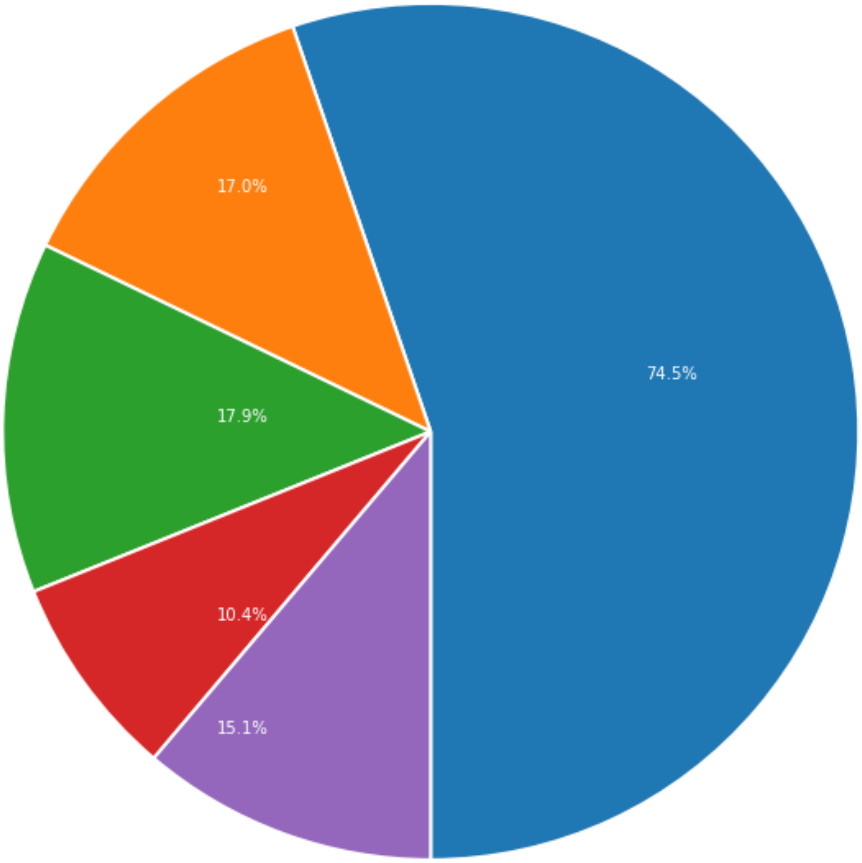
Chapter11

August 4, 2023

[326]:
```
import pandas as pd
import matplotlib.pyplot as plt
import matplotlib.ticker as ticker

import plotly.graph_objects as go
import numpy as np
import os
```

[40]:
```
bridges = pd.read_csv(os.path.join('data','bridges.csv'))
bridges = bridges[~bridges['MATERIAL'].isna()]
```

[152]:
```
fig, ax = plt.subplots(1,1,figsize=(6,6))
categories = ['steel','crafts','modern','iron','wood']
nums = [0.745, 0.17, 0.179, 0.104, 0.151]
patches, texts =ax.pie(nums,
                       labels =categories,
                       #  autopct=lambda p : '{:,.0f}%'.format(p),
                       startangle=-90,
                       wedgeprops={'edgecolor':'white',"linewidth":2},
                       radius=2)
for text in texts:
    text.set_color('w')
    text.set_fontsize(16)


for i, patch in enumerate(patches):
    ang = (patch.theta2 - patch.theta1)/2. + patch.theta1

    y = np.sin(np.deg2rad(ang))
    x = np.cos(np.deg2rad(ang))
    patch.set_edgecolor('w')
    ax.annotate(
        str(nums[i]*100)+"%",
        xy = (x, y),
        xytext = (np.sign(x), 1.5*y),
        color = "w"
    )
```

