- Shin’s Lab -

Python for Data Visualization

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-Chapter.4 Bar Plot -

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4-05. Exercises

1. Exercise 4-01
2. Exercise 4-02
3. Exercise 4-03
4. Exercise 4-04

1. Exercise 4-01

Vehicle Re-identification in Aerial Imagery: Dataset and Approach*

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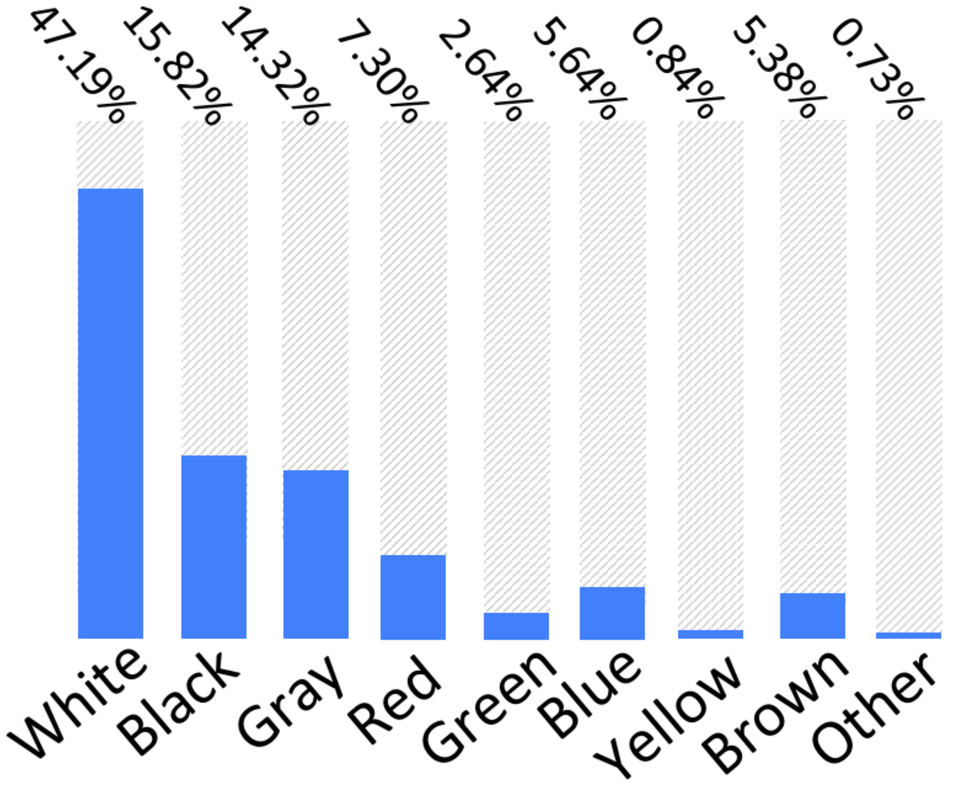
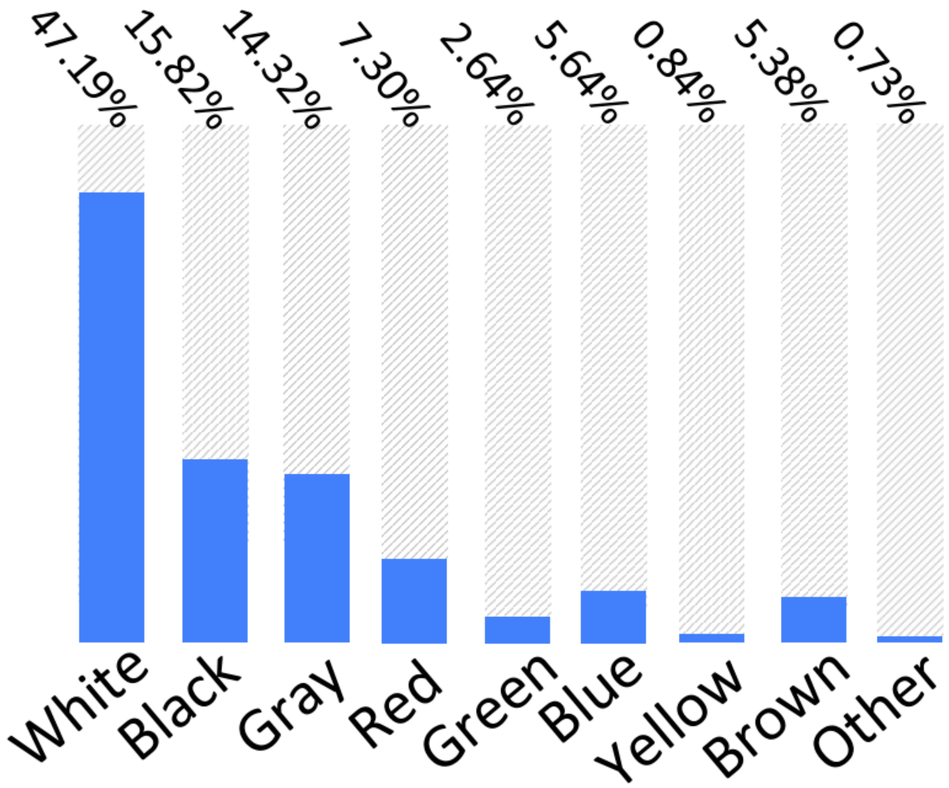


