Plotly

Data Visualziation

Data Visualization is the graphical representation of information and data. By using visual elements like charts, graphs, and maps, data visualization tools provide an accessible way to see and understand trends, outliers, and patterns in data.

Plotly

`Plotly` is a Python library which is used to design graphs, especially interactive graphs.

- It can plot various graphs and charts like histogram, barplot, boxplot, spreadplot, and many more.
- It is mainly used in data analysis as well as financial analysis. Plotly is an interactive visualization library.

Benefits of using plolty:

- Plotly is interactive, the graphs can be zoomed in and out, downloaded as a PNG file, hovered over to see the data points, and much more.
- Plotly is compatible with Pandas DataFrames, making it easy to plot data directly from CSVs.
- Plotly can help making animated plots, which can be very useful for visualizing data over time.
- Plotly can be used to style interactive graphs with Jupyter notebook.
- Plotly with dash is a great choice for creating interactive dashboards that can be deployed on the web.

```
!pwd
```

```
/content
```

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import plotly.express as px
import plotly.graph_objects as go
```

```
# remove warning
import warnings
warnings.filterwarnings('ignore')
```

```
df = pd.read_csv('/content/sample_data/diamonds.csv')
print(df.shape)
df = df.sample(frac=0.1, random_state=10) # 10% of data
print(df.shape)
```

```
(53940, 10)
(5394, 10)
```

```
df.head()
```

	carat	cut	color	clarity	depth	table	price	x	y	z
8018	1.01	Premium	E	SI1	61.7	56.0	4330	6.44	6.39	3.96
1583	0.70	Very Good	D	VS1	60.4	58.0	3008	5.71	5.78	3.47
9138	1.13	Very Good	H	SI2	59.8	59.0	4537	6.75	6.82	4.06
2787	0.76	Ideal	F	VS2	61.0	55.0	3257	5.89	5.92	3.60
52429	0.70	Premium	I	VVS1	61.2	59.0	2513	5.65	5.69	3.47

Next steps: Generate code with `df` View recommended plots New interactive sheet

```
# reindex the data
df.reset_index(drop=True, inplace=True)
```

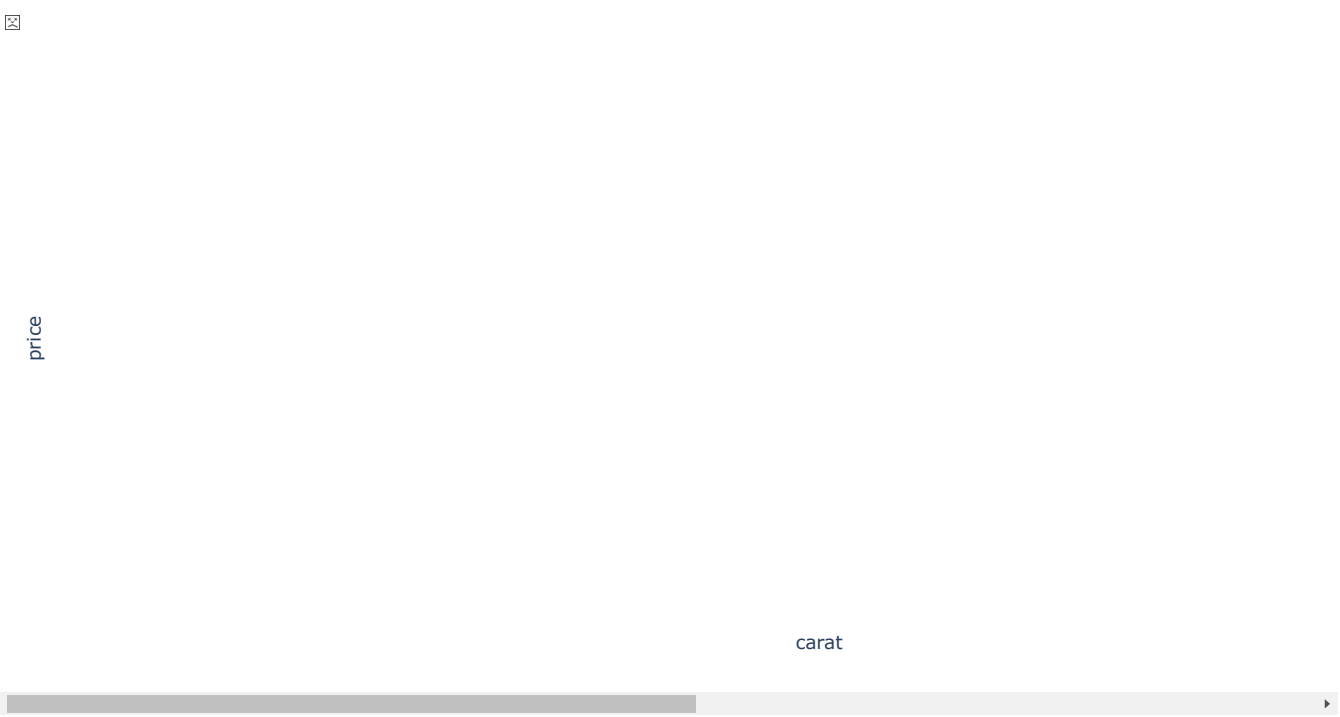
```
df.head()
```

	carat	cut	color	clarity	depth	table	price	x	y	z
0	1.01	Premium	E	SI1	61.7	56.0	4330	6.44	6.39	3.96
1	0.70	Very Good	D	VS1	60.4	58.0	3008	5.71	5.78	3.47
2	1.13	Very Good	H	SI2	59.8	59.0	4537	6.75	6.82	4.06
3	0.76	Ideal	F	VS2	61.0	55.0	3257	5.89	5.92	3.60
4	0.70	Premium	I	VVS1	61.2	59.0	2513	5.65	5.69	3.47

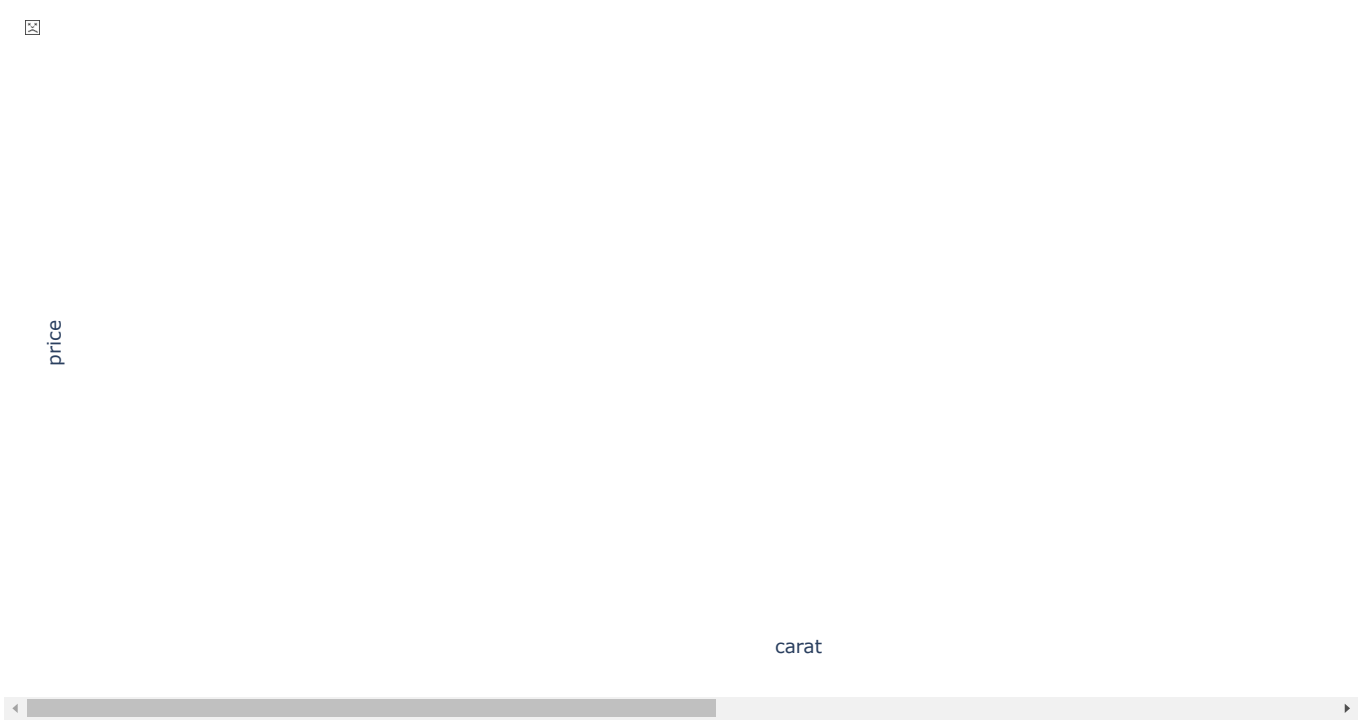
Next steps: Generate code with df | View recommended plots | New interactive sheet

```
# scatter plot
fig = px.scatter(df, x='carat', y='price')
fig.show()
```


```
# line plot
fig = px.line(df, x='carat', y='price')
fig.show()
```



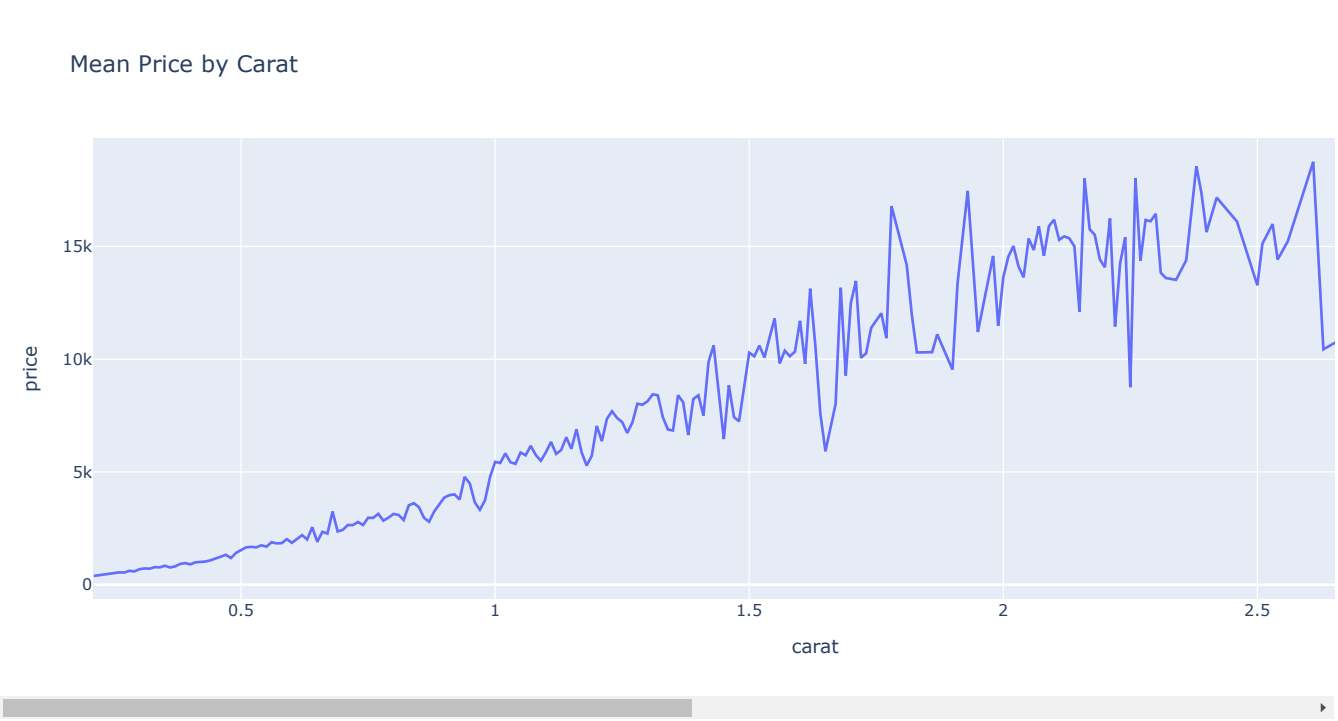
```
# scatter plot
fig = px.scatter(df, x='carat', y='price', color='cut')
fig.show()
```



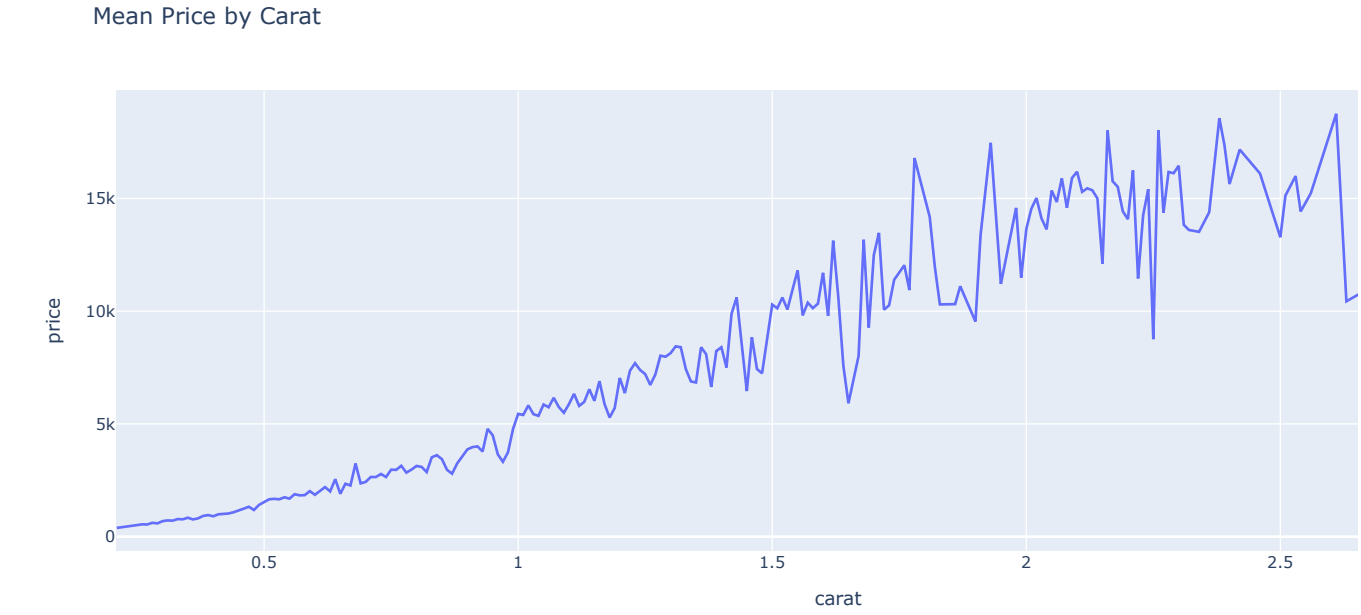

