Visualización de la información: Tarea #2

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Objetivo:

Reproducir lo más fielmente dos (2) visualizaciones distintas provistas por el profesor, la idea aquí es crear una visualización lo más cercana a las dadas por el profesor en cuanto a anotaciones, colores, espacios, fuentes, textos, tipo de grafico, etcétera.

Criterios de evaluación

- Título, subtitulo y notas adicionales de la visualización
- Ejes X e Y, labels, ticks, rangos, tipo de escala (lineal, logarítmica)
- Grilla y leyenda
- Gráfico y/o representación de datos (si es gráfico de líneas, de barras, de calor, etcétera)
- Colores, mapa de colores y escalas de colores, donde además se incluyen el rango y los labels de la escala
- Anotaciones más cualquiero elemento que resalte algún aspecto del gráfico (rectángulos, círculos, líneas)

Desarrollo

En los siguientes bloques de codigos se implementan la replica de visualizaciones entregadas

In [60]:
```
# Importación de librerias
import numpy as np
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
from IPython.display import Image
from matplotlib.colors import LinearSegmentedColormap
from matplotlib.transforms import Affine2D
```

```
from matplotlib.collections import PathCollection
from matplotlib import lines
from matplotlib import patches
from matplotlib.patches import FancyArrowPatch
from matplotlib.patheffects import withStroke
from mpl_toolkits.axisartist.grid_finder import DictFormatter
import mpl_toolkits.axisartist.floating_axes as floating_axes
from flexitext import flexitext
from skimage import io
from matplotlib.colors import Normalize
import matplotlib.cm as cm
from matplotlib.lines import Line2D
import matplotlib.lines as mlines
```

Visualización N_1

In [61]:
```
# Carga del dataframe N_1
try:
    df = pd.read_csv(r'.\data\01-behavioural-finance.csv', index_col=0)
except FileNotFoundError:
    print("El archivo no se encontró.")
except pd.errors.EmptyDataError:
    print("El archivo está vacío.")
except Exception as e:
    print(f"Ocurrió un error: {e}")
```

In [62]:
```
# Revisión inicial
df.info()

df.head()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 15 entries, Aus to UK
Data columns (total 15 columns):
 #   Column  Non-Null Count  Dtype  
---  ------  --------------  -----  
 0   Aus     14 non-null     float64
 1   Bel     15 non-null     float64
 2   Den     15 non-null     float64
 3   Fin     14 non-null     float64
 4   Fra     15 non-null     float64
 5   Ger     15 non-null     float64
 6   Gre     15 non-null     float64
 7   Ire     15 non-null     float64
 8   Ita     15 non-null     float64
 9   NL      15 non-null     float64
 10  Nor     14 non-null     float64
 11  Por     15 non-null     float64
 12  Spa     15 non-null     float64
 13  Swe     14 non-null     float64
 14  UK      15 non-null     float64
dtypes: float64(15)
memory usage: 1.9+ KB
```

Out[62]:

Origin of trust	Aus	Bel	Den	Fin	Fra	Ger	Gre	Ire	Ita	NL	Nor	Por	Spa
Aus	0.38	-0.00	-0.06	-0.04	-0.05	0.10	-0.02	-0.06	-0.01	-0.04	-0.04	-0.03	-0.04
Bel	-0.03	0.12	-0.02	-0.04	0.02	-0.03	-0.00	-0.01	0.02	-0.03	-0.06	0.01	-0.01
Den	0.05	-0.04	0.31	0.04	-0.08	-0.03	-0.05	0.02	-0.04	0.10	0.22	-0.04	-0.06
Fin	0.05	-0.04	0.06	0.36	-0.08	-0.07	-0.10	-0.05	-0.12	-0.03	0.16	-0.12	-0.14
Fra	-0.07	0.04	-0.01	-0.03	0.25	0.06	0.01	0.01	0.05	-0.02	-0.03	0.04	0.04