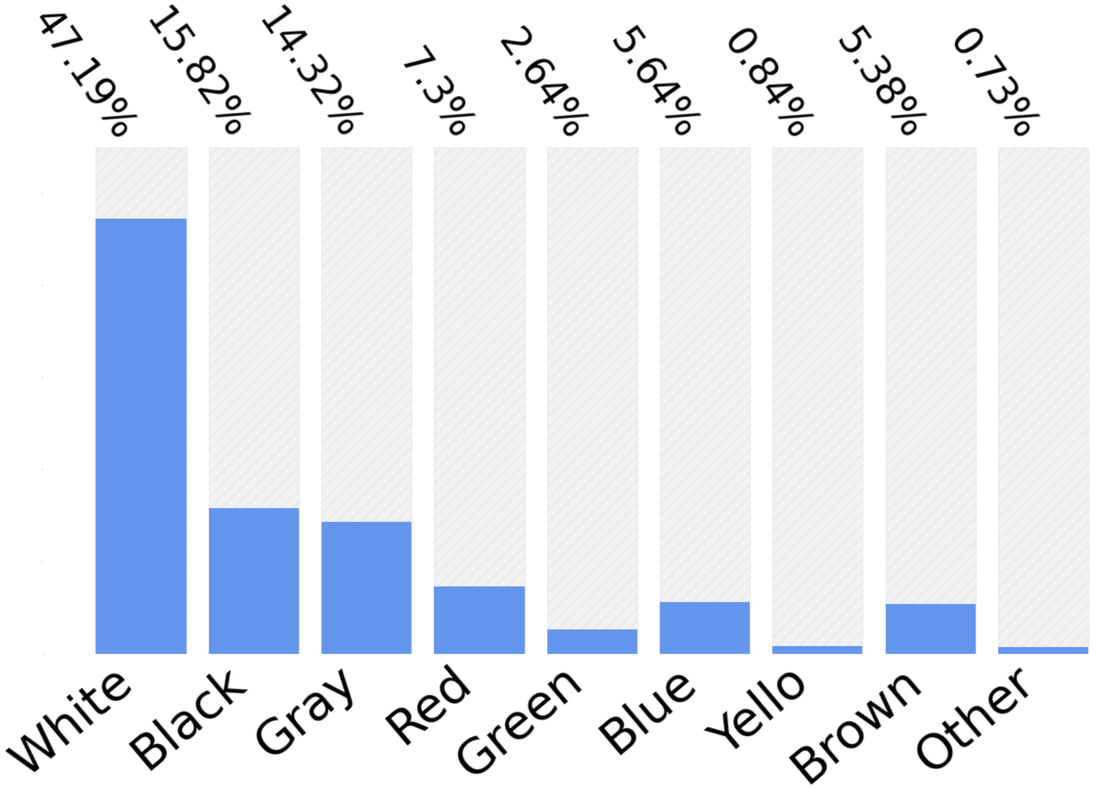
1. Exercise 4-01

```
import numpy as np
import matplotlib.pyplot as plt

### data setting
xticklabels = np.array(['White', 'Black', 'Gray', 'Red', 'Green',
                        'Blue', 'Yello', 'Brown', 'Other'])
data = np.array([47.19, 15.82, 14.32, 7.30, 2.64,
                 5.64, 0.84, 5.38, 0.73])
background = 55*np.ones_like(data)
xticks = np.arange(len(data))


fig, ax = plt.subplots(figsize = (20,10))
### background plotting
ax.bar(xticks, background,
       color = 'k',
       alpha = 0.05,
       hatch = '//',
       edgecolor = 'k')
### bar plotting
rects = ax.bar(xticks, data,
               color = 'cornflowerblue')
```

```
### annotation
for rect in rects:
    height = rect.get_height()
    width = rect.get_width()
    x = rect.get_x()

    ax.text(x + width/2, 55,
            str(height) + '%',
            fontsize=40,
            rotation=-55,
            ha='right',
            va='bottom')

### tick & ticklabel customizing
ax.set_xticks(xticks)
ax.set_xticklabels(xticklabels,
                   fontsize=50,
                   rotation=40,
                   ha='right')
ax.tick_params(axis = 'y',
               labelsize = 0,
               size = 0)
ax.tick_params(axis = 'x',
               size = 0)

### spine customizing
for spine_idx, spine_loc in enumerate(ax.spines):
    ax.spines[spine_loc].set_visible(False)
```

