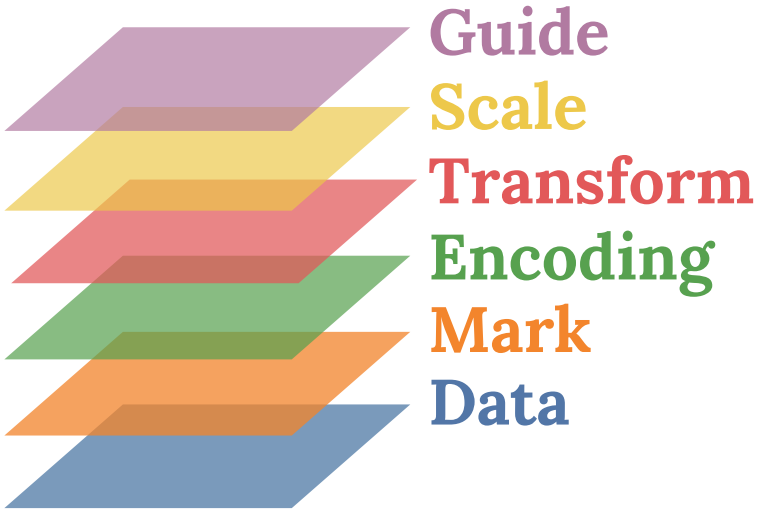
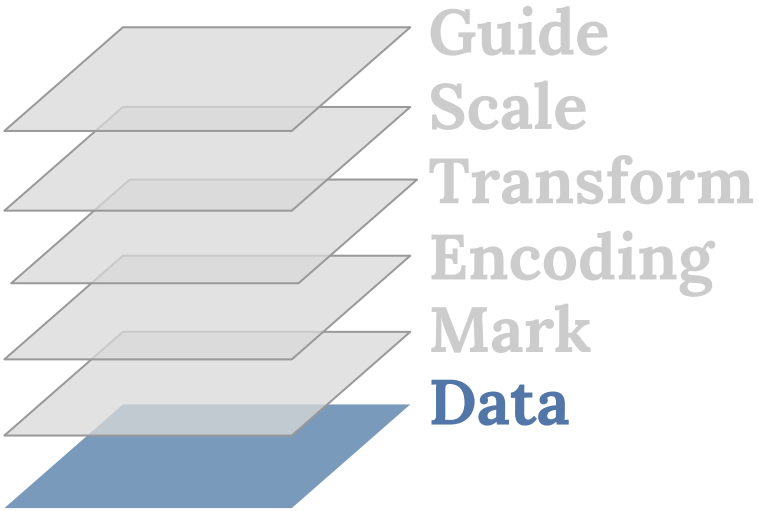
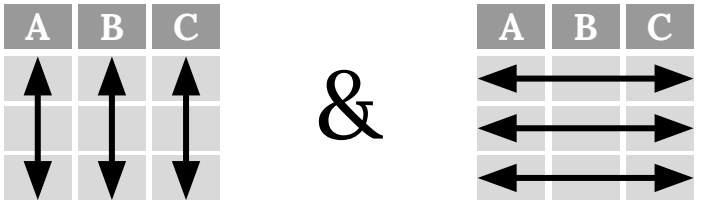
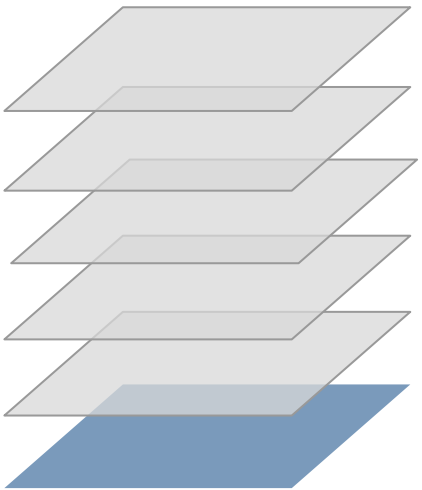