In [63]:

```
# Manejo del dataframe
nuevo_orden = ['Fin', 'Nor', 'Swe', 'Den', 'UK', 'Ire', 'NL', 'Ger', 'Bel', 'Aus',
nuevo_orden_inverso = nuevo_orden[::-1]
df_reordenado = df.reindex(nuevo_orden,columns=nuevo_orden_inverso + [columna for c
df_reordenado = df_reordenado * 100
df_reordenado.head()
```

Out[63]:

Origin of trust	Gre	Por	Spa	Ita	Fra	Aus	Bel	Ger	NL	Ire	UK	Den	Swe	Nor
Fin	-10.0	-12.0	-14.0	-12.0	-8.0	5.0	-4.0	-7.0	-3.0	-5.0	3.0	6.0	9.0	16.0
Nor	-8.0	-8.0	-10.0	-6.0	-5.0	NaN	1.0	-4.0	5.0	2.0	10.0	24.0	NaN	NaN
Swe	-8.0	-7.0	-12.0	-8.0	-11.0	8.0	-6.0	-8.0	-3.0	2.0	7.0	12.0	10.0	15.0
Den	-5.0	-4.0	-6.0	-4.0	-8.0	5.0	-4.0	-3.0	10.0	2.0	5.0	31.0	15.0	22.0
UK	-1.0	1.0	-1.0	3.0	-8.0	-5.0	-2.0	-11.0	4.0	3.0	28.0	2.0	-3.0	-1.0

In [64]:

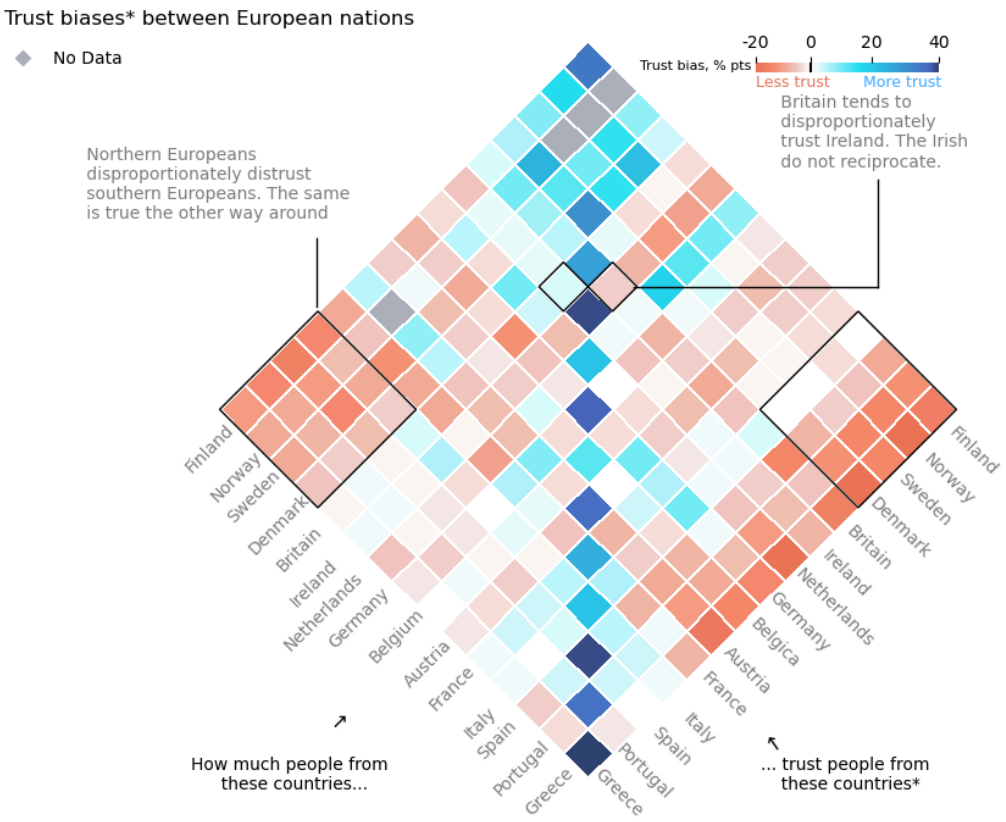
```
# Definición de paleta de colores
mask = df_reordenado.isna()
my_gradient=LinearSegmentedColormap.from_list('my_gradient', (
    (0.000, (0.922, 0.455, 0.349)),
    (0.105, (0.969, 0.553, 0.443)),
    (0.225, (0.937, 0.796, 0.769)),
    (0.295, (1.000, 1.000, 1.000)),
    (0.305, (1.000, 1.000, 1.000)),
    (0.566, (0.141, 0.875, 0.945)),
    (0.950, (0.290, 0.416, 0.757)),
    (1.000, (0.188, 0.255, 0.435))))
my_gradient.set_bad(color=(0.675, 0.690, 0.733))
```

