



Streamline Plots in Python

How to make a streamline plot in Python. A streamline plot displays vector field data.

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A Streamline plot is a representation based on a 2-D vector field interpreted as a velocity field, consisting of closed curves tangent to the velocity field. In the case of a stationary velocity field, streamlines coincide with trajectories (see also the [Wikipedia page on streamlines, streaklines and pathlines](https://en.wikipedia.org/wiki/Streamlines,_streaklines,_and_pathlines) (https://en.wikipedia.org/wiki/Streamlines,_streaklines,_and_pathlines)).

For the streamline [figure factory](#) ([/python/figure-factories/](#)), one needs to provide

- uniformly spaced ranges of x and y values (1D)
- 2-D velocity values u and v defined on the cross-product (`np.meshgrid(x, y)`) of x and y.

Velocity values are interpolated when determining the streamlines. Streamlines are initialized on the boundary of the x-y domain.

Basic Streamline Plot

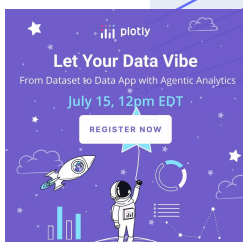
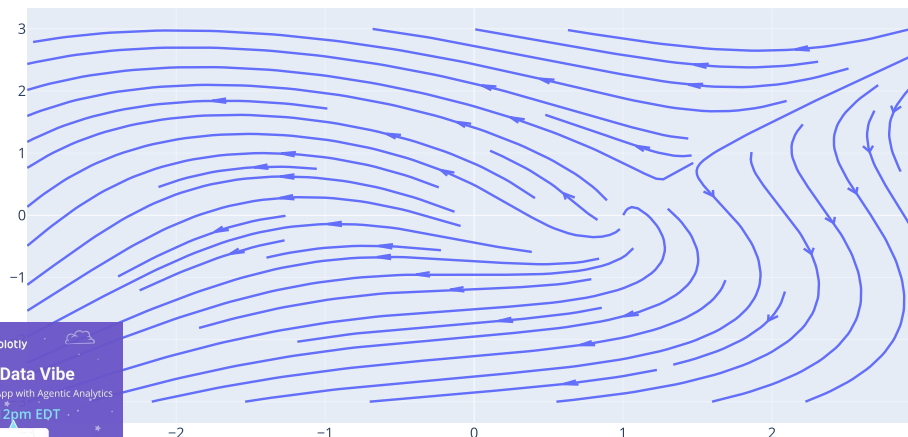
Streamline plots can be made with a [figure factory](#) ([/python/figure-factories/](#)) as detailed in this page.

```
import plotly.figure_factory as ff

import numpy as np

x = np.linspace(-3, 3, 100)
y = np.linspace(-3, 3, 100)
Y, X = np.meshgrid(x, y)
u = -1 - X**2 + Y
v = 1 + X - Y**2

# Create streamline figure
fig = ff.create_streamline(x, y, u, v, arrow_scale=.1)
fig.show()
```



Streamline and Source Point Plot

```

import plotly.figure_factory as ff
import plotly.graph_objects as go

import numpy as np

N = 50
x_start, x_end = -2.0, 2.0
y_start, y_end = -1.0, 1.0
x = np.linspace(x_start, x_end, N)
y = np.linspace(y_start, y_end, N)
X, Y = np.meshgrid(x, y)
source_strength = 5.0
x_source, y_source = -1.0, 0.0

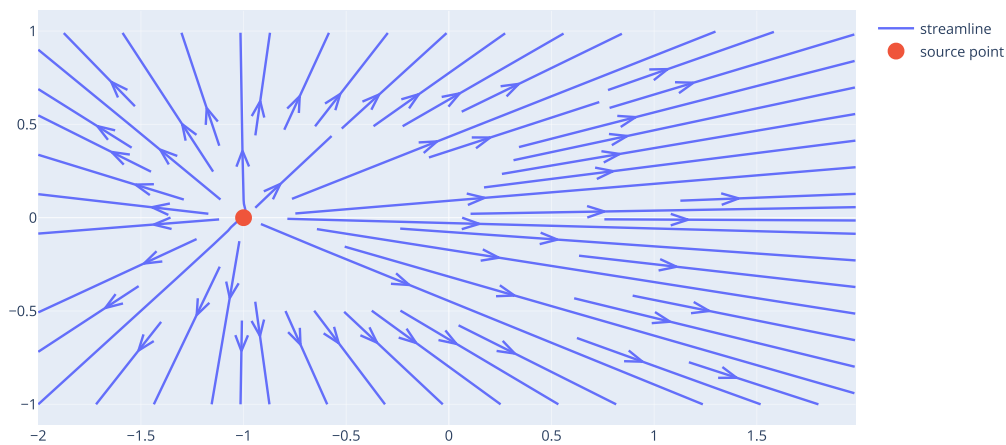
# Compute the velocity field on the mesh grid
u = (source_strength/(2*np.pi) *
      (X - x_source)/((X - x_source)**2 + (Y - y_source)**2))
v = (source_strength/(2*np.pi) *
      (Y - y_source)/((X - x_source)**2 + (Y - y_source)**2))

# Create streamline figure
fig = ff.create_streamline(x, y, u, v,
                          name='streamline')

# Add source point
fig.add_trace(go.Scatter(x=[x_source], y=[y_source],
                        mode='markers',
                        marker_size=14,
                        name='source point'))

fig.show()

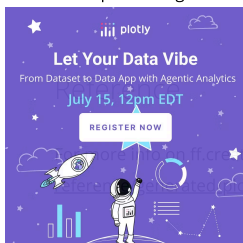
```



See also

For a 3D version of streamlines, use the trace `go.Streamtube` documented [here](https://plotly.com/python/streamtube-plot/) (`/python/streamtube-plot/`).

For representing the 2-D vector field as arrows, see the [quiver plot tutorial](https://plotly.com/python/quiver-plots/) (`/python/quiver-plots/`).



For `fig.create_streamline()`, see the [full function reference](https://plotly.com/python-api-plotly.figure_factory.create_streamline.html) (`https://plotly.com/python-api-plotly.figure_factory.create_streamline.html`).

What About Dash?

Dash (<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>) 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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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	9119152	Americas	65.554	3821.137884



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

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