Visualization Grammar



Tabular Data



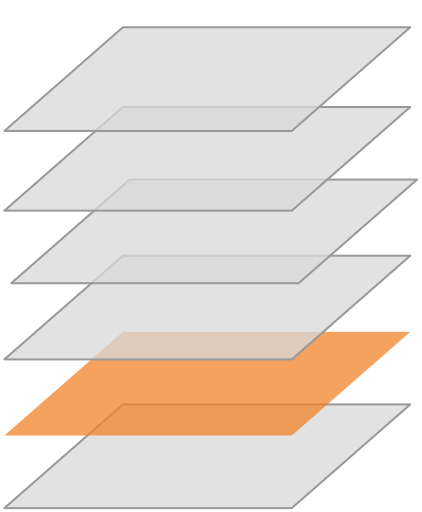


Guide
Scale
Transform
Encoding
Mark
Data

```
A,B,C,D,E
4,6,4,4,3
4,4,8,4,3
7,5,5,0,1
5,9,3,0,5
0,1,2,4,2
```

```
[
 { "A":4, "B":6, "C":4, "D":4, "E":3 },
 { "A":4, "B":4, "C":8, "D":4, "E":3 },
 { "A":7, "B":5, "C":5, "D":0, "E":1 },
 { "A":5, "B":9, "C":3, "D":0, "E":5 },
 { "A":0, "B":1, "C":2, "D":4, "E":2 }
]
```

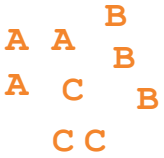
https://eitanlees.com/ABC.csv



Guide
Scale
Transform
Encoding
Mark
Data

Line

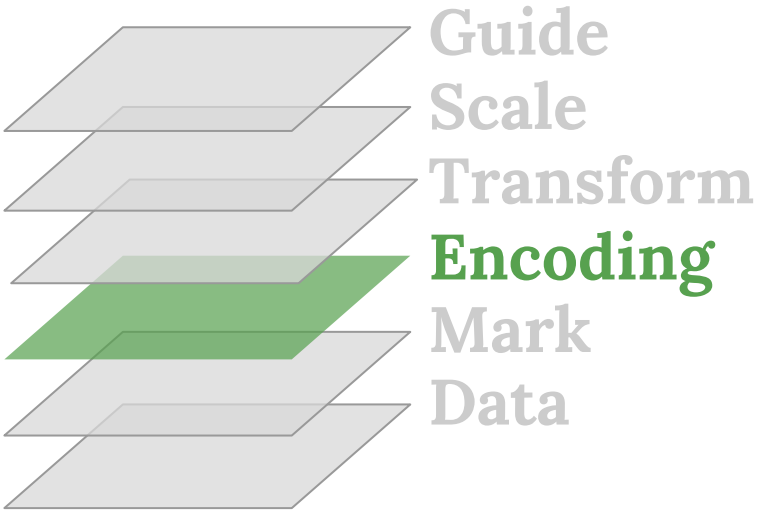
Circle



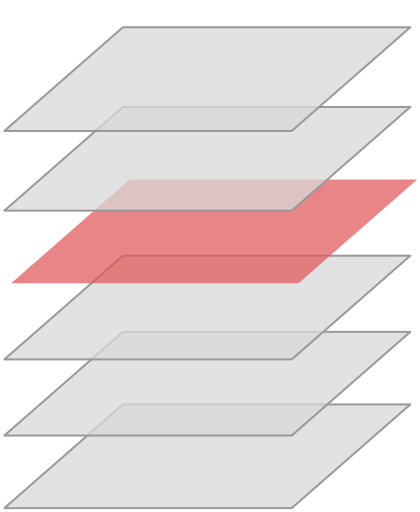
Text

Bar

and many more ...

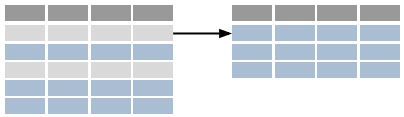


Channel	Variable
X Position	A
Y Position	B
Size	C
Color	D
⋮	⋮



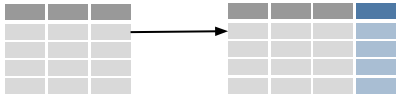
Guide
Scale
Transform
Encoding
Mark
Data