In [65]:
```
def rotate_axes(fig, rect, angle):
    tr = Affine2D().scale(1, -1).rotate_deg(angle)

    grid_helper = floating_axes.GridHelperCurveLinear(
        tr, extremes=(0, df.shape[0],0, df.shape[0]))

    ax1 = floating_axes.FloatingSubplot(fig, rect, grid_helper=grid_helper)

    fig.add_subplot(ax1)
    ax1.axis[:].set_visible(False)
    aux_ax = ax1.get_aux_axes(tr)
    return aux_ax
```

In [165…
```
# Creación de figura y axis con eje rotado
fig, ax = plt.subplots(1, 1, figsize=(10, 8))
ax0 = rotate_axes(fig, 111, 45)
# Heatmap
heatmap = sns.heatmap(df_reordenado,
                      annot=False,
                      mask=mask,
                      cmap=my_gradient,
                      ax=ax0,
                      linecolor='white',
                      linewidths=0.5,
                      cbar_kws={'orientation': 'horizontal'})
ax.set_axis_off()
# Titulo y subtitulo
fig.suptitle("Equity analysts are less likely to recommend stocks from countries th
ax.set_title("Trust biases* between European nations", fontsize=12)
ax.title.set_position([0.1, 1])
# Leyendas
plt.scatter([], [], color=(0.675, 0.690, 0.733), label='No Data', marker='D')
plt.legend(bbox_to_anchor=(-0.1, 1), frameon=False)
plt.text(13.7, 9.9, 'Trust bias, % pts',
         horizontalalignment='center', verticalalignment='center', fontsize=8, colo
# Barra de color
cbar = heatmap.collections[0].colorbar
cbar.ax.set_position([0.65, 0.55, 0.15, 0.3])  # Ajuste de posición y tamaño para q
cbar.set_ticks([cbar.vmin, 0, 20, cbar.vmax])
cbar.ax.xaxis.set_label_position('top')
cbar.ax.xaxis.set_ticks_position('top')
cbar.set_ticklabels(['-20', '0', '20', '40'])
cbar.ax.axvline(0.05, color='black', linestyle='-')
cbar.ax.text(0.2, -1.1, 'Less trust', ha='center', va='center', transform=cbar.ax.t
cbar.ax.text(0.8, -1.1, 'More trust', ha='center', va='center', transform=cbar.ax.t
# Ajustar los recuadros
rect = plt.Rectangle((0, 0), 4, 4, linewidth=1, edgecolor='black', facecolor='none'
rect_2 = plt.Rectangle((11, 11), 4, 4, linewidth=1, edgecolor='black', facecolor='n
rect_3 = plt.Rectangle((9, 4), 1, 1, linewidth=1, edgecolor='black', facecolor='non
rect_4 = plt.Rectangle((10, 5), 1, 1, linewidth=1, edgecolor='black', facecolor='no
ax0.add_patch(rect)
ax0.add_patch(rect_2)
ax0.add_patch(rect_3)
ax0.add_patch(rect_4)
# Añadir textos explicativos
```

```
plt.text(16, 8, ' Britain tends to\n disproportionately\n trust Ireland. The Irish\
