

Customizing glyph settings

INTERACTIVE DATA VISUALIZATION WITH BOKEH

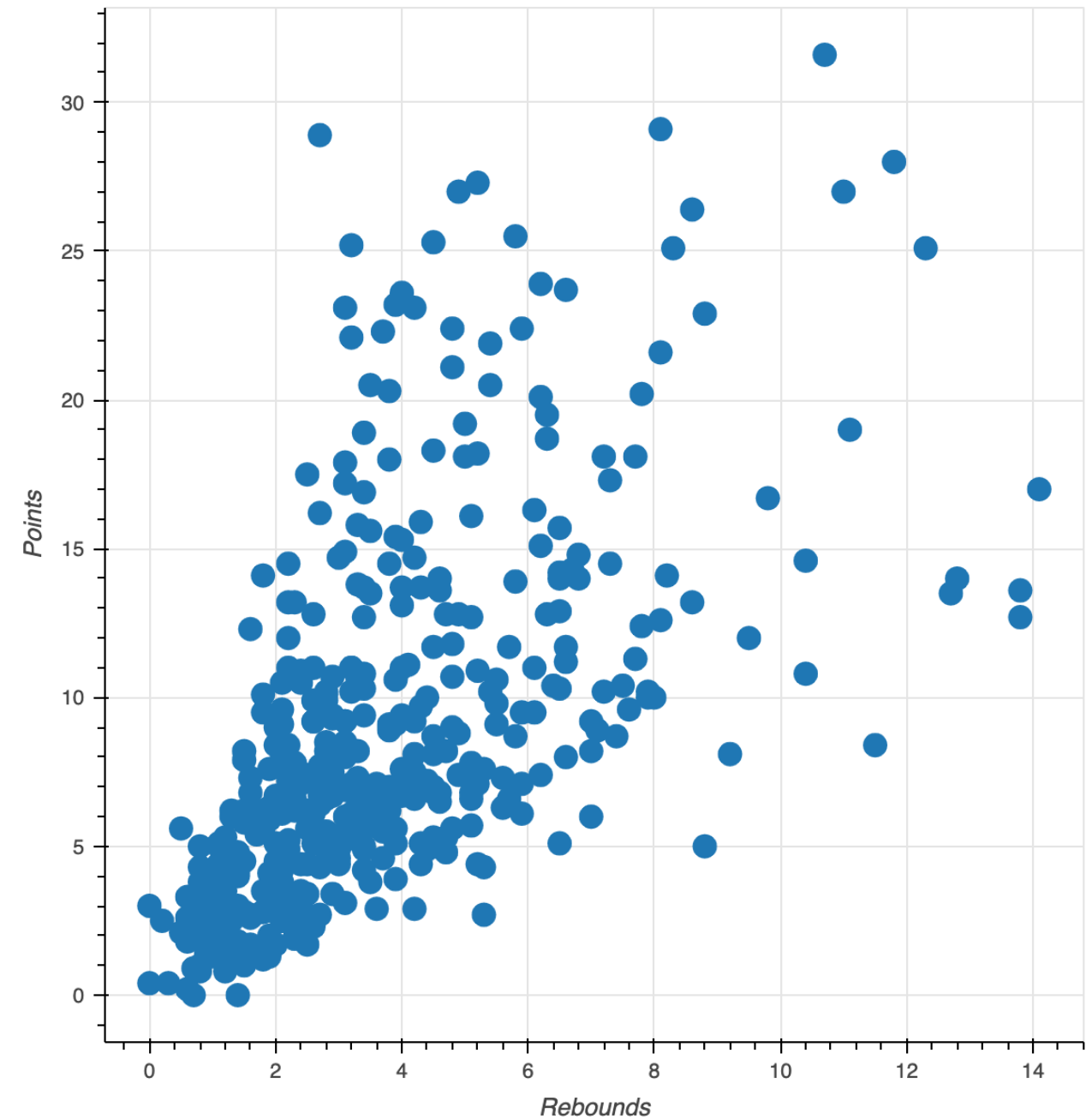


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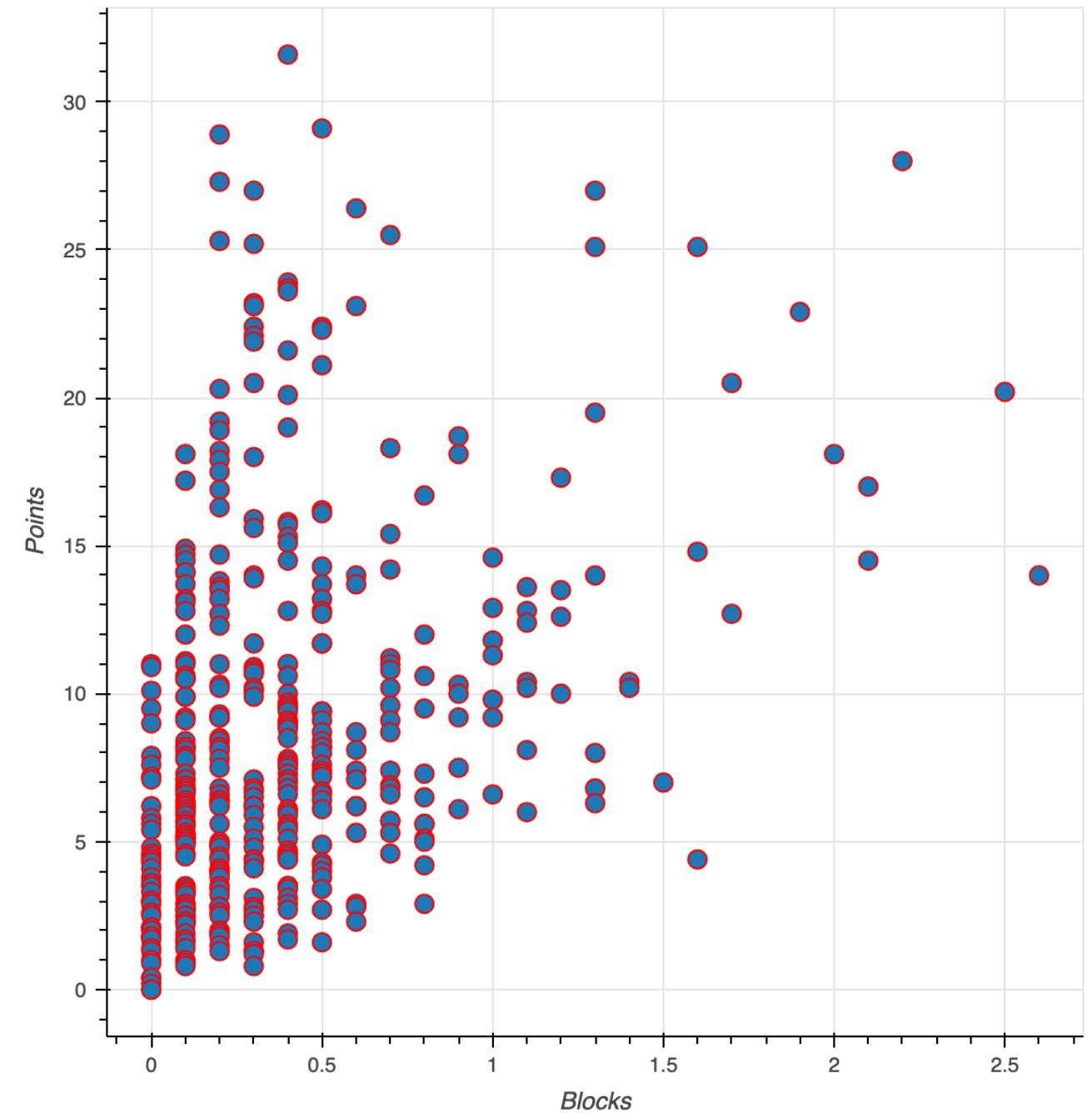
Glyph size

```
fig = figure(x_axis_label="Rebounds",  
            y_axis_label="Points")  
fig.circle(x="rebounds", y="points",  
          source=source, size=12)  
output_file(filename="size_12_scatter.html")  
show(fig)
```



