the data you want to plot.
- Note that that only the last two buttons (*plot(C1-C2)* and *scatter(C1-C2)*) require two columns of data from your spreadsheet file. One column is plotted against the other. The rest of the buttons only require one column of data in spreadsheet to plot.

Example 3: Generate a horizontal bar chart using a single column of data.

- Let's say we have some data in excel file as shown in Figure 9.

	A	B	C	D	E	F	G	H
1	X		Y	values		Year	GDP (Billion USD)	
2	1200		12501	22000		2000	11	
3	1350		13001	22500		2001	13	
4	1500		13501	23000		2002	15	
5	1234		18765	23500		2003	15	
6	1800		14501	24000		2004	16	
7	2543		16543	24500		2005	15	
8	2100		15501	25000		2006	16	
9	2250		23543	25500		2007	17	
10	3243		16501	26000		2008	17	
11	2550		23240	26500		2009	18	
12	1590		12143	35000		2010	14	
13	2850		18001	23555		2011	16	
14	1543		23454	28000		2012	17	
15	3150		19001	28500		2013	17	
16	2341		22431	29000		2014	28	
17	3450		20001	29500		2015	28	
18	4000		21345	30000		2016	29	
19	2353		12543	30500		2017	30	
20	4121		21501	35000		2018	30	
21	4050		17543	23000		2019	32	
22	3421		16543	32000		2020	31	
23	4576		15435	32500		2021	31	
24	4500		23501	33000		2022	32	
25	3453		12530	22000		2023	33	
26	4800		14256	34000		2024	33	
27								

Figure 9. Sample spreadsheet data to be imported and plotted.

- We want to plot the data in the column called '*values*' in an excel file called 'test'. We want our plot to be in horizontal bars.

Step 1 – Import the data using the import function in the menu.

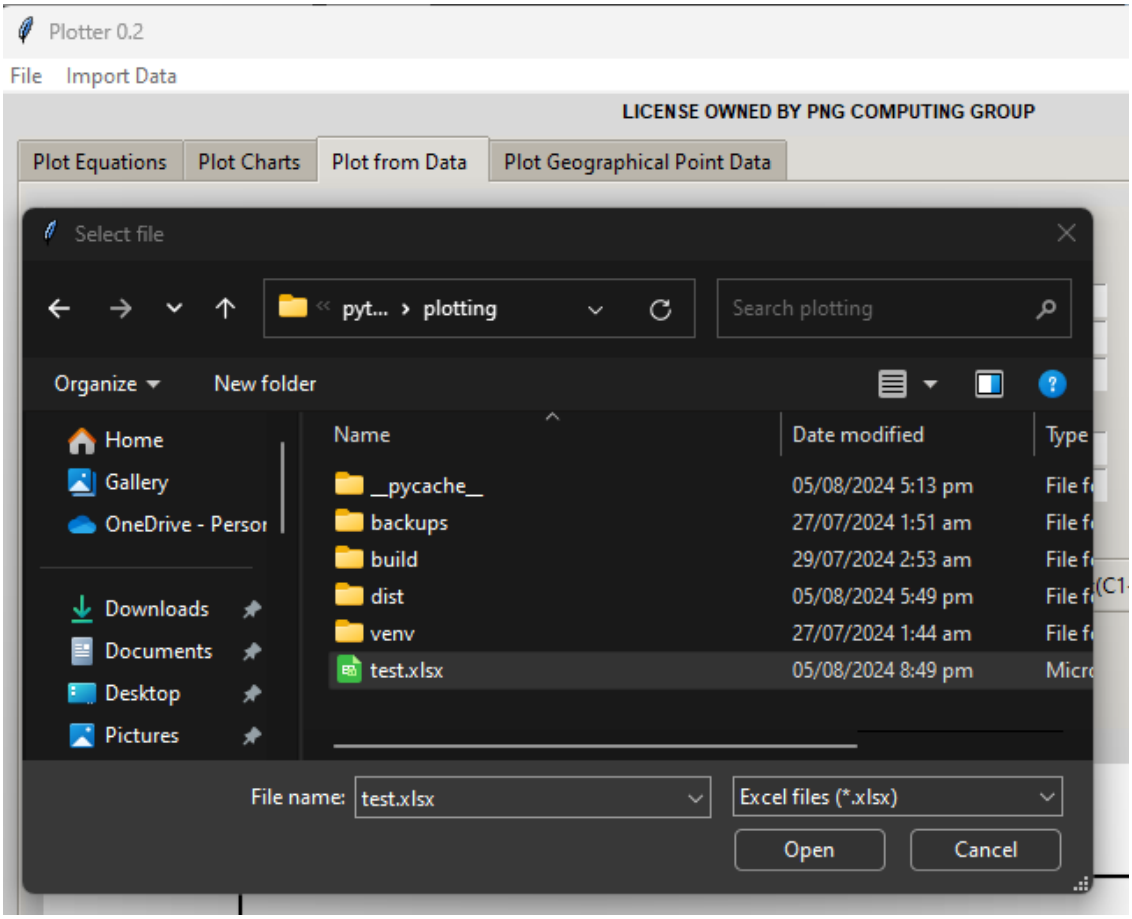


Figure 10. Importing spreadsheet data using the "Import Data" function in the top menu. In the figure, note that the file type is indicated as "Excel files (.xlsx)" at the bottom right corner. Here, you can click and change file type to .csv if your data is in csv file.*

Step 2 – Fill in the rest of the information with careful naming of the "values" column as shown in Figure 11. Then click the '*hbar(C1)*' button.

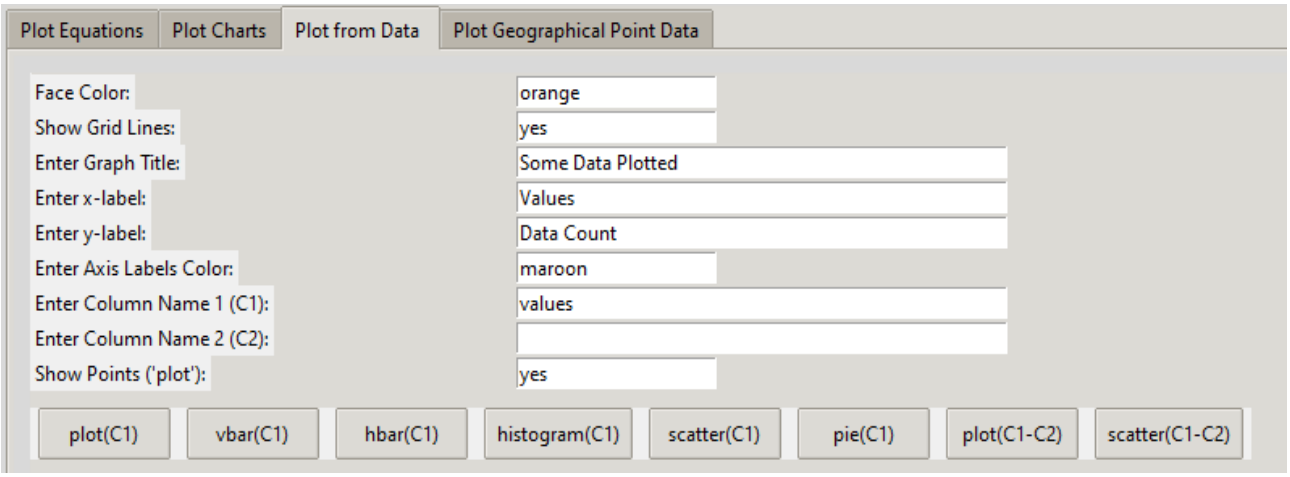


Figure 11. Filling in the rest of the information.

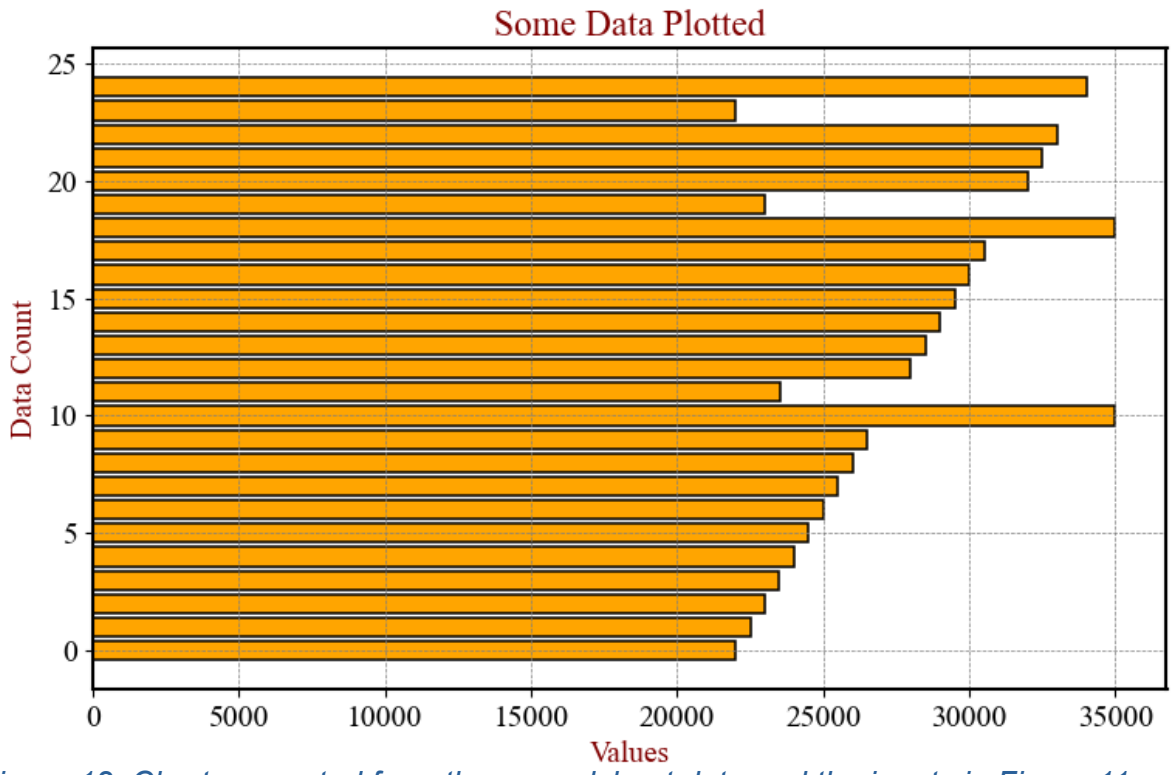


Figure 12. Chart generated from the spreadsheet data and the inputs in Figure 11.

Example 4: Potting data from two column of data.

- Lets use the same spreadsheet as in *Example 3*. But here we want to plot data from two columns.
- Let's say column F and G in the spreadsheet file (Figure 9) have PNGs GDP from 2000 to present. We want to plot this data.

Step 1. Import the data using the Import Data function in the menu.
Step 2. Fill in the rest of the information as shown in Figure 13.
Step 3. Click the 'plot(C1-C2)' button.

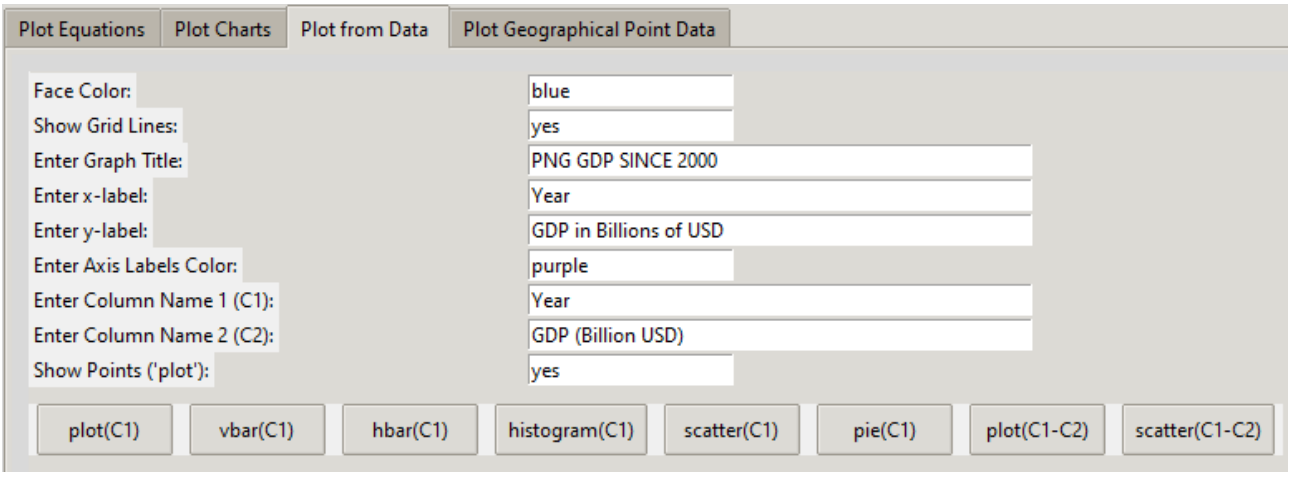


Figure 13. Filling in the rest of the inputs. Note: careful naming of the collumns C1 and C2.

This generates a plot as shown in Figure 14.

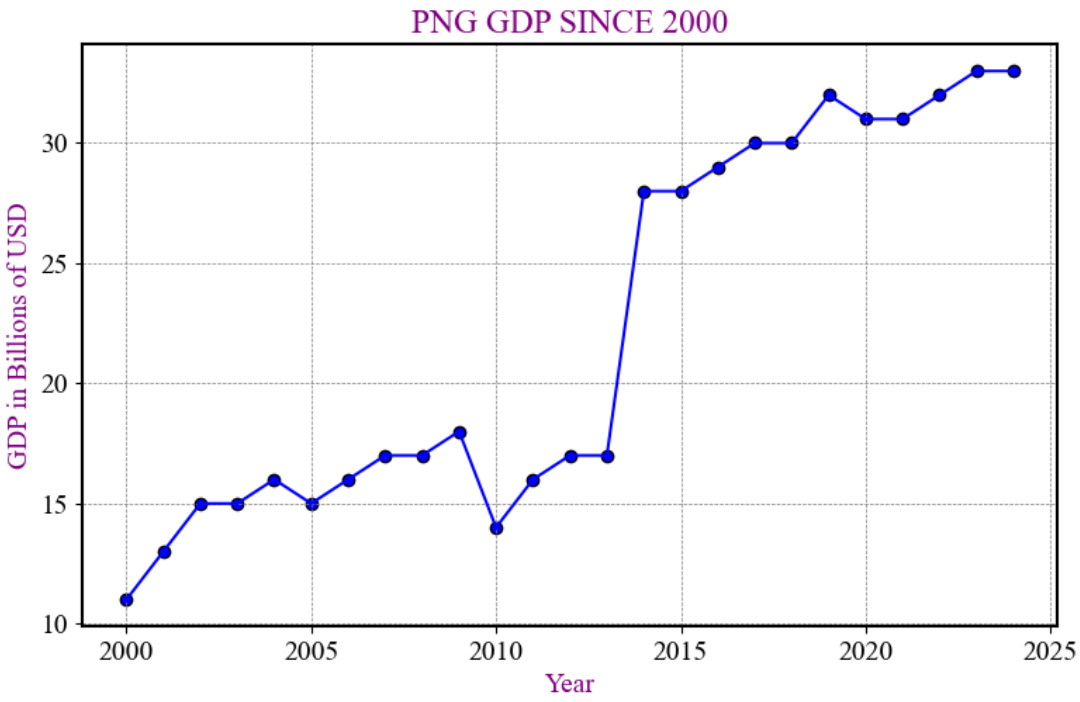


Figure 14. Plot generated from the imported data and the inputs in Figure 13. Note: this data is just made up and does not reflect the actual PNG's GDP over the plotted period.

3.4. Plot Geographical Point Data

The data entry canvas for the "Plot Geographical Point Data" tab looks like Figure 15.

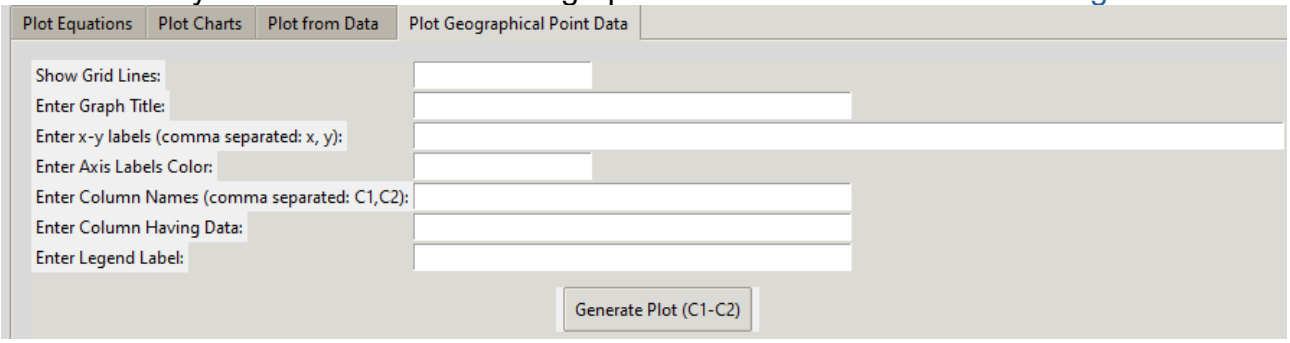


Figure 15. Data entry canvas for the "Plot Chart" tab.

Example 5: Plotting Geographical Point Data

- Here we have referred to the tab as "Geographical Point Data", which infers plotting some point data on a geographical coordinates or grid. However, you are not limited to plotting only geographical. You can customize the plots to any data in spreadsheet with three columns.
- For this example, let's use the same data in our excel file in Figure 9, also shown in Figure 16.
- Assume column 'X' and 'Y' are coordinates (say Easting and Northing) of fuel stations in a town and the "values" column has weekly income in PGK of the fuel stations. Let's plot this information.

Step 1. Import the data using the Import Data function in the menu.
Step 2. Fill in the rest of the information as shown in Figure 17.
Step 3. Click the 'Generate Plot (C1-C2)' button.

	A	B	C	D	E	F	G	H
1	X		Y	values		Year	GDP (Billion USD)	
2	1200		12501	22000		2000	11	
3	1350		13001	22500		2001	13	
4	1500		13501	23000		2002	15	
5	1234		18765	23500		2003	15	
6	1800		14501	24000		2004	16	
7	2543		16543	24500		2005	15	
8	2100		15501	25000		2006	16	

Figure 16. Part of the data as shown in Figure 9. Here, X and Y are coordinates of fuel stations of a town and "values" column has the weekly income (PGK) of the fuel stations.