         horizontalalignment='left', verticalalignment='center', fontsize=10, color
plt.text(-4, 6.5, ' Northern Europeans\n disproportionately distrust\n southern Eur
         horizontalalignment='left', verticalalignment='center', fontsize=10, color
plt.text(2, -10.5, 'How much people from\n  these countries...',
         horizontalalignment='center', verticalalignment='center', fontsize=10, col
plt.text(3.5, -9, '→',
         horizontalalignment='center', verticalalignment='center', fontsize=12, col
plt.text(18, -10.5, '... trust people from\n  these countries*',
         horizontalalignment='center', verticalalignment='center', fontsize=10, col
plt.text(16, -9.5, '→',
         horizontalalignment='center', verticalalignment='center', fontsize=12, col
# Etiquetas de paises
paises = ['Finland', 'Norway', 'Sweden', 'Denmark', 'Britain', 'Ireland', 'Netherla
          'Germany', 'Belgium', 'Austria', 'France', 'Italy', 'Spain',
          'Portugal', 'Greece']
x_positions = [-0.3, 0.5, 1, 1.7, 2.3, 2.7, 3, 4, 5.1, 6, 6.7, 7.5, 8, 8.7, 9.5]
y_positions = [-1.1, -1.9, -2.5, -3.3, -4, -5, -5.8, -6, -6.5, -7.3, -8, -9, -9.5,
for pais, x, y in zip(paises, x_positions, y_positions):
    plt.text(x, y, pais,
             horizontalalignment='center', verticalalignment='center',
             fontsize=10, color='grey', rotation=45)
paises_2 = ['Greece', 'Portugal', 'Spain', 'Italy', 'France', 'Austria', 'Belgica',
            'Germany', 'Netherlands', 'Ireland', 'Britain', 'Denmark', 'Sweden',
            'Norway', 'Finland']
x_positions_2 = [11.5, 12.2, 13, 13.8, 14.5, 15.2, 16, 16.7, 17.7, 18, 18.7, 19.6,
y_positions_2 = [-11, -10.4, -9.7, -9.2, -8.2, -7.5, -6.7, -6.1, -5.7, -4.7, -4, -3
for pais, x, y in zip(paises_2, x_positions_2, y_positions_2):
    plt.text(x, y, pais,
             horizontalalignment='center', verticalalignment='center',
             fontsize=10, color='grey', rotation=-45)
#Lineas
fig.add_artist(plt.Line2D([0.02, 1], [0.99, 0.99], color='black', linewidth=1))
fig.add_artist(plt.Line2D([0.02, 0.05], [0.92, 0.92], color='black', linewidth=1))
fig.add_artist(plt.Line2D([0.55, 0.75], [0.62, 0.62], color='black', linewidth=1))
fig.add_artist(plt.Line2D([0.29, 0.29], [0.6, 0.67], color='black', linewidth=1))
fig.add_artist(plt.Line2D([0.75, 0.75], [0.62, 0.73], color='black', linewidth=1))
# Mostrar grafico
plt.show()
```