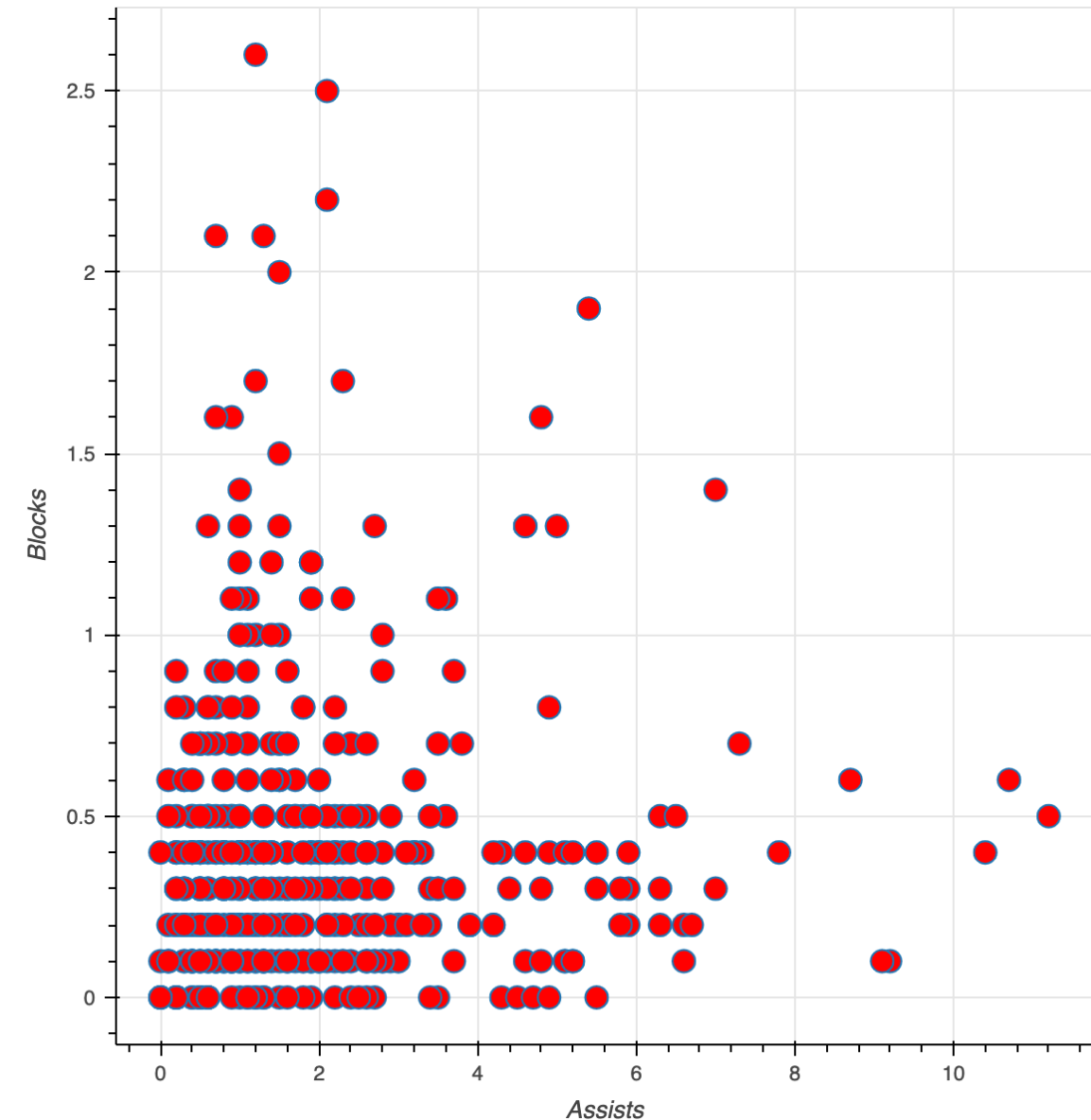
Glyph outline color

```
fig = figure(x_axis_label="Blocks",  
            y_axis_label="Points")  
fig.circle(x="blocks", y="points",  
          source=source, size=10,  
          line_color="red")  
output_file(filename="red_lines.html")  
show(fig)
```



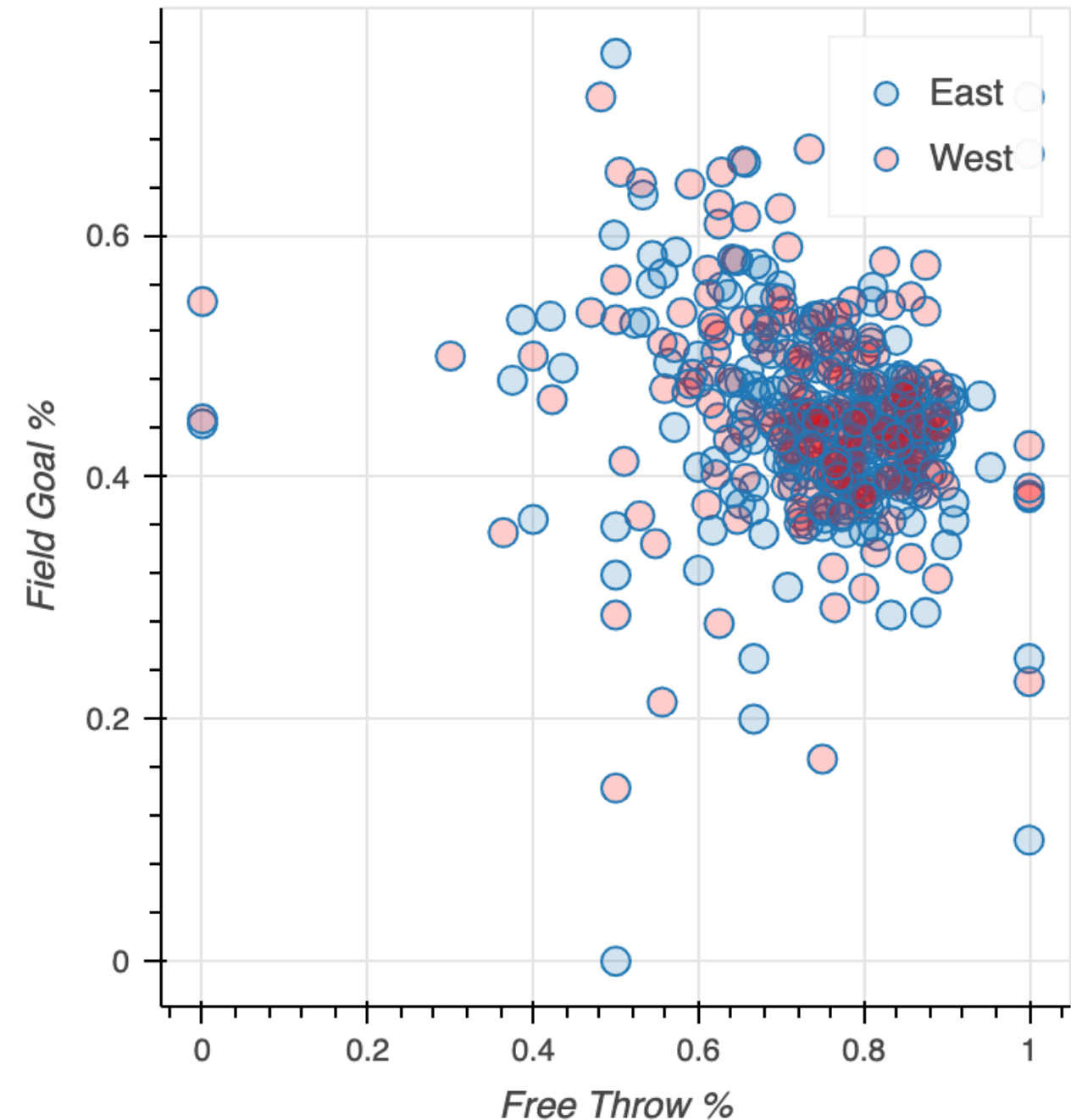
Glyph fill color

```
fig = figure(x_axis_label="Assists",  
            y_axis_label="Blocks")  
fig.circle(x="blocks", y="points",  
          source=source, size=12,  
          fill_color="red")  
output_file(filename="red_circles.html")  
show(fig)
```



Glyph transparency

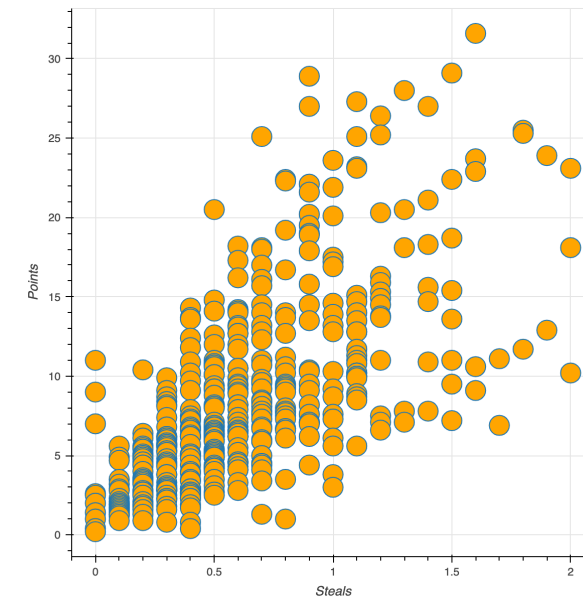
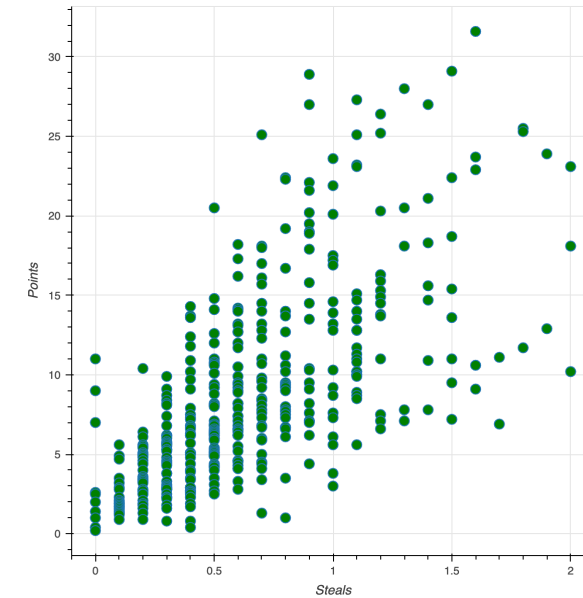
```
fig = figure(x_axis_label="Free Throw %",
            y_axis_label="Field Goal %")
fig.circle(x="free_throw_perc",
          y="field_goal_perc",
          source=east, size=10,
          fill_alpha=0.2, legend_label="East")
fig.circle(x="free_throw_perc",
          y="field_goal_perc",
          source=west, size=10,
          fill_alpha=0.2, fill_color="red",
          legend_label="West")
output_file(filename="transparent.html")
show(fig)
```