```
# scatter plot
fig = px.scatter(df, x='carat', y='price', color='cut',
                 title='Diamond Price vs Carat Weight',
                 )
fig.show()
```


```
# scatter plot
fig = px.scatter(df, x='carat', y='price', color='cut',
                 title='Diamond Price vs Carat Weight',
                 labels={'carat':'Carat Weight', 'price':'Price ($)'}
                 )
fig.show()
```


```
# Plot a line chart (example: mean price by carat)
df_mean = df.groupby('carat')['price'].mean().reset_index()
df_mean.head()
fig = px.line(df_mean, x='carat', y='price',
              title='Mean Price by Carat')
fig.show()
```

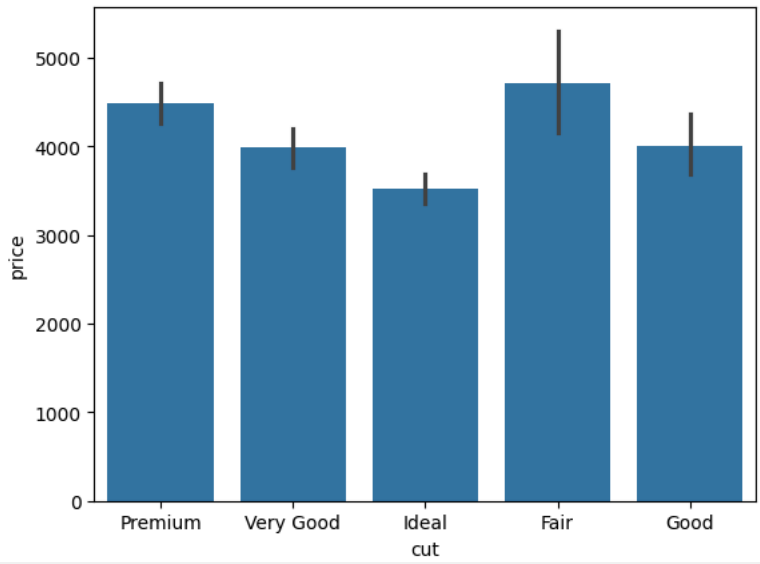



```
# Plot a line chart (example: mean price by carat)
df_mean = df.groupby('carat')['price'].mean().reset_index()
df_mean.head()
fig = px.line(df_mean, x='carat', y='price',
              title='Mean Price by Carat')
fig.show()
```



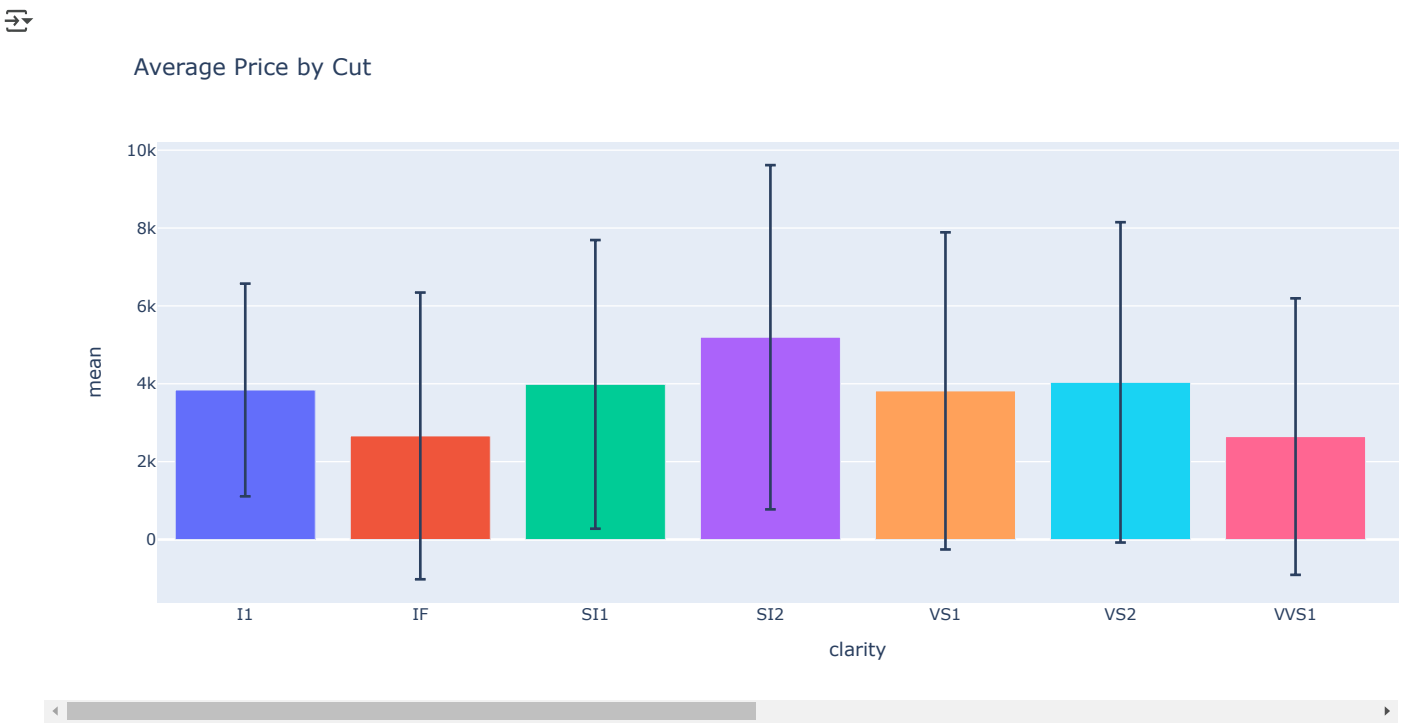

```
sns.barplot(x='cut', y='price', data=df)
```

```
<Axes: xlabel='cut', ylabel='price'>
```



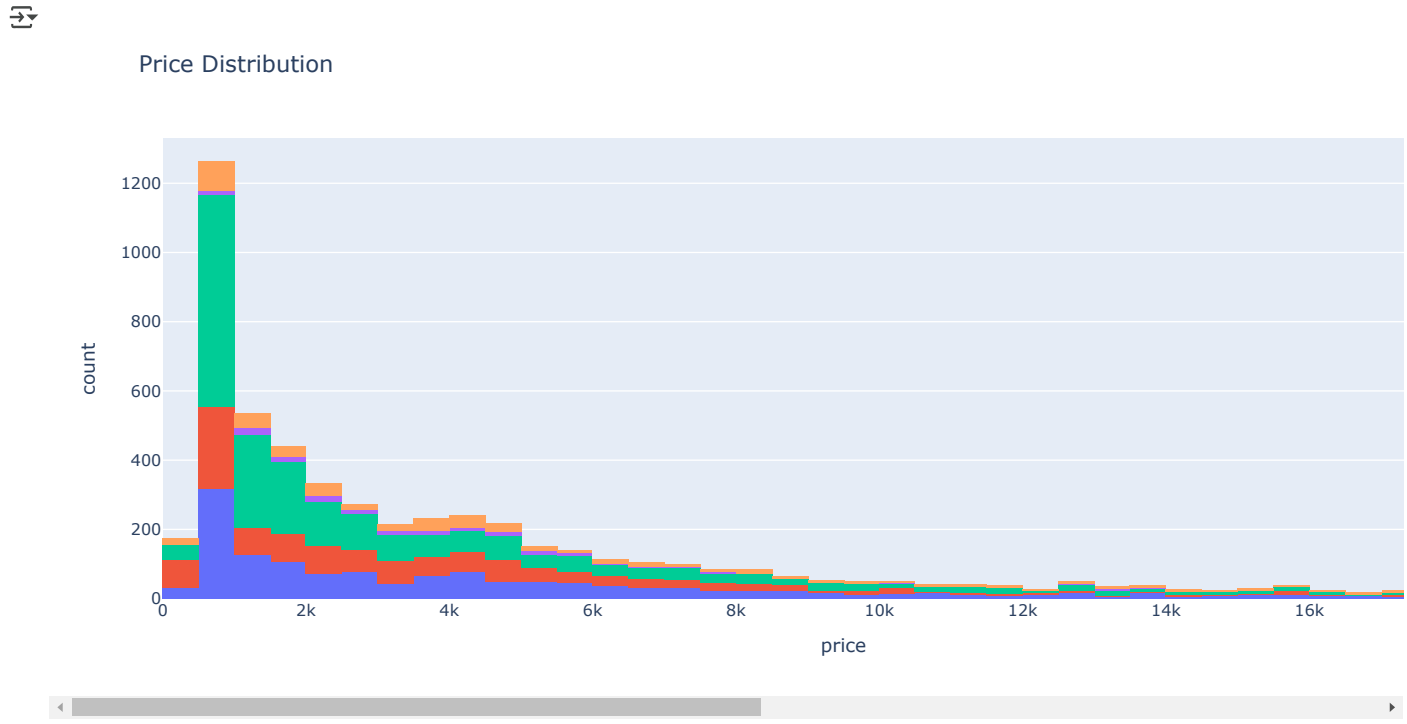

```
# Bar plot for average price per cut category
fig = px.bar(df, x='cut', y='price',
             title='Average Price by Cut', color='cut')
fig.show()
```


```
df_stats = df.groupby('clarity')['price'].agg(['mean', 'std']).reset_index()
df_stats.head()

# Bar plot for average price per cut category
fig = px.bar(df_stats, x='clarity', y='mean', error_y='std',
             title='Average Price by Cut', color='clarity')
fig.show()
```

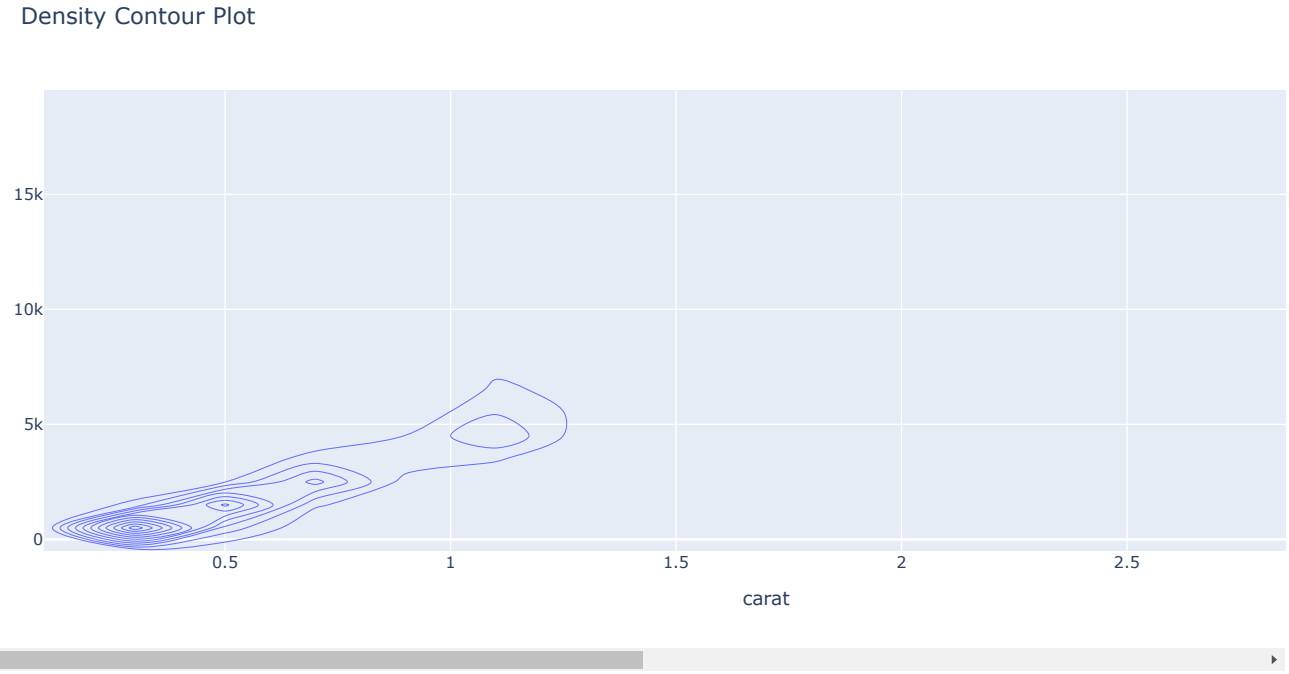