Filter

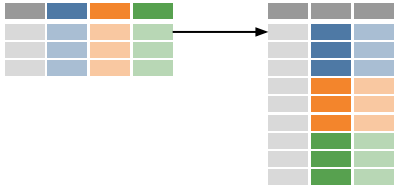


Aggregate

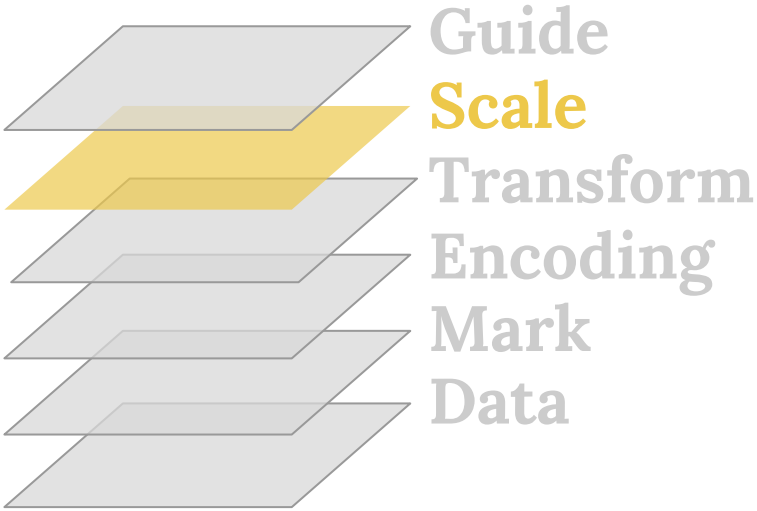
Calculate



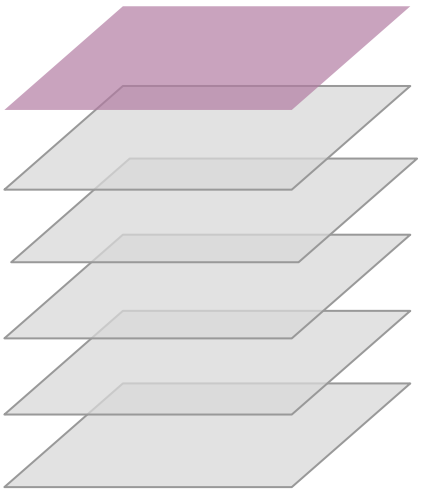
Fold



and many more ...