Updating glyphs

```
fig = figure(x_axis_label="Steals",  
            y_axis_label="Points")  
circle = fig.circle(x="steals", y="assists",  
                   source=source, size=10,  
                   fill_color="green")  
output_file(filename="original.html")  
show(fig)
```

```
circle.glyph.size = 20  
circle.glyph.fill_color = "orange"  
output_file(filename="updated.html")  
show(fig)
```



Line glyphs

Scatter argument	Line plot equivalent
size	line_width
fill_alpha	alpha
color	line_color
fill_color	Not applicable
line_color	Not applicable

The dataset

```
print(nba.iloc[:3, :6])
```

	player	position	minutes	field_goal_perc	three_point_perc	free_throw_perc
0	Russell Westbrook	PG	34.6	0.425	0.343	0.845
1	James Harden	PG	36.4	0.440	0.347	0.847
2	Isaiah Thomas	PG	33.8	0.463	0.379	0.909

```
print(nba.iloc[:3, 6:])
```

	rebounds	assists	steals	blocks	points	team	conference	scorer_category
0	10.7	10.4	1.6	0.4	31.6	OKC	West	High Scorer
1	8.1	11.2	1.5	0.5	29.1	HOU	West	High Scorer
2	2.7	5.9	0.9	0.2	28.9	BOS	East	High Scorer

Let's practice!

INTERACTIVE DATA VISUALIZATION WITH BOKEH

Highlighting and contrasting

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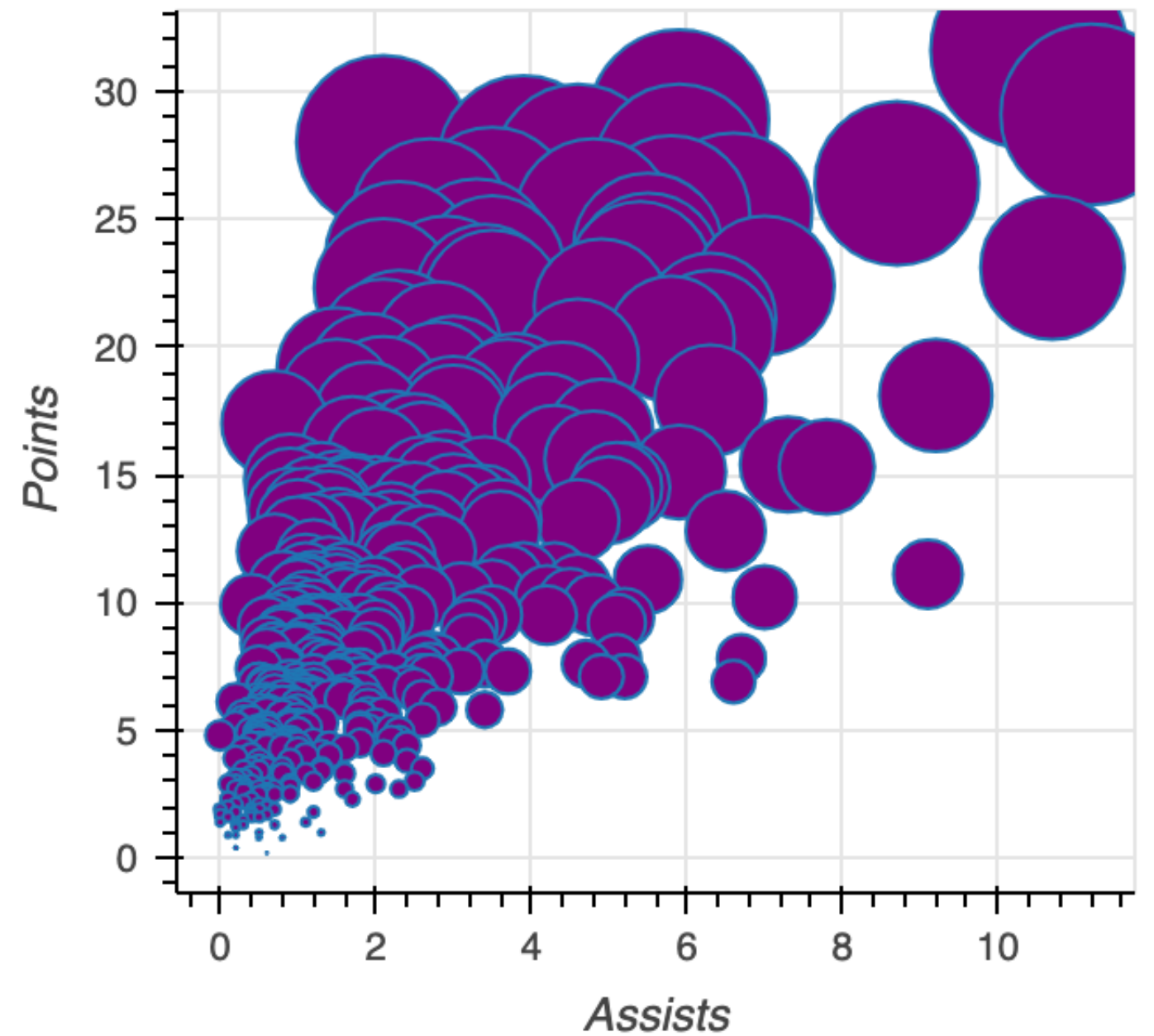
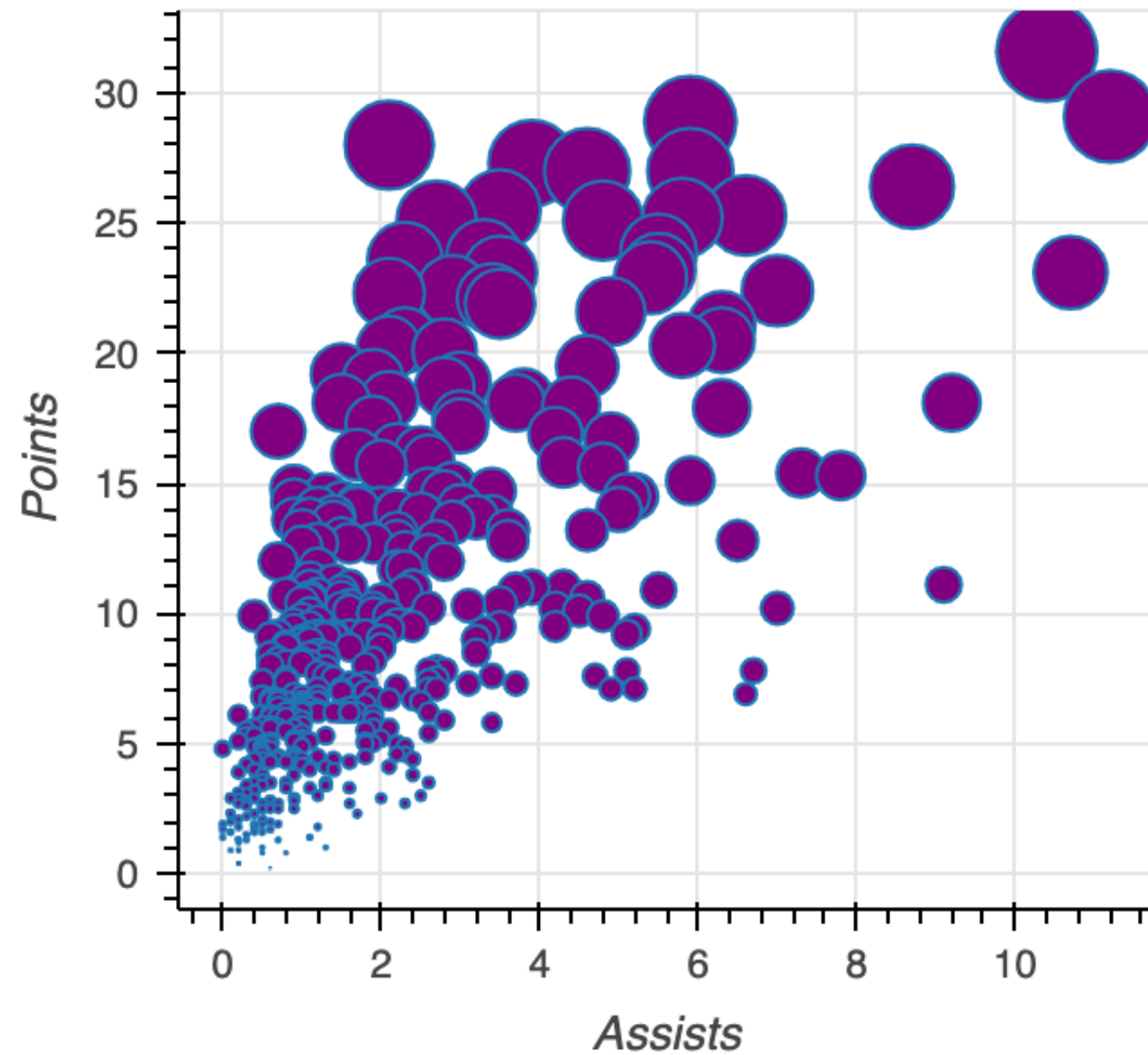
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Vectorizing glyph size