```
# histogram
fig = px.histogram(df, x='price', nbins=50,
                   title='Price Distribution')
fig.show()
```

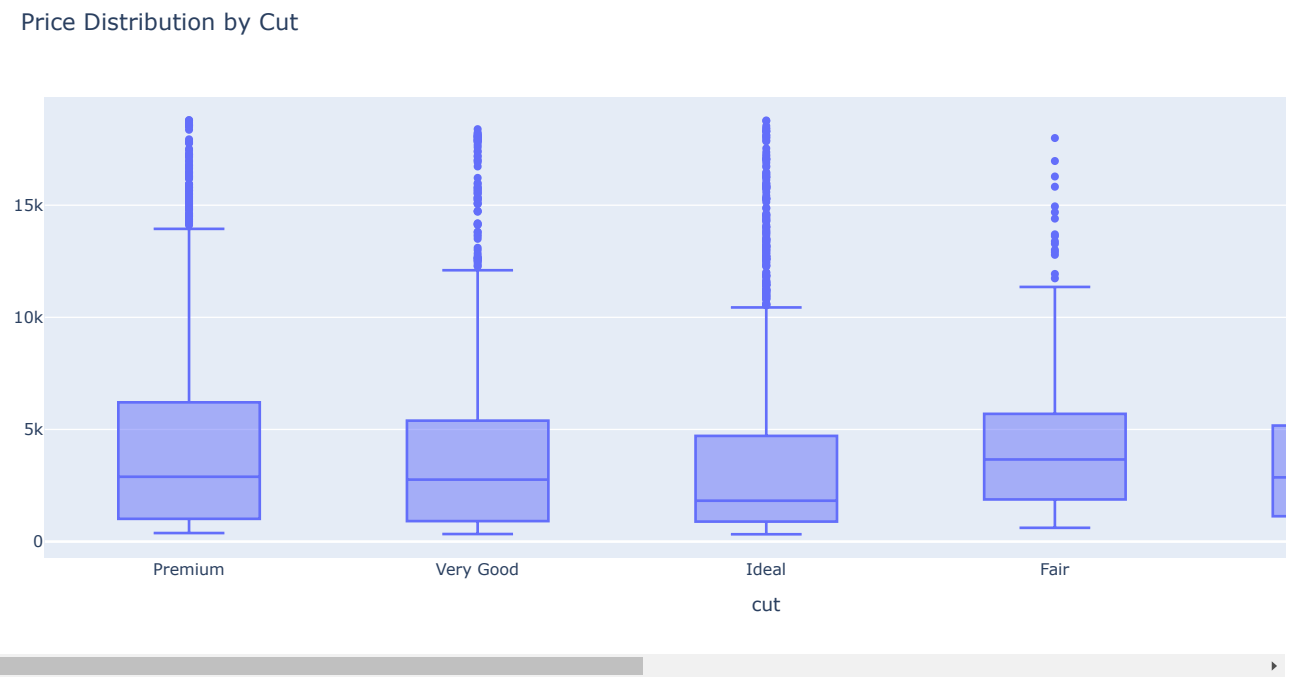

```
# histogram
fig = px.histogram(df, x='price', nbins=50, color='cut',
                   title='Price Distribution')
fig.show()
```



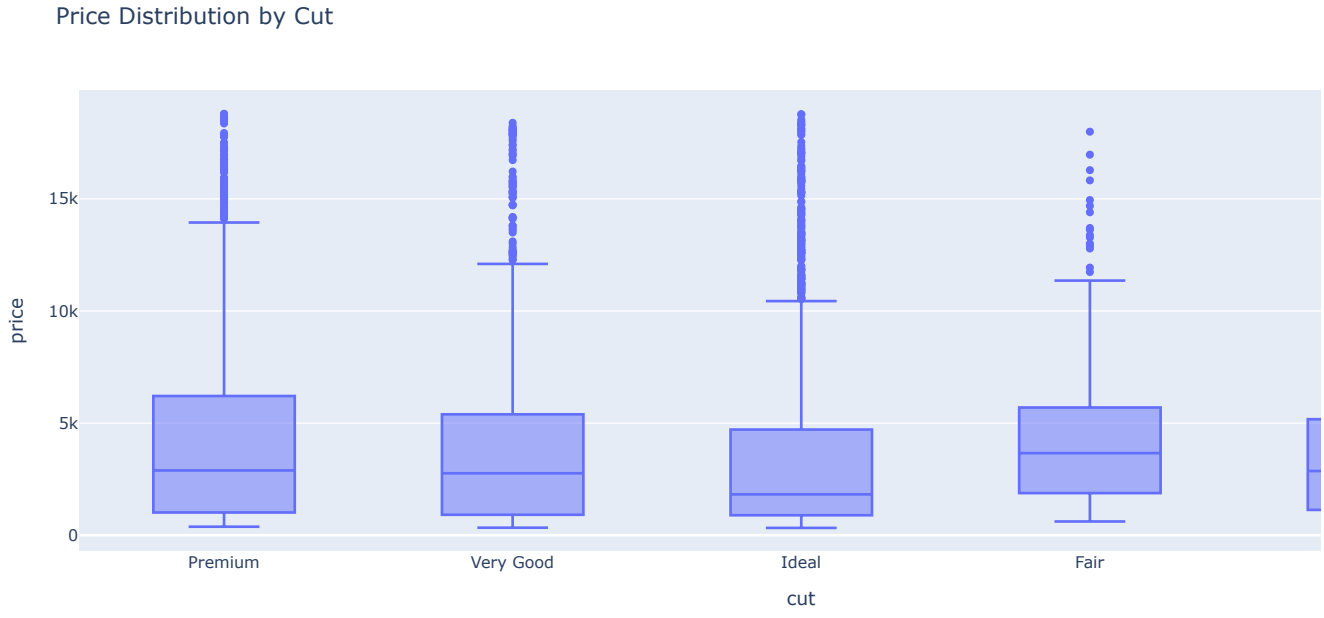

```
# density contour plot
fig = px.density_contour(df, x='carat', y='price',
                         title='Density Contour Plot')
fig.show()
```



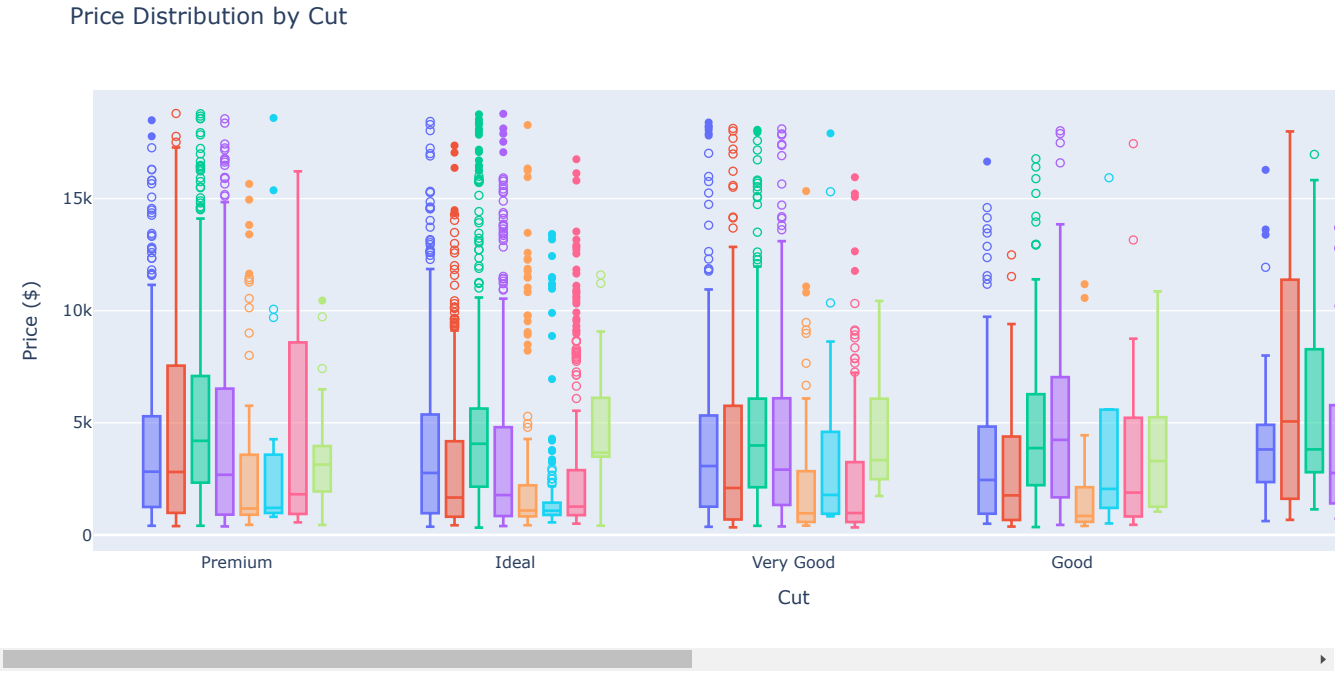

```
# box plot
fig = px.box(df, x='cut', y='price',
             title='Price Distribution by Cut')
fig.show()
```



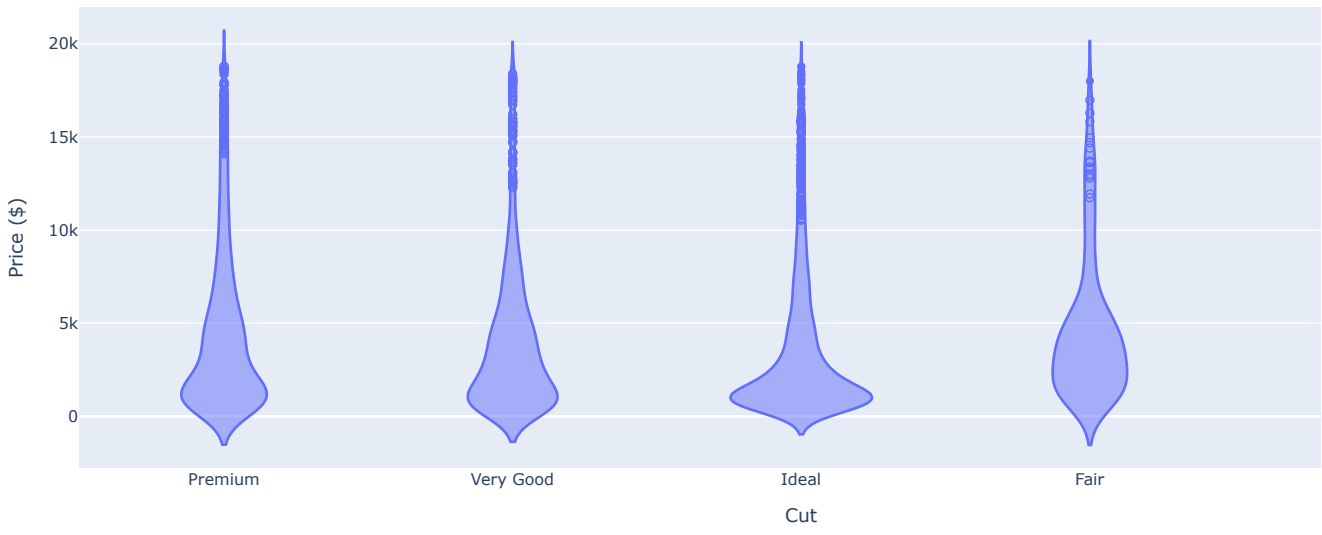

```
# box plot
fig = px.box(df, x='cut', y='price',
             # outliers
            points='outliers', # 'outliers', 'suspectedoutliers'
            title='Price Distribution by Cut')
fig.show()
```




```
# box plot
fig = px.box(df, x='cut', y='price', color='clarity',
             # outliers
            points='suspectedoutliers', # 'outliers', 'suspectedoutliers'
            title='Price Distribution by Cut',
            labels={'price':'Price ($)', 'cut':'Cut', 'clarity':'Clarity'}
            )
fig.show()
```

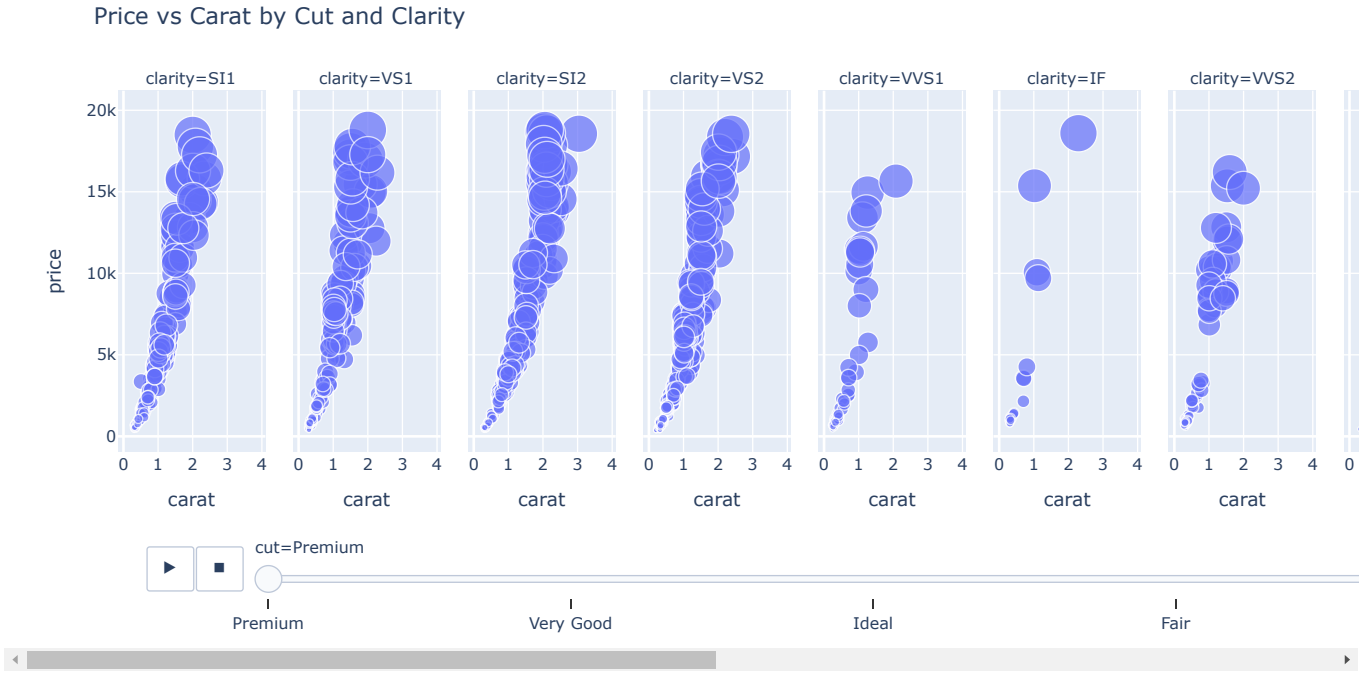



