

# Analizando las relaciones de los personajes en 'Marmalade Boy'

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```
[1]: #Francisco José Soler Conchello
```

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from PIL import Image
from plotly.offline import init_notebook_mode, iplot
init_notebook_mode(connected=True)
import plotly.graph_objs as go
from plotly.subplots import make_subplots
import os
import seaborn as sns
```

```
[2]: df = pd.read_csv(r"C:\Users\frans\Downloads\MarmaladeBoy_Script.csv",
    ↪names=["index", "episode", "scene", "character", "dialogue"], header=None)
```

```
[3]: df.drop(0, inplace=True)
```

```
[4]: df2 = pd.DataFrame(df.character.value_counts()).iloc[:20]
```

```
[5]: df2
```

```
[5]:
```

	character
Miki Koishikawa	831
Yuu Matsuura	452
Ginta Suou	225
Meiko Akizuki	147
Arimi Suzuki	147
Tsutomu Rokutanda	98
Jin Koishikawa	59
Takuji Kijima	54
Chiyako Koishikawa	51
Rumi Matsuura	50
Namura	34
Satoshi Miwa	27
Miki's friend	23
Youji Matsuura	22

Ryoko Momoi	15
Customer	15
Student	13
Reporter	12
Tennis Official	7
Ginta's friend	6

```
[6]: trace = go.Bar(y=df2.character, x=df2.index,
    ↪marker=dict(color="blue",line=dict(color='black', width=2)),opacity=0.75)
```

```
[7]: fig = make_subplots(rows=1, cols=1,horizontal_spacing=1,
    ↪subplot_titles=("Marmalade Boy"))
```

```
[8]: fig.append_trace(trace, 1, 1)
```

```
[9]: fig['layout'].update(showlegend=False ,height=800,title="Número de dialogos
    ↪según el personaje",paper_bgcolor='rgb(248, 248, 255)',
    plot_bgcolor='rgb(248, 248, 255)')

iplot(fig)
```

```
[10]: import re
import nltk
from nltk.corpus import stopwords
import nltk as nlp
from nltk.probability import FreqDist
```

```
[11]: description_list=[]
for description in df.dialogue:
    # Limpieza de texto
    description=re.sub("[^A-Za-z_ÑñÁáÉéÍíÓóÚú]+", " ", description)
    description=description.lower()
    description=nltk.word_tokenize(description)
    description=[word for word in description if not word in set(stopwords.
    ↪words("spanish"))]
    lemma=nlp.WordNetLemmatizer()
    description=[lemma.lemmatize(word) for word in description]
    description=" ".join(description)
    description_list.append(description)
```

```
[12]: df["new_script"]=description_list
df
```

```
[12]:
```

	index	episode	scene	character	\
1	1	1	1	Miki Koishikawa	
2	2	1	1	Miki Koishikawa	
3	3	1	1	Miki Koishikawa	

4	4	1	1	Miki Koishikawa
5	5	1	1	Miki Koishikawa
...	...	...	...	...
2298	2298	10	434	Miki Koishikawa
2299	2299	10	435	Rumi Matsuura
2300	2300	10	435	Chiyako Koishikawa
2301	2301	10	435	Jin Koishikawa
2302	2302	10	435	Youji Matsuura

```

                                dialogue \
1                                Con Meiko
2    Después de las actividades del club me detuve ...
3    Y resulto que en la mesa de al lado había un c...
4                                Pero su novia vino enseguida
5                                Lo que me desilusionó bastante
...
2298                                ¿Pero no es?
2299                                Decidas lo que decidas estará bien
2300                                Si, no debemos obligarte a nada
2301                                Pero no te preocupes
2302                                No pasa nada, lo aceptaremos

```

```

                                new_script
1                                meiko
2    después actividades club detuve cafetería yoko...
3                                resulto mesa lado chico guapísimo
4                                novia vino enseguida
5                                desilusionó bastante
...
2298                                ...
2299                                decidas decidas bien
2300                                si debemos obligarte
2301                                preocupes
2302                                pasa aceptaremos

```

[2302 rows x 6 columns]

```
[13]: fdist = FreqDist(description_list)
      fdist
```

```
[13]: FreqDist({'': 58, 'miki': 21, 'si': 18, 'verdad': 13, 'ginta': 10, 'yuu': 9,
              'bien': 9, 'arimi': 8, 'buenas tardes': 7, 'gracias': 7, ...})
```

```
[14]: fdist.most_common(50)
```

```
[14]: [('', 58),
      ('miki', 21),
```