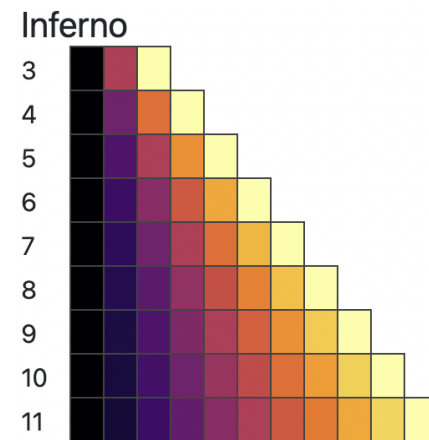
```
sizes = nba["points"] / 50
fig = figure(x_axis_label="Assists", y_axis_label="Points")
fig.circle(x=nba["assists"], y=nba["points"], fill_color="purple", radius=sizes)
output_file(filename="glyph_vectorization.html")
show(fig)
```

Different sizes

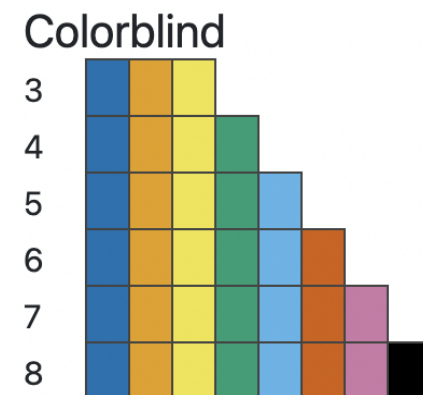


Palettes

```
from bokeh.palettes import Inferno3
```



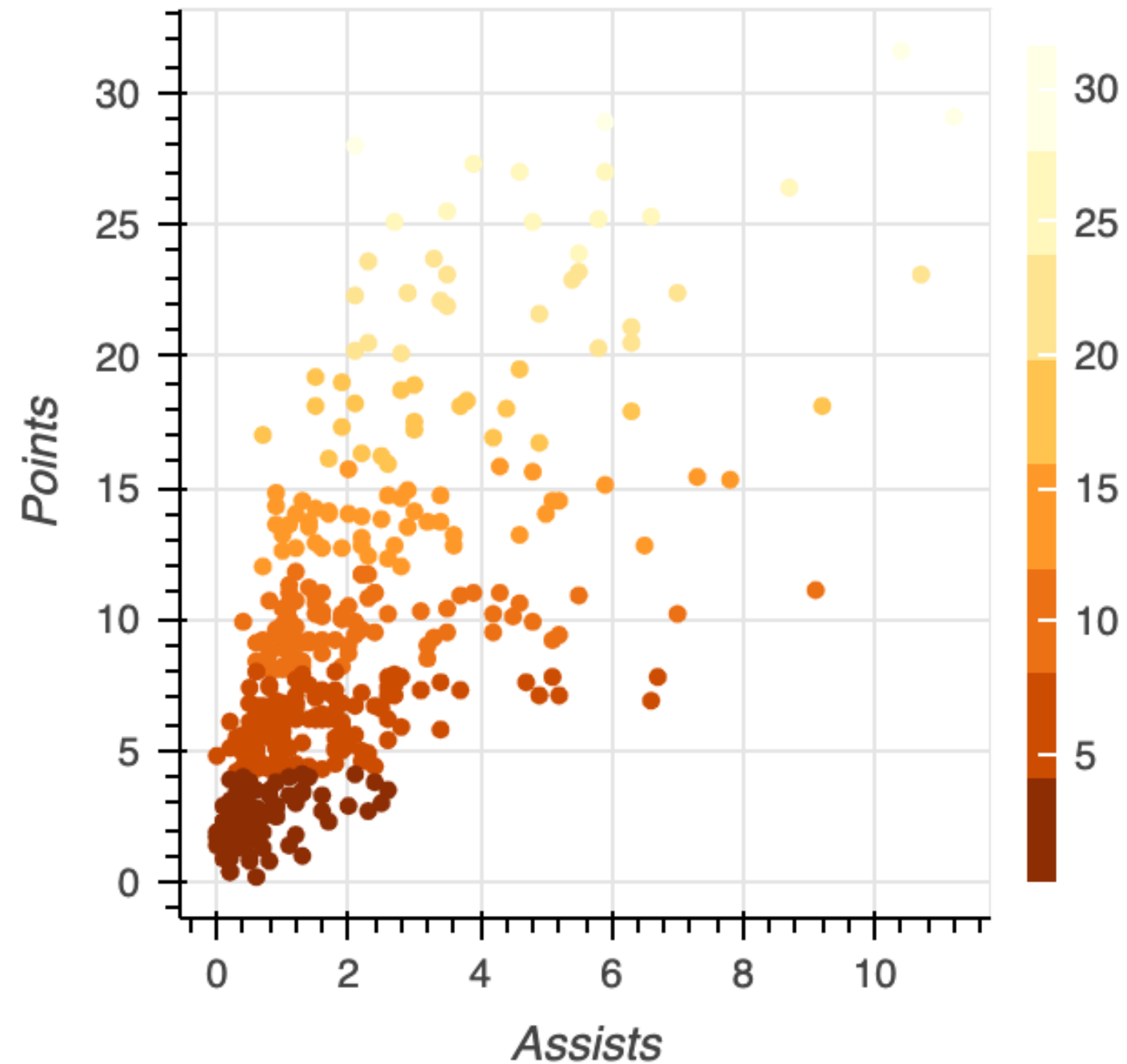
```
from bokeh.palettes import Colorblind4
```



```
from bokeh.palettes import __palettes__  
__palettes__[:8]
```

```
['Accent3',  
 'Accent4',  
 'Accent5',  
 'Accent6',  
 'Accent7',  
 'Accent8',  
 'Blues3',  
 'Blues4']
```