```
# violin plot
fig = px.violin(df, x='cut', y='price',
                # color='clarity',
             # outliers
            points='suspectedoutliers', # 'outliers', 'suspectedoutliers'
            title='Price Distribution by Cut',
            labels={'price':'Price ($)', 'cut':'Cut',
                    # 'clarity':'Clarity'
                    }
            )
fig.show()
```




```
# facet scatter plot by clarity
fig = px.scatter(df, x='carat', y='price',
                 color='cut',
                 facet_col='clarity',
                 title='Price vs Carat by Cut and Clarity',)
fig.show()
```


```
# facet scatter plot by clarity
fig = px.scatter(df, x='carat', y='price',
                color='cut',
                size='price',
                facet_col='clarity',
                 # animate by cut
                animation_frame='cut',
                title='Price vs Carat by Cut and Clarity',)
fig.show()
```

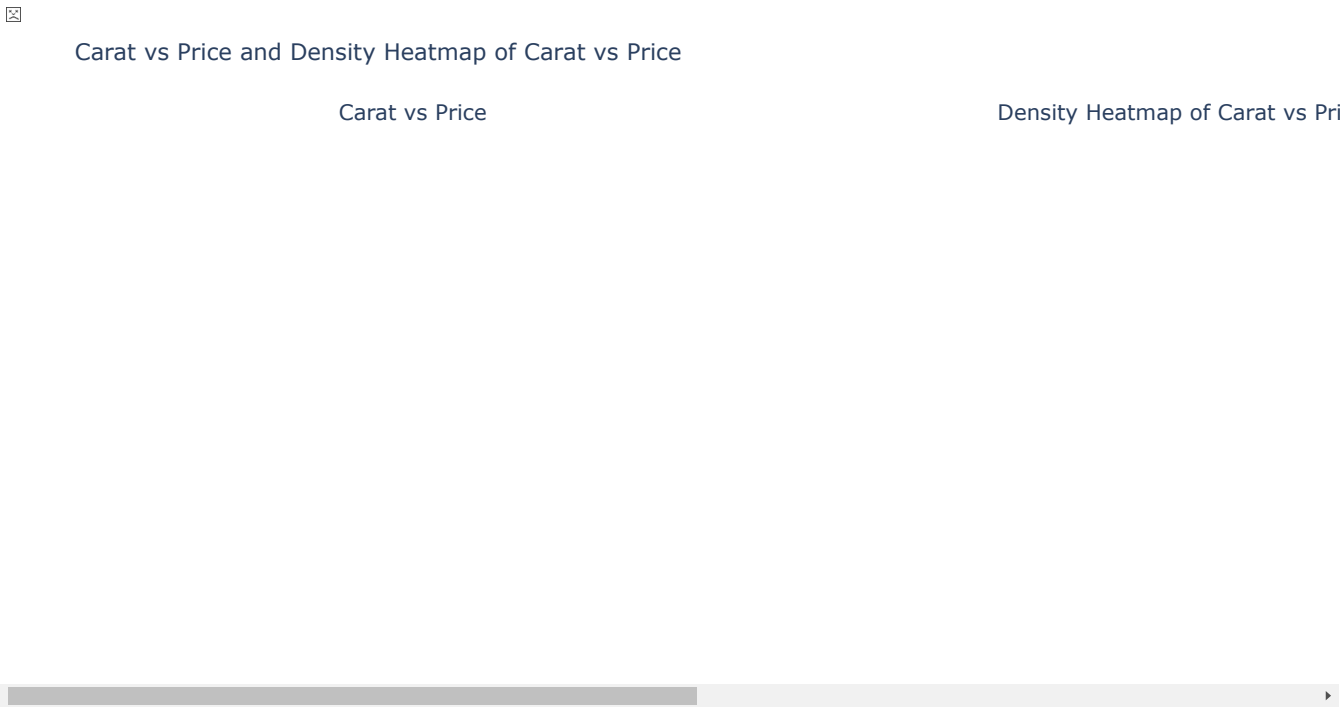



```
# Density heatmap of carat and price
fig = px.density_heatmap(df, x='carat', y='price',
                         title='Density Heatmap of Carat vs Price')
fig.show()
```

Subplots

```
from plotly.subplots import make_subplots

# Create subplots
fig = make_subplots(rows=1, cols=2,
                    subplot_titles=('Carat vs Price',
                                    'Density Heatmap of Carat vs Price'))

# Scatter plot of carat vs price
scatter = px.scatter(df, x='carat', y='price').data[0]
fig.add_trace(scatter, row=1, col=1)

# Density heatmap of carat vs price
heatmap = px.density_heatmap(df, x='carat', y='price').data[0]
fig.add_trace(heatmap, row=1, col=2)
```

```
# Update layout
fig.update_layout(title_text='Carat vs Price and Density Heatmap of Carat vs Price')
fig.show()
```

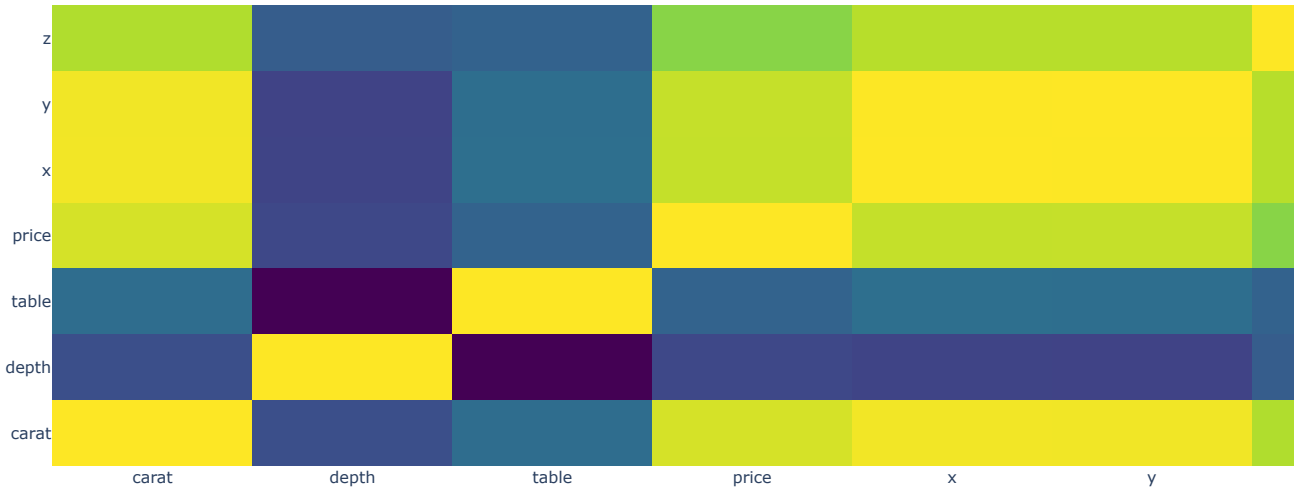



```
# creat heatmap of correlation matrix of only numerical columns
corr = df[['carat', 'depth', 'table', 'price', 'x', 'y', 'z']].corr()
corr
```

	carat	depth	table	price	x	y	z
carat	1.000000	0.025077	0.167961	0.921045	0.977872	0.977024	0.847328
depth	0.025077	1.000000	-0.290898	-0.008800	-0.025174	-0.028279	0.086228
table	0.167961	-0.290898	1.000000	0.116569	0.180099	0.173648	0.113192
price	0.921045	-0.008800	0.116569	1.000000	0.887243	0.889251	0.765929
x	0.977872	-0.025174	0.180099	0.887243	1.000000	0.998270	0.861521
y	0.977024	-0.028279	0.173648	0.889251	0.998270	1.000000	0.861205
z	0.847328	0.086228	0.113192	0.765929	0.861521	0.861205	1.000000

Next steps: Generate code with corr | View recommended plots | New interactive sheet

```
# creat heatmap of correlation matrix of only numerical columns
corr = df[['carat', 'depth', 'table', 'price', 'x', 'y', 'z']].corr()
fig = go.Figure(data=go.Heatmap(x=corr.index.values,
                                y=corr.columns.values,
                                z=corr.values,
                                colorscale='Viridis'))
# colorscale can be 'Viridis', 'Cividis', 'Blues', 'Greens', 'Reds', 'Oranges', 'YlOrRd', 'YlGnBu', 'RdBu', 'Picnic', 'Rainbow', 'Portl
fig.show()
```



3D plots

```
# 3D scatter plot
fig = px.scatter_3d(df,
                    x='carat',
                    y='depth',
                    z='price',
                    color='cut',
                    title='3D Scatter Plot of Carat, Depth, and Price')
fig.show()
```


```
# 3d line plot
fig = px.line_3d(df, x='carat', y='depth', z='price', color='cut')
fig.show()
```

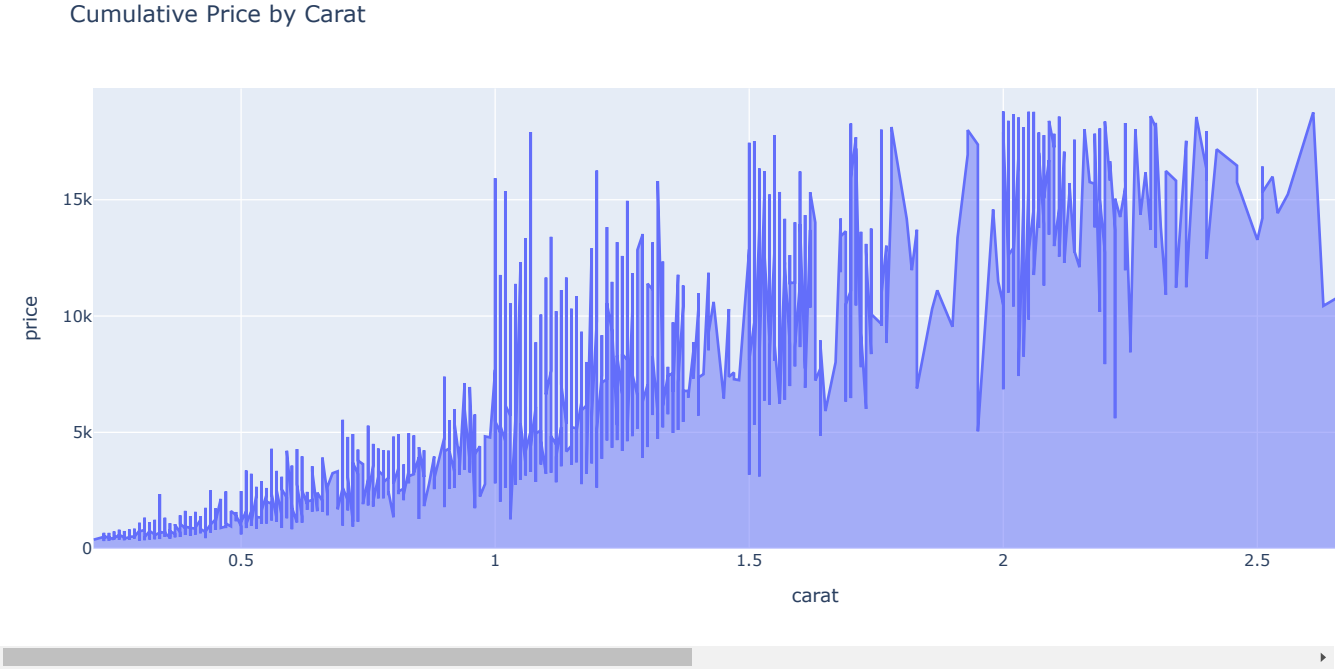