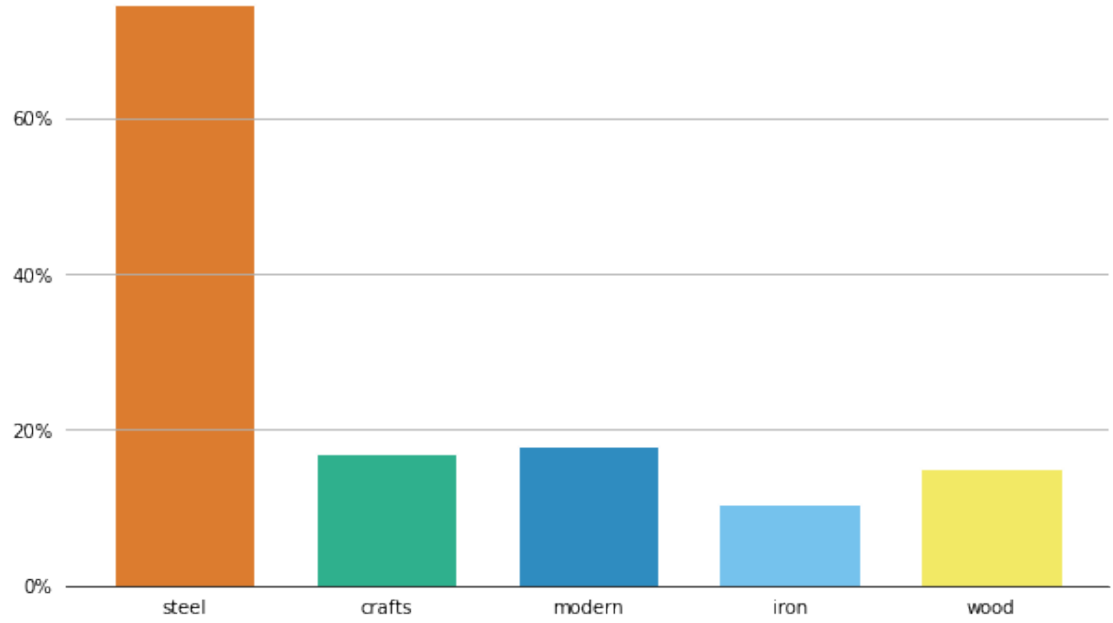


[107]:
```
fig, ax = plt.subplots(1,1,figsize=(10,6))
categories = ['steel','crafts','modern','iron','wood']
nums = [0.745, 0.17, 0.179, 0.104, 0.151]
ax.bar(
    categories,
    nums,
    width = 0.7,
    color = ["#D55E00D0", "#009E73D0", "#0072B2D0", "#56B4E9D0", "#F0E442D0"],
    edgecolor = 'w',
    linewidth = 1
    )
ax.spines[:].set_visible(False)
ax.spines["bottom"].set_visible(True)
ax.xaxis.set_ticks_position("none")
ax.yaxis.set_ticks_position("none")
ax.yaxis.set_major_locator(ticker.MultipleLocator(0.2))
ax.yaxis.grid()
ax.spines['bottom'].set_position(('data',0))
ax.set_yticklabels(["","0%","20%","40%","60%"])
```

```
ax.plot()
```

```
/var/folders/rj/3hb6b83x2tjd4kzvbypmj6cc0000gn/T/ipykernel_34834/3947993789.py:1
9: UserWarning: FixedFormatter should only be used together with FixedLocator
  ax.set_yticklabels(["","0%","20%","40%","60%"])
```