Color mapping and color bars



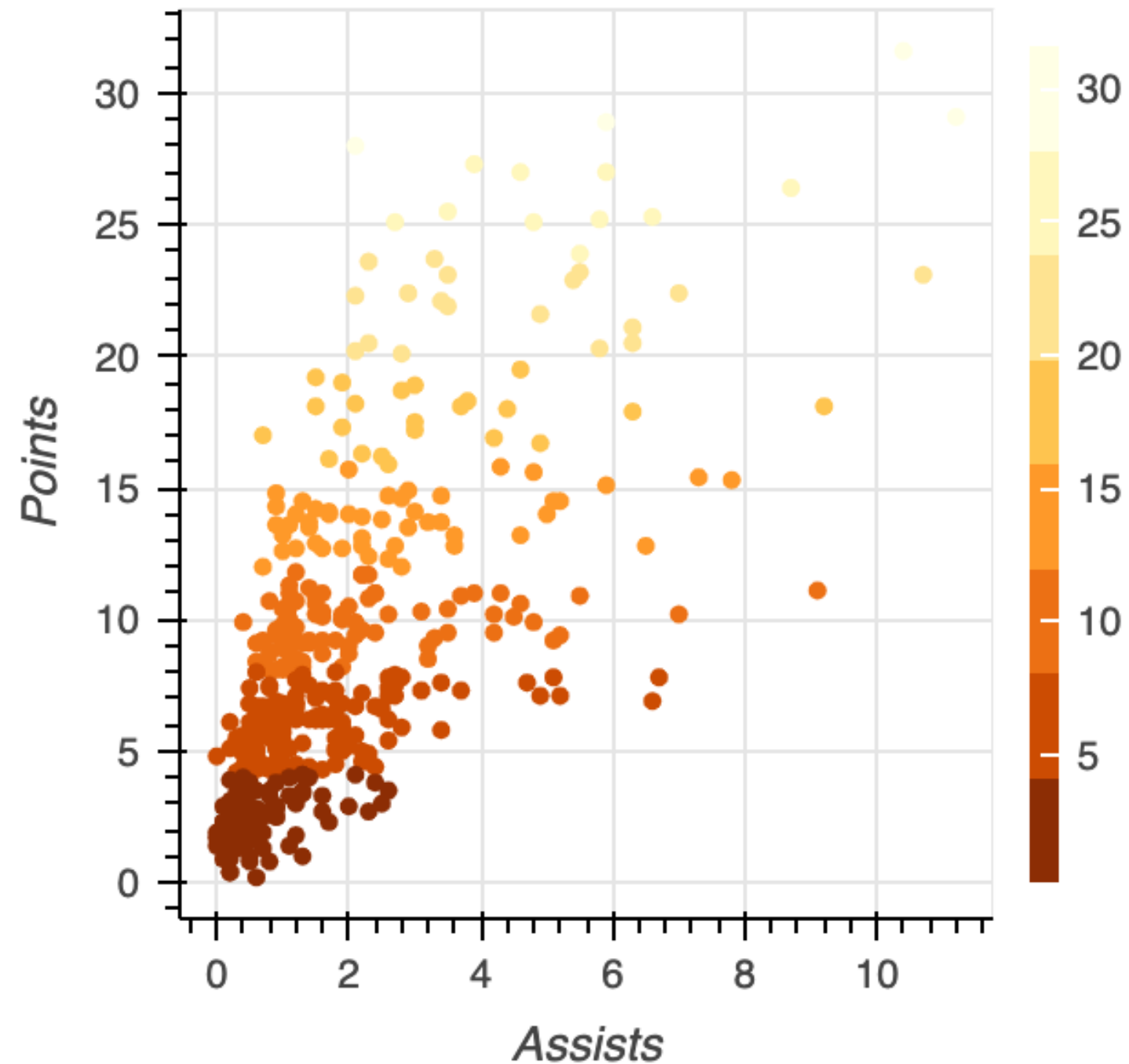
Linear color mapping

```
from bokeh.transform import linear_cmap
from bokeh.palettes import YlOrBr8
from bokeh.models import ColorBar

mapper = linear_cmap(field_name="points", palette=YlOrBr8,
                    low=min(nba["points"]), high=max(nba["points"]))

fig = figure(x_axis_label="Assists", y_axis_label="Points")
fig.circle(x="assists", y="points", source=source, fill_color=mapper, line_color=mapper)
color_bar = ColorBar(color_mapper=mapper["transform"], width=8)
fig.add_layout(color_bar, "right")
output_file(filename="linear_cmap.html")
show(fig)
```

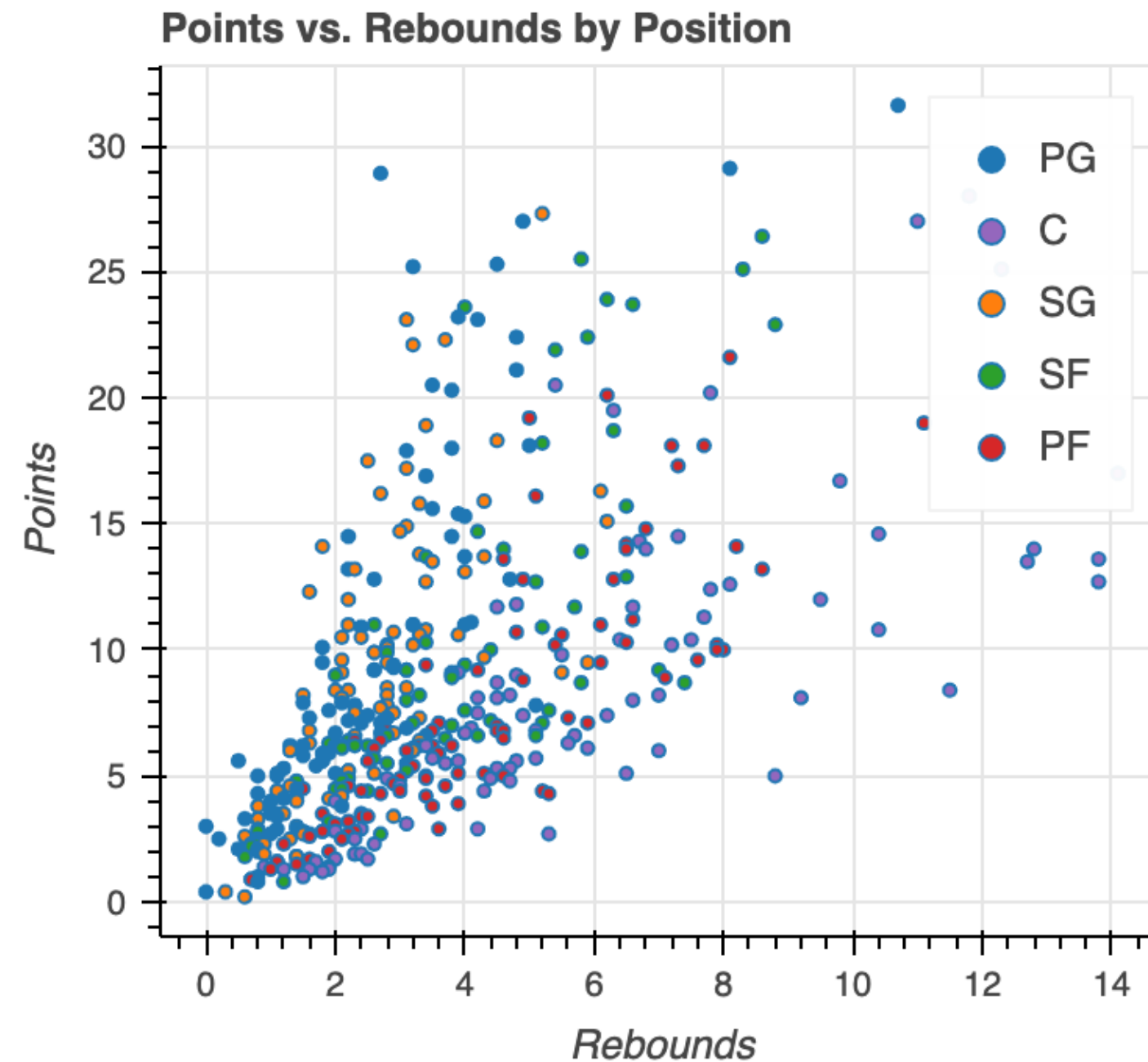
Linear color map scatter plot



Factor color mapping

```
from bokeh.transform import factor_cmap
from bokeh.palettes import Category10_5
positions = ["PG", "SG", "SF", "PF", "C"]
fig = figure(x_axis_label="Rebounds", y_axis_label="Points")
fig.circle(x="rebounds", y="points", source=source,
           fill_color=factor_cmap("position", palette=Category10_5, factors=positions),
           legend_field="position")
output_file(filename="factor_cmap.html")
show(fig)
```

Color categorized bar plot



Let's practice!