$$f(\texttt{domain}) \rightarrow \texttt{range}$$



Guide

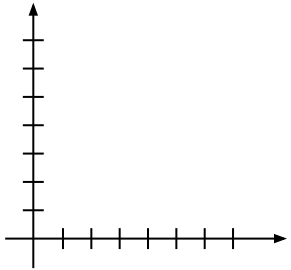
Scale

Transform

Encoding

Mark

Data

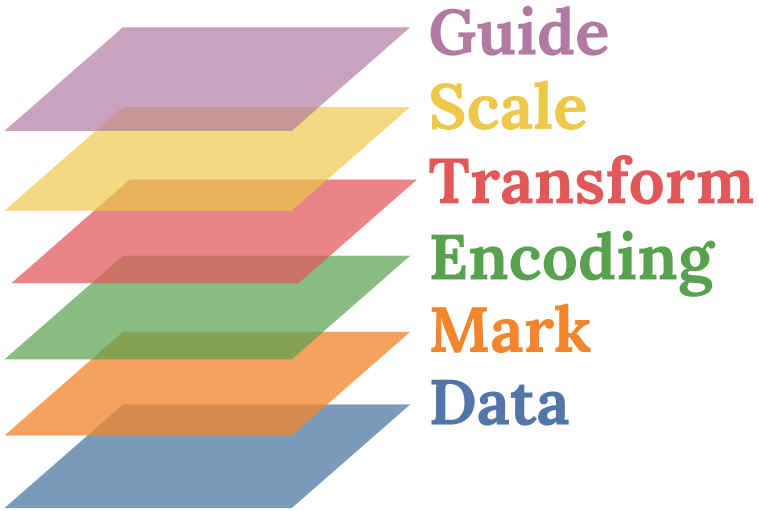


Legend

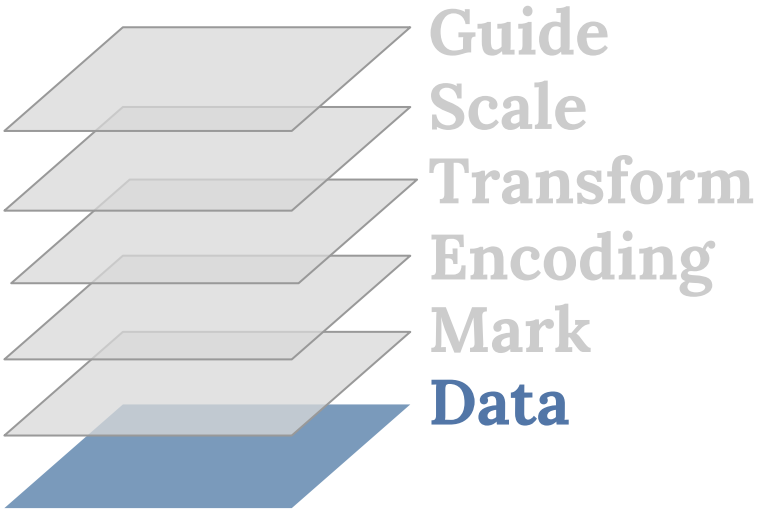
A

B

C



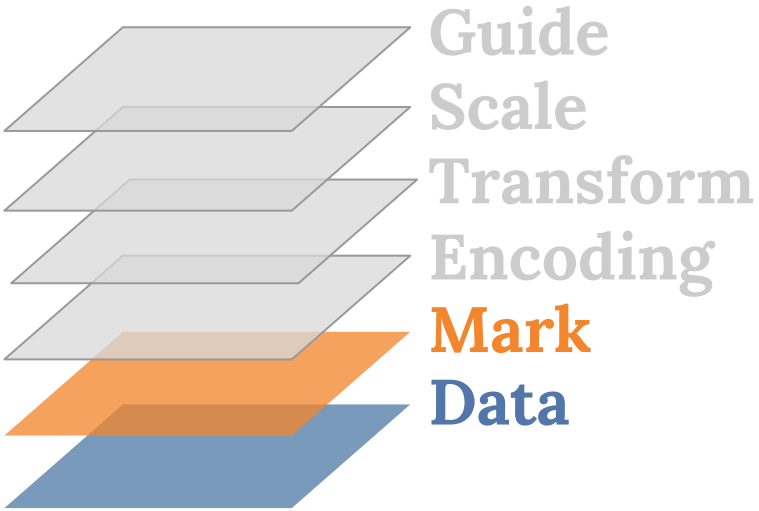
Let’s make a chart



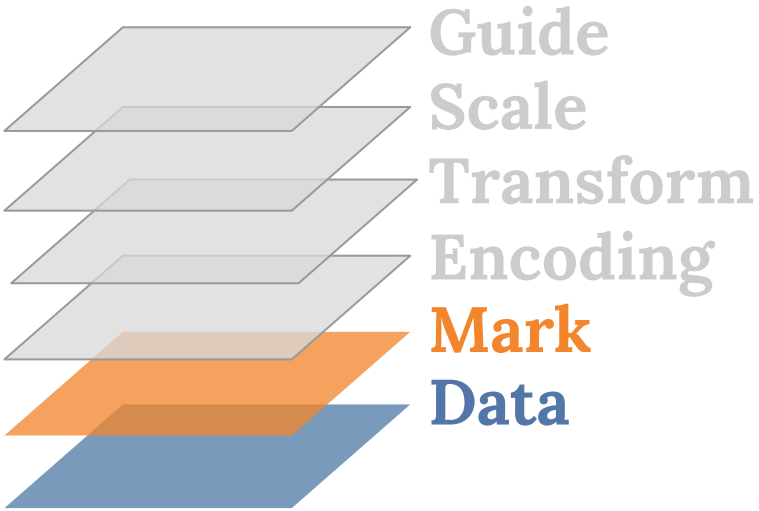

```
import altair as alt
from vega_datasets import data

iris = data.iris()
```

sepalLength	sepalWidth	PetalLength	PetalWidth	species
5.1	3.5	1.4	0.2	setosa
4.9	3.0	1.4	0.2	setosa
4.7	3.2	1.3	0.2	setosa
4.6	3.1	1.5	0.2	setosa

⋮

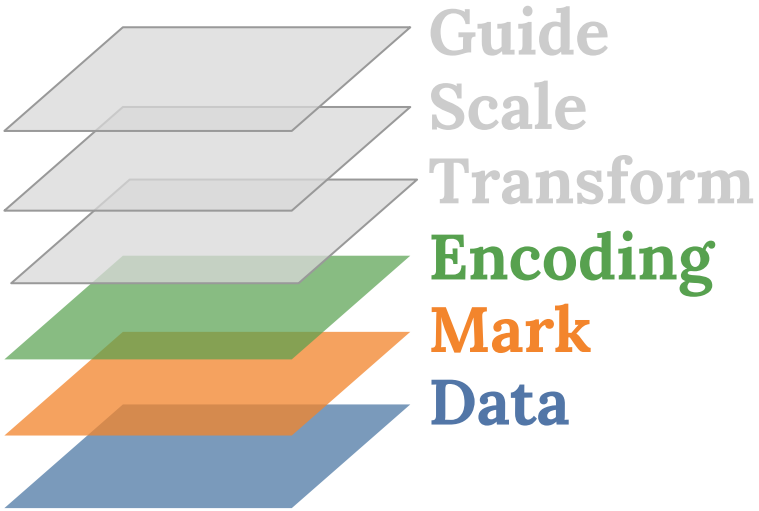



```
import altair as alt
from vega_datasets import data

iris = data.iris()
alt.Chart(iris).mark_circle()
```

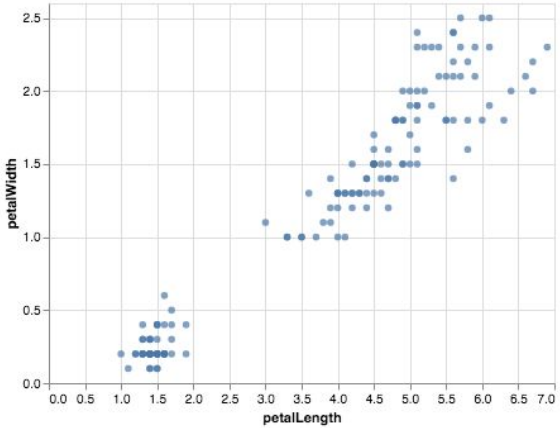


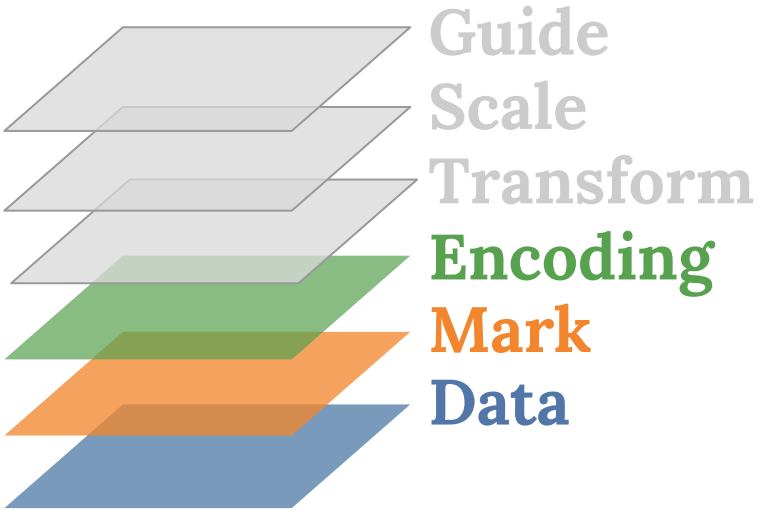

```
import altair as alt
from vega_datasets import data

iris = data.iris()
alt.Chart(iris).mark_circle()
```

Without an encoding our chart is not very interesting

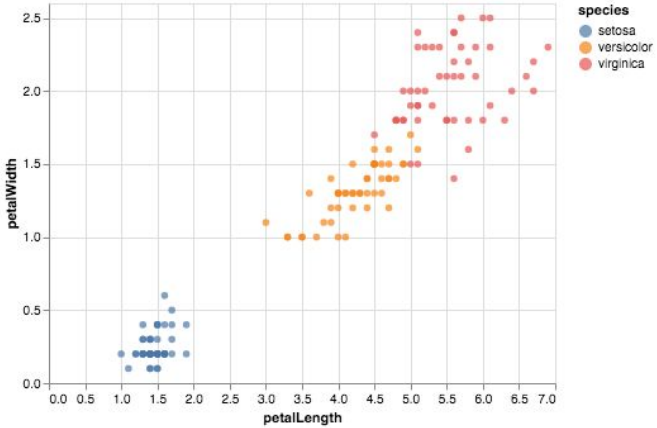



```
import altair as alt
from vega_datasets import data

iris = data.iris()
alt.Chart(iris).mark_circle().encode(
    alt.X('petalLength'),
    alt.Y('petalWidth')
)
```