1. Exercise 4-01





2. Exercise 4-02

SANet: Scene Agnostic Network for Camera Localization

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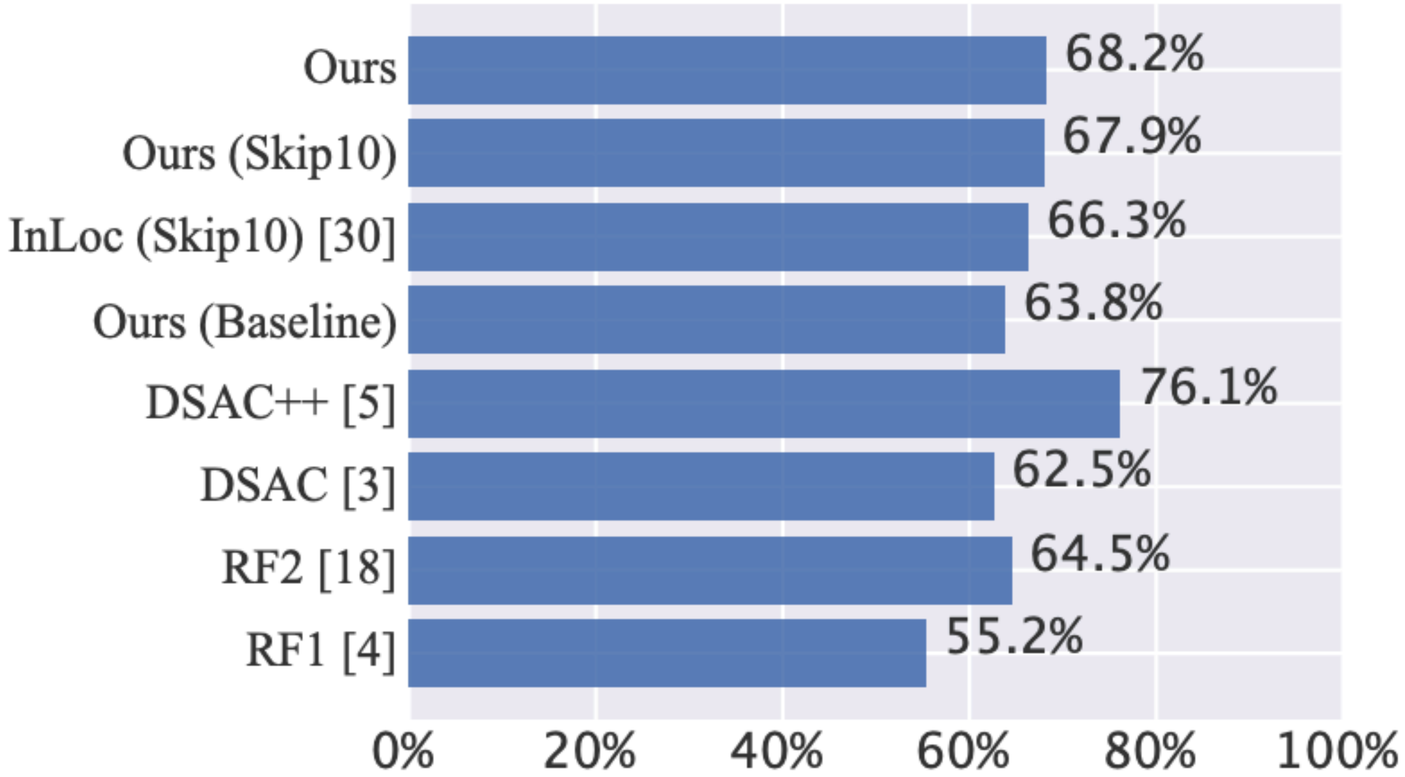
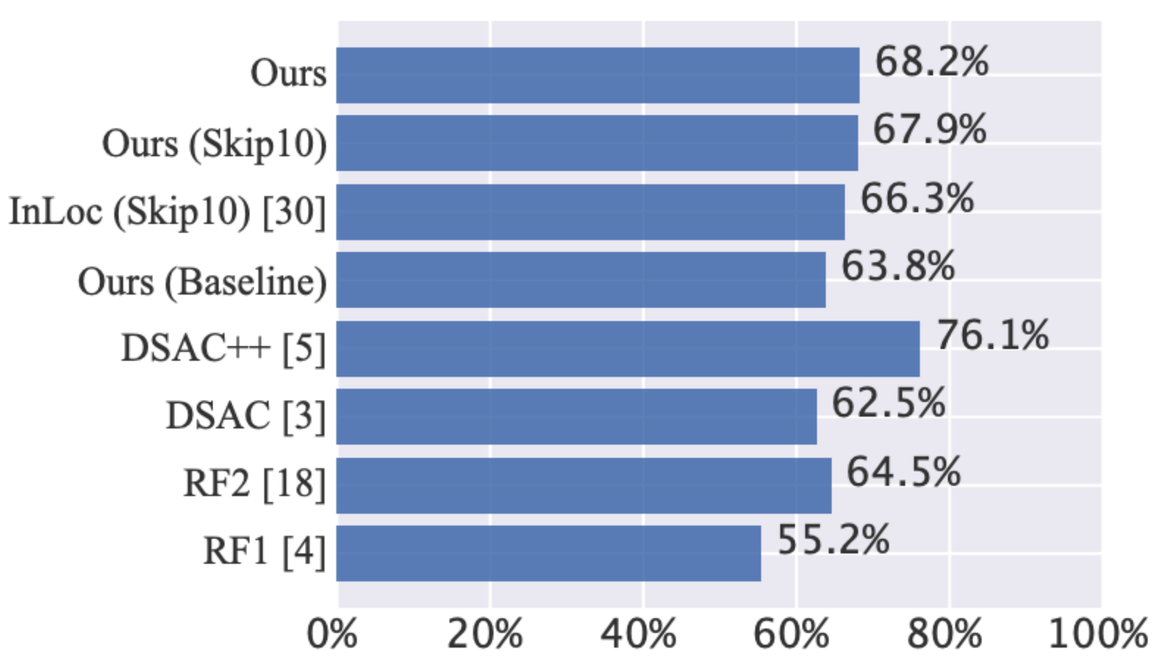
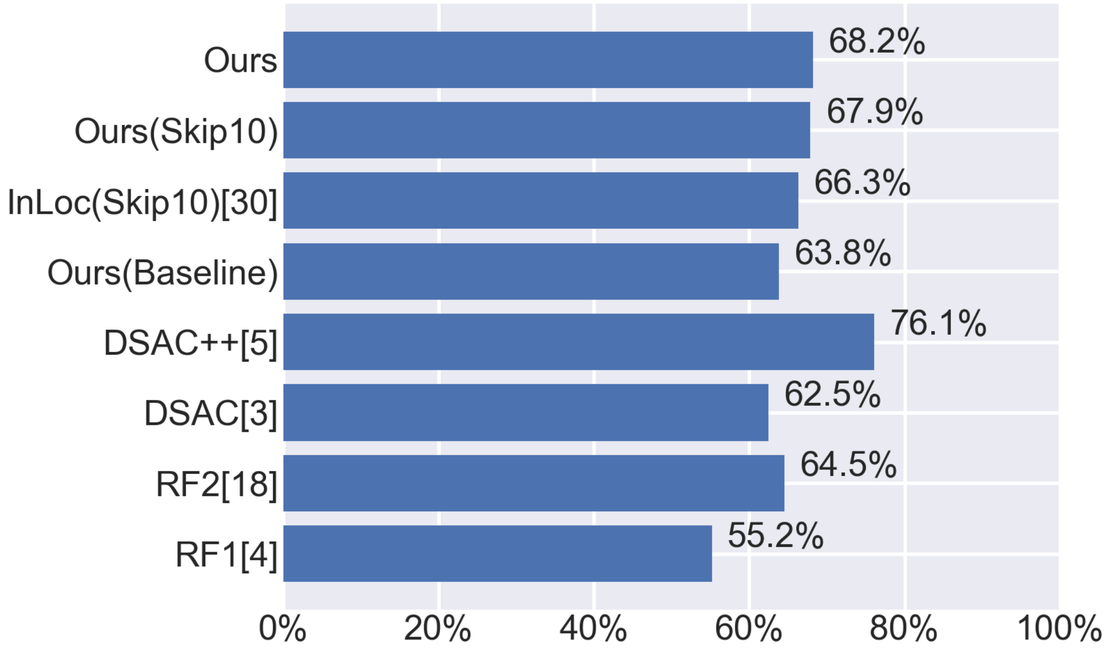