INTERACTIVE DATA VISUALIZATION WITH BOKEH

Communicating with text

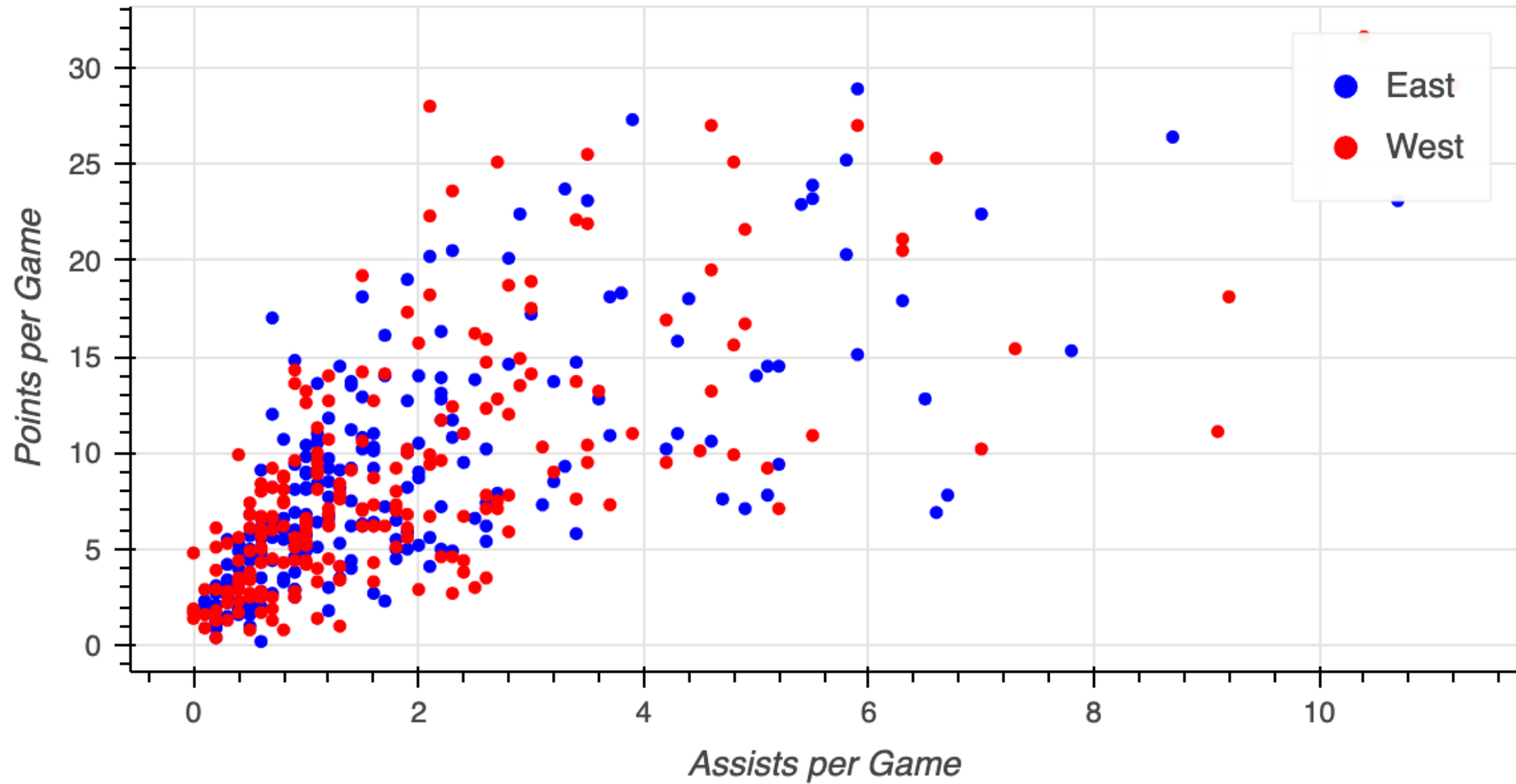
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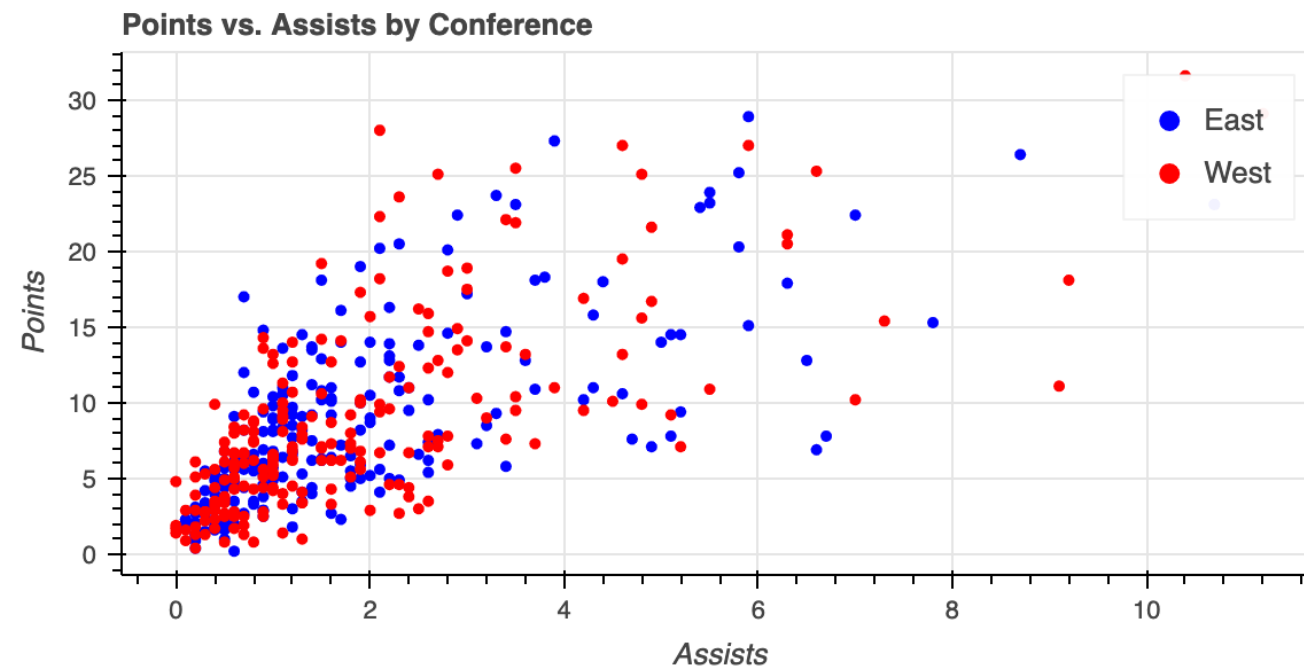
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Our plot



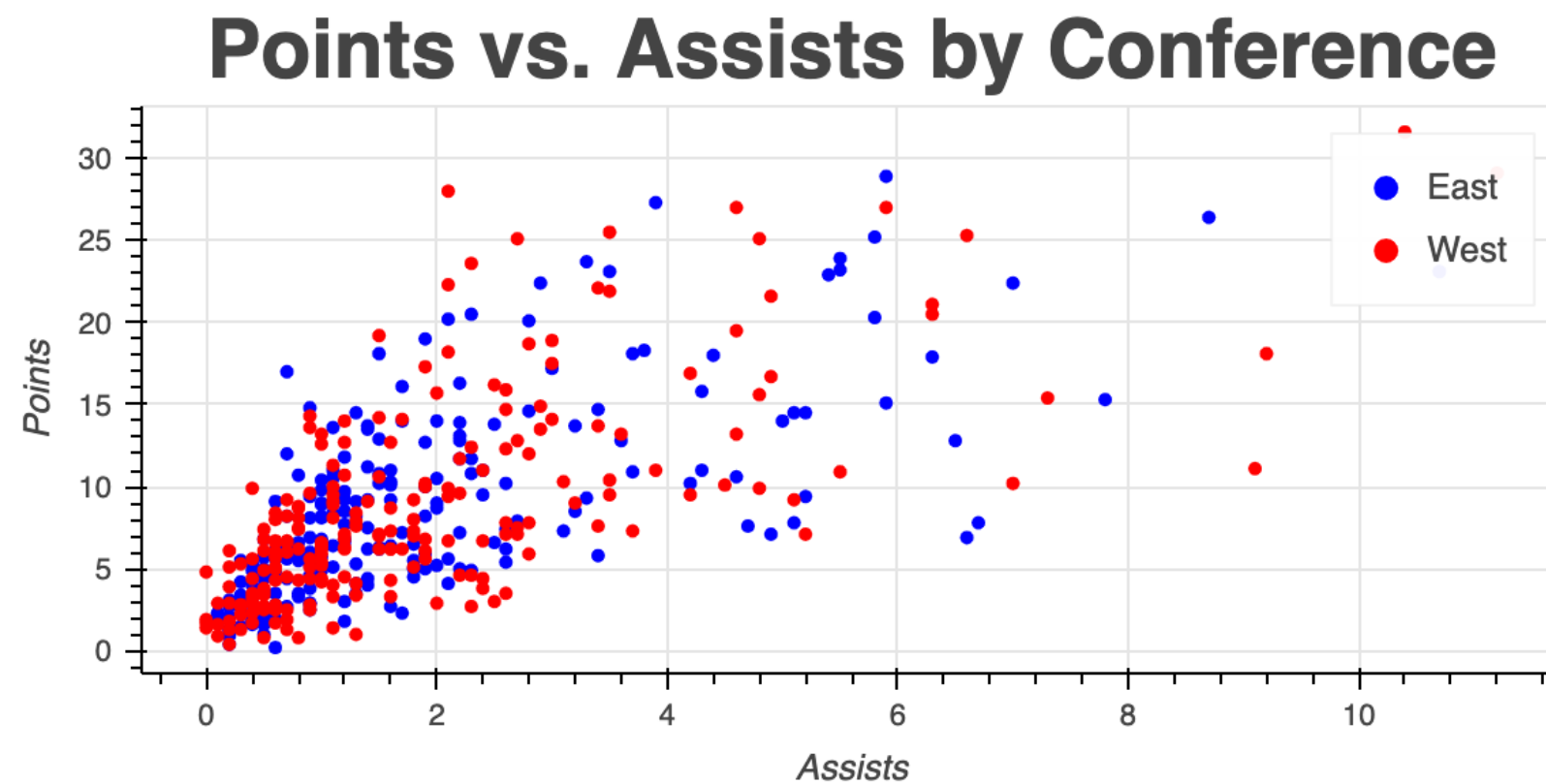
Adding a title

```
fig = figure(x_axis_label='Assists per Game', y_axis_label='Points per Game',  
            title="Points vs. Assists by Conference")  
fig.circle(x='assists', y='points', source=east, color='blue', legend_label='East')  
fig.circle(x='assists', y='points', source=west, color='red', legend_label='West')  
output_file(filename="points_vs_assists_by_conference.html")  
show(fig)
```