```
# 3D scatter plot
fig = px.scatter_3d(df,
                    x='carat',
                    y='depth',
                    z='cut',
                    color='price',
                    title='3D Scatter Plot of Carat, Depth, and Price')
fig.show()
```

3D Scatter Plot of Carat, Depth, and Price

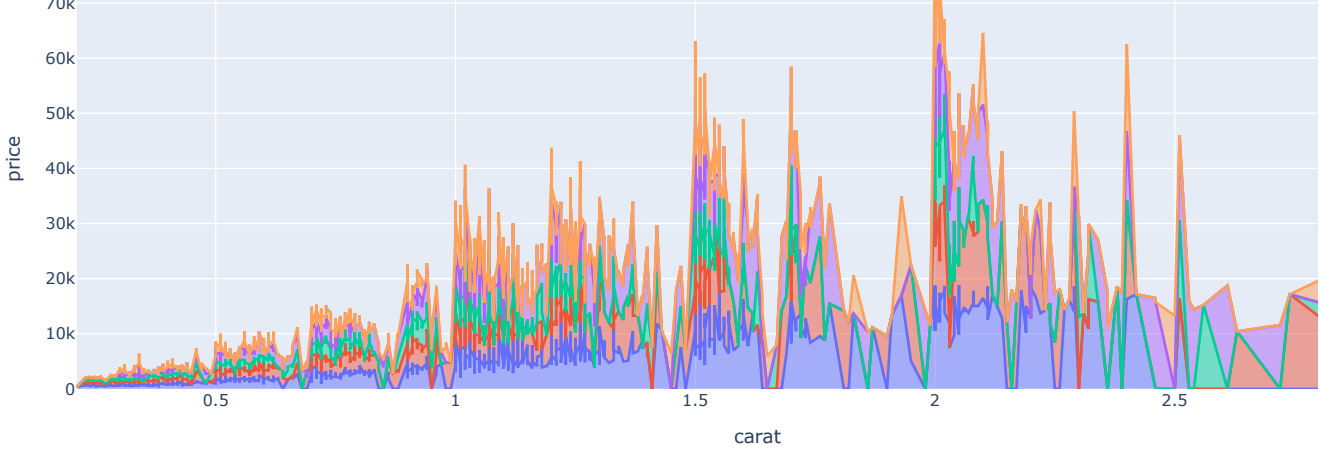
Other plots

```
# Bubble chart with carat and price, using depth as size
fig = px.scatter(df,
                 x='carat',
                 y='price',
                 size='price',
                 color='cut',
                 title='Bubble Chart: Carat vs Price with Depth')
fig.show()
```

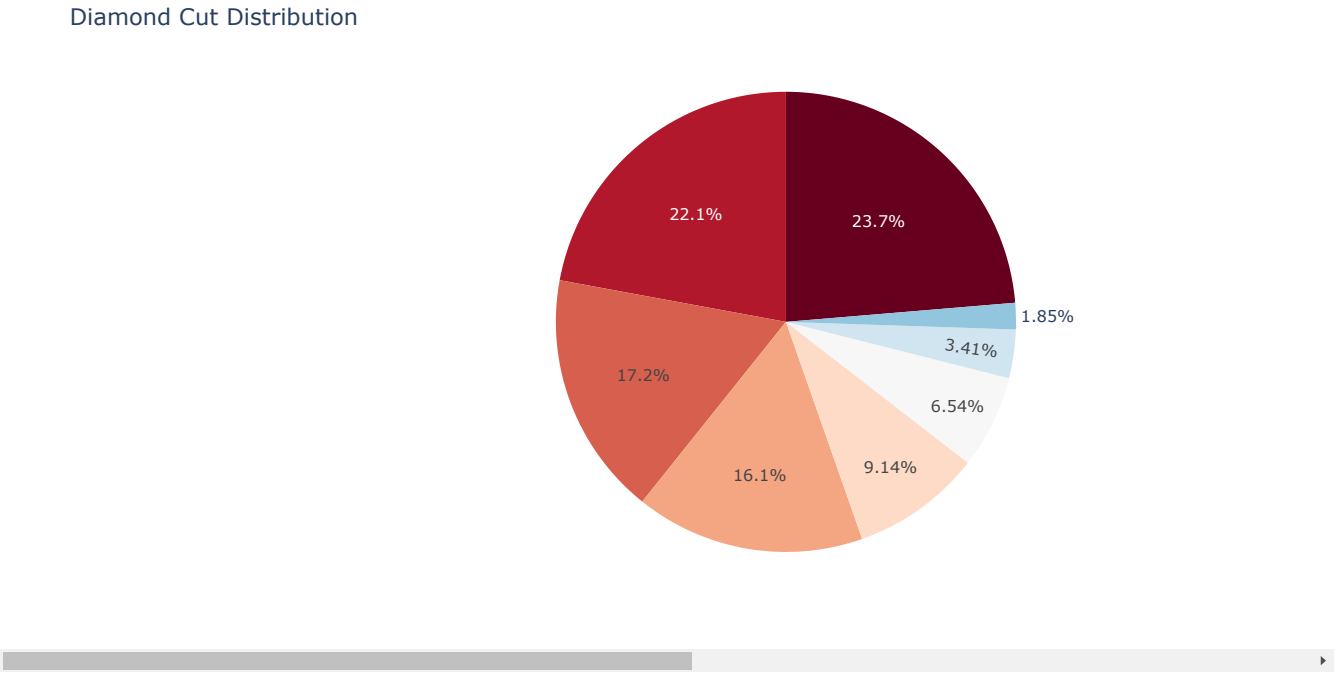

```
# Area chart of cumulative price over carat
df_sorted = df.sort_values(by='carat')
fig = px.area(df_sorted,
              x='carat',
              y='price',
            #   color='cut',
              title='Cumulative Price by Carat')
fig.show()
```




```
# Area chart of cumulative price over carat
df_sorted = df.sort_values(by='carat')
fig = px.area(df_sorted,
              x='carat',
              y='price',
              color='cut',
              title='Cumulative Price by Carat')
fig.show()
```

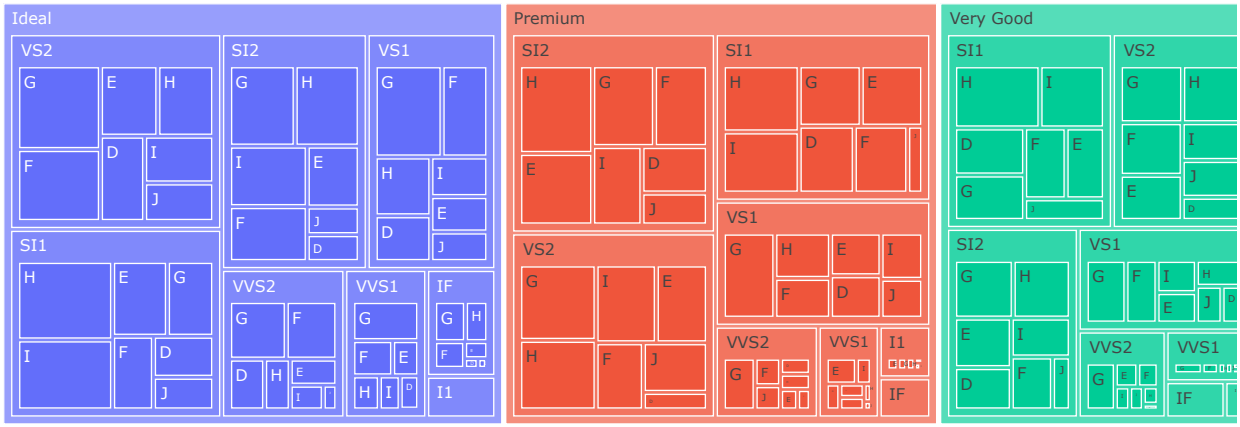



```
# pie
fig = px.pie(df, names='clarity',
             # pallete
             color_discrete_sequence=px.colors.sequential.RdBu,
             title='Diamond Cut Distribution')
fig.show()
```



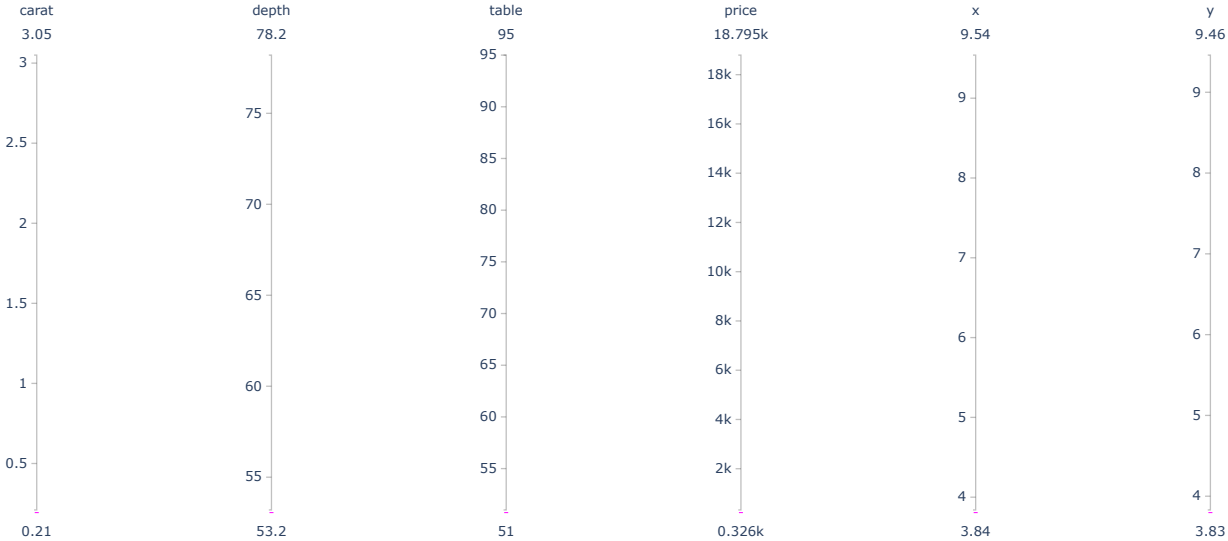

```
# treemap
fig = px.treemap(df, path=['cut', 'clarity', 'color'],
                 values='price',
                 title='Diamond Price by Cut and Clarity')
fig.show()
```

Diamond Price by Cut and Clarity

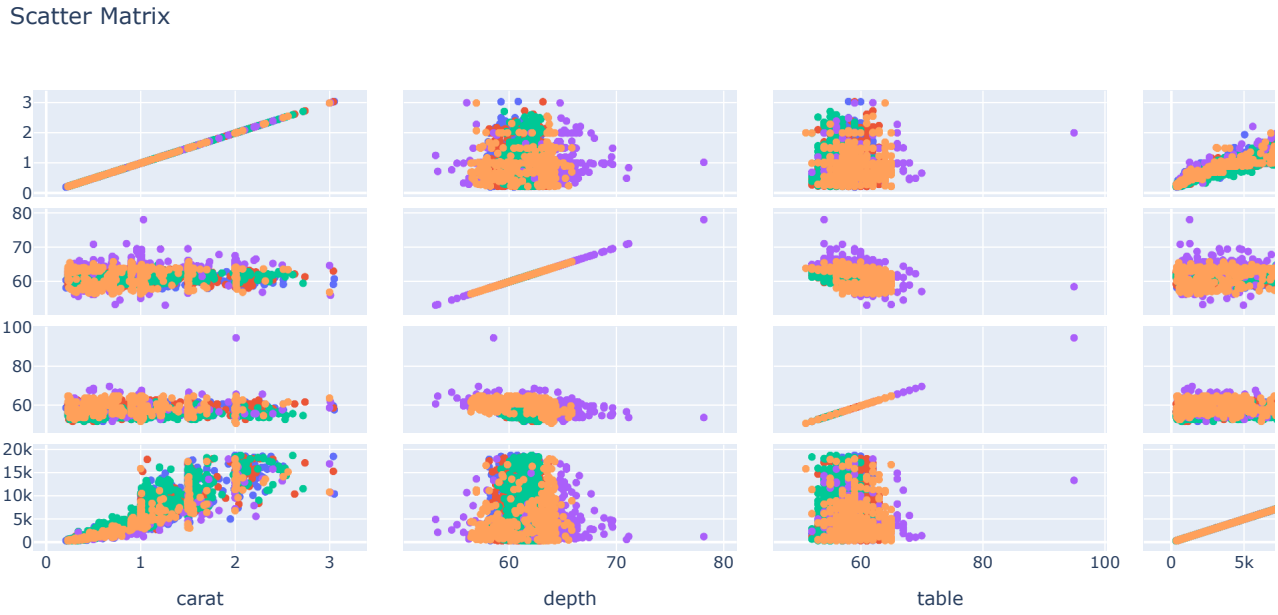