2. Exercise 4-02

```python
import numpy as np
import matplotlib.pyplot as plt

### matplotlib style customizing
plt.style.use('seaborn')

### data setting
labels = np.array(['Ours', 'Ours(Skip10)', 'InLoc(Skip10)[30]',
                   'Ours(Baseline)', 'DSAC++[5]', 'DSAC[3]',
                   'RF2[18]', 'RF1[4]'])
data = np.array([68.2, 67.9, 66.3, 63.8, 76.1,
                 62.5, 64.5, 55.2])
yticks = np.arange(len(labels))

### fontdict setting
label_fontdict = {'fontfamily':'sans-serif',
                  'size':50}
annot_fontdict = {'size':50,
                  'ha':'left',
                  'va':'bottom'}

### barh plotting
fig, ax = plt.subplots(figsize = (20,16))
rects = ax.barh(yticks, data)
ax.invert_yaxis()

### tick & ticklabel customizing
ax.set_yticks(yticks)
ax.set_yticklabels(labels,
                   fontdict=label_fontdict)

xticks = np.arange(0, 101, 20)
xticklabels = [str(i) + '%' for i in xticks]
ax.set_xticks(xticks)
ax.set_xticklabels(xticklabels,
                   fontdict=label_fontdict)

ax.grid(linewidth=5)

### annotation
xtick_interval = xticks[1] - xticks[0]
for rect_idx, rect in enumerate(rects):
    y = rect.get_y()
    height = rect.get_height()
    width = rect.get_width()

    ax.text(width + xtick_interval*0.1,
            y + height/2,
            str(width)+'%',
            fontdict=annot_fontdict)
```