Equity analysts are less likely to recommend stocks from countries their nation is biased against



Visualización N_2

In [48]:
```
# Carga del dataframe
try:
    df_happiness = pd.read_csv(r'.\data\02-happiness-economics.csv')
except FileNotFoundError:
    print("El archivo no se encontró.")
except pd.errors.EmptyDataError:
    print("El archivo está vacío.")
except Exception as e:
    print(f"Ocurrió un error: {e}")
```

In [49]:
```
# Encabezados
df_happiness.head()
```

Out[49]:

	Unnamed: 0	name	iso2c	happy	gdp.pc	pop	obs	year	quadra
0	1	Afghanistan	AF	3.723590	1298.143187	1.324255e+07	1	2008	rise-f
1	2	Albania	AL	4.634252	8754.565278	2.269081e+06	1	2008	rise-r
2	3	Argentina	AR	6.115706	17643.280656	2.932879e+07	3	2008	rise-f
3	4	Armenia	AM	4.607600	6893.071401	2.384185e+06	3	2008	rise-r
4	5	Australia	AU	7.293279	40313.264414	1.670645e+07	3	2008	rise-f

In [50]:
```
# Descripción estadistica
df_happiness.describe()
```

Out[50]:

	Unnamed: 0	happy	gdp.pc	pop	obs	year	pop.le
count	250.000000	250.000000	250.000000	2.500000e+02	250.000000	250.00000	250.000
mean	125.500000	5.452395	17979.488308	3.881314e+07	3.108000	2013.00000	1.332
std	72.312977	1.125600	17590.526322	1.293912e+08	0.957079	5.01003	0.656
min	1.000000	3.005142	652.056768	2.511490e+05	1.000000	2008.00000	1.000
25%	63.250000	4.663815	3729.216182	3.883648e+06	3.000000	2008.00000	1.000
50%	125.500000	5.311014	12239.157128	8.017570e+06	3.000000	2013.00000	1.000
75%	187.750000	6.213347	27652.936668	2.346547e+07	4.000000	2018.00000	1.000
max	250.000000	7.941353	96244.356304	1.140639e+09	4.000000	2018.00000	4.000

In [51]:
```
# Manejo de variables
# Escala logaritmica para visualización
df_happiness['gdp.pc'] = np.log(df_happiness['gdp.pc'])
# Modificación de nombre
df_happiness['name'] = df_happiness['name'].replace('United Arab Emirates', 'UAE')
# Filtrar el DataFrame para mostrar los países con una población de más de 5 millon
countries_with_pop_over_5m_2018 = df_happiness[(df_happiness['pop'] > 5000000) & (d
filtered_df = df_happiness[df_happiness['name'].isin(countries_with_pop_over_5m_201
```

In [52]:
```
# Encabezados
filtered_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 170 entries, 0 to 249
Data columns (total 12 columns):
 #   Column      Non-Null Count  Dtype
---  ------      --------------  -----
 0   Unnamed: 0  170 non-null    int64
 1   name        170 non-null    object
 2   iso2c       170 non-null    object
 3   happy       170 non-null    float64
 4   gdp.pc      170 non-null    float64
 5   pop         170 non-null    float64
 6   obs         170 non-null    int64
 7   year        170 non-null    int64
 8   quadrant    170 non-null    object
 9   paradox     170 non-null    bool
 10  pop.break   170 non-null    object
 11  pop.levels  170 non-null    int64
dtypes: bool(1), float64(3), int64(4), object(4)
memory usage: 16.1+ KB
```

In [53]:
```
# Descripción estadistica
filtered_df.describe()
```

Out[53]:

	Unnamed: 0	happy	gdp.pc	pop	obs	year	pop.lev
count	170.000000	170.000000	170.000000	1.700000e+02	170.000000	170.000000	170.000(
mean	126.370588	5.418117	9.150151	5.574971e+07	3.223529	2013.000000	1.4882
std	73.548505	1.102004	1.247295	1.541588e+08	0.833847	5.014771	0.7476
min	1.000000	3.067623	6.541033	3.883987e+06	1.000000	2008.000000	1.000(
25%	59.250000	4.590787	8.041228	7.876587e+06	3.000000	2008.000000	1.000(
50%	125.500000	5.285717	9.410153	1.594438e+07	3.000000	2013.000000	1.000(
75%	183.750000	6.219966	10.214751	4.369942e+07	4.000000	2018.000000	2.000(
max	250.000000	7.515624	11.386073	1.140639e+09	4.000000	2018.000000	4.000(

In [54]:
```
# Filtrar datos para los años 2008 y 2018
df_2008 = filtered_df[filtered_df['year'] == 2008]
df_2018 = filtered_df[filtered_df['year'] == 2018]
```

In [55]:
```
# Descripción estadistica
df_2018.describe()
```

Out[55]:

	Unnamed: 0	happy	gdp.pc	pop	obs	year	pop.levels
count	85.000000	85.000000	85.000000	8.500000e+01	85.000000	85.0	85.000000
mean	188.870588	5.443562	9.247475	5.961310e+07	3.788235	2018.0	1.517647
std	38.585338	1.096159	1.217198	1.634811e+08	0.599486	0.0	0.765503
min	126.000000	3.067623	6.541033	5.594583e+06	2.000000	2018.0	1.000000
25%	155.000000	4.676749	8.215490	8.591547e+06	4.000000	2018.0	1.000000
50%	184.000000	5.427583	9.499736	1.645359e+07	4.000000	2018.0	1.000000
75%	223.000000	6.181672	10.235504	4.474566e+07	4.000000	2018.0	2.000000
max	250.000000	7.487322	11.123786	1.140639e+09	4.000000	2018.0	4.000000