```
# parallel corrdinates plot
fig = px.parallel_coordinates(df, color='price',
                              # dimensions=['carat', 'depth'], # choose columns
                             title='Parallel Coordinates Plot')
fig.show()
```

Parallel Coordinates Plot

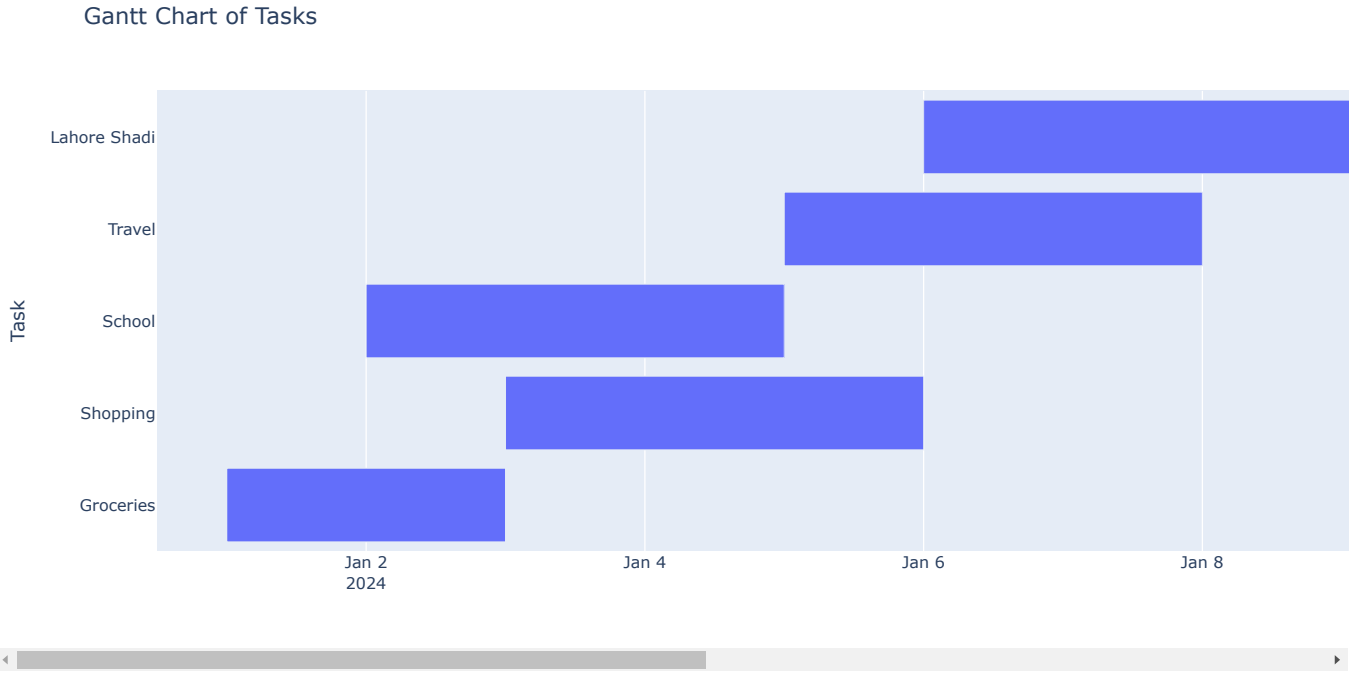



```
# Scatter matrix for carat, depth, table, and price
fig = px.scatter_matrix(df,
                        dimensions=['carat', 'depth', 'table', 'price'],
                        color='cut',
                        title='Scatter Matrix')
fig.show()
```



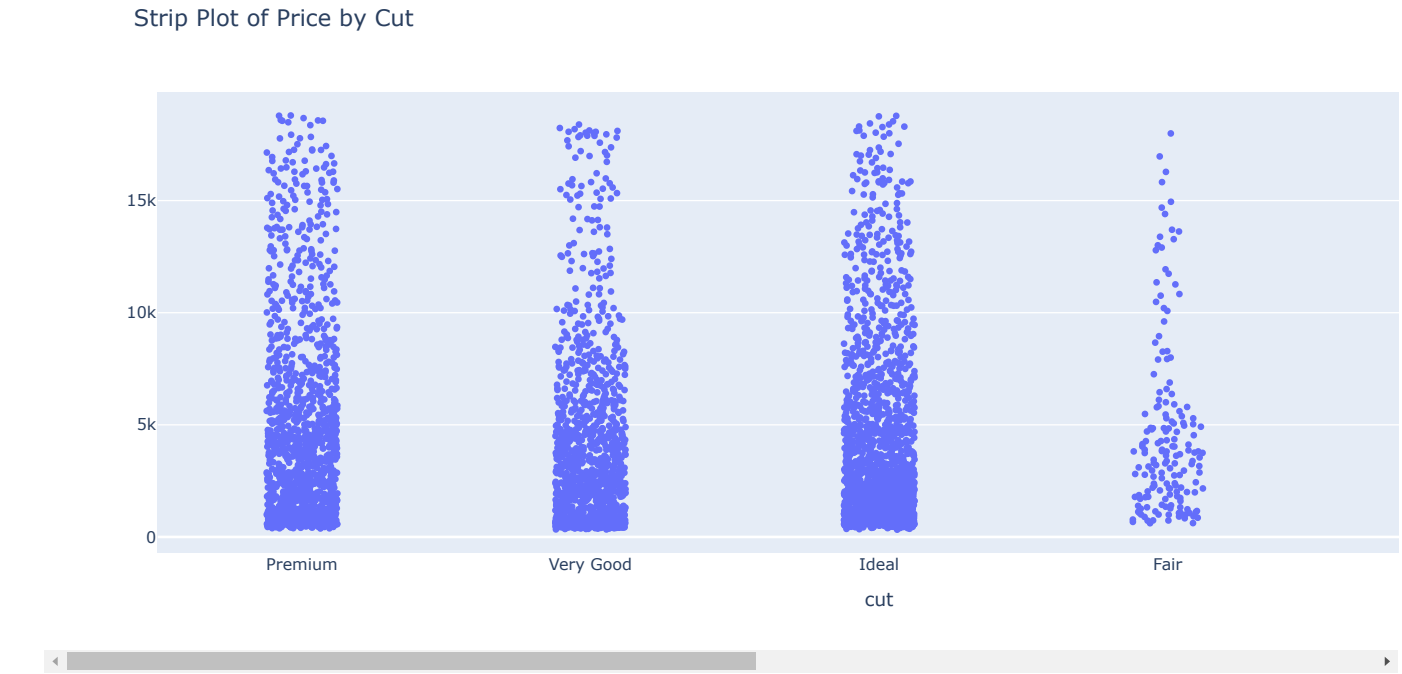

```
# Gantt chart of a random time series data from 2020-01-01 to 2020-01-10
df_gantt = pd.DataFrame({
    'Task': ['Groceries', 'Shopping', 'School', 'Travel', 'Lahore Shadi'],
    'Start': pd.to_datetime(['2024-01-01', '2024-01-03', '2024-01-02', '2024-01-05', '2024-01-06']),
    'Finish': pd.to_datetime(['2024-01-03', '2024-01-06', '2024-01-05', '2024-01-08', '2024-01-10'])
})
print(df_gantt.head())
fig = px.timeline(df_gantt,
                  x_start='Start',
                  x_end='Finish',
                  y='Task',
                  title='Gantt Chart of Tasks')
fig.show()
```

```
           Task      Start     Finish
0     Groceries 2024-01-01 2024-01-03
1      Shopping 2024-01-03 2024-01-06
2        School 2024-01-02 2024-01-05
3        Travel 2024-01-05 2024-01-08
4  Lahore Shadi 2024-01-06 2024-01-10
```



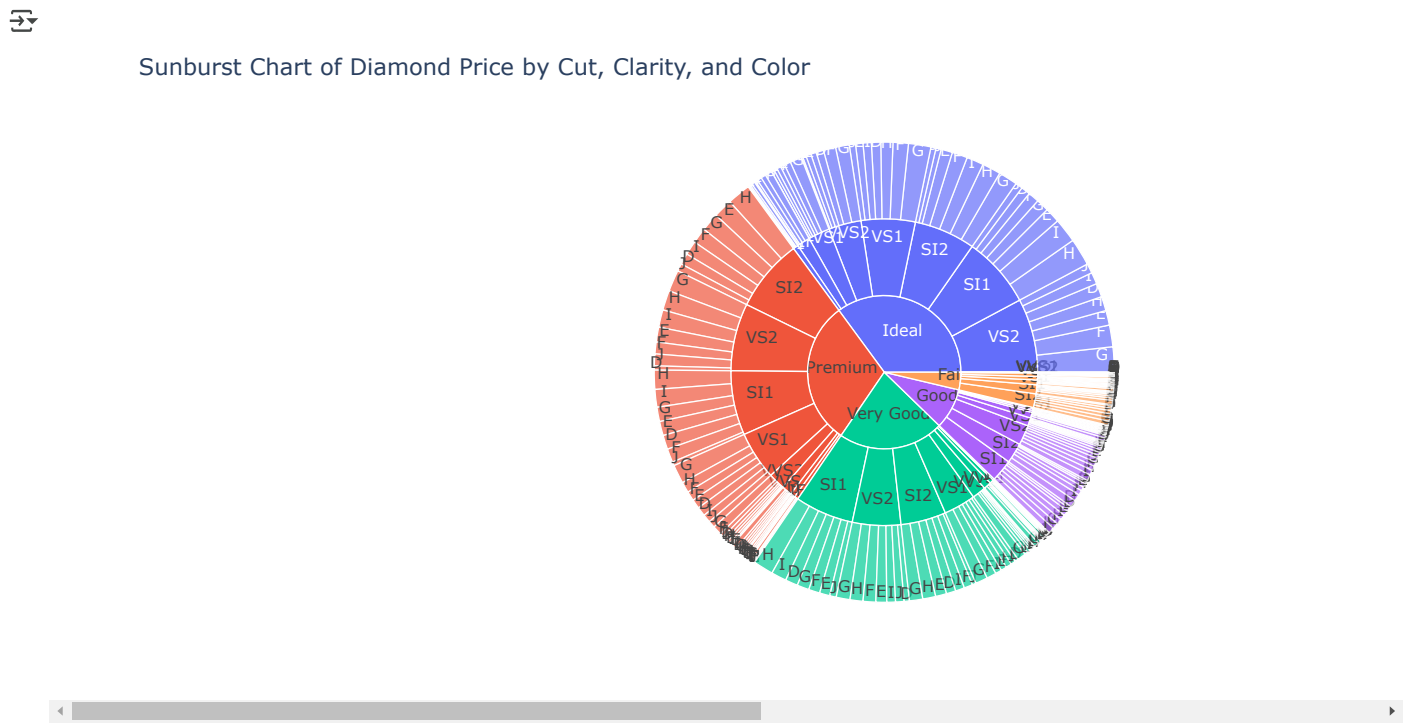
```
# strip plot
fig = px.strip(df, x='cut', y='price',
               title='Strip Plot of Price by Cut')
fig.show()
```


```
# strip plot
fig = px.strip(df, x='cut', y='price',
               title='Strip Plot of Price by Cut')
fig.update_traces(jitter=0.5, marker=dict(size=5))
fig.show()
```




```
# strip plot
fig = px.strip(df, x='cut', y='price',
               color='clarity',
               hover_data=['carat'],
               title='Strip Plot of Price by Cut')
fig.update_layout(title_font_size=20,
                  xaxis_title='Carat Size',
                  yaxis_title='Diamond Price')
fig.show()
```


```
# sunburst chart

fig = px.sunburst(df,
                  path=['cut', 'clarity', 'color'],
                  values='price',
                  title='Sunburst Chart of Diamond Price by Cut, Clarity, and Color')
fig.show()
```




```
from google.colab import drive
drive.mount('/content/drive')
```

```
---------------------------------------------------------------------------
ValueError                                Traceback (most recent call last)
<ipython-input-52-d5df0069828e> in <cell line: 0>()
      1 from google.colab import drive
----> 2 drive.mount('/content/drive')

 1 frames
/usr/local/lib/python3.11/dist-packages/google/colab/drive.py in _mount(mountpoint, force_remount, timeout_ms, ephemeral, readonly)
    275             'https://research.google.com/colaboratory/faq.html#drive-timeout'
    276         )
--> 277       raise ValueError('mount failed' + extra_reason)
    278     elif case == 4:
    279       # Terminate the DriveFS binary before killing bash.

ValueError: mount failed
```

Next steps: Explain error

```
!mkdir /content/sample_data
```

```
mkdir: cannot create directory ‘/content/sample_data’: File exists
```

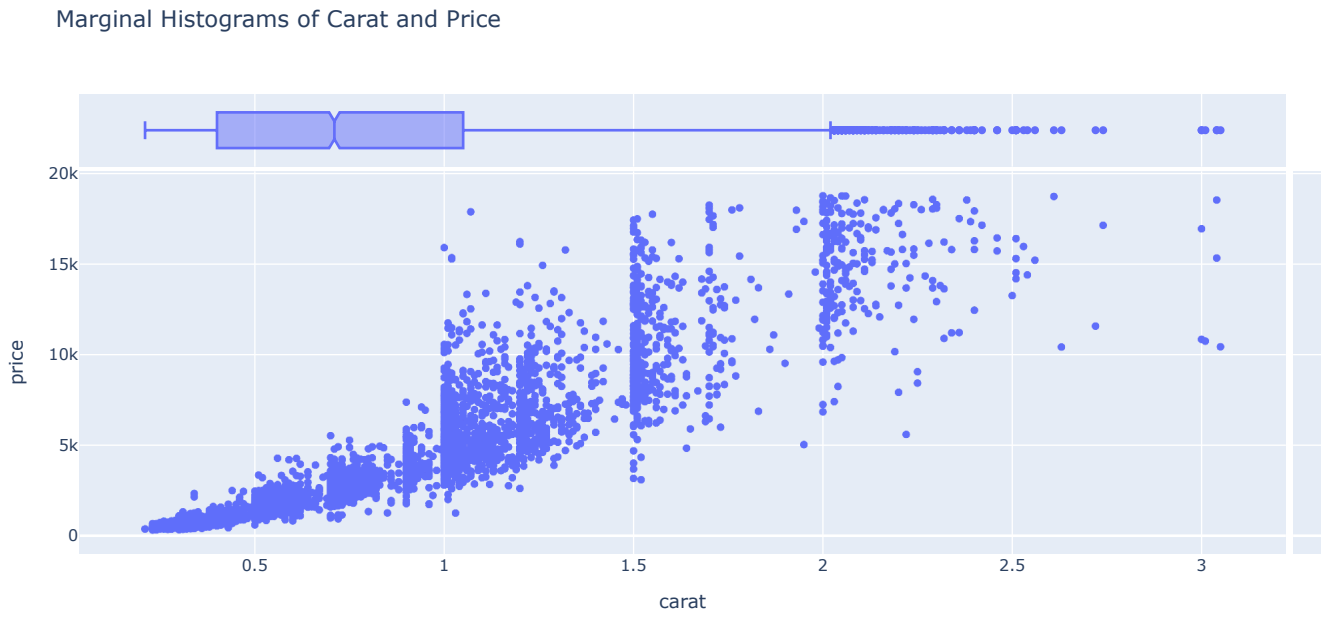
Plotly Express