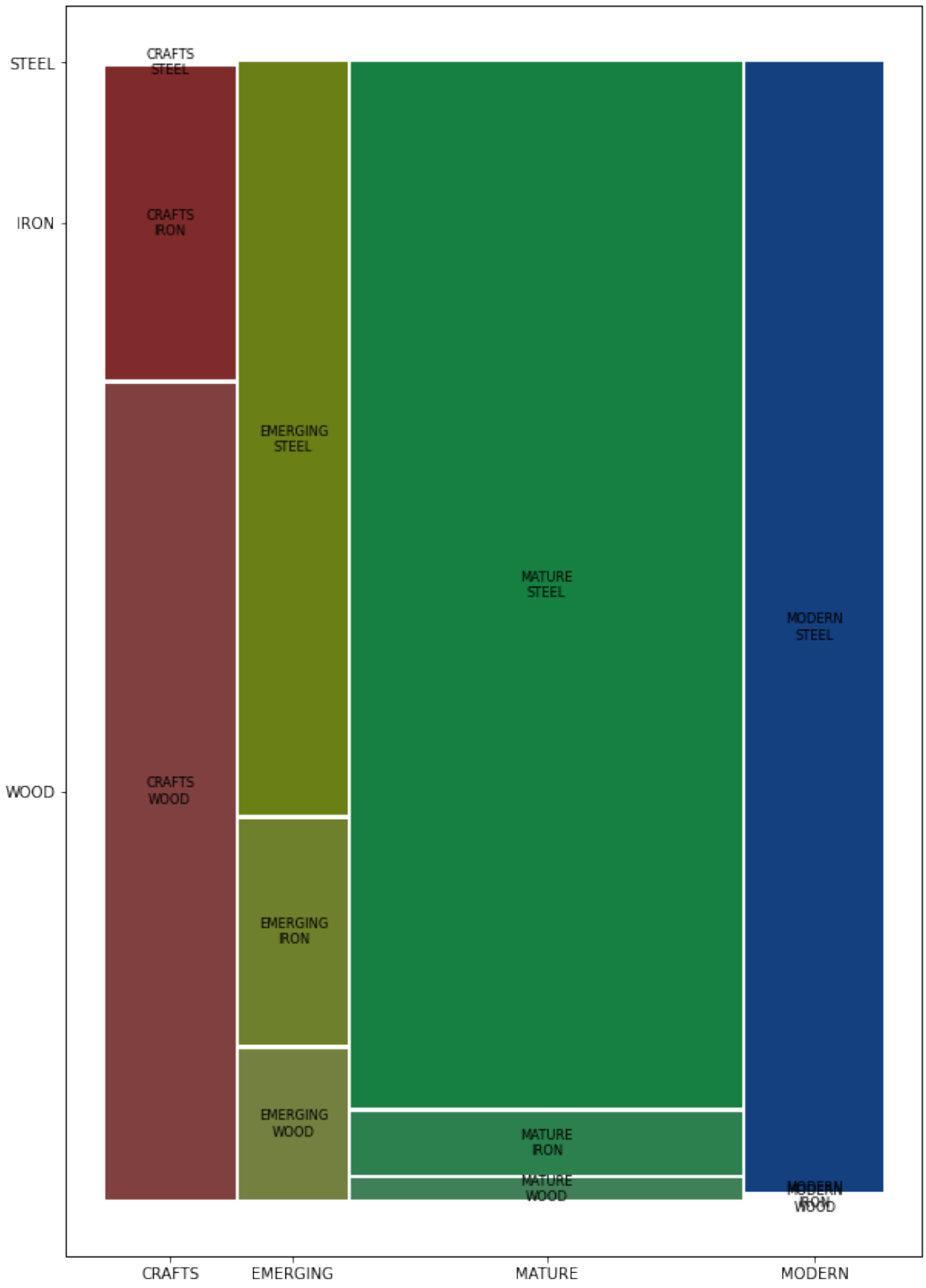
[107]: []



[108]:
```
from statsmodels.graphics.mosaicplot import mosaic
```

[115]:
```
fig, ax = plt.subplots(1,1,figsize=(10,15))
mosaic(bridges, ["ERECTED","MATERIAL"],ax=ax)
ax.plot()
```

[115]: []


STEEL
IRON
WOOD
CRAFTS
EMERGING
MATURE
MODERN
CRAFTS STEEL
CRAFTS IRON
CRAFTS WOOD
EMERGING STEEL
EMERGING IRON
EMERGING WOOD
MATURE STEEL
MATURE IRON
MATURE WOOD
MODERN STEEL