2. Exercise 4-02





3. Exercise 4-03

DeepVCP: An End-to-End Deep Neural Network for Point Cloud Registration

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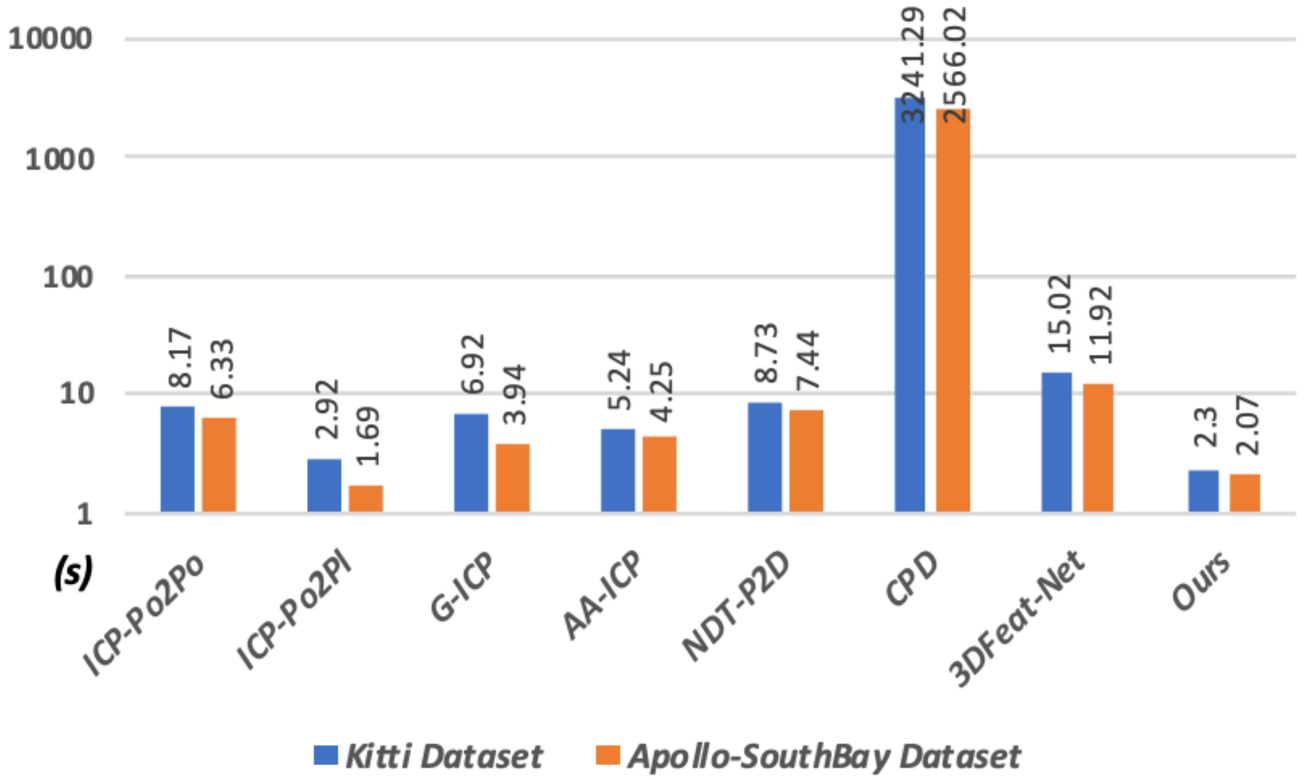