('si', 18),  
('verdad', 13),  
('ginta', 10),  
('yuu', 9),  
('bien', 9),  
('arimi', 8),  
('buenas tardes', 7),  
('gracias', 7),  
('va', 7),  
('vale', 6),  
('hola', 6),  
('ah', 5),  
('buenos días', 5),  
('pasa', 5),  
('meiko', 4),  
('veo', 4),  
('claro', 4),  
('rico', 4),  
('bueno', 4),  
('pues', 4),  
('parece', 4),  
('hablar', 4),  
('broma', 3),  
('ver', 3),  
('cómo', 3),  
('luego', 3),  
('tampoco', 3),  
('ah perdona', 3),  
('idiota', 3),  
('sé', 3),  
('asunto', 3),  
('dice', 3),  
('entonces', 3),  
('tsutomu rokutanda', 3),  
('primo', 3),  
('genial', 3),  
('ah si', 3),  
('hacer', 2),  
('guapo', 2),  
('importa', 2),  
('increíble', 2),  
('eh miki', 2),  
('creo', 2),  
('adiós', 2),  
('gusta', 2),  
('embargo', 2),  
('entiendo', 2),

```
('bueno luego', 2)]
```

```
[15]: from sklearn.feature_extraction.text import CountVectorizer

max_features = 50

count_vectorizer = CountVectorizer(max_features=max_features, stop_words =
    ↪ "english")

sparse_matrix = count_vectorizer.fit_transform(description_list).toarray()

print("{} palabras más comunes: {}".format(max_features, count_vectorizer.
    ↪ get_feature_names_out()))
```

```
50 palabras más comunes: ['ah' 'ahora' 'aquí' 'arimi' 'así' 'bien' 'bueno'
'casa' 'chica' 'chico'
'claro' 'creo' 'cómo' 'eh' 'entonces' 'espera' 'ginta' 'gracias' 'gusta'
'hacer' 'hecho' 'matsuura' 'mejor' 'miki' 'nunca' 'oye' 'padre' 'parece'
'pasa' 'puede' 'puedo' 'pues' 'quieres' 'quiero' 'quién' 'sabes' 'ser'
'si' 'siempre' 'solo' 'sé' 'tan' 'va' 'vamos' 'vaya' 'ver' 'verdad' 'vez'
'voy' 'yuu']
```

```
[16]: speaker_scene_count = {}
for name, df in df.groupby(['episode', 'scene']):
    for speaker_name in df.character.unique().tolist():
        if speaker_name in speaker_scene_count.keys():
            speaker_scene_count[speaker_name][0] += 1
            speaker_scene_count[speaker_name][1] += df.character.tolist().
            ↪ count(speaker_name)
        else:
            speaker_scene_count[speaker_name] = []
            speaker_scene_count[speaker_name].append(1)
            speaker_scene_count[speaker_name].append(df.character.tolist().
            ↪ count(speaker_name))
scene_count = {k: v for k, v in sorted(speaker_scene_count.items(), key=lambda
    ↪ item: item[1], reverse = True)}

# Mostrar líneas habladas y escenas en las que aparece cada personaje
scene_count
```

```
[16]: {'Miki Koishikawa': [262, 831],
'Yuu Matsuura': [123, 452],
'Ginta Suou': [90, 225],
'Arimi Suzuki': [52, 147],
'Meiko Akizuki': [50, 147],
'Tsutomu Rokutanda': [28, 98],
'Chiyako Koishikawa': [22, 51],
```

```

'Rumi Matsuura': [22, 50],
'Namura': [19, 34],
'Jin Koishikawa': [18, 59],
'Takuji Kijima': [15, 54],
'Youji Matsuura': [14, 22],
'Miki's friend': [10, 23],
'Ryoko Momoi': [9, 15],
'Customer': [8, 15],
'Student': [7, 13],
'Tennis Official': [6, 7],
'Satoshi Miwa': [5, 27],
'Ginta's friend': [4, 6],
'Reporter': [2, 12],
'All fathers': [2, 4],
'Ginta's friends': [2, 2],
'Tsutomu's friend': [2, 2],
'Miki's friends': [1, 3],
'Miki's fathers': [1, 1],
'Yuu's fathers': [1, 1],
'Arimi's boyfriend': [1, 1]}