```
from google.colab import drive
import plotly.express as px
import os

# Mount Google Drive
drive.mount('/content/drive')

# Install Kaleido (required for image export)
!pip install -U kaleido

# Define the folder path (replace "Sunburst_Charts" with your folder name)
folder_path = "/content/drive/MyDrive/Sunburst_Charts/"

# Create the folder if it doesn't exist
os.makedirs(folder_path, exist_ok=True)

# Generate the sunburst chart
fig = px.sunburst(
    df,
    path=['cut', 'clarity', 'color'],
    values='price',
    title='Sunburst Chart of Diamond Price by Cut, Clarity, and Color'
)

# Save files to Google Drive
fig.write_html(f"{folder_path}sunburst_chart.html")  # Save HTML
fig.write_image(f"{folder_path}sunburst_chart.png")  # Save PNG (scale=2 removed for testing)
fig.write_image(f"{folder_path}sunburst_chart.svg")  # Save SVG
fig.write_image(f"{folder_path}sunburst_chart.pdf")  # Save PDF
```

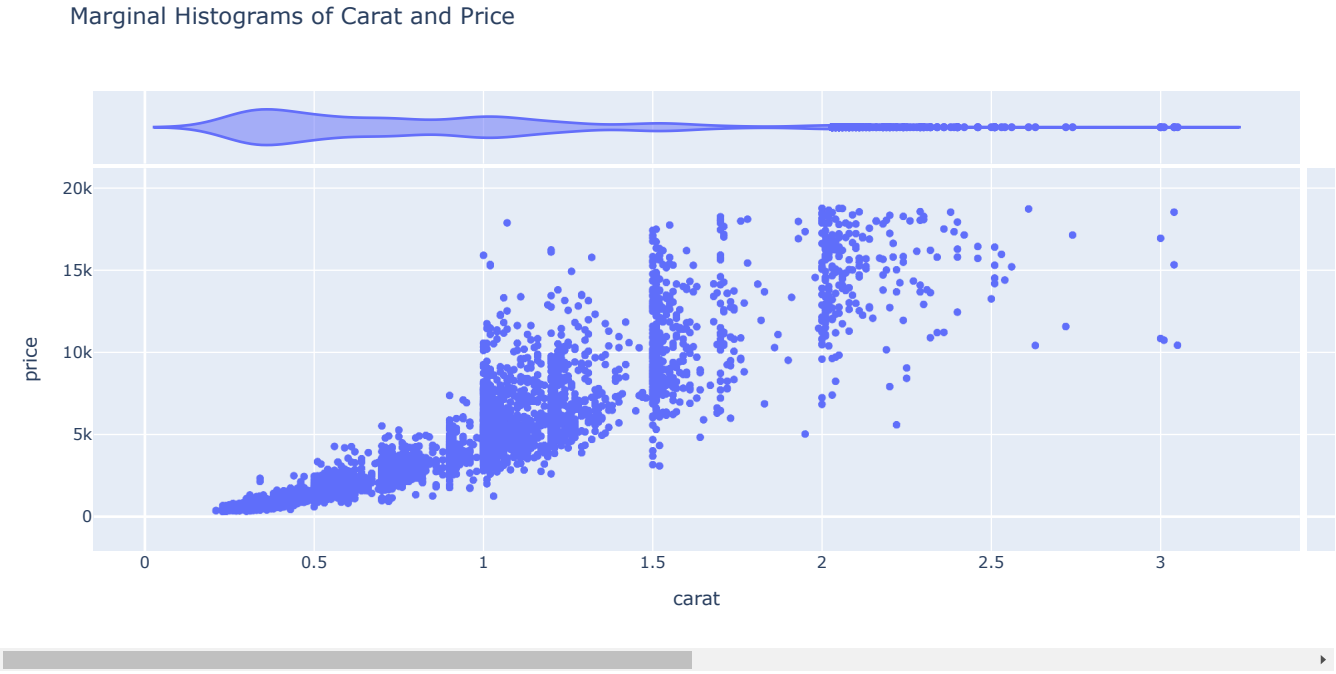
Marginal pltos using plotly

```
# scatter plot with marginal histograms
fig = px.scatter(df, x='carat', y='price',
                 marginal_x='histogram',
                 marginal_y='histogram',
                 title='Marginal Histograms of Carat and Price')
fig.show()
```


```
# scatter plot with marginal histograms
fig = px.scatter(df, x='carat', y='price',
                 marginal_x='box',
                 marginal_y='box',
                 title='Marginal Histograms of Carat and Price')
fig.show()
```

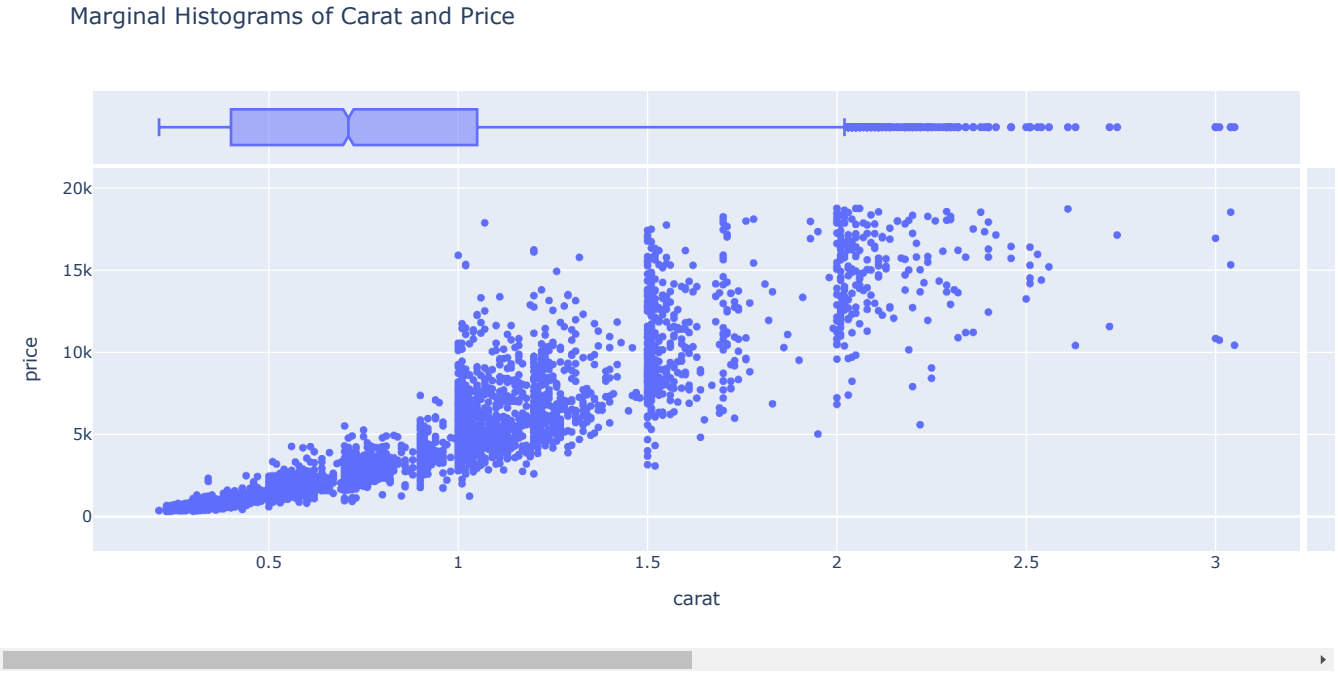



```
# scatter plot with marginal histograms
fig = px.scatter(df, x='carat', y='price',
                 marginal_x='violin',
                 marginal_y='violin',
                 title='Marginal Histograms of Carat and Price')
fig.show()
```



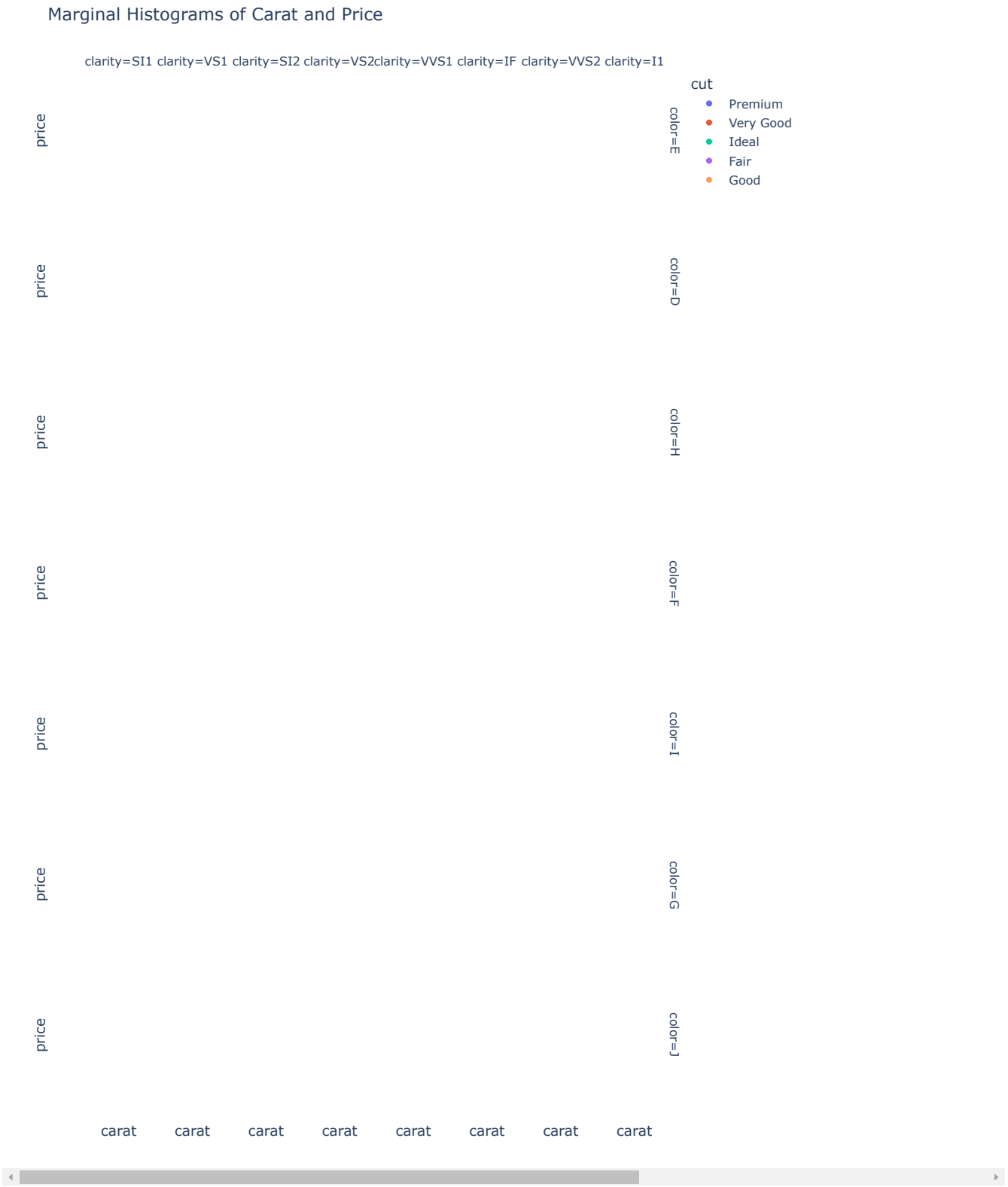

```
# scatter plot with marginal histograms
fig = px.scatter(df, x='carat', y='price',
                 marginal_x='box',
                 marginal_y='histogram',
                 title='Marginal Histograms of Carat and Price')
fig.show()
```


```
# scatter plot with marginal histograms
fig = px.scatter(df, x='carat', y='price',
                 marginal_x='box',
                 marginal_y='violin',
                 title='Marginal Histograms of Carat and Price')
fig.show()
```




```
# scatter plot with marginal histograms
fig = px.scatter(df, x='carat', y='price',
                 marginal_x='box',
                 marginal_y='violin',
                 color='cut',
                 title='Marginal Histograms of Carat and Price')
fig.show()
```


```
# scatter plot with marginal histograms
fig = px.scatter(df, x='carat', y='price',
                 marginal_x='box',
                 marginal_y='violin',
                 color='cut',
                 facet_col='clarity',
                 facet_row='color',
                 title='Marginal Histograms of Carat and Price')
# figure size
fig.update_layout(height=1200, width=800)
fig.show()
```



Video Plots Animated Plots

```
# Scatter plot
fig = px.scatter(df, x='carat', y='price',
                 color='cut',
                 size='price',
                 facet_col='color',
                #  facet_row='clarity',
                 animation_frame='cut',
                 title='Diamond Price vs Carat Weight')
# remove legends from the plot
fig.update_layout(showlegend=False)
# size of figure
fig.update_layout(height=400, width=1000)
fig.show()
```

```
# save as html
fig.write_html('./03_plotly/diamond_price_carat_animated.html')
```


```
---------------------------------------------------------------------------
FileNotFoundError                         Traceback (most recent call last)
<ipython-input-61-73582c40a5b9> in <cell line: 0>()
     14
     15 # save as html
---> 16 fig.write_html('./03_plotly/diamond_price_carat_animated.html')

                                 3 frames
/usr/lib/python3.11/pathlib.py in open(self, mode, buffering, encoding, errors, newline)
   1042         if "b" not in mode:
   1043             encoding = io.text_encoding(encoding)
-> 1044         return io.open(self, mode, buffering, encoding, errors, newline)
   1045
   1046     def read_bytes(self):

FileNotFoundError: [Errno 2] No such file or directory: '03_plotly/diamond_price_carat_animated.html'
```

Next steps: Explain error

Save animated plot as video

```
import plotly.express as px
import seaborn as sns
import os
from moviepy.editor import ImageSequenceClip

# Load the diamonds dataset
df = sns.load_dataset('diamonds')

# Check for missing values
if df.isnull().any().any():
    raise ValueError("The dataset contains missing values. Please handle them before plotting.")