[166]:
```
piechartdf = bridges[['ERECTED','MATERIAL','IDENTIF']].
  ↪groupby(['ERECTED','MATERIAL']).agg('count').reset_index()
piechartdf['Names'] = piechartdf['ERECTED']+" ("+piechartdf['MATERIAL']+")"
```

[187]:
```
fig = px.sunburst(
    bridges,
    path=['ERECTED','MATERIAL']
)
fig.update_traces(
    textinfo='label+value',
    rotation=90
    )
fig.update_layout(
    margin=dict(
        l=0,
        r=0,
        t=0,
        b=0
    ),
    width=500
)
fig.show()
```

```
/Applications/Utilities/anaconda/anaconda3/lib/python3.9/site-
packages/plotly/express/_core.py:1637: FutureWarning:

The frame.append method is deprecated and will be removed from pandas in a
future version. Use pandas.concat instead.

/Applications/Utilities/anaconda/anaconda3/lib/python3.9/site-
packages/plotly/express/_core.py:1637: FutureWarning:

The frame.append method is deprecated and will be removed from pandas in a
future version. Use pandas.concat instead.
```

[186]:
```
fig = px.pie(
    piechartdf,
    values='IDENTIF',
    names = 'Names',

    # facet_row = 'MATERIAL'
)
fig.update_traces(
    textinfo='value+label',
    # visible="legendonly"
     legendgroup = "ERECTED",
```

```
     marker=dict(
        line = dict(
            color = "white",
            width = 1
        )
     )
)
fig.update_layout(
    margin = dict(
        r=0,
        l=10,
        t=0,
        b=0
    ),
    width=500,
    showlegend = False
)
```

[317]:
```
sankeyBridgesdf
```

[317]:

	MATERIAL	LENGTH	ERECTED	RIVER	count	color
0	IRON	MEDIUM	CRAFTS	A	3	lightorange
1	IRON	MEDIUM	CRAFTS	M	2	lightorange
2	IRON	MEDIUM	EMERGING	M	1	lightorange
3	STEEL	LONG	EMERGING	O	1	lightblue
4	STEEL	LONG	MATURE	A	7	lightblue
5	STEEL	LONG	MATURE	M	7	lightblue
6	STEEL	LONG	MATURE	O	1	lightblue
7	STEEL	LONG	MODERN	A	1	lightblue
8	STEEL	LONG	MODERN	M	2	lightblue
9	STEEL	LONG	MODERN	O	2	lightblue
10	STEEL	MEDIUM	EMERGING	A	1	lightblue
11	STEEL	MEDIUM	EMERGING	M	4	lightblue
12	STEEL	MEDIUM	MATURE	A	7	lightblue
13	STEEL	MEDIUM	MATURE	M	10	lightblue
14	STEEL	MEDIUM	MATURE	O	5	lightblue
15	STEEL	MEDIUM	MATURE	Y	1	lightblue
16	STEEL	MEDIUM	MODERN	A	2	lightblue
17	STEEL	MEDIUM	MODERN	M	3	lightblue
18	STEEL	MEDIUM	MODERN	O	1	lightblue
19	STEEL	SHORT	MATURE	A	5	lightblue
20	STEEL	SHORT	MODERN	A	3	lightblue
21	STEEL	SHORT	MODERN	M	2	lightblue
22	STEEL	SHORT	MODERN	O	1	lightblue
23	WOOD	MEDIUM	CRAFTS	A	4	lightgreen
24	WOOD	MEDIUM	CRAFTS	M	1	lightgreen
25	WOOD	MEDIUM	EMERGING	A	2	lightgreen

```
26     WOOD  MEDIUM    MATURE     A       1   lightgreen
27     WOOD   SHORT    CRAFTS     A       1   lightgreen
```