```

```

[17]: df_scenes_lines = pd.DataFrame(scene_count)
df_scenes_lines = df_scenes_lines.T
df_scenes_lines.columns = ['Número de escenas', 'Líneas habladas']
df_scenes_lines.info()

```

```

<class 'pandas.core.frame.DataFrame'>
Index: 27 entries, Miki Koishikawa to Arimi's boyfriend
Data columns (total 2 columns):
#   Column                Non-Null Count  Dtype
---  -
0   Número de escenas     27 non-null    int64
1   Líneas habladas       27 non-null    int64
dtypes: int64(2)
memory usage: 648.0+ bytes

```

```

[18]: df_scenes_lines['# of lines per scene'] = df_scenes_lines['Líneas habladas']/
      ↪ df_scenes_lines['Número de escenas']
# Número de personajes relevantes
num = 12
f, axes = plt.subplots(1, 2, figsize=(18,8))
scenes = df_scenes_lines['Número de escenas'].sort_values(ascending=False).
      ↪ head(num)
scenes_character = [ x.title() for x in df_scenes_lines['Número de escenas'].
      ↪ sort_values(ascending=False).head(num).index]

sns.barplot(x=scenes,y=scenes_character, ax=axes[0])

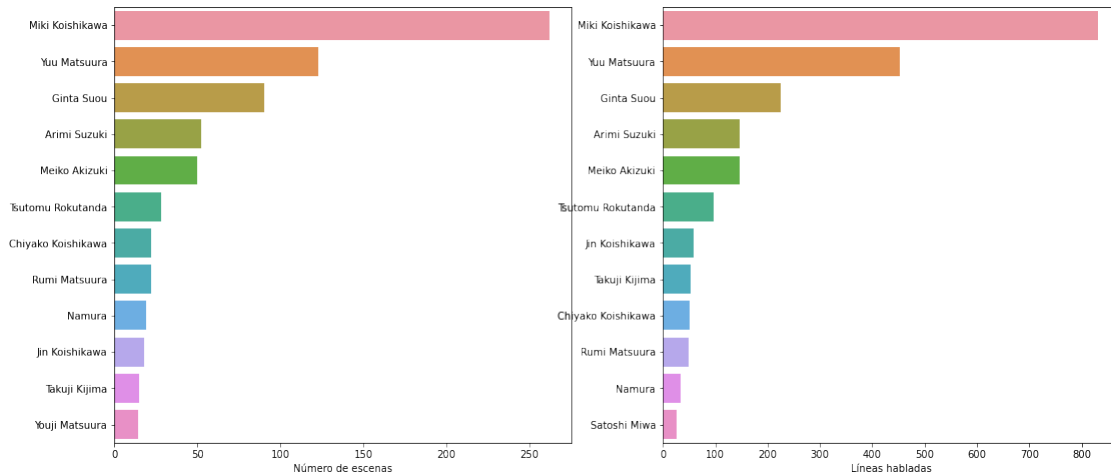
```

```

lines_spoken = df_scenes_lines['Líneas habladas'].sort_values(ascending=False).
↳head(num)
lines_spoken_character = [ x.title() for x in df_scenes_lines['Líneas_
↳habladas'].sort_values(ascending=False).head(num).index]
sns.barplot(x=lines_spoken,y=lines_spoken_character, ax=axes[1])

```

[18]: <AxesSubplot:xlabel='Líneas habladas'>



```

[19]: df = pd.read_csv(r"C:\Users\frans\Downloads\MarmaladeBoy_Script.csv",
↳names=["index", "episode", "scene", "character", "dialogue"], header=None)

```

```

[20]: char_dict = {}

for group, group_df in df.groupby(['episode', 'scene']):

    char_in_scene = str(group_df['character'].sort_values().unique().
↳tolist())[1:-1].replace("'", "")

    if char_in_scene in char_dict.keys():
        char_dict[char_in_scene] += 1
    else:
        char_dict[char_in_scene] = 1

sorted_dict = {k: v for k, v in sorted(char_dict.items(), key=lambda item:
↳item[1], reverse = True)}
sorted_dict

```

```

[20]: {'Miki Koishikawa': 110,
      'Miki Koishikawa, Yuu Matsuura': 48,