3. Exercise 4-03

```
import matplotlib.pyplot as plt
import numpy as np

### data setting
ex_name = ['Kitti Dataset', 'Apollo-SouthBay Dataset']
labels = ['ICP-Po2Po', 'ICP-Po2PI', 'G-ICP',
          'AA-ICP', 'NDT-P2d', 'CPD',
          '3DFeat-Net', 'Ours']
xticks = np.arange(len(labels))

kitti_data = [8.17, 2.92, 6.92, 5.24, 8.73,
              3241.29, 15.02, 2.3]
apollo_data = [6.33, 1.69, 3.94, 4.25, 7.44,
               2566.02, 11.92, 2.07]


fig, ax = plt.subplots(figsize = (22,10))
ax.set_yscale('log')

### bar plotting
WIDTH = 0.25
rect1 = ax.bar(xticks - WIDTH/2 - 0.03,
               kitti_data,
               width=WIDTH,
               label=ex_name[0])
rect2 = ax.bar(xticks + WIDTH/2 + 0.03,
               apollo_data,
               width=WIDTH,
               label=ex_name[1])
```

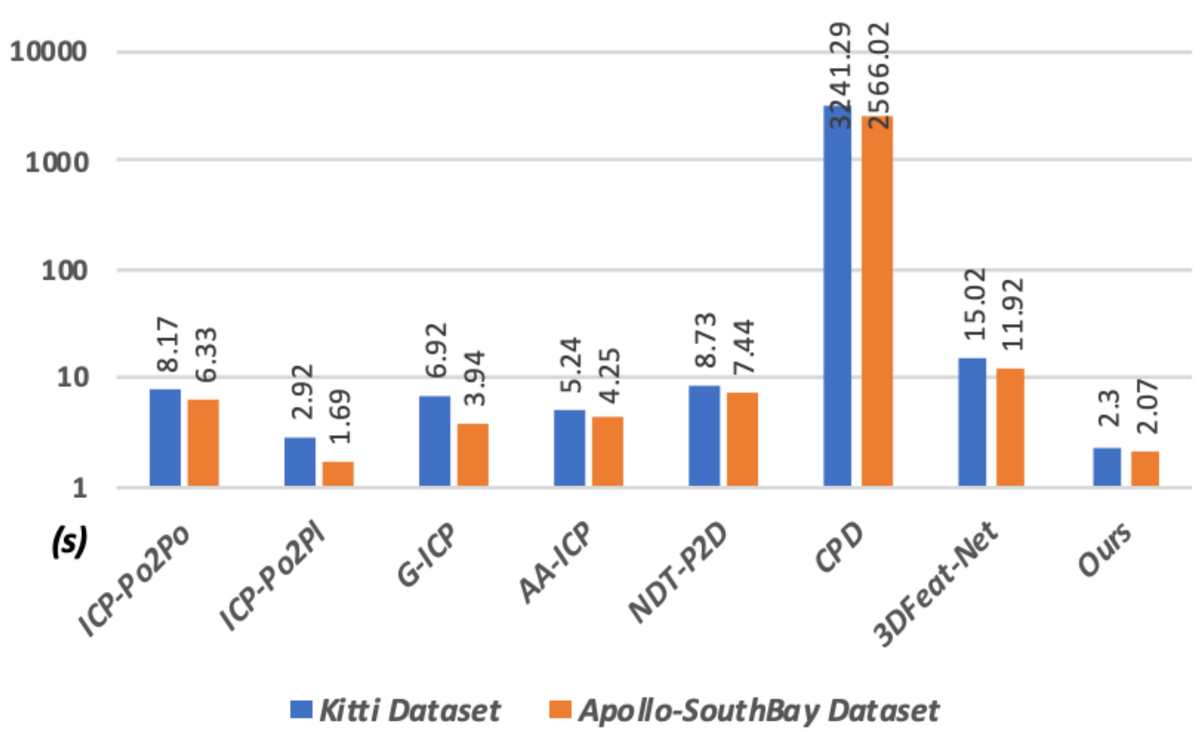
```
### legend customizing
ax.legend(loc = 'upper center',
          bbox_to_anchor = (0.5, -0.3),
          fontsize = 30,
          ncol = len(ex_name))

### tick & ticklabel customizing
yticks = [10**i for i in range(5)]
x_tick_fontdict = {'size':30,
                   'weight':'semibold',
                   'rotation':40}
y_tick_fontdict = x_tick_fontdict.copy()
del y_tick_fontdict['rotation']
ax.set_yticks(yticks)
ax.set_yticklabels(yticks,
                   fontdict=y_tick_fontdict)
ax.set_yticks([], minor = True)
ax.set_xticks(xticks)
ax.set_xticklabels(labels,
                   fontdict=x_tick_fontdict)
ax.tick_params(axis = 'both',
               size = 0)
```

