1 Scatter Plots

- The `Scatter` high-level chart can be used to generate 1D or (more commonly) 2D scatter plots.
- It is used by passing in DataFrame-like object as the first argument then specifying the columns to use for x and y coordinates:

```
from bokeh.charts import Scatter, output_file, show
from bokeh.sampledata.autompg import autompg as df

p = Scatter(df, x='mpg', y='hp',
            title="HP vs MPG",
            xlabel="Miles Per Gallon", ylabel="Horsepower")

output_file("scatter.html")

show(p)
```

1.1 Color

The `color` parameter can be used to control the color of the scatter markers:

```
from bokeh.charts import Scatter, output_file, show
from bokeh.sampledata.autompg import autompg as df

p = Scatter(df, x='mpg', y='hp',
            title="HP vs MPG",
            color="navy",   #    <<<------NEW
            xlabel="Miles Per Gallon",
            ylabel="Horsepower")

output_file("scatter.html")

show(p)
```

1.2 Color Groups

If color is supplied with the name of a data column then the data is first grouped by the values of that column, and then a different color is used for every group:

```
from bokeh.charts import Scatter, output_file, show
from bokeh.sampledata.autompg import autompg as df

p = Scatter(df, x='mpg', y='hp',
            color='cyl',   #  <<<---------------NEW
            title="HP vs MPG (shaded by CYL)",
            xlabel="Miles Per Gallon",
            ylabel="Horsepower")

output_file("scatter.html")

show(p)
```

1.3 Adding Legends

When grouping, a legend is usually useful, and its location can be specified by the legend parameter:

```
from bokeh.charts import Scatter, output_file, show
from bokeh.sampledata.autompg import autompg as df

p = Scatter(df, x='displ', y='hp',
            color='cyl',
            title="HP vs DISPL (shaded by CYL)", legend="top_left",# <<<-------
            xlabel="Displacement", ylabel="Horsepower")

output_file("scatter.html")

show(p)
```

1.4 Markers

The marker parameter can be used to control the shape of the scatter marker:

```
from bokeh.charts import Scatter, output_file, show
from bokeh.sampledata.autompg import autompg as df

p = Scatter(df, x='displ', y='hp',
            marker='square',
            title="HP vs DISPL",
            legend="top_left",
            xlabel="Displacement", ylabel="Horsepower")

output_file("scatter.html")

show(p)
```

As with color, the `marker` parameter can be given a column name to group by the values of that column, using a different marker shape for each group:

```
from bokeh.charts import Scatter, output_file, show
from bokeh.sampledata.autompg import autompg as df

p = Scatter(df, x='displ', y='hp',
            marker='cyl',
            title="HP vs DISPL (marked by CYL)",
            legend="top_left",
            xlabel="Displacement",
            ylabel="Horsepower")

output_file("scatter.html")

show(p)
```

Often it is most useful to group both the color and marker shape together:

```
from bokeh.charts import Scatter, output_file, show
from bokeh.sampledata.autompg import autompg as df
```

```
p = Scatter(df, x='displ', y='hp',
            marker='cyl', color='cyl',
            title="HP vs DISPL (marked by CYL)", legend="top_left",
            xlabel="Displacement", ylabel="Horsepower")

output_file("scatter.html")

show(p)
```