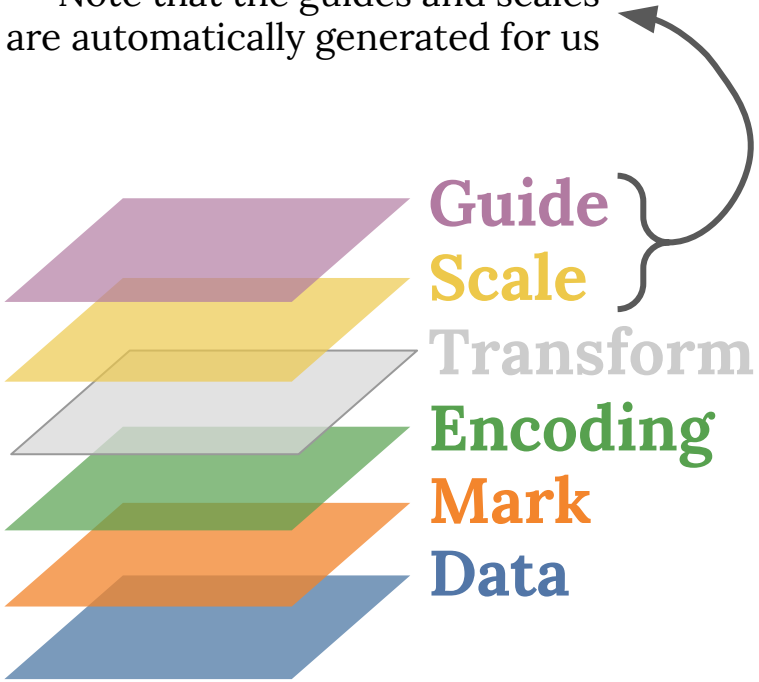




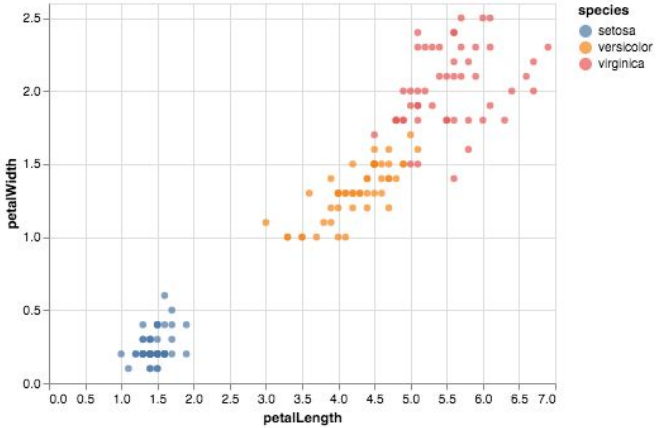

```
import altair as alt
from vega_datasets import data

iris = data.iris()
alt.Chart(iris).mark_circle().encode(
    alt.X('petalLength'),
    alt.Y('petalWidth'),
    alt.Color('species')
)
```

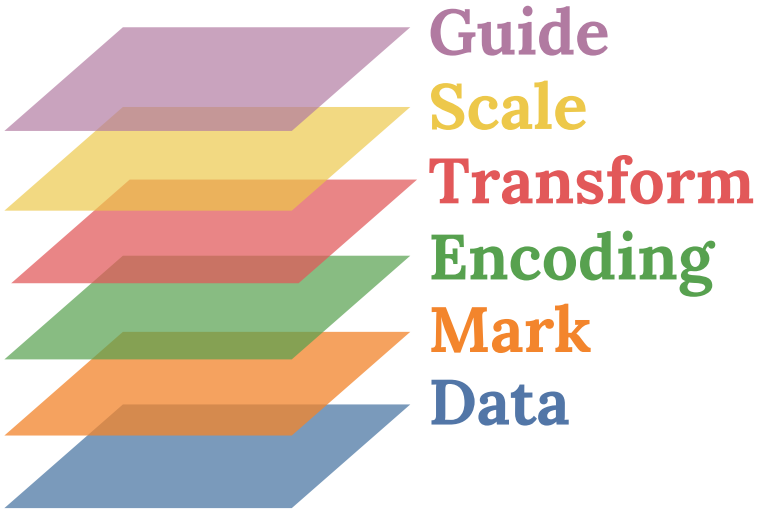


Note that the guides and scales are automatically generated for us




```
import altair as alt
from vega_datasets import data

iris = data.iris()
alt.Chart(iris).mark_circle().encode(
    alt.X('petalLength'),
    alt.Y('petalWidth'),
    alt.Color('species')
)
```






```
import altair as alt
from vega_datasets import data

iris = data.iris()
alt.Chart(iris).mark_circle().encode(
    alt.X('petalLength'),
    alt.Y('petalWidth'),
    alt.Color('species')
).transform_filter(
    alt.datum.sepalWidth < 3
)
```