```

'Ginta Suou': 24,  
 'Yuu Matsuura': 19,  
 'Meiko Akizuki, Miki Koishikawa': 17,  
 'Ginta Suou, Miki Koishikawa': 12,  
 'Arimi Suzuki, Miki Koishikawa': 12,  
 'Arimi Suzuki': 12,  
 'Tsutomu Rokutanda': 11,  
 'Arimi Suzuki, Ginta Suou': 11,  
 'Meiko Akizuki': 8,  
 'Chiyako Koishikawa, Jin Koishikawa, Miki Koishikawa, Rumi Matsuura, Youji Matsuura, Yuu Matsuura': 7,  
 'Ginta Suou, Yuu Matsuura': 7,  
 'Ginta Suou, Meiko Akizuki': 5,  
 'Arimi Suzuki, Yuu Matsuura': 5,  
 'Tennis Official': 5,  
 'Miki Koishikawa, "Mikis friend"': 4,  
 '"Mikis friend"': 4,  
 'Namura, Ryoko Momoi': 4,  
 'Meiko Akizuki, Miki Koishikawa, Yuu Matsuura': 4,  
 'Ginta Suou, Tsutomu Rokutanda': 4,  
 'Customer': 4,  
 'Meiko Akizuki, Yuu Matsuura': 3,  
 'Ginta Suou, Meiko Akizuki, Miki Koishikawa': 3,  
 'Miki Koishikawa, Takuji Kijima, Yuu Matsuura': 3,  
 'Miki Koishikawa, Namura': 3,  
 'Arimi Suzuki, Miki Koishikawa, Yuu Matsuura': 3,  
 'Arimi Suzuki, Ginta Suou, Miki Koishikawa': 3,  
 'Meiko Akizuki, Miki Koishikawa, Takuji Kijima, Yuu Matsuura': 3,  
 'Takuji Kijima': 3,  
 'Meiko Akizuki, Satoshi Miwa': 3,  
 'Chiyako Koishikawa, Rumi Matsuura': 2,  
 'Jin Koishikawa, Miki Koishikawa, Rumi Matsuura': 2,  
 'Chiyako Koishikawa, Jin Koishikawa, Rumi Matsuura, Youji Matsuura': 2,  
 'Chiyako Koishikawa, Miki Koishikawa': 2,  
 'Miki Koishikawa, Rumi Matsuura': 2,  
 'Ryoko Momoi': 2,  
 'Miki Koishikawa, Takuji Kijima': 2,  
 'Ginta Suou, Student': 2,  
 'Namura': 2,  
 '"Gintas friend"': 2,  
 'Ginta Suou, Tsutomu Rokutanda, Yuu Matsuura': 2,  
 'Tsutomu Rokutanda, "Tsutomus friend"': 2,  
 'Ginta Suou, Miki Koishikawa, Tsutomu Rokutanda, Yuu Matsuura': 2,  
 'Chiyako Koishikawa': 2,  
 'Chiyako Koishikawa, Jin Koishikawa, Miki Koishikawa, Rumi Matsuura, Youji Matsuura': 2,  
 'All fathers, Chiyako Koishikawa, Jin Koishikawa, Miki Koishikawa, Rumi