Customizing the title

```
fig.title.text_font_size = "30px"  
fig.title.align = "center"  
output_file(filename="modified_title.html")  
show(fig)
```



Modifying the legend

```
fig.legend.title = "Conference"  
fig.legend.location = "bottom_right"  
show(fig)
```

legend.location

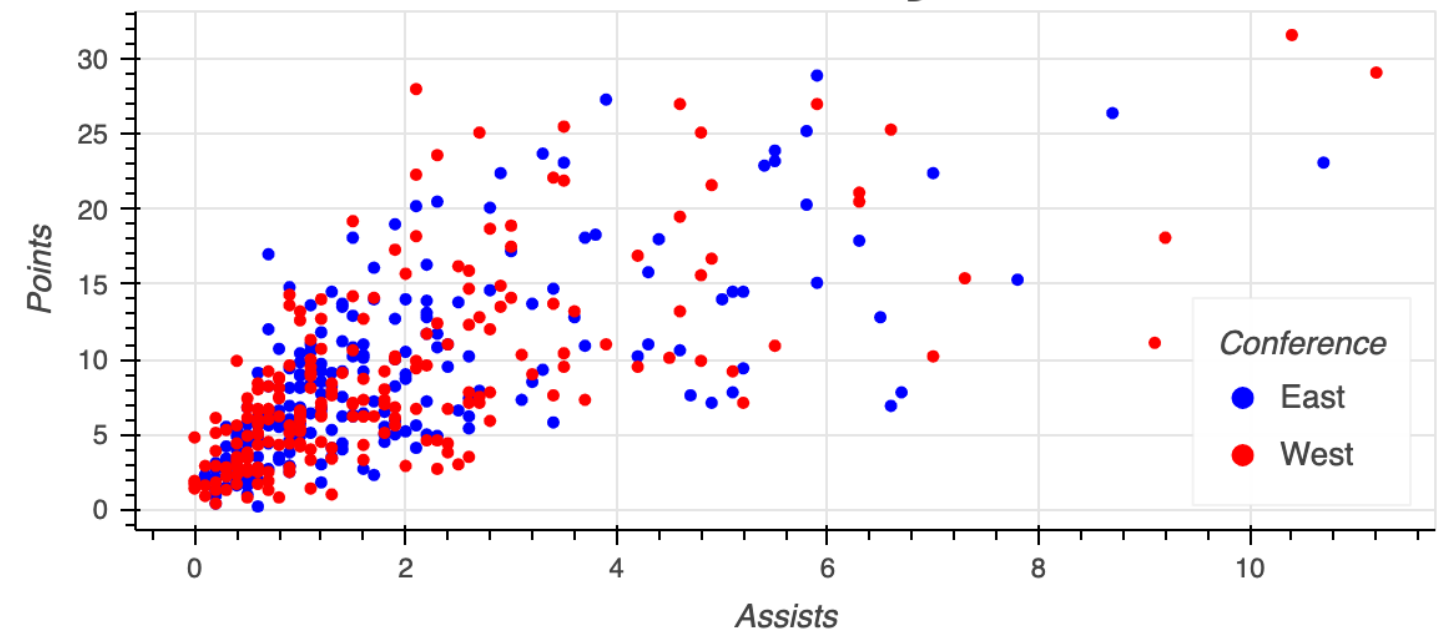
"top_left"

"top_right"

"bottom_left"

"bottom_right"

Points vs. Assists by Conference

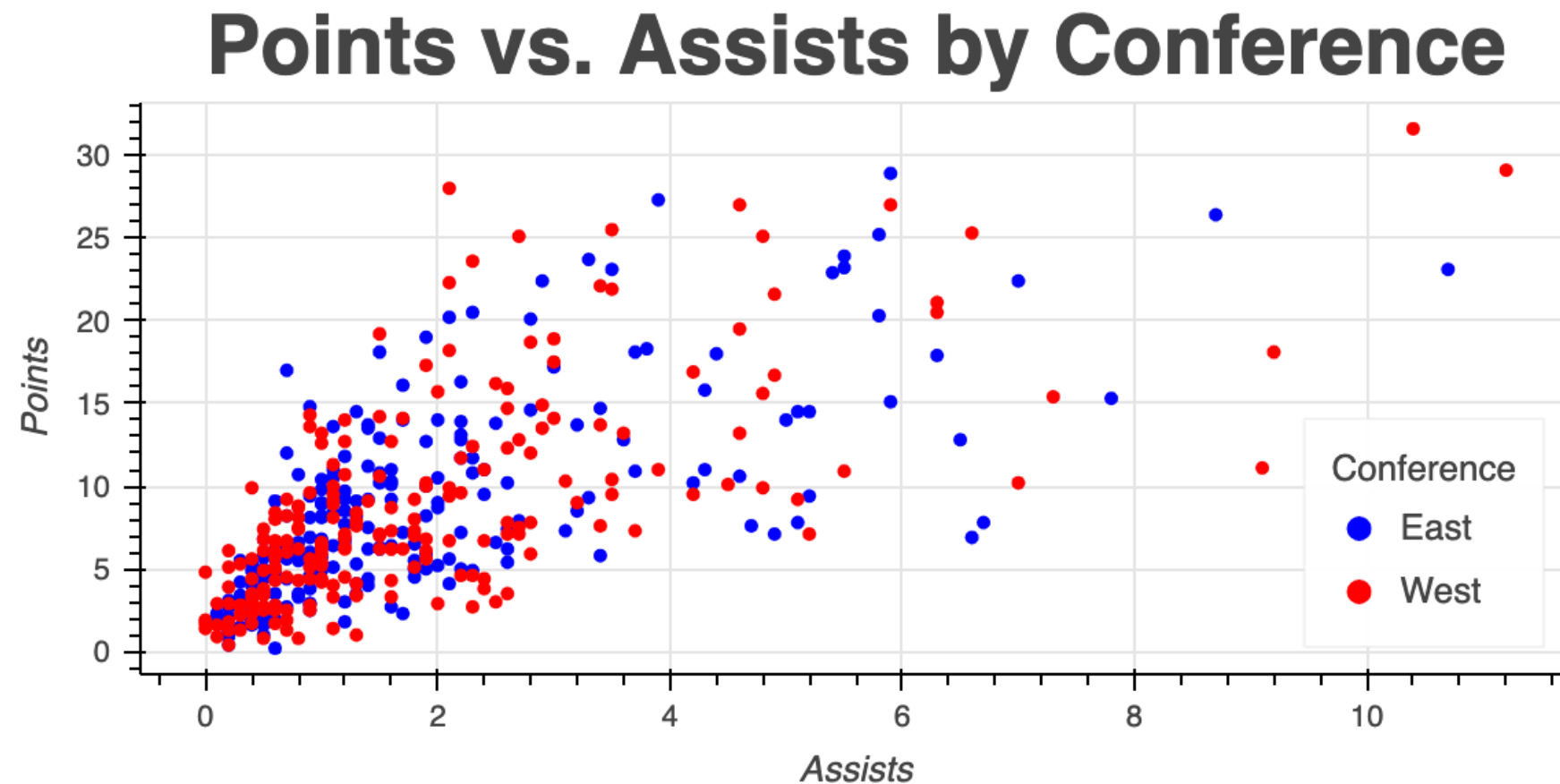


Legend title's font style

<code>legend.title_text_font_style</code>
<code>"bold"</code>
<code>"normal"</code>
<code>"italic"</code>