In [56]:
```
# Colores para la visualización
# Paleta de colores para visualización
color_same_direction = (0.0, 0.651, 0.749)
color_opposite_direction = (0.945, 0.306, 0.196)
# Definición de color
def get_color(df_2008, df_2018, country):
    gdp_change = df_2018[df_2018['name'] == country]['gdp.pc'].values[0] - df_2008[
    happy_change = df_2018[df_2018['name'] == country]['happy'].values[0] - df_2008
    if (gdp_change > 0 and happy_change > 0) or (gdp_change < 0 and happy_change <
        return color_same_direction  # Misma dirección
    else:
        return color_opposite_direction  # Direcciones opuestas
```

In [164…
```
# Creación de figura y axis
fig, ax = plt.subplots(figsize=(14, 10))
# Paises destacados
countries_to_label = ['India', 'Burundi', 'Tanzania', 'Benin', 'India', 'Vietnam',
                      'Ukraine', 'China', 'Brazil', 'Venezuela', 'Greece', 'Hong Ko
                      'Japan', 'Spain', 'Germany', 'Netherlands', 'United States',
# Definición de tipo de gráfico
scatter = ax.scatter(
    df_2018['gdp.pc'],
    df_2018['happy'],
    s=df_2018['pop'] / 1e6,
    c=[get_color(df_2008, df_2018, country) for country in df_2018['name']],
    alpha=[1.0 if country in countries_to_label else 0.3 for country in df_2018['na
    edgecolors="w",
    linewidth=0.5)
# Generación de linea para periodo anterior
for country in df_2018['name'].unique():
    if country in df_2008['name'].values:
        gdp_2008 = df_2008[df_2008['name'] == country]['gdp.pc'].values[0]
        happy_2008 = df_2008[df_2008['name'] == country]['happy'].values[0]
        gdp_2018 = df_2018[df_2018['name'] == country]['gdp.pc'].values[0]
        happy_2018 = df_2018[df_2018['name'] == country]['happy'].values[0]
        color = get_color(df_2008, df_2018, country)
        alpha_value = 1.0 if country in countries_to_label else 0.3
        ax.plot(
```

```
            [gdp_2008, gdp_2018],
            [happy_2008, happy_2018],
            color=color,
            linestyle='-',
            linewidth=0.8,
            alpha=alpha_value)
# Título, subtítulo, texto referencial
ax.text(0.43, 0.97, "Self-reported happiness tends to be higher in richer countries
        ha='center', va='center', transform=ax.transAxes, fontsize=12, color='black
ax.text(0.1, 0.93, "GDP per person v self-reported happiness",
        ha='center', va='center', transform=ax.transAxes, fontsize=10, color='black
ax.text(0.08, 0.90, "85 countries with adult population over 5",
        ha='center', va='center', transform=ax.transAxes, fontsize=10, color='black
# Ejes
# Eje Y: titulo, limites, ticks y anotaciones
ax.set_ylabel('Happiness \n 0-10 scale', rotation=0, labelpad=20,color='gray')
ax.yaxis.set_label_coords(0.95, 0.92)
ax.set_ylim(3, 9)
ax.set_yticks([4, 5, 6, 7, 8])
fig.text(0.82, 0.70,
         'Happier ↑',
         ha='left', fontsize=10, color='black',)
fig.text(0.82, 0.20,
         'Less happy ↓',
         ha='left', fontsize=10, color='black')
ax.yaxis.set_label_position("right")
ax.yaxis.tick_right()
ax.tick_params(axis='y', direction='in', length=6, width=1.5, colors='black', pad=-
ax.tick_params(axis='y', which='major', length=0)
for tick in ax.get_yticklabels():
    tick.set_verticalalignment('bottom')
# Eje X: titulo, limites, ticks y anotaciones
ax.set_xlabel('GDP per person, $000', fontweight='bold')
x_min = 6.541033
x_max = 11.123786
ax.set_xlim(x_min, x_max)
values = [1000, 5000, 10000, 50000, 100000]
positions = np.log(values)
ax.set_xticks(positions)
ax.set_xticklabels(['1', '5', '10', '50', '100'])
ax.annotate('← Poorer', xy=(0.1, -0.055), xycoords='axes fraction', fontsize=10,
            xytext=(-15, -0), textcoords='offset points', fontweight='bold')
ax.annotate('Richer →', xy=(0.9, -0.055), xycoords='axes fraction', fontsize=10,
            xytext=(15, 0), textcoords='offset points', fontweight='bold')
ax.tick_params(axis='x', which='major', labelcolor='black', color='black')
# Grilla
ax.grid(alpha=0.2, color='grey', zorder=0)
ax.xaxis.grid(False)
# Leyendas
# Primera leyenda
legend_labels = ['5-25', '25-100', '100-500', '500+']
legend_sizes = [5e6, 25e6, 100e6, 500e6]

for size, label in zip(legend_sizes, legend_labels):
    plt.scatter([], [], edgecolors='k', facecolors='none', alpha=0.6, s=size / 1e6,
plt.legend(scatterpoints=1, frameon=False, labelspacing=1.5, title='Population, m',
```

```
# Segunda Leyenda
legend_ax2 = fig.add_axes([0.45, 0.65, 0.1, 0.1], frameon=False)
legend_colors = [color_same_direction, color_opposite_direction]
legend_labels = ['moving in the same direction', 'moving in opposite directions']
for color, label in zip(legend_colors, legend_labels):
    legend_ax2.plot([], [], color=color, linewidth=2, label=label)
    legend_ax2.scatter([], [], c=[color], edgecolors="w", linewidth=0.5)
legend2 = legend_ax2.legend(scatterpoints=1, frameon=False, labelspacing=1.5, title
legend_ax2.axis('off')
for text, color in zip(legend2.get_texts(), legend_colors):
    text.set_color(color)
# Etiquetas del grafico
for i, row in df_2018.iterrows():
    if row['name'] in countries_to_label:
        if row['name'] in ['India', 'China']:
            ax.text(
                row['gdp.pc'],
                row['happy'],
                row['name'],
                fontsize=10,
                ha='center',
                va='baseline',
                color="white",
                fontweight='light'
            )
        else:
            color = get_color(df_2008, df_2018, row['name'])
            ax.text(
                row['gdp.pc'],
                row['happy'],
                row['name'],
                fontsize=8,
                ha='right',
                va='baseline',
                color=color,
                fontweight='light'
            )
#Textos informativos
fig.text(0.8, 0.03, 'Sources: World Happiness Report,by John Helliwell, Richard\n L
x_label_position = ax.xaxis.label.get_position()
ax.text(x_label_position[0], x_label_position[1] - 0.08,'At purchasing-power parity
        ha='center', fontsize=10, color='black', transform=ax.transAxes)
fig.text(0.12, 0.7, '2005-08',
         ha='left', fontsize=10, color='black')
fig.text(0.20, 0.7, '2015-18',
         ha='left', fontsize=10, color='black')
fig.text(0.12, 0.69, 'average',
         ha='left', fontsize=8, color='black')
fig.text(0.20, 0.69, 'average',
         ha='left', fontsize=8, color='black')
fig.text(0.45, 0.14,'↑ Indias GDP per person has\n increased by 80% in ten years\n
fig.text(0.63, 0.67,'→ Life satisfaction is high\n but decreasing in many\n Europea
fig.text(0.40, 0.55,'→ A decade ago Venezuela was among\n the happiest countries in
#  Spine
ax.spines['left'].set_edgecolor('white')
ax.spines['right'].set_edgecolor('white')
```

```
ax.spines['top'].set_edgecolor('white')
#Lineas
fig.add_artist(plt.Line2D([0.09, 0.9], [0.88, 0.88], color='black', linewidth=1))
fig.add_artist(plt.Line2D([0.09, 0.12], [0.84, 0.84], color='black', linewidth=1))
fig.add_artist(plt.Line2D([0.165, 0.195], [0.705, 0.705], color='lightgrey', linewi
# Mostrar grafico
plt.show()
```