# Create a directory to save frames
frames_dir = "frames"
os.makedirs(frames_dir, exist_ok=True)

# Extract unique values for the 'cut' column to iterate over
unique_cuts = df['cut'].unique()

# Save each frame as an image
for i, cut in enumerate(unique_cuts):
    # Filter the data for the current cut
    filtered_df = df[df['cut'] == cut]

    # Ensure filtered data is valid
    if filtered_df.empty:
        continue

    # Create the scatter plot for the current cut
    frame_fig = px.scatter(
        filtered_df, x='carat', y='price',
        color='color',
        title=f'Carat vs Price for {cut} Cut',
```

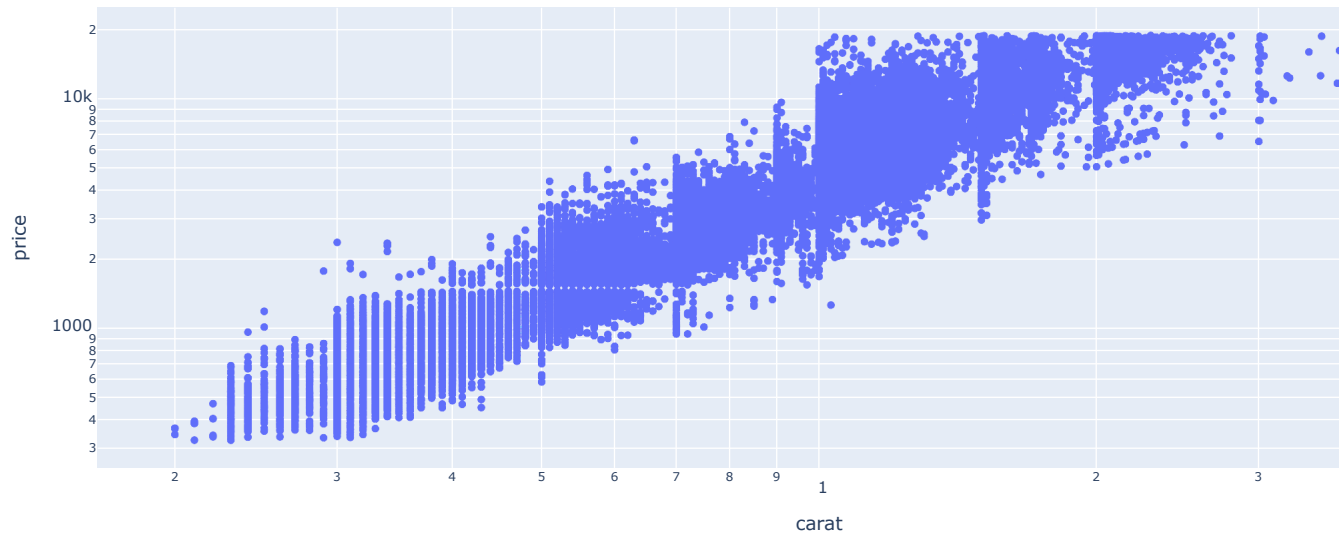
```
        size='depth',
        hover_data=['clarity']
    )

    # Save the frame image using Kaleido
    frame_filename = os.path.join(frames_dir, f"frame_{i:03d}.png")
    frame_fig.write_image(frame_filename, engine="kaleido")

# Create a GIF or MP4 using moviepy
image_files = [os.path.join(frames_dir, f) for f in sorted(os.listdir(frames_dir)) if f.endswith('.png')]
clip = ImageSequenceClip(image_files, fps=2)  # Adjust fps as needed
clip.write_gif("./03_plotly/animated_plot.gif", fps=2)    # Save as GIF
clip.write_videofile("./03_plotly/animated_plot.mp4", fps=1)  # Save as MP4
# save HD video
clip.write_videofile("./03_plotly/animated_plot_HD.mp4", fps=1, codec="libx264", preset="ultrafast", bitrate="3000k")
# Display the GIF in Jupyter Notebook
from IPython.display import Image
Image("./03_plotly/animated_plot.gif")
```

```
---------------------------------------------------------------------------
ValueError                                Traceback (most recent call last)
<ipython-input-62-3a569a90cfc9> in <cell line: 0>()
     38     # Save the frame image using Kaleido
     39     frame_filename = os.path.join(frames_dir, f"frame_{i:03d}.png")
---> 40     frame_fig.write_image(frame_filename, engine="kaleido")
     41
     42 # Create a GIF or MP4 using moviepy

                                  2 frames
/usr/local/lib/python3.11/dist-packages/plotly/io/_kaleido.py in to_image(fig, format, width, height, scale, validate, engine)
    130     # Raise informative error message if Kaleido is not installed
    131     if scope is None:
--> 132         raise ValueError(
    133             """
    134 Image export using the "kaleido" engine requires the kaleido package,

ValueError:
Image export using the "kaleido" engine requires the kaleido package,
which can be installed using pip:
    $ pip install -U kaleido
```

Next steps: Explain error

More Plots in Plotly

```
# scatter plot
fig = px.scatter(df, x='carat', y='price',
                 title='Diamond Price vs Carat Weight',
                 log_y=True,
                 log_x=True,
                 )
fig.show()
```




```
# Set axes ranges
fig = px.scatter(df, x='carat', y='price', color= 'cut' ,title='Custom Axes Ranges')
fig.update_xaxes(range=[0, 5])
fig.update_yaxes(range=[0, 10000])
fig.show()
```

```
# Polar chart using cut as a category
df = sns.load_dataset('diamonds')
df = df.sample(frac=0.1, random_state=10)
```

```
import plotly.express as px
import seaborn as sns

df = sns.load_dataset('diamonds')
df = df.sample(frac=0.1, random_state=10)

fig = px.bar_polar(df, r='price', theta='cut', title='Polar Chart: Price by Cut', color='cut')
fig.show()
```

```
# Polar chart using cut as a category
df = sns.load_dataset('diamonds')
df = df.sample(frac=0.1, random_state=10)
fig = px.line_polar(df, r='price', theta='cut', title='Polar Chart: Price by Cut')
fig.show()
```

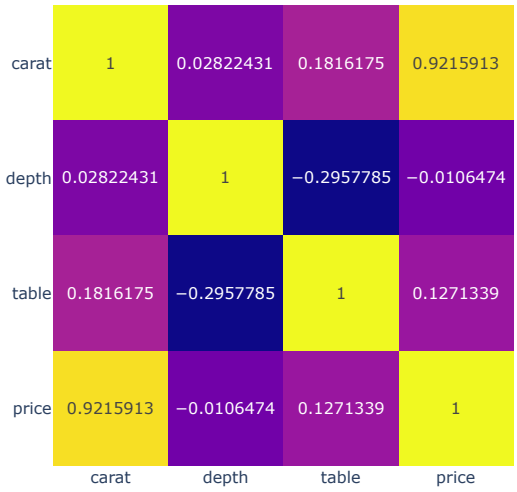
Resolve this error

```
df[['carat', 'depth', 'table', 'price']].corr()
```

	carat	depth	table	price
carat	1.000000	0.028224	0.181618	0.921591
depth	0.028224	1.000000	-0.295779	-0.010647
table	0.181618	-0.295779	1.000000	0.127134
price	0.921591	-0.010647	0.127134	1.000000

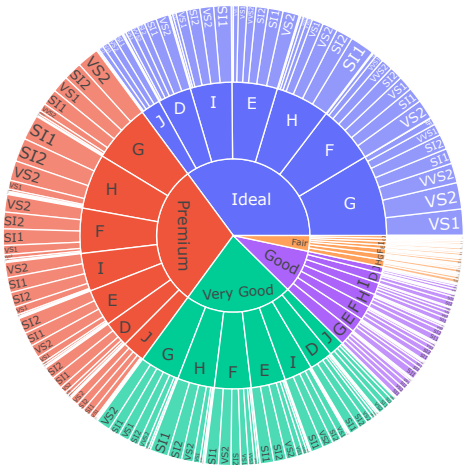
```
# Heatmap with annotations

fig = px.imshow(df[['carat', 'depth', 'table', 'price']].corr(),
                text_auto=True,
                title='Correlation Heatmap with Annotations')
fig.show() # correlation heatmap
```

Correlation Heatmap with Annotations

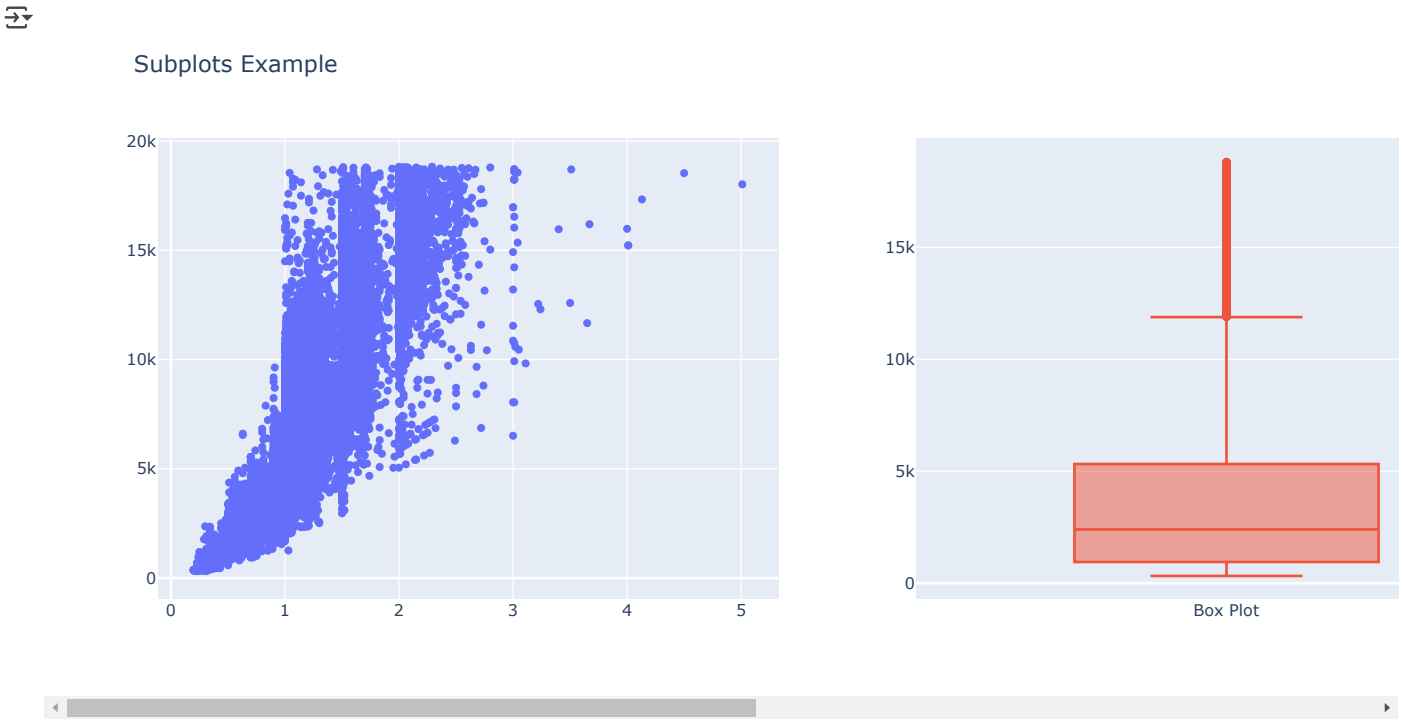



```
# Sunburst chart with values as price
fig = px.sunburst(df, path=['cut', 'color', 'clarity'],
                  values='price',
                  title='Sunburst Chart with Price Values')
fig.show()
```

Sunburst Chart with Price Values




```
from plotly.subplots import make_subplots
# Creating subplots
fig = make_subplots(rows=1, cols=2)
fig.add_trace(go.Scatter(x=df['carat'], y=df['price'], mode='markers', name='Scatter'), row=1, col=1)
fig.add_trace(go.Box(y=df['price'], name='Box Plot'), row=1, col=2)
fig.update_layout(title_text='Subplots Example')
fig.show()
```




```
# scatter plot with dual y-axes
fig = make_subplots(specs=[[{"secondary_y": True}]])
fig.add_trace(go.Scatter(x=df['carat'], y=df['price'], mode='markers', name='Carat vs Price'), secondary_y=False)
fig.add_trace(go.Scatter(x=df['carat'], y=df['depth'], mode='markers', name='Carat vs Depth'), secondary_y=True)
fig.update_layout(title_text='Scatter Plot with Dual Y-Axes')
# label each y axis
fig.update_yaxes(title_text='Price', secondary_y=False)
fig.update_yaxes(title_text='Depth', secondary_y=True)
fig.show()
```


```
# Waterfall chart of price by cut
cut_avg_price = df.groupby('cut')['price'].mean().reset_index()

# Create waterfall chart using plotly.graph_objects
fig = go.Figure(go.Waterfall(
    name="Average Price",
    orientation="v",
    x=cut_avg_price['cut'],
    y=cut_avg_price['price']
))

fig.update_layout(title='Waterfall Chart of Average Price by Cut')
fig.show()
```

Waterfall Chart of Average Price by Cut