Matsuura, Youji Matsuura, Yuu Matsuura': 1,  
 'Jin Koishikawa, Miki Koishikawa, "Mikis fathers", Rumi Matsuura': 1,  
 'Miki Koishikawa, Namura, Yuu Matsuura': 1,  
 'Chiyako Koishikawa, Jin Koishikawa, Miki Koishikawa, Rumi Matsuura, Youji  
 Matsuura, "Yuus fathers": 1,  
 'Miki Koishikawa, Reporter, Yuu Matsuura': 1,  
 'Ginta Suou, "Gintas friend": 1,  
 '"Mikis friends": 1,  
 'Satoshi Miwa, Yuu Matsuura': 1,  
 'Satoshi Miwa': 1,  
 'Chiyako Koishikawa, Miki Koishikawa, Yuu Matsuura': 1,  
 'Arimi Suzuki, "Arimis boyfriend": 1,  
 'Chiyako Koishikawa, Jin Koishikawa, Rumi Matsuura': 1,  
 'Ginta Suou, "Gintas friend", "Gintas friends": 1,  
 '"Gintas friends": 1,  
 'Ginta Suou, Miki Koishikawa, Yuu Matsuura': 1,  
 'Ginta Suou, Miki Koishikawa, Namura, Student': 1,  
 'Ginta Suou, Miki Koishikawa, Namura': 1,  
 'Ginta Suou, Miki Koishikawa, Namura, Yuu Matsuura': 1,  
 'Namura, Yuu Matsuura': 1,  
 'Reporter, Yuu Matsuura': 1,  
 'Arimi Suzuki, Ginta Suou, Yuu Matsuura': 1,  
 'Arimi Suzuki, Ginta Suou, Miki Koishikawa, Tsutomu Rokutanda, Yuu Matsuura':  
 1,  
 'Ginta Suou, Miki Koishikawa, Tsutomu Rokutanda': 1,  
 'Miki Koishikawa, "Mikis friend", Student': 1,  
 'Ginta Suou, Namura': 1,  
 'Namura, Ryoko Momoi, Tennis Official': 1,  
 'Meiko Akizuki, Miki Koishikawa, Student': 1,  
 'Arimi Suzuki, Ginta Suou, Miki Koishikawa, Yuu Matsuura': 1,  
 'Ginta Suou, Meiko Akizuki, Yuu Matsuura': 1,  
 'Meiko Akizuki, Miki Koishikawa, "Mikis friend", Student': 1,  
 'Meiko Akizuki, Student': 1,  
 'All fathers, Chiyako Koishikawa, Jin Koishikawa, Rumi Matsuura, Youji  
 Matsuura': 1,  
 'Customer, Miki Koishikawa': 1,  
 'Customer, Yuu Matsuura': 1,  
 'Arimi Suzuki, Ginta Suou, Tsutomu Rokutanda, Yuu Matsuura': 1,  
 'Takuji Kijima, Tsutomu Rokutanda': 1,  
 'Ginta Suou, Takuji Kijima, Tsutomu Rokutanda, Yuu Matsuura': 1,  
 'Customer, Namura': 1,  
 'Customer, Tsutomu Rokutanda': 1,  
 'Namura, Ryoko Momoi, Takuji Kijima': 1,  
 'Arimi Suzuki, Ginta Suou, Miki Koishikawa, Namura, Ryoko Momoi, Takuji Kijima,  
 Tsutomu Rokutanda, Yuu Matsuura': 1,  
 'characters': 1}

```
[21]: # Seleciono los personajes más relevantes
sorted_chars = sorted(['Miki Koishikawa', 'Yuu Matsuura', 'Meiko Akizuki',
↳ 'Ginta Suou', 'Arimi Suzuki', 'Chiyako Koishikawa', 'Rumi Matsuura', 'Youji'
↳ 'Matsuura',
    'Jin Koishikawa', 'Satoshi Miwa', 'Namura', 'Ryoko Momoi', 'Takuji'
↳ 'Kijima', 'Tsutomu Rokutanda'])
sorted_chars
```

```
[21]: ['Arimi Suzuki',
    'Chiyako Koishikawa',
    'Ginta Suou',
    'Jin Koishikawa',
    'Meiko Akizuki',
    'Miki Koishikawa',
    'Namura',
    'Rumi Matsuura',
    'Ryoko Momoi',
    'Satoshi Miwa',
    'Takuji Kijima',
    'Tsutomu Rokutanda',
    'Youji Matsuura',
    'Yuu Matsuura']
```

```
[22]: relations = [x+', '+y for x in sorted_chars for y in sorted_chars if x != y and
↳ x<y]
```

```
[23]: relations.extend([x+', '+y+', '+z for x in sorted_chars for y in sorted_chars
↳ for z in sorted_chars if x<y and y<z])
relations
```

```
[23]: ['Arimi Suzuki, Chiyako Koishikawa',
    'Arimi Suzuki, Ginta Suou',
    'Arimi Suzuki, Jin Koishikawa',
    'Arimi Suzuki, Meiko Akizuki',
    'Arimi Suzuki, Miki Koishikawa',
    'Arimi Suzuki, Namura',
    'Arimi Suzuki, Rumi Matsuura',
    'Arimi Suzuki, Ryoko Momoi',
    'Arimi Suzuki, Satoshi Miwa',
    'Arimi Suzuki, Takuji Kijima',
    'Arimi Suzuki, Tsutomu Rokutanda',
    'Arimi Suzuki, Youji Matsