

plotly | Graphing Libraries (<https://plotly.com/>)(/graphing-libraries/)

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Python (/python) > 3D Charts (/python/3d-charts) > Trisurf Plots

Suggest an edit to this page(<https://github.com/plotly/plotly.py/edit/doc-prod/doc/python/trisurf.md>)

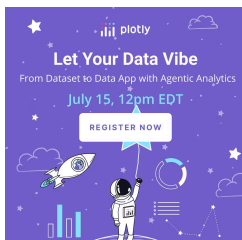
Trisurf Plots in Python

How to make tri-surf plots in Python with Plotly. Trisurfs are formed by replacing the boundaries of a compact surface by touching triangles.

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Trisurf plots can be made using a [figure factory](https://plotly.com/figure-factories/)(/python/figure-factories/) as detailed in this page.

Torus



```

import plotly.figure_factory as ff

import numpy as np
from scipy.spatial import Delaunay

u = np.linspace(0, 2*np.pi, 20)
v = np.linspace(0, 2*np.pi, 20)
u,v = np.meshgrid(u,v)
u = u.flatten()
v = v.flatten()

x = (3 + (np.cos(v)))*np.cos(u)
y = (3 + (np.cos(v)))*np.sin(u)
z = np.sin(v)

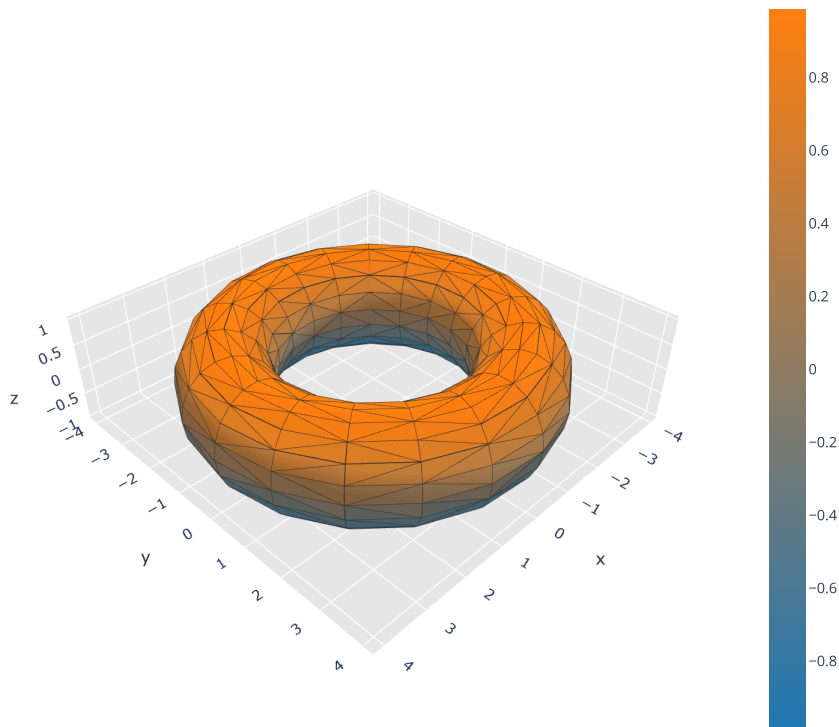
points2D = np.vstack([u,v]).T
tri = Delaunay(points2D)
simplices = tri.simplices

fig = ff.create_trisurf(x=x, y=y, z=z,
                        simplices=simplices,
                        title=dict(text="Torus"), aspectratio=dict(x=1, y=1, z=0.3))

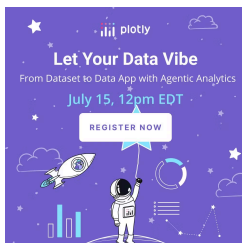
fig.show()

```

Torus



Mobius Band



```

import plotly.figure_factory as ff

import numpy as np
from scipy.spatial import Delaunay

u = np.linspace(0, 2*np.pi, 24)
v = np.linspace(-1, 1, 8)
u,v = np.meshgrid(u,v)
u = u.flatten()
v = v.flatten()

tp = 1 + 0.5*v*np.cos(u/2.)
x = tp*np.cos(u)
y = tp*np.sin(u)
z = 0.5*v*np.sin(u/2.)

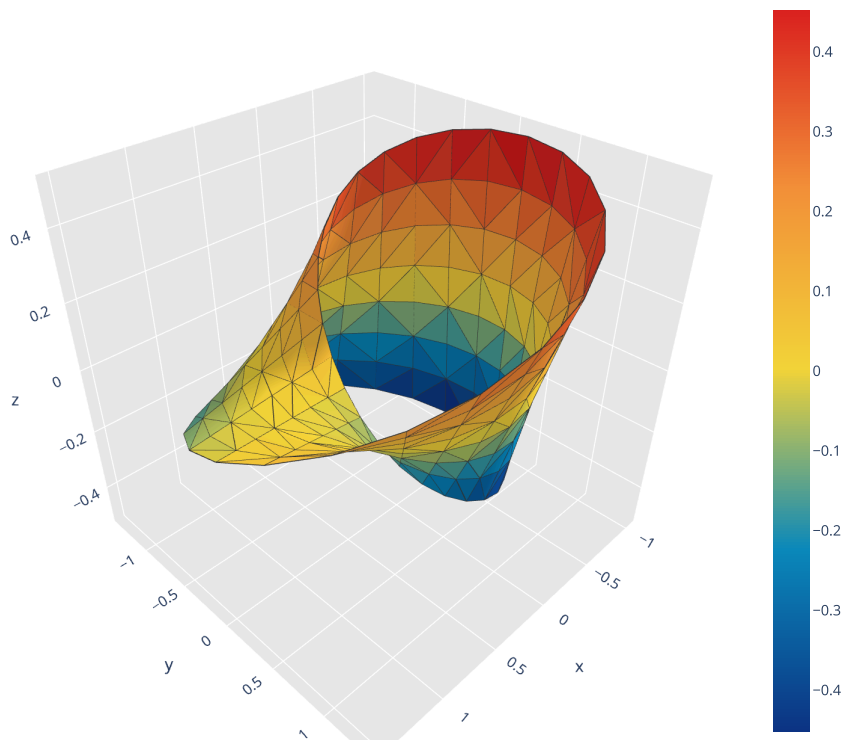
points2D = np.vstack([u,v]).T
tri = Delaunay(points2D)
simplices = tri.simplices

fig = ff.create_trisurf(x=x, y=y, z=z,
                       colormap="Portland",
                       simplices=simplices,
                       title=dict(text="Mobius Band"))

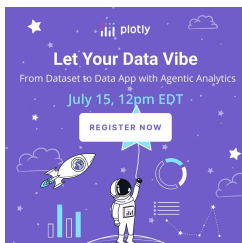
fig.show()

```

Mobius Band



Boy's Surface



```

import plotly.figure_factory as ff

import numpy as np
from scipy.spatial import Delaunay

u=np.linspace(-np.pi/2, np.pi/2, 60)
v=np.linspace(0, np.pi, 60)
u,v=np.meshgrid(u,v)
u=u.flatten()
v=v.flatten()

x = (np.sqrt(2)*(np.cos(v)*np.cos(v))*np.cos(2*u) + np.cos(u)*np.sin(2*v))/(2 - np.sqrt(2)*np.sin(3*u)*np.sin(2*v))
y = (np.sqrt(2)*(np.cos(v)*np.cos(v))*np.sin(2*u) - np.sin(u)*np.sin(2*v))/(2 - np.sqrt(2)*np.sin(3*u)*np.sin(2*v))
z = (3*(np.cos(v)*np.cos(v)))/(2 - np.sqrt(2)*np.sin(3*u)*np.sin(2*v))

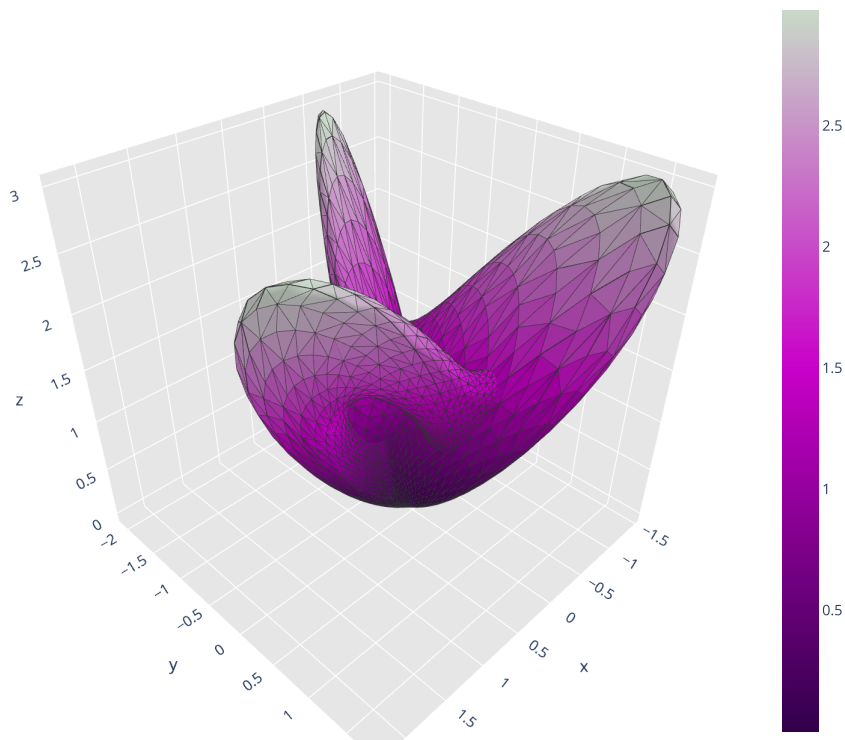
points2D = np.vstack([u, v]).T
tri = Delaunay(points2D)
simplices = tri.simplices

fig = ff.create_trisurf(x=x, y=y, z=z,
                      colormap=['rgb(50, 0, 75)', 'rgb(200, 0, 200)', '#c8dcc8'],
                      show_colorbar=True,
                      simplices=simplices,
                      title=dict(text="Boy's Surface"))

fig.show()

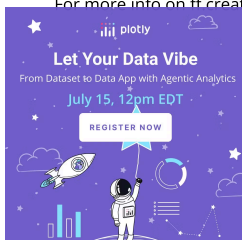
```

Boy's Surface



Reference

For more info on `ff.create_trisurf()`, see the [full function reference \(https://plotly.com/python-api-reference/generated/plotly.figure_factory.create_trisurf.html\)](https://plotly.com/python-api-reference/generated/plotly.figure_factory.create_trisurf.html)



What About Dash?

[Dash \(https://dash.plot.ly/\)](https://dash.plot.ly/) is an open-source framework for building analytical applications, with no Javascript required, and it is tightly integrated with the Plotly graphing library.

Learn about how to install Dash at <https://dash.plot.ly/installation> (https://dash.plot.ly/installation).


Everywhere in this page that you see `fig.show()`, you can display the same figure in a Dash application by passing it to the `figure` argument of the [Graph component](https://dash.plot.ly/dash-core-components/graph) (https://dash.plot.ly/dash-core-components/graph) from the built-in `dash_core_components` package like this:

```
import plotly.graph_objects as go # or plotly.express as px
fig = go.Figure() # or any Plotly Express function e.g. px.bar(...)
# fig.add_trace( ... )
# fig.update_layout( ... )

from dash import Dash, dcc, html

app = Dash()
app.layout = html.Div([
    dcc.Graph(figure=fig)
])

app.run(debug=True, use_reloader=False) # Turn off reloader if inside Jupyter
```



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pop

lifeExp

gdpPerCap

country	pop	continent	lifeExp	gdpPerCap
Afghanistan	31889923	Asia	43.828	974.5883384
Albania	3600523	Europe	76.423	5937.829525999999
Algeria	33333216	Africa	72.381	6223.367465
Angola	12420476	Africa	42.731	4707.231267
Argentina	40301927	Americas	75.32	12779.37964
Australia	20434176	Oceania	81.235	34435.367439999995
Austria	8199783	Europe	79.829	36126.4927
Bahrain	706573	Asia	75.635	29796.04834
Bangladesh	150448339	Asia	64.062	1701.253792
Belgium	10391226	Europe	79.441	33062.04908
Benin	8878314	Africa	56.728	1441.284873
Bolivia	9139352	Americas	65.554	3821.137884



(https://dash.plotly.com/tutorial?utm_medium=graphing_libraries&utm_content=python_footer)

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