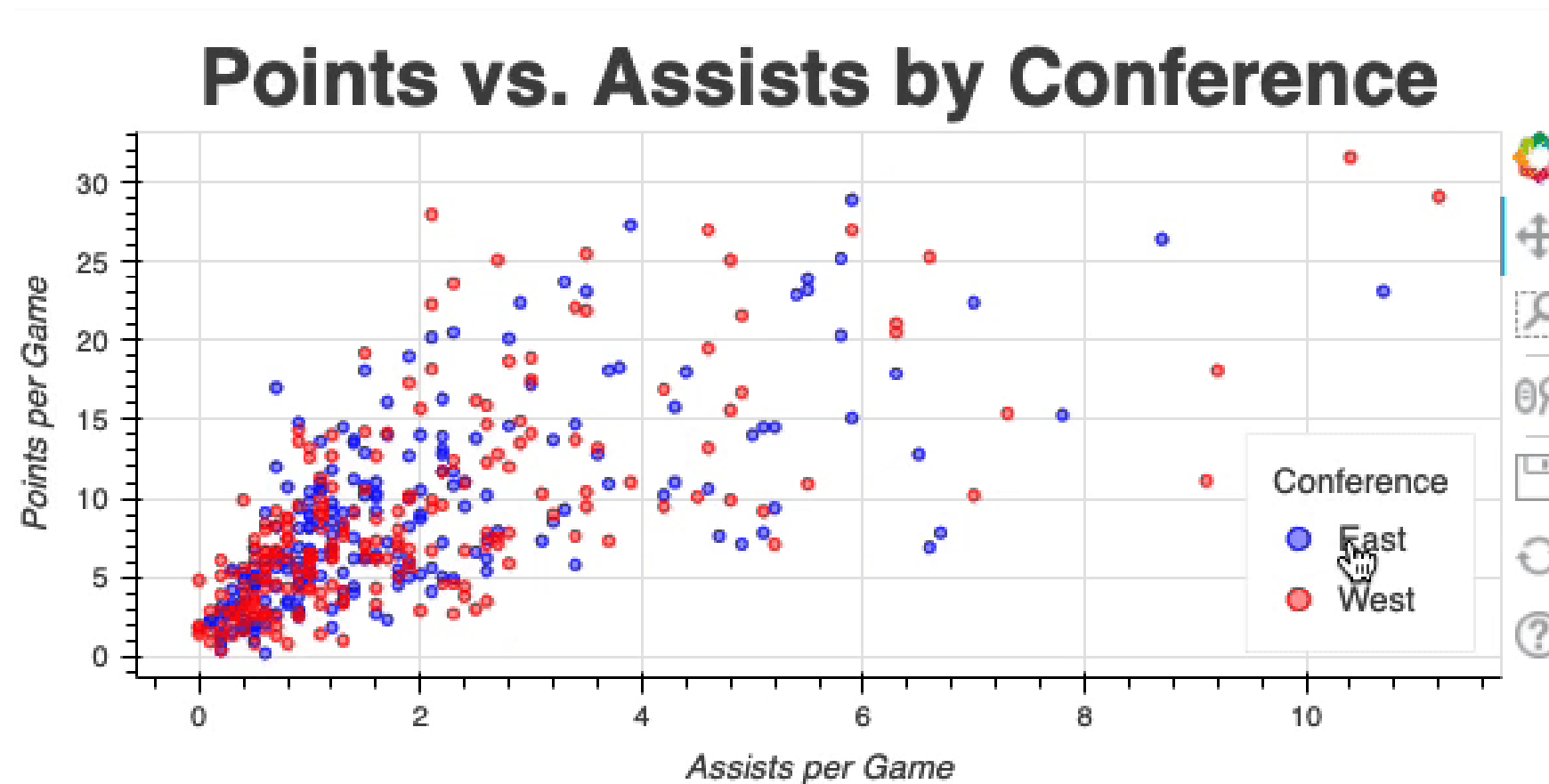
Legend title font style

```
fig.legend.title_text_font_style = "normal"  
output_file(filename="normal_legend_title.html")  
show(fig)
```



Displaying an interactive legend

```
fig.legend.click_policy = "hide"  
output_file(filename="interactive_legend.html")  
show(fig)
```



The dataset

```
print(bakery.shape)
```

```
(17486, 6)
```

```
print(bakery.columns)
```

```
Index(['transaction', 'items', 'day_time', 'day_type', 'date', 'sales'],  
      dtype='object')
```

Let's practice!

INTERACTIVE DATA VISUALIZATION WITH BOKEH

Adding annotations

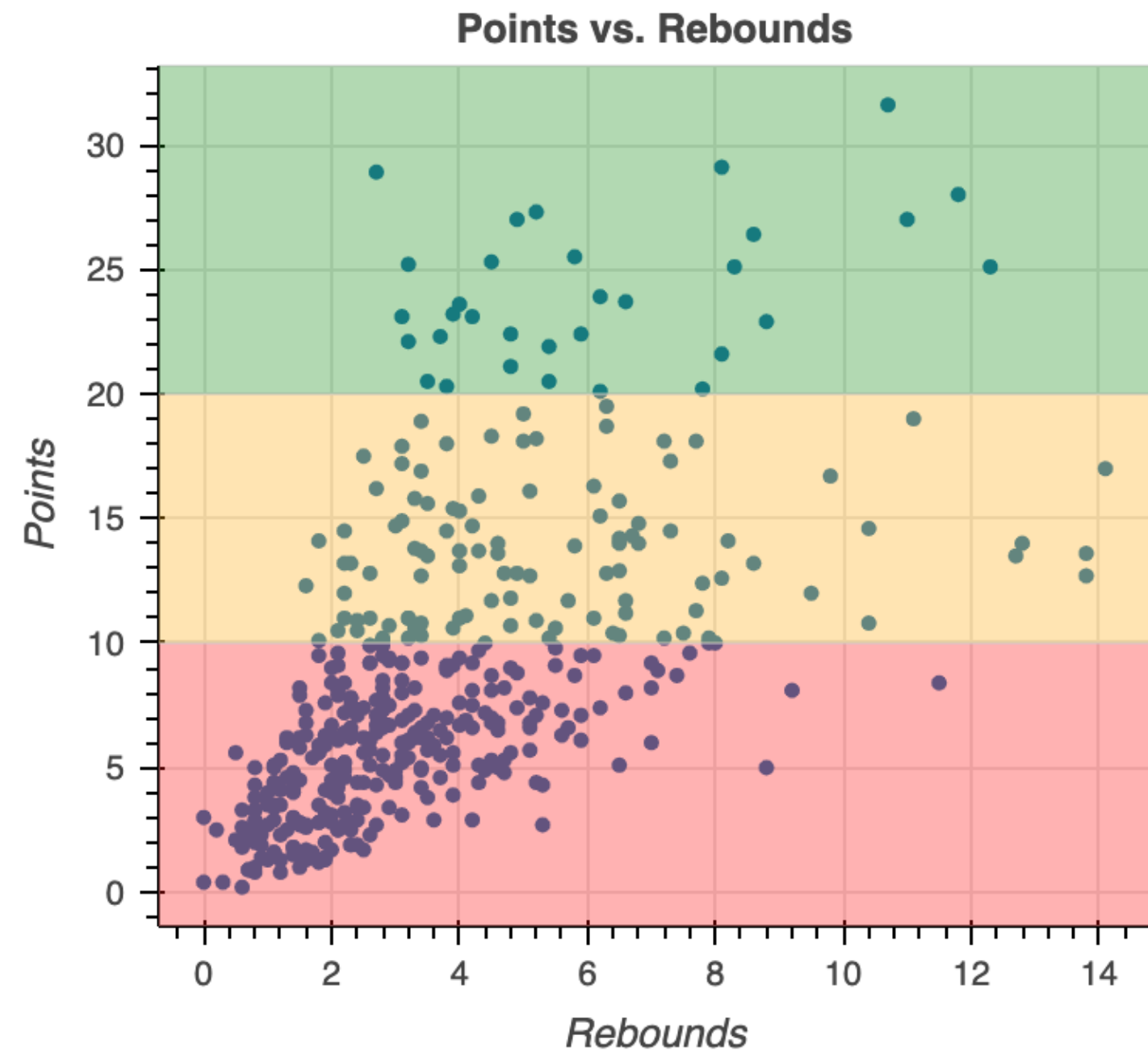
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Box annotation



Adding box annotations

```
from bokeh.models import BoxAnnotation
fig = figure(x_axis_label="Rebounds", y_axis_label="Points", title="Points vs. Rebounds")
fig.circle(x="rebounds", y="points", source=source)
low_box = BoxAnnotation(top=10, fill_color="red", fill_alpha=0.3)
mid_box = BoxAnnotation(bottom=10, top=20, fill_color="orange", fill_alpha=0.3)
high_box = BoxAnnotation(bottom=20, fill_color="green", fill_alpha=0.3)
fig.add_layout(low_box)
fig.add_layout(mid_box)
fig.add_layout(high_box)
fig.title.align = "center"
output_file("color_annotated_plot.html")
show(fig)
```


Polygon annotation



Adding a polygon annotation

```
import datetime as dt
from bokeh.models import PolyAnnotation

fig = figure(title="Nvidia Stock Price", x_axis_label="Date", y_axis_label="Price")
fig.line(x="date", y="close", source=source)
fig.xaxis[0].formatter = DatetimeTickFormatter(months="%b %Y")
fig.yaxis[0].formatter = NumeralTickFormatter(format="$0")
start_date = dt.datetime(2017, 5, 9)
end_date = dt.datetime(2017, 6, 12)
start_float = start_date.timestamp() * 1000
end_float = end_date.timestamp() * 1000
start_data = nvidia.loc[nvidia['date'] == start_date]['close'].values[0]
end_data = nvidia.loc[nvidia['date'] == end_date]['close'].values[0]
polygon = PolyAnnotation(fill_color="green", fill_alpha=0.4,
                        xs = [start_float, start_float, end_float, end_float],
                        ys = [start_data-8, start_data+28, end_data+20, end_data-10])

fig.add_layout(polygon)
output_file(filename="nvidia_polygon_annotation.html")
show(fig)
```

Let's practice!

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