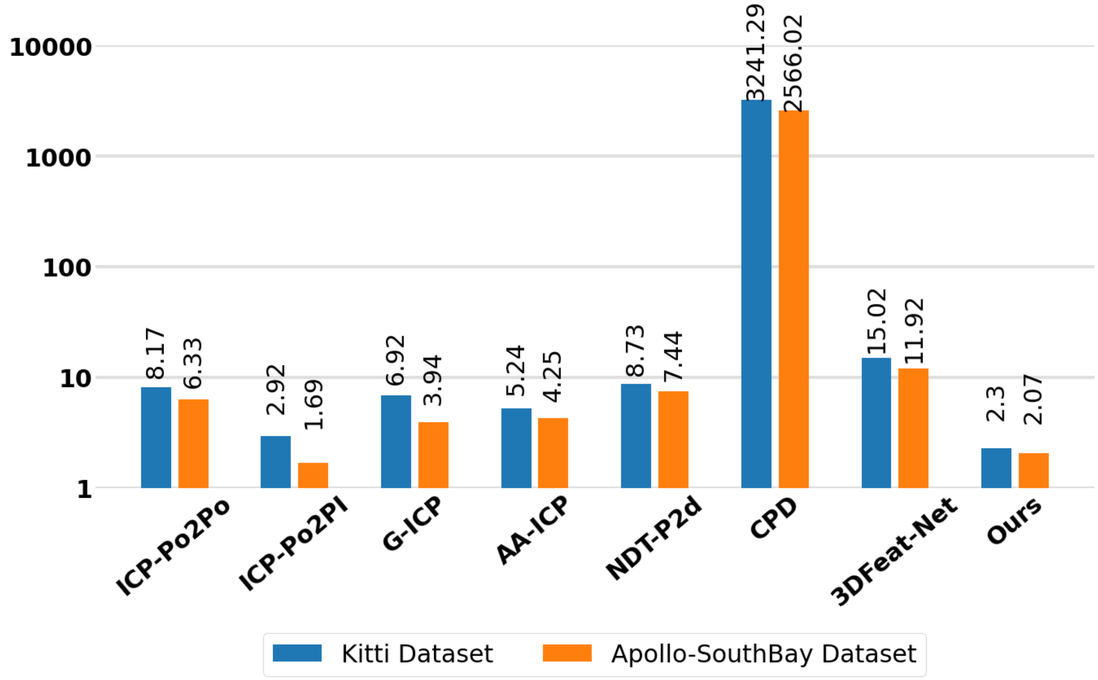
3. Exercise 4-03

```
### grid customizing
ax.grid(axis = 'y',
        linewidth = 4,
        alpha = 0.4)
ax.set_axisbelow(True)

### spine customizing
for spine_idx, spine_loc in enumerate(ax.spines):
    ax.spines[spine_loc].set_visible(False)

### annotation
yticks = ax.get_yticks()
ytick_interval = yticks[1] - yticks[0]
annot_fontdict = {'size':30,
                  'rotation':90,
                  'va':'bottom',
                  'ha':'center'}
```

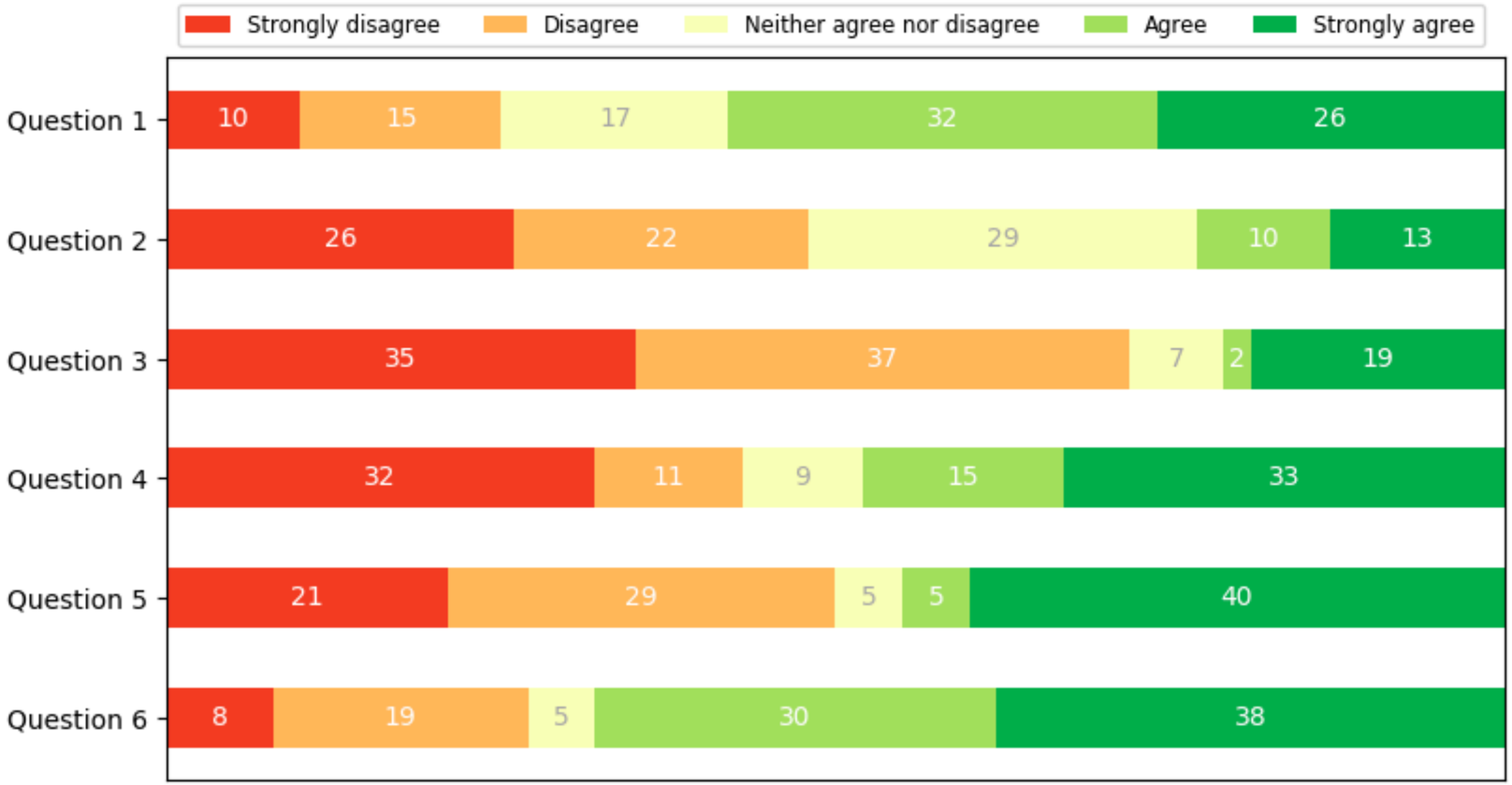
```
for rect in rect1:
    height = rect.get_height()
    width = rect.get_width()
    x = rect.get_x()

    ax.text(x + width/2,
            height + ytick_interval*0.2,
            str(height),
            fontdict=annot_fontdict)

for rect in rect2:
    height = rect.get_height()
    width = rect.get_width()
    x = rect.get_x()

    ax.text(x + width/2,
            height + ytick_interval*0.2,
            str(height),
            fontdict=annot_fontdict)
```

3. Exercise 4-03





4. Exercise 4-04



https://matplotlib.org/3.1.1/gallery/lines_bars_and_markers/horizontal_barchart_distribution.html#sphx-glr-gallery-lines-bars-and-markers-horizontal-barchart-distribution-py

4. Exercise 4-04

```
import matplotlib.pyplot as plt
import matplotlib.cm as cm
import numpy as np

### data setting
category_names = ['Strongly disagree', 'Disagree',
                  'Neither agree nor disagree', 'Agree', 'Strongly agree']
results = {
    'Question 1': [10, 15, 17, 32, 26],
    'Question 2': [26, 22, 29, 10, 13],
    'Question 3': [35, 37, 7, 2, 19],
    'Question 4': [32, 11, 9, 15, 33],
    'Question 5': [21, 29, 5, 5, 40],
    'Question 6': [8, 19, 5, 30, 38]
}

### data preprocessing
labels = list(results.keys())
data = np.array(list(results.values()))
data_idx = np.arange(data.shape[0])
data_cum = data.cumsum(axis=1)
cmap = cm.get_cmap('RdYlGn')
category_colors = cmap(np.linspace(0.15, 0.85, data.shape[1]))

### ax customizing
fig, ax = plt.subplots(figsize=(9.2, 5))
ax.invert_yaxis()
ax.xaxis.set_visible(False)
ax.set_xlim([0, 100])


for i, (colname, color) in enumerate(zip(category_names, category_colors)):
    ### bar plotting
    widths = data[:, i]
    starts = data_cum[:, i] - widths
    ax.barh(labels, widths, left=starts, height=0.5,
            label=colname, color=color)
    xcenters = starts + widths / 2

    ### annotation
    r, g, b, _ = color
    text_color = 'white' if r * g * b < 0.5 else 'darkgrey'
    for y, (x, c) in enumerate(zip(xcenters, widths)):
        ax.text(x, y, str(int(c)), ha='center', va='center',
                color=text_color)
### legend customizing
ax.legend(loc='lower left',
          bbox_to_anchor=(0, 1),
          fontsize='small',
          ncol=len(category_names))
```

Python for Data Visualization

-Chapter.4 Bar Plot -

4-05. Exercises

1. Exercise 4-01
2. Exercise 4-02
3. Exercise 4-03
4. Exercise 4-04