[337]:
```
sankeyBridgesdf = bridges[["MATERIAL","LENGTH","ERECTED","RIVER","IDENTIF"]].
 ↪groupby(["MATERIAL","LENGTH","ERECTED","RIVER"]).agg('count')
sankeyBridgesdf.columns = ['count']
sankeyBridgesdf = sankeyBridgesdf.reset_index()
sankeyBridgesdf['color'] = sankeyBridgesdf['MATERIAL'].apply(lambda x:␣
 ↪"lightgreen" if x=="WOOD" else("lightblue" if x=="STEEL" else "lightorange"))
```

[338]:
```
nodes = sankeyBridgesdf['MATERIAL'].unique().tolist()+sankeyBridgesdf['LENGTH'].
 ↪unique().tolist()+sankeyBridgesdf['ERECTED'].unique().
 ↪tolist()+sankeyBridgesdf['RIVER'].unique().tolist()
```

[339]:
```
sankeyBridgesdf['MATERIAL'].replace({'IRON':0,"STEEL":1,"WOOD":2},inplace=True)
sankeyBridgesdf['LENGTH'].replace({'MEDIUM':3,"LONG":4,"SHORT":5},inplace=True)
sankeyBridgesdf['ERECTED'].replace({'CRAFTS':6,"EMERGING":7,"MATURE":8,"MODERN":
 ↪9},inplace=True)
sankeyBridgesdf['RIVER'].replace({'A':10,"M":11,"O":12,"Y":13},inplace=True)
```

[342]:
```
source = [0, 1, 1, 1, 2, 2, 3, 3, 3, 3, 3, 4, 4, 4, 5, 5, 3, 3, 3, 5,6, 6, 7,␣
 ↪7, 7, 8, 8, 8,
 8, 9, 9, 9, 7, 8, 8, 8, 9, 9, 9, 8, 9, 9, 9, 6, 6, 7, 8, 6]
target = [3, 3, 4, 5, 3, 5, 6, 7, 7, 8, 9, 7, 8, 9, 8, 9, 6, 7, 8, 6,10, 11,␣
 ↪11, 10,
 11, 10, 11, 12, 13, 10, 11, 12, 12, 10, 11, 12, 10, 11, 12, 10, 10, 11, 12,␣
 ↪10, 11, 10, 10, 10]
value =  [3, 9, 7, 4, 4, 1, 2, 1, 2, 4, 3, 1, 3, 3, 1, 3, 2, 1, 1, 1, 1,
 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,␣
 ↪1]
color = ["#DF9E9B","#99BADF","#99BADF","#99BADF","#D8E7CA","#D8E7CA",'#DF9E9B',
 '#DF9E9B',  '#99BADF', '#99BADF', '#99BADF', '#99BADF', '#99BADF', '#99BADF',
 '#99BADF', '#99BADF', '#D8E7CA', '#D8E7CA', '#D8E7CA', '#D8E7CA', '#DF9E9B',
 '#DF9E9B', '#DF9E9B', '#99BADF', '#99BADF', '#99BADF', '#99BADF', '#99BADF',
 '#99BADF', '#99BADF', '#99BADF', '#99BADF', '#99BADF', '#99BADF', '#99BADF',
 '#99BADF', '#99BADF', '#99BADF', '#99BADF', '#99BADF', '#99BADF', '#99BADF',
 '#99BADF', '#D8E7CA', '#D8E7CA', '#D8E7CA', '#D8E7CA', '#D8E7CA' ]
```

[348]:
```
fig = go.Figure(data = [go.Sankey(
    node = dict(
        pad = 15,
        thickness = 15,
        line = dict(
            color = "white",
            width = 1
        ),
        label = nodes,
```

```
        color = 'slategrey'
    ),
    link = dict(
        source = source,
        target = target,
        value = value,
        color = color
    )
)])

fig.update_layout(
    margin = dict(
        t=20,
        b=20,
        l=10,
        r=10
    )
)
fig.show()
```

[ ]:

[ ]: