2023-06-05_Charleston-Example

June 9, 2023

[2]:
```
import numpy as np
import scipy
import imageio

import matplotlib
import matplotlib.pyplot as plt
import matplotlib.cm as cm

matplotlib.rc('image', interpolation='nearest')
matplotlib.rc('figure',facecolor='white')
matplotlib.rc('image',cmap='viridis')
colors=plt.rcParams['axes.prop_cycle'].by_key()['color']
%matplotlib inline
```

[3]:
```
# original data
# number of victims
categoriesVictims=["total", "white", "black", "hisp", "other"]
total=np.array([6484507,4091971,955800,995996,440741])
# distribution of offenders: rows are victim categories, columns are␣
 ↪percentages of offenders
categoriesOffenders=["white", "black", "hisp", "other", "unknown"]
ratios=np.array([\
        [42.9,22.4,14.8,12.1,7.8],
        [56.0,13.7,11.9,10.6,7.8],
        [10.4,62.2,4.7,15.0,7.7],
        [21.7,21.2,38.6,11.6,6.9],
        [40.3,19.3,10.6,20.3,9.5]
        ])/100.

# total ethnic census (careful: data from 2019, only for coarse illustrative␣
 ↪purposes)
population=np.array([0.603,0.134,0.185,0])
population[-1]=1-np.sum(population)
```

[7]:
```
# compute absolute numbers
# columns: victim category, rows: offender category
numbers=total.reshape((-1,1))*ratios
```

```
# now: normalize by colum (drop first row: total)
sums=np.sum(numbers[1:],axis=0)
ratios2=numbers[1:]/(sums.reshape((1,-1)))
```

[9]:
```
def print_table(offenders,victims,numbers,formstr):
    print("\t\toffender")
    print("\t",end="")
    for of in offenders:
        print("\t"+of,end="")
    print("")
    print("victim\t|")
    for i,vic in enumerate(victims):
        print(vic+"\t|",end="")
        for j in range(numbers.shape[1]):
            print("\t"+formstr.format(numbers[i,j]),end="")
        print("")
```

[10]:
```
print("absolute numbers (in 1E6)\n")
print_table(categoriesOffenders,categoriesVictims[1:],numbers[1:]/1E6,"{:5.2f}")

print("")
print("="*60)
print("")

print("relative numbers (per victim category: rows sum to 1)\n")
print_table(categoriesOffenders,categoriesVictims[1:],ratios[1:],"{:5.2f}")

print("")
print("="*60)
print("")

print("relative numbers (per offender category: cols sum to 1)\n")
print_table(categoriesOffenders,categoriesVictims[1:],ratios2,"{:5.2f}")
```

```
absolute numbers (in 1E6)

                offender
                white   black   hisp    other   unknown
victim  |
white   |        2.29    0.56    0.49    0.43    0.32
black   |        0.10    0.59    0.04    0.14    0.07
hisp    |        0.22    0.21    0.38    0.12    0.07
other   |        0.18    0.09    0.05    0.09    0.04

============================================================
```

```
relative numbers (per victim category: rows sum to 1)

                offender
                white   black   hisp    other   unknown
victim  |
white   |        0.56    0.14    0.12    0.11    0.08
black   |        0.10    0.62    0.05    0.15    0.08
hisp    |        0.22    0.21    0.39    0.12    0.07
other   |        0.40    0.19    0.11    0.20    0.10

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relative numbers (per offender category: cols sum to 1)

                offender
                white   black   hisp    other   unknown
victim  |
white   |        0.82    0.39    0.51    0.55    0.63
black   |        0.04    0.41    0.05    0.18    0.15
hisp    |        0.08    0.15    0.40    0.15    0.14
other   |        0.06    0.06    0.05    0.11    0.08
```

[7]:
```
# if we show the ratios normalized by victim category, we find that
# the highest value is "on the diagonal"
# Bureau of Justice Statistics (according to Cairo):
# "intraracial" crime is usualy higher than "interracial" for all crimes except␣
 ↪robbery
# usually you do not choose victims. mostly a matter of proximity (e.g.␣
 ↪domestic violence, or neighbours)
```

[15]:
```
fig=plt.figure(figsize=(10,6))

fig.add_subplot(2,4,1)
plt.title("victim: white")
plt.pie(ratios[1],labels=categoriesOffenders)

fig.add_subplot(2,4,2)
plt.title("victim: black")
plt.pie(ratios[2],labels=categoriesOffenders)

fig.add_subplot(2,4,3)
plt.title("victim: hisp")
plt.pie(ratios[3],labels=categoriesOffenders)


fig.add_subplot(2,4,5)
plt.title("offender: white")
```

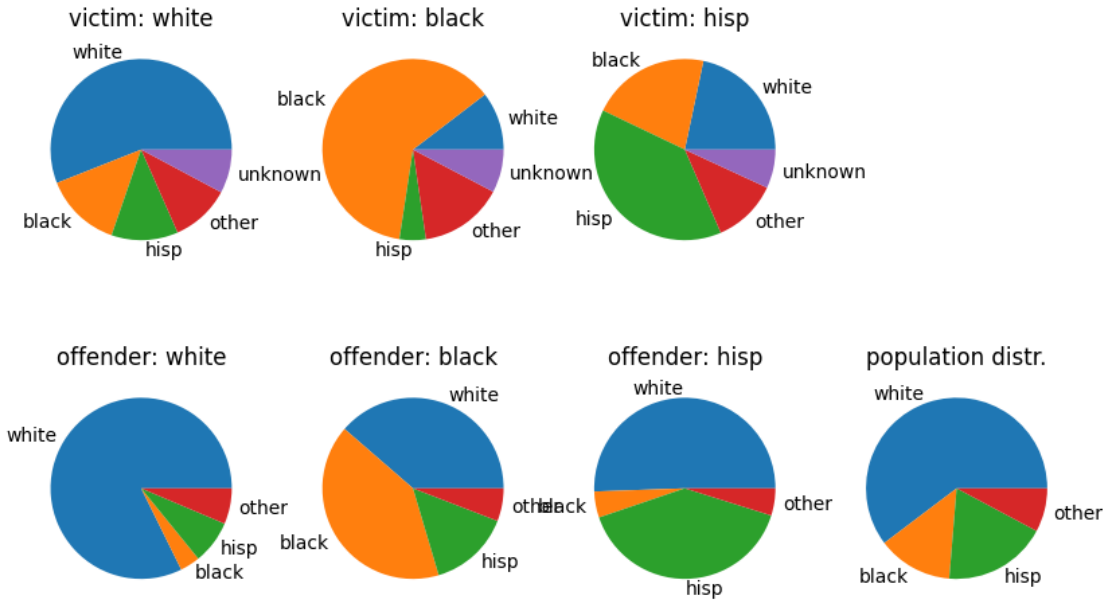
```
plt.pie(ratios2[:,0],labels=categoriesVictims[1:])

fig.add_subplot(2,4,6)
plt.title("offender: black")
plt.pie(ratios2[:,1],labels=categoriesVictims[1:])

fig.add_subplot(2,4,7)
plt.title("offender: hisp")
plt.pie(ratios2[:,2],labels=categoriesVictims[1:])

fig.add_subplot(2,4,8)
plt.title("population distr.")
plt.pie(population,labels=categoriesVictims[1:])


plt.show()
```



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