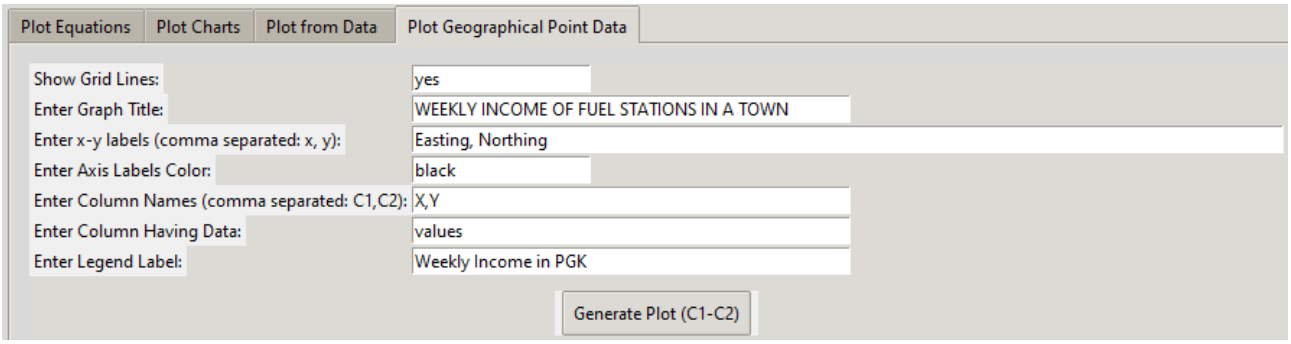


Figure 17. Filling in the inputs. Note: careful naming of the collumns x-y labels as well as C1 and C1 are now entered side-by-side separated with a comma.

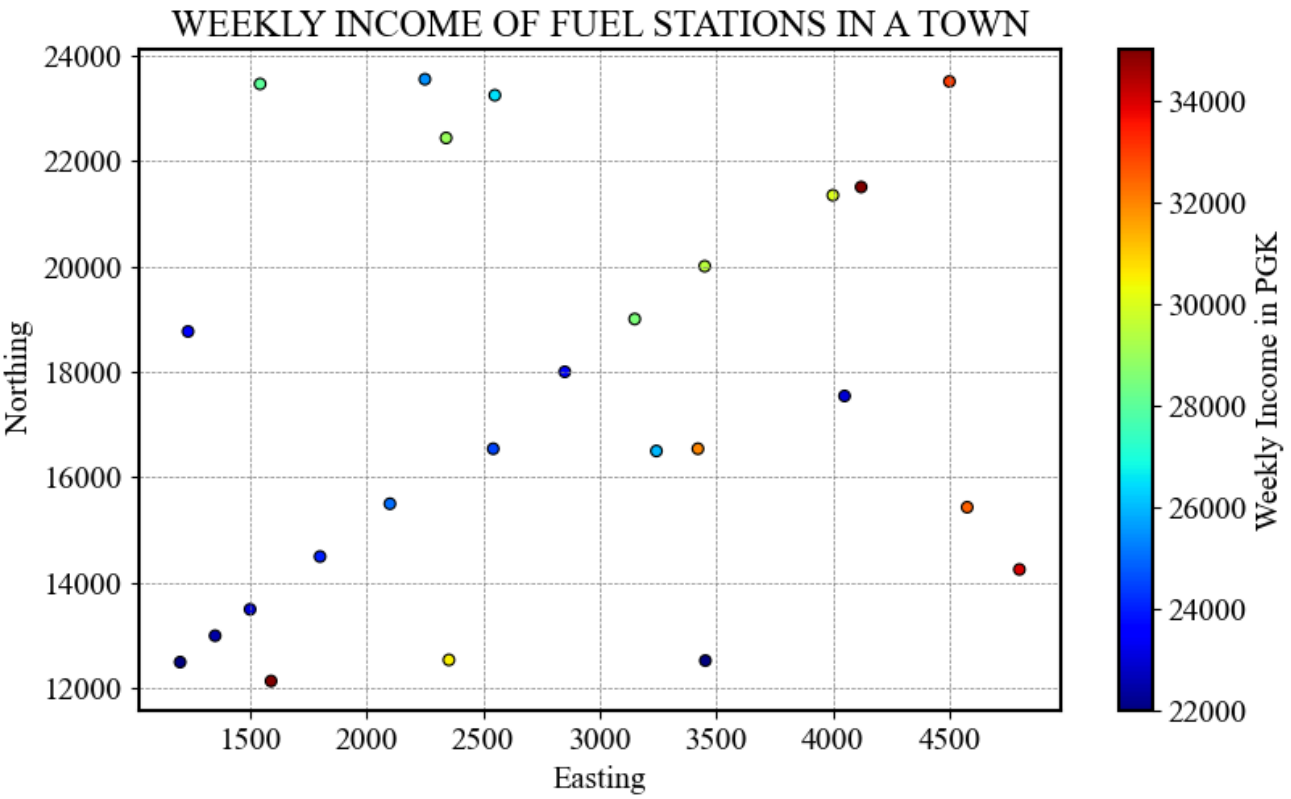


Figure 18. Plot generated from the inputs in Figure 17 and data from the excel file. The plot assumes weekly income of fuel stations in a town plotted over a easting-northing projected coordinate system.

4. Interpolation (2D visual): Geographical Data

Three interpolation functions included in the *Plot Geographical Data* tab are shown in Figure 19.

- Cubic,
- Linear, and
- Nearest-neighbor

Example 6: Interpolating Geographical Point Data and Visualizing in 2D

Refer to Example 5, Figure 18 where we plotted weekly income for fuel stations. Assume that there are other fuel stations within the mapped area and we have not captured those data. We can make a rough estimation of their weekly income using the samples we already collected as shown in Figure 18. Lets estimate these using the cubic interpolation function.

Step 1. Import the data using the Import Data function in the menu.
Step 2. Fill in the rest of the information as shown in Figure 19. Note that in the Axis Labels Color input, you have to put in the color map after a comma. Some colormaps to choose include: *ocean, hsv, jet, terrain, viridis, magma, hot, summer, winter*
Step 3. Click the '*Cubic 2D*' button.

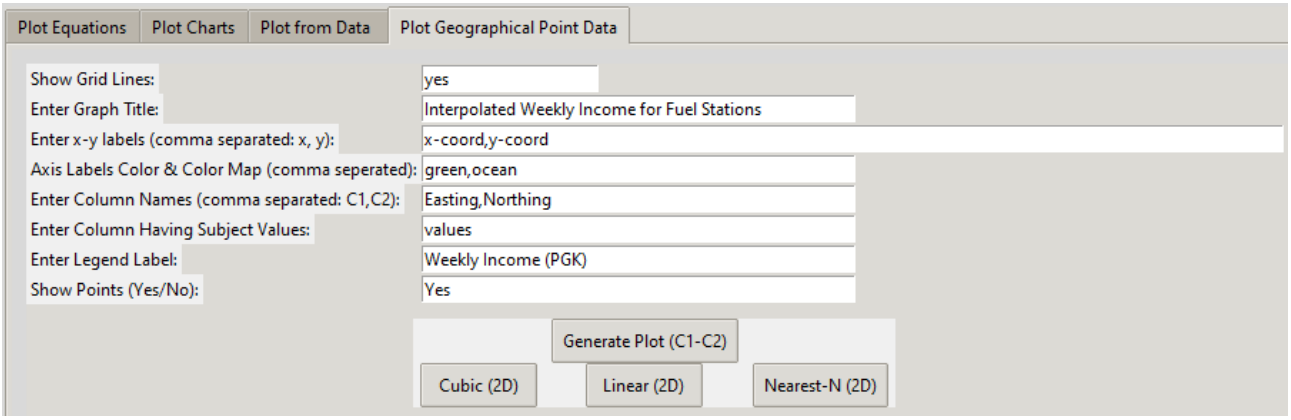


Figure 19. Updated Tab with interpolation functions and filled in data for fuel stations.

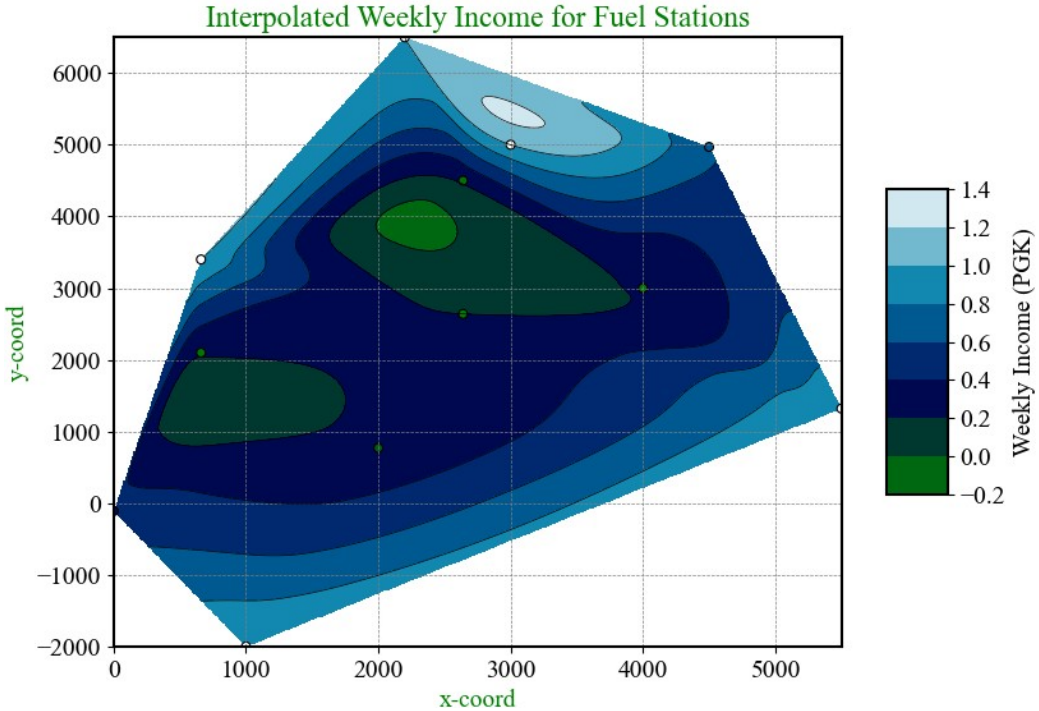


Figure 20. Plot generated from data in Figure 19 and the cubic function.

5. Interpolation (3D visual): Geographical Data

Plotter v0.4 tab is as shown in Figure 22. Let's demonstrate how to use this tab with an example.

Example 7: Interpolating Geological Point Data and Visualizing in 3D

Let's say we have an excel file with water reservoir data as shown Figure 21.

	A	B	C	D	E	F	G
	well_id	x	y	depth	h	poro	sw
	W1	0	-110	-4900	25	0.2	0.5
	W2	4500	4970	-4920	33	0.205	0.65
	W3	2640	2640	-4800	44	0.2	0.2
	W4	660	2100	-4900	36	0.19	0.22
	W5	2000	770	-4850	22	0.023	0.27
	W6	2640	4500	-4850	45	0.242	0.23
	W7	4000	3000	-4880	23	0.235	0.22
	W8	660	3400	-5100	34	0.23	1
	W9	5500	1320	-5050	24	0.19	1
	W10	2200	6500	-5010	11	0.21	1
	W11	1000	-2000	-5000	24	0.18	1
	W12	3000	5000	-4990	28	0.12	1

Figure 21. Data from 12 wells drilled through water reservoir.

Step 1. Import the data using the Import Data function in the menu.
Step 2. Fill in the rest of the information as shown in Figure 22. Note that in the Axis Labels Color input, you have to put in the color map after a comma. Some colormaps to choose include: *ocean, hsv, jet, terrain, viridis, magma, hot, summer, winter.* Also note that in the Grid Edge Color & Resolution input, you have to put in the resolution (integer) after a comma. High resolution will have a larger number.
Step 3. Click the '*Cubic*' button.

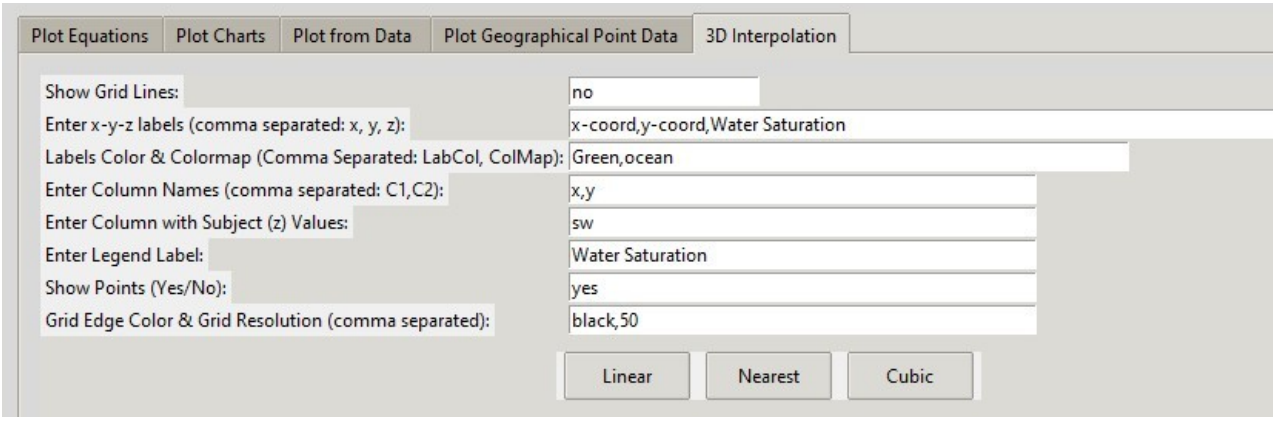


Figure 22. Filling in the information for the wells

The plot generated from this inputs is as shown in Figure 23. Other plots are included at the appendix section.

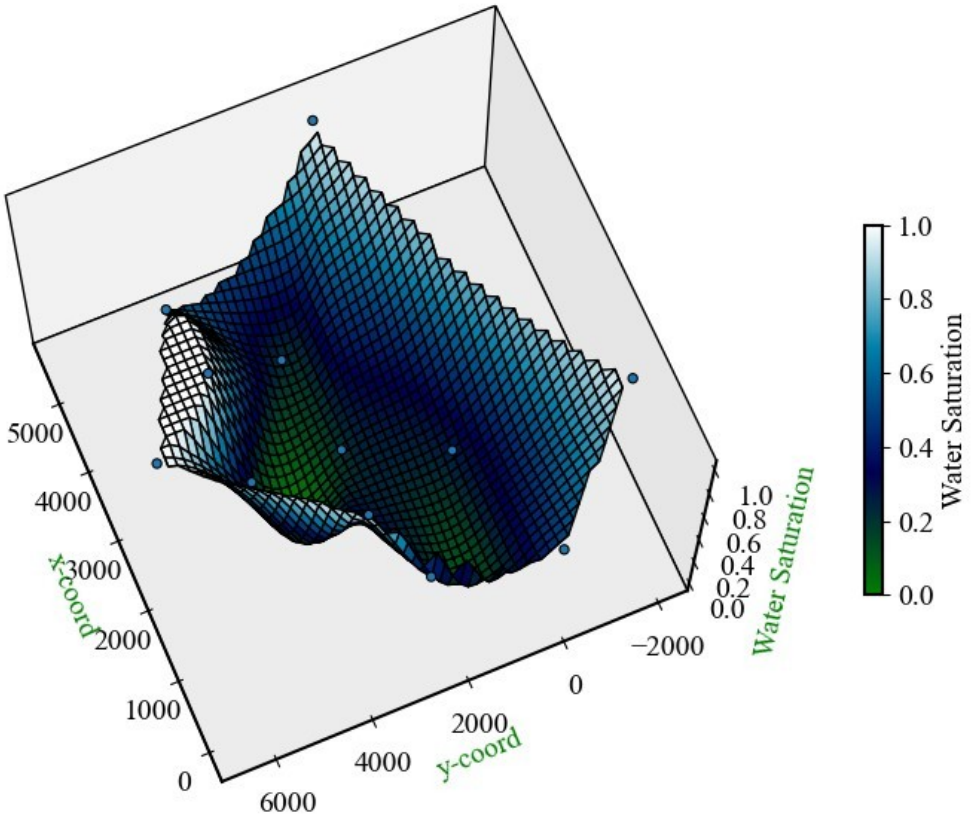


Figure 23. Plot generated from the inputs in Figure 22.

6. Closing

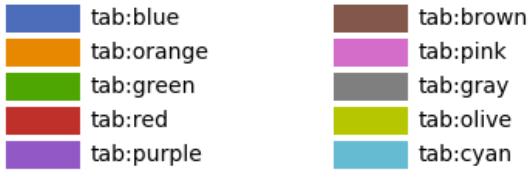
The trial version has up to 10 days before expiry. You can share the trial version with your friends and colleagues. For full licence or for further customization of this app to suit specific requirements in your work, kindly contact 71087533 or email optimusservices@gmail.com. **Plotter** software is a product of Optimus Geotechnics Limited, a fully PNG owned start-up that provides a range of technical services including advanced data analytics and custom software development (web, desktop) with artificial intelligence (AI) capabilities.

Appendix

Color Codes for Customizing Plot Colors

Base Colors

Tableau Palette



CSS Colors

Other Sample Plots

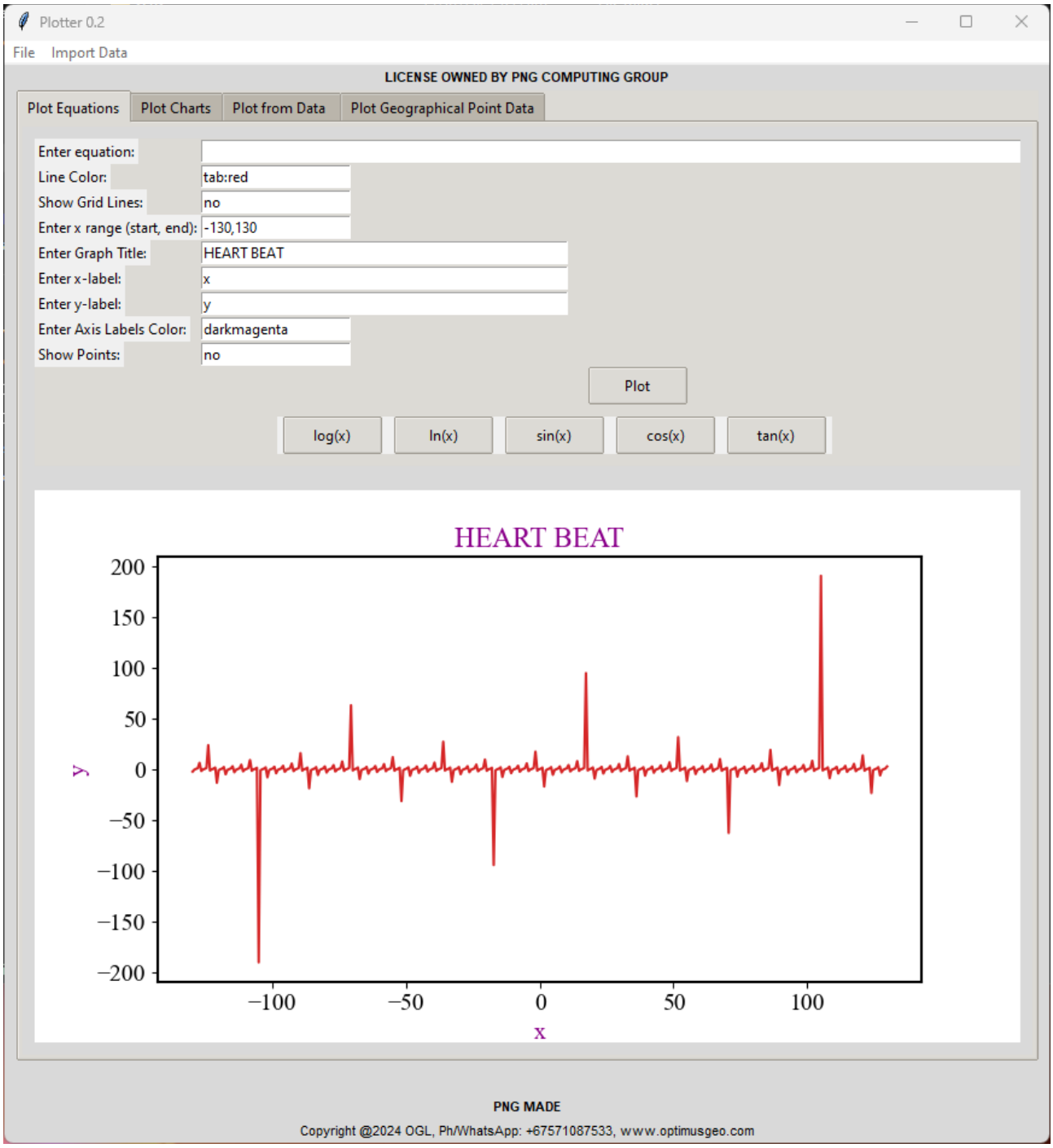


Figure 24. Sample plot using the tan(x) button.

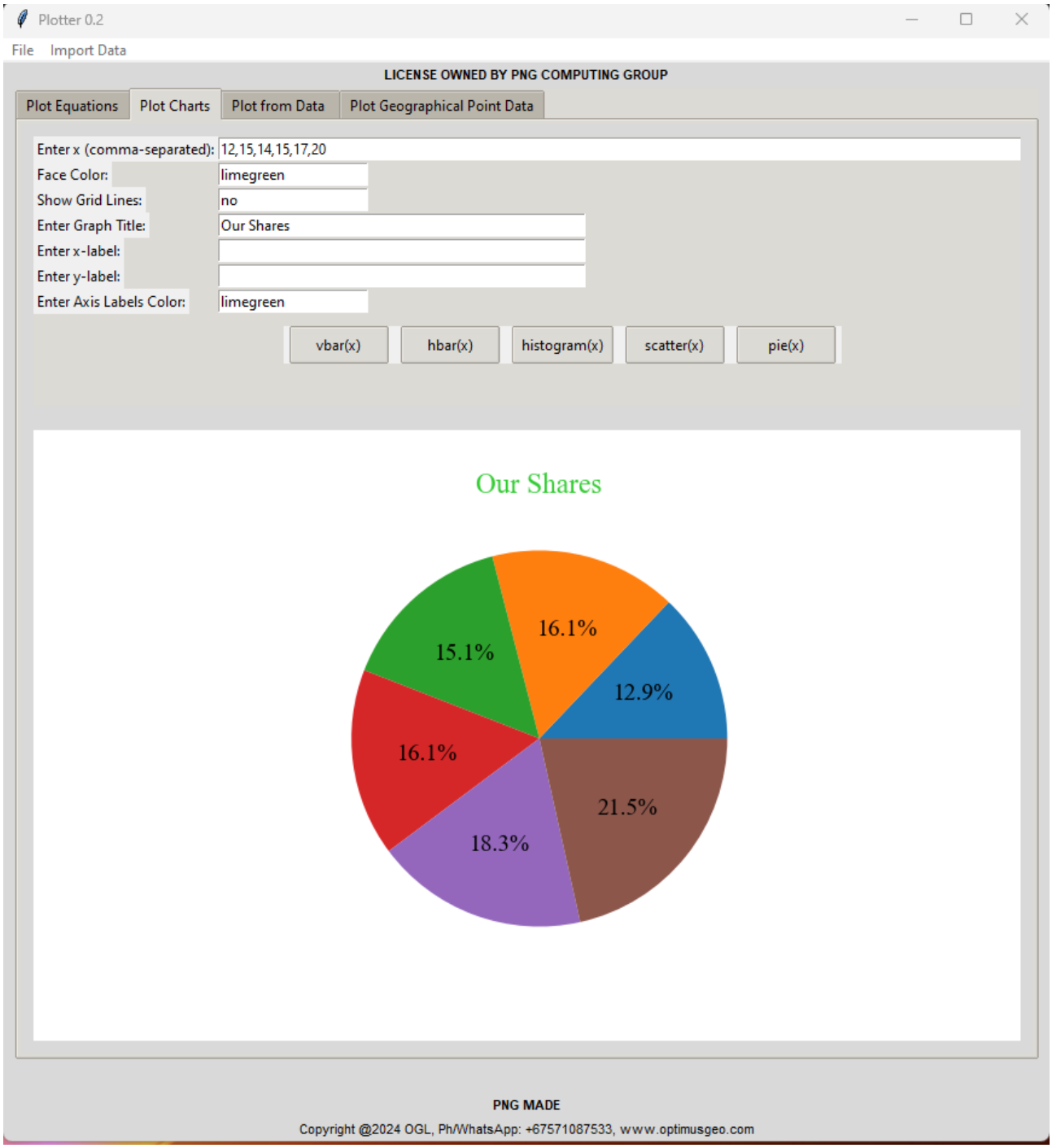


Figure 25. Sample plot using the pie(x) button.

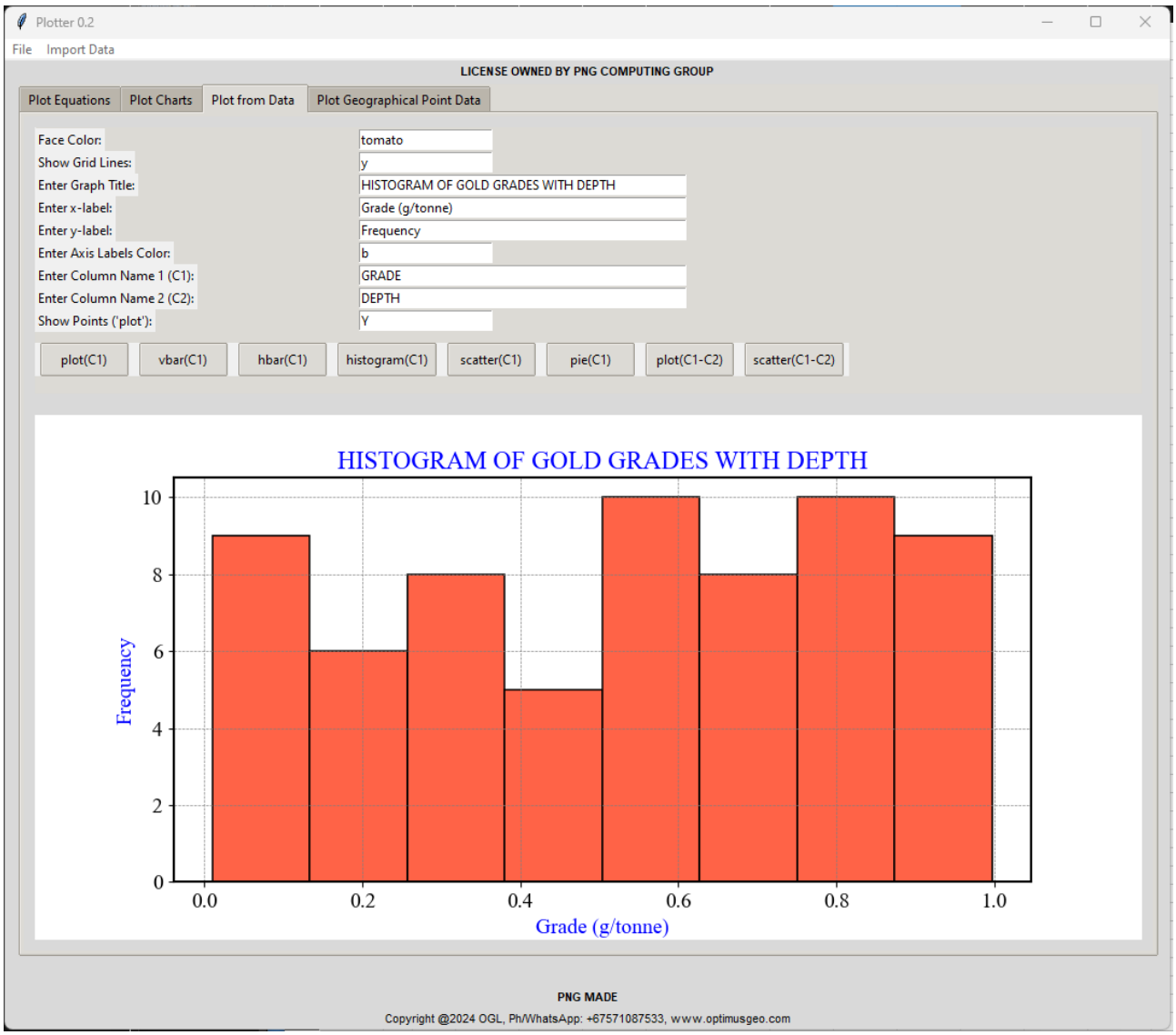


Figure 26. Sample plot using the histogram(C1) button.

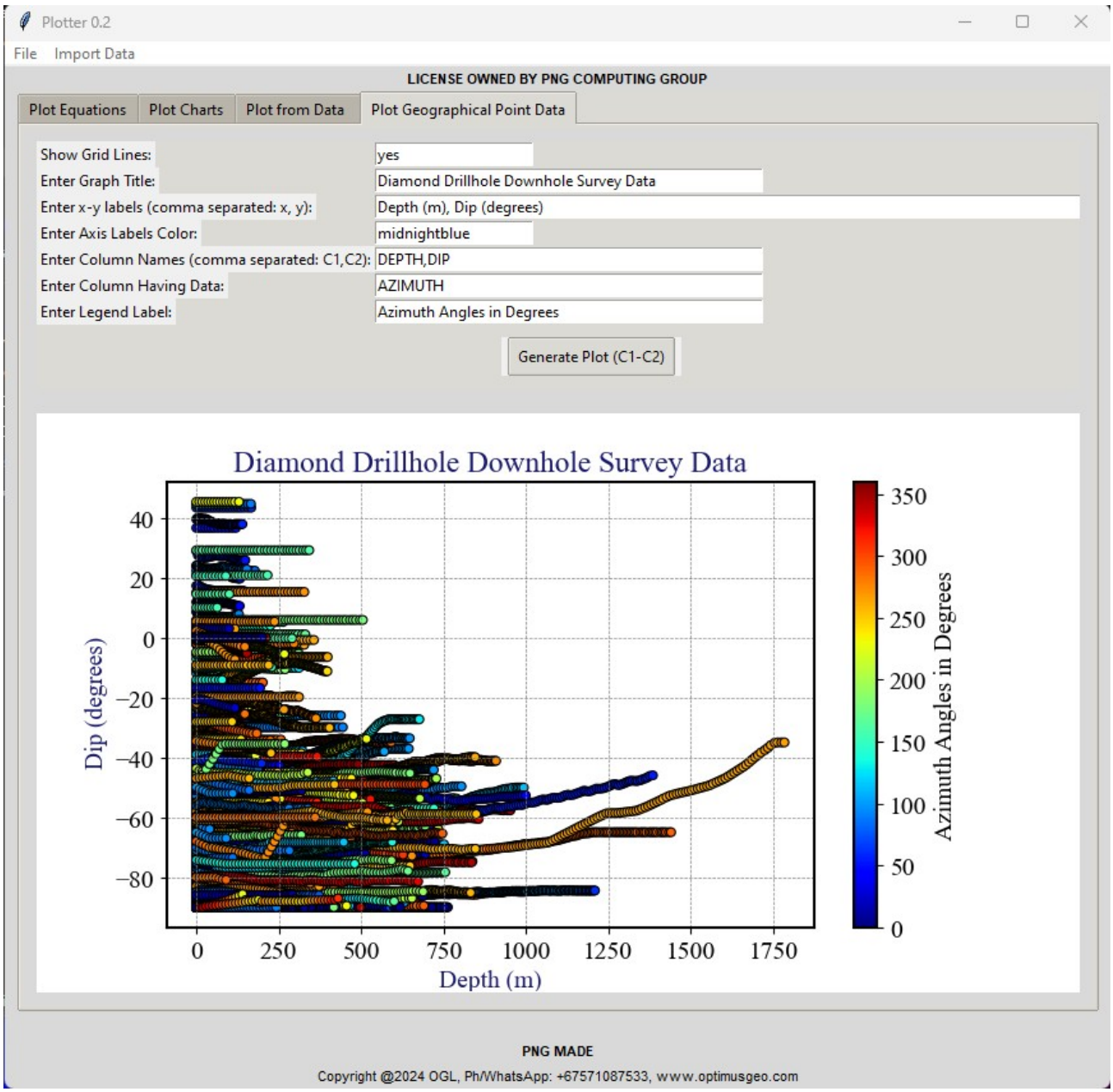


Figure 27. Sample plot of some drill-hole survey data in spreadsheet.

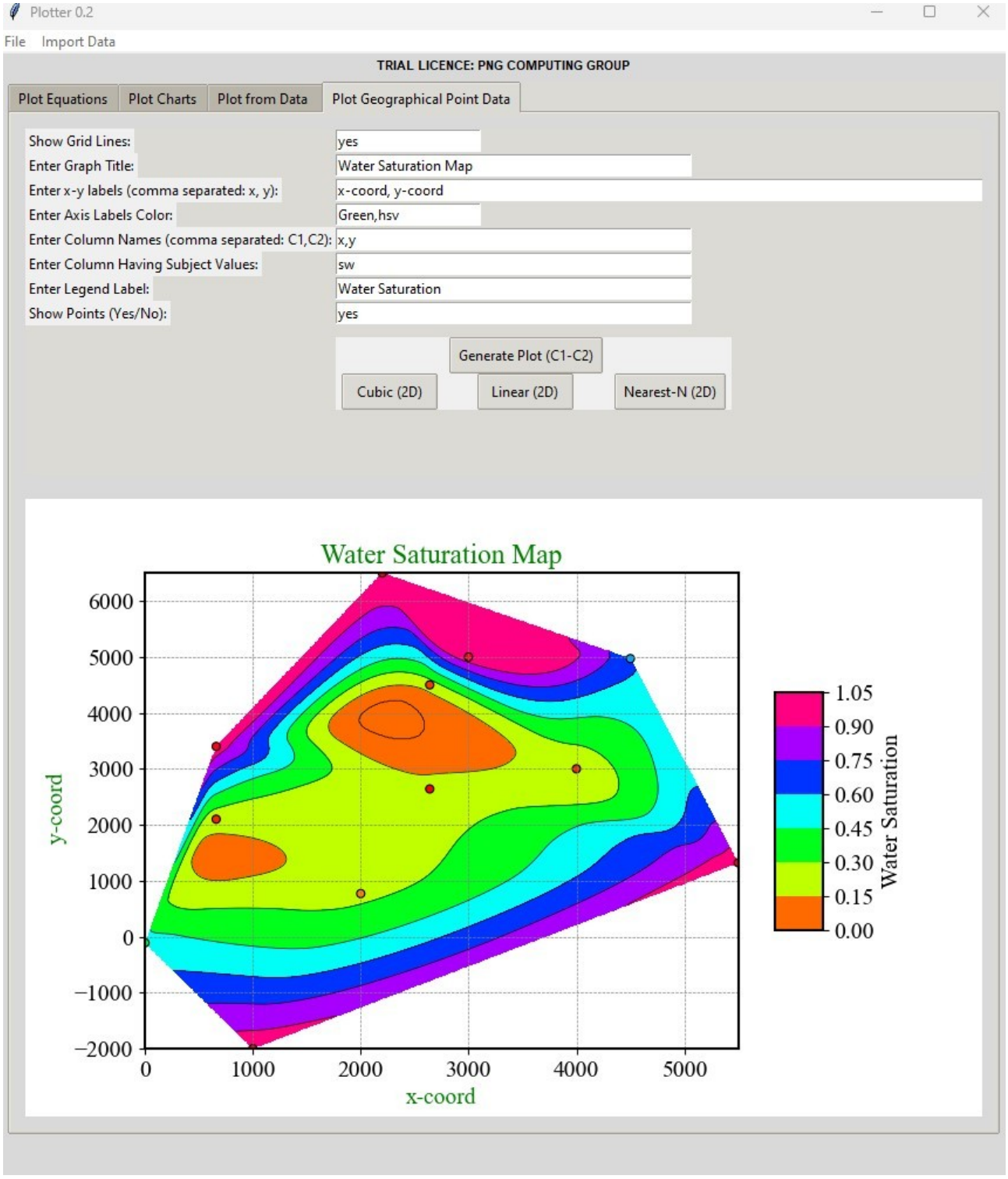


Figure 28. Sample plot of interpolated data with cubic 2D.

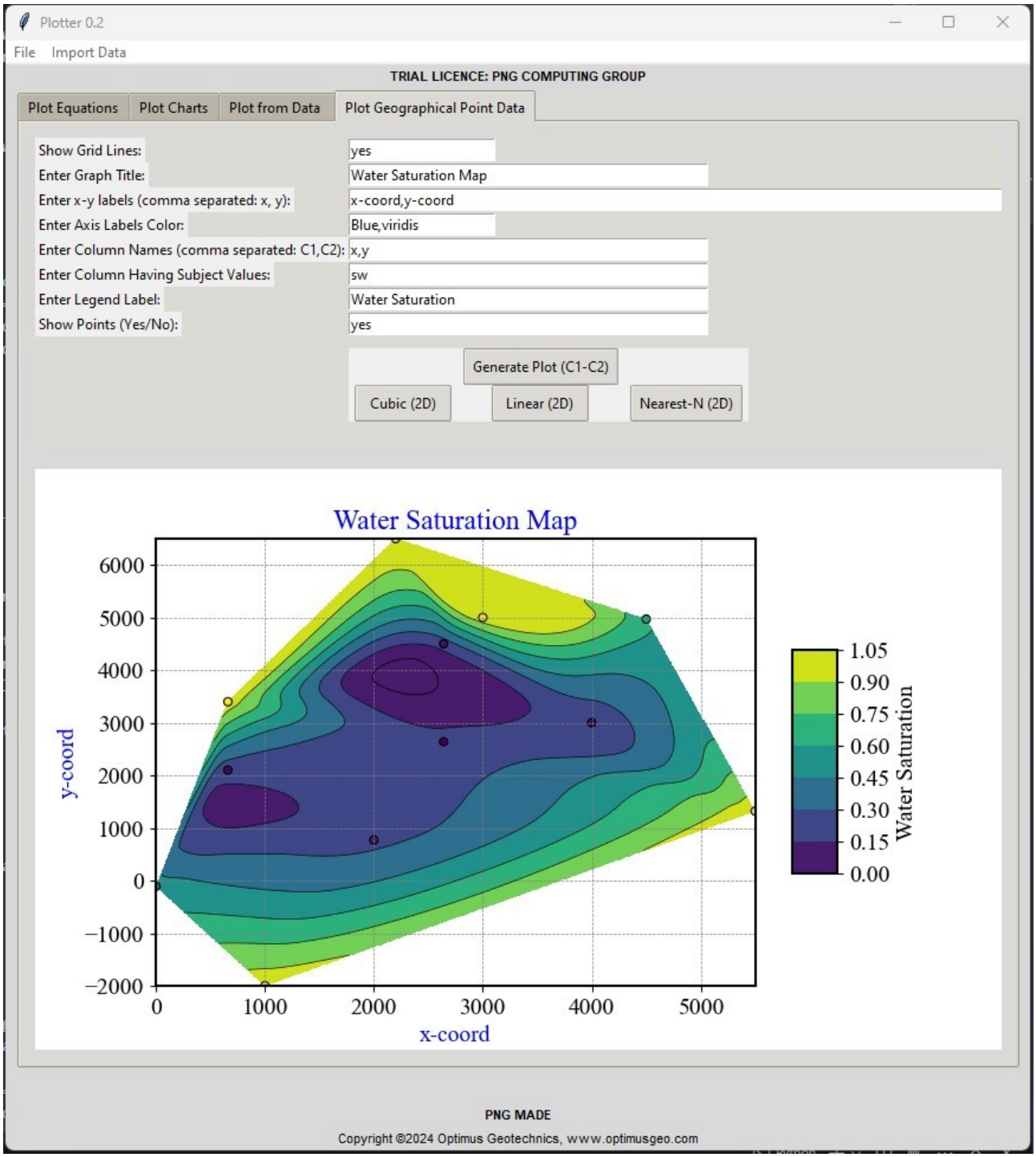


Figure 29. Sample plot of interpolated data with cubic 2D.

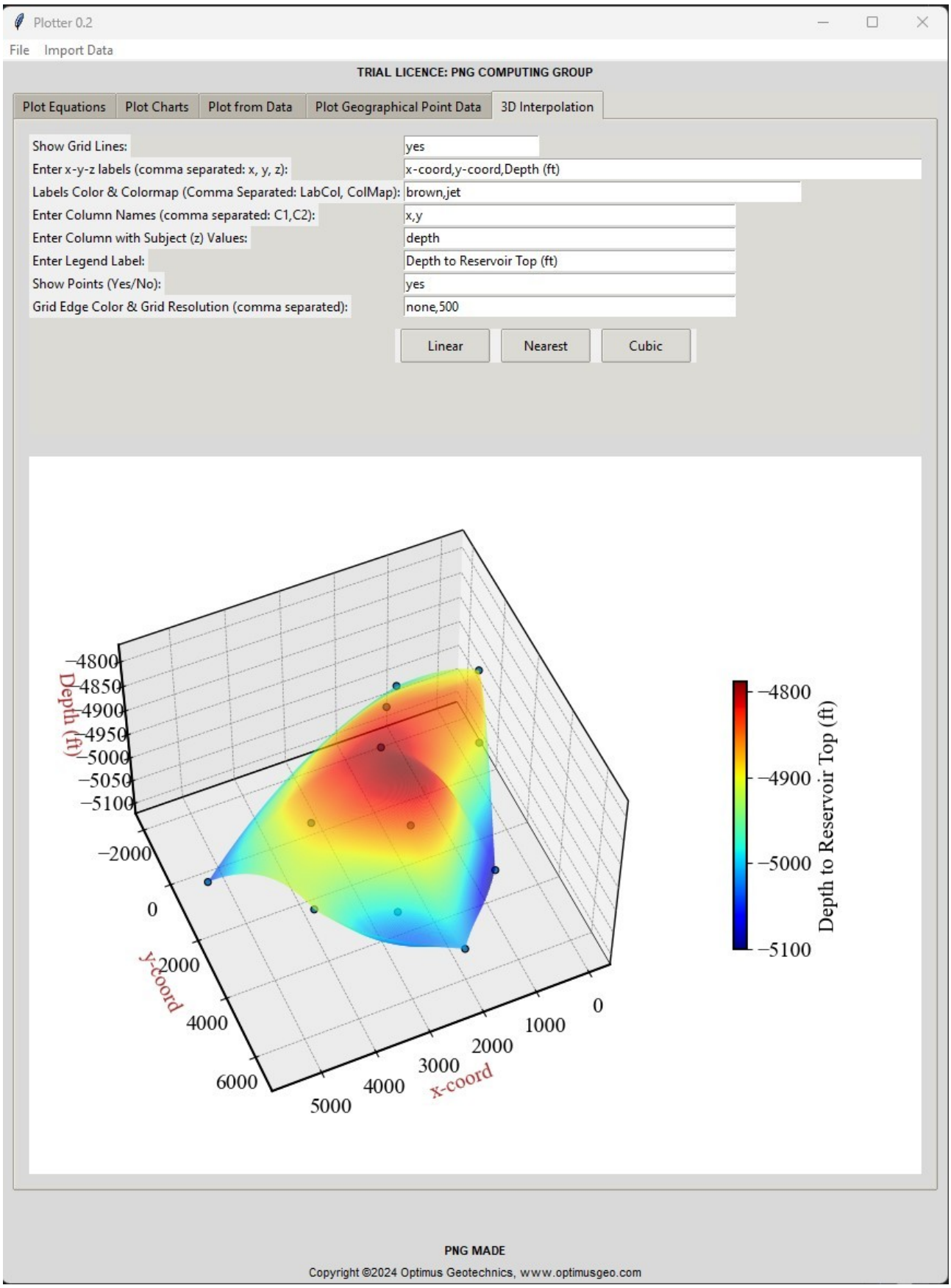
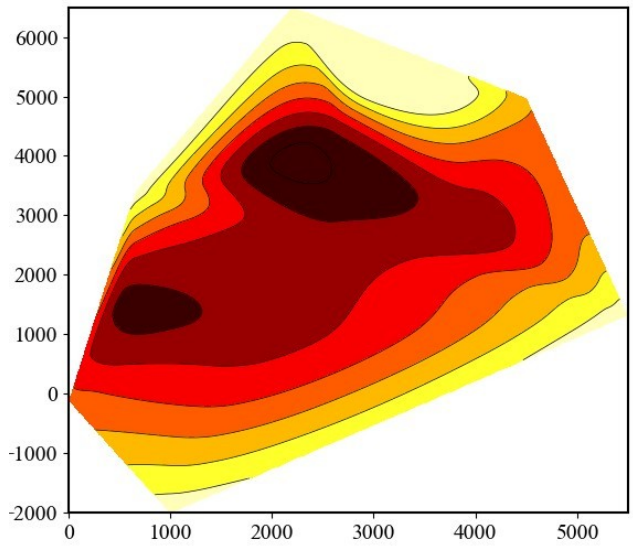
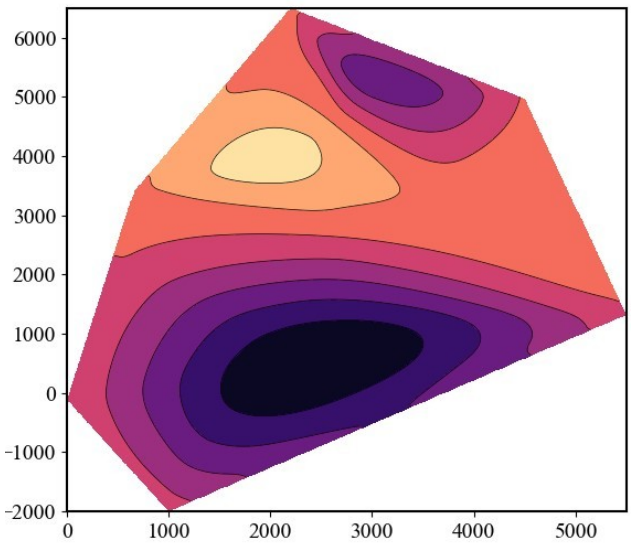
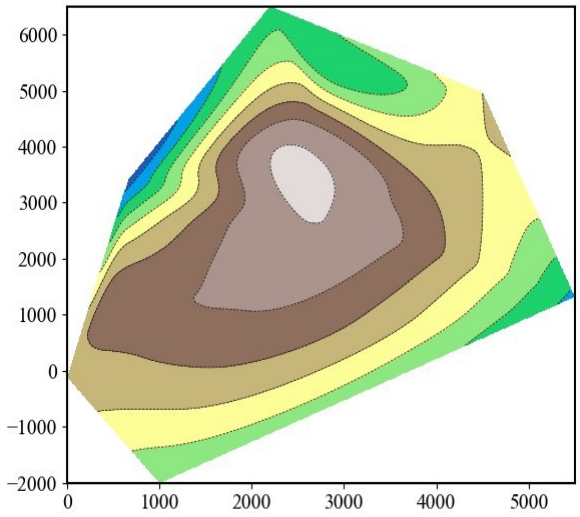
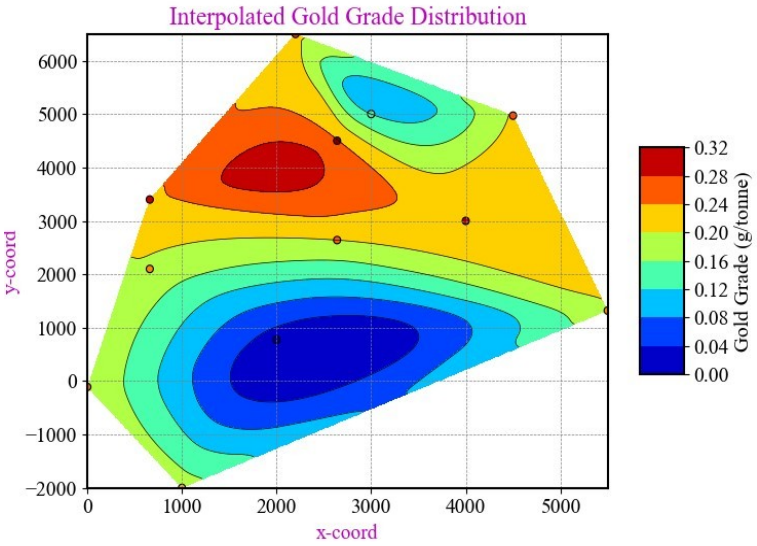


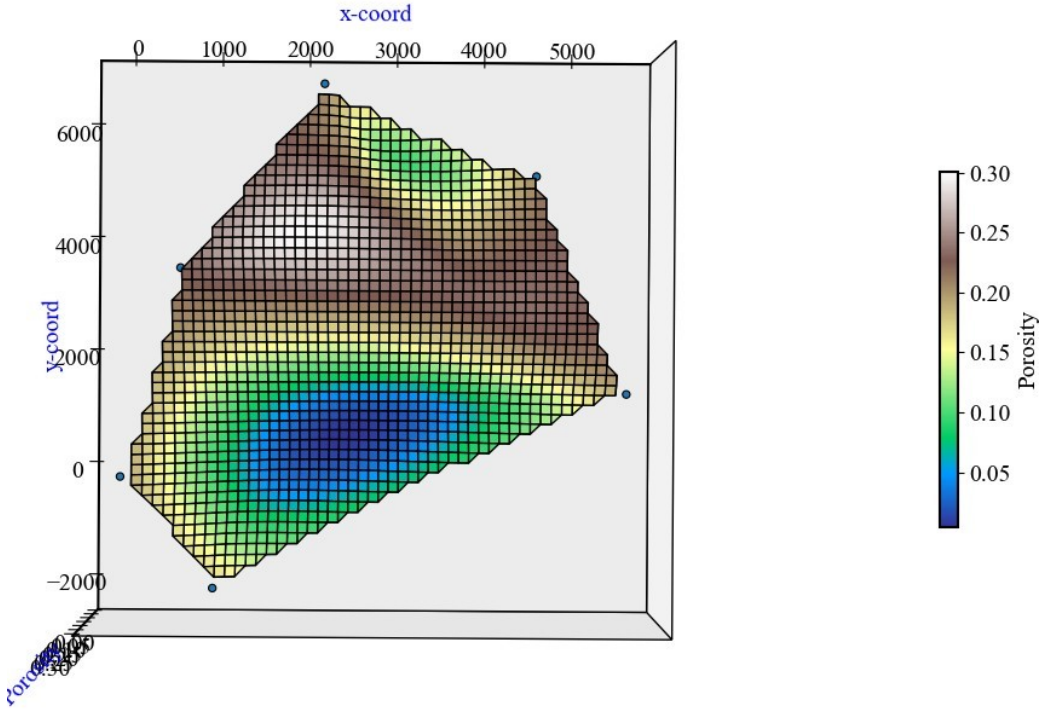
Figure 30. Sample plot of interpolated data with cubic in 3D interpolation tab.

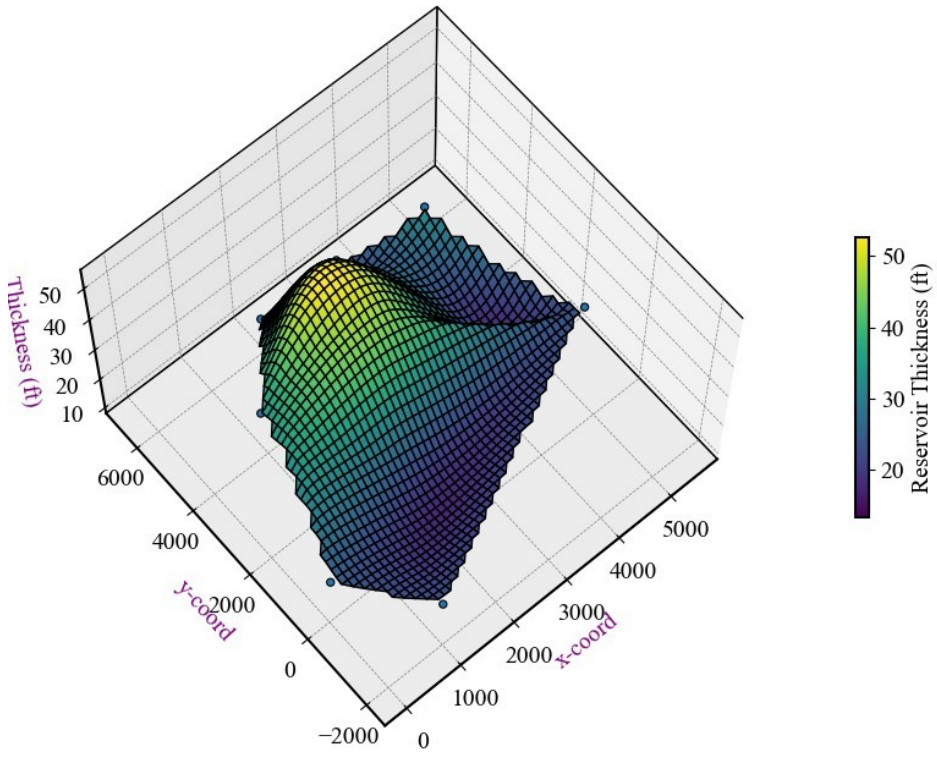

6000
5000
4000
3000
2000
1000
0
-1000
-2000
0
1000
2000
3000
4000
5000

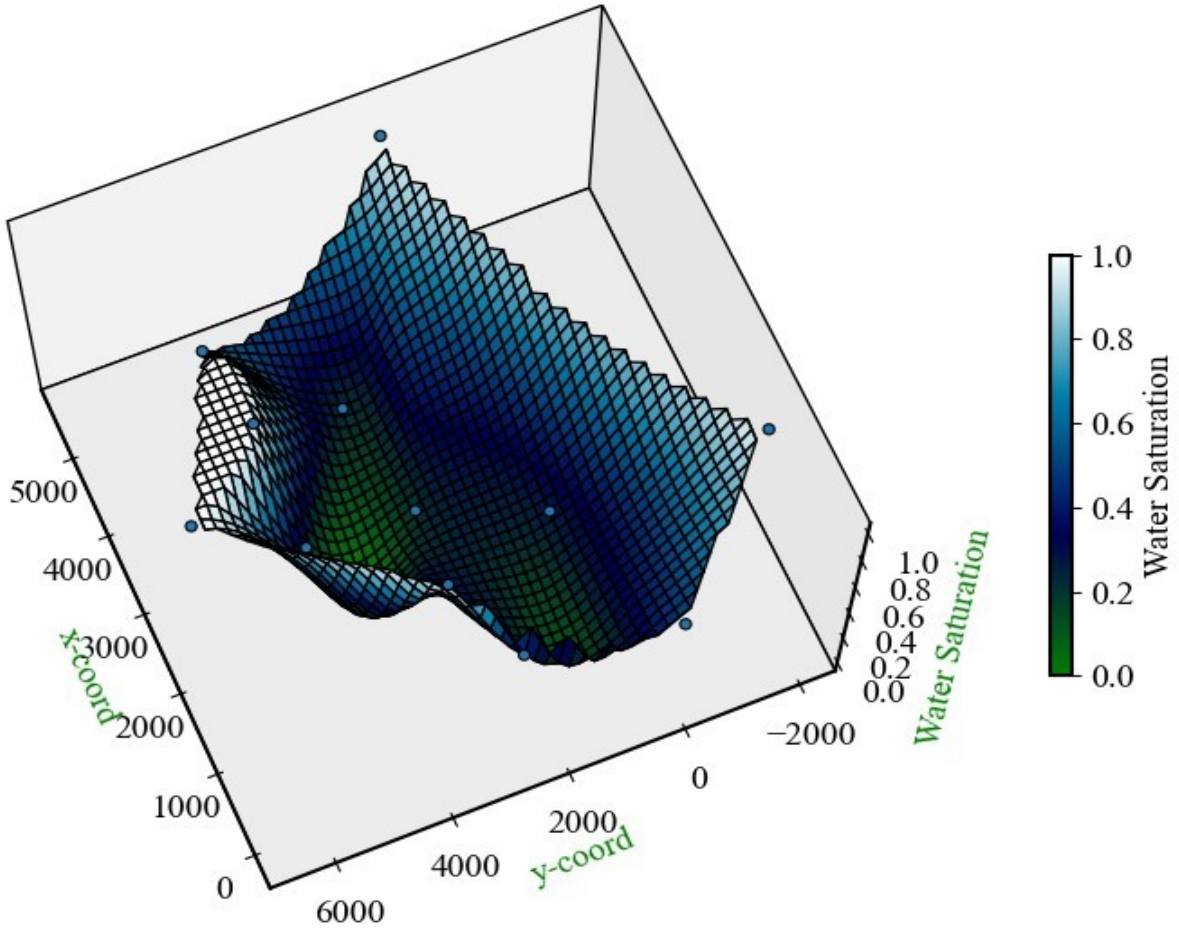

6000
5000
4000
3000
2000
1000
0
-1000
-2000
0
1000
2000
3000
4000
5000


6000
5000
4000
3000
2000
1000
0
-1000
-2000
0
1000
2000
3000
4000
5000


Interpolated Gold Grade Distribution
y-coord
x-coord
0
1000
2000
3000
4000
5000
6000
5000
4000
3000
2000
1000
0
-1000
-2000
0.32
0.28
0.24
0.20
0.16
0.12
0.08
0.04
0.00
Gold Grade (g/tonne)


x-coord
0
1000
2000
3000
4000
5000
6000
4000
2000
0
-2000
y-coord
0.30
0.25
0.20
0.15
0.10
0.05
Porosity


Thickness (ft)
50
40
30
20
10
6000
4000
2000
0
−2000
y-coord
5000
4000
3000
2000
1000
0
x-coord
Reservoir Thickness (ft)
50
40
30
20


5000
4000
3000
2000
1000
0
x-coord
6000
4000
2000
0
−2000
y-coord
Water Saturation
1.0
0.8
0.6
0.4
0.2
0.0
Water Saturation
1.0
0.8
0.6
0.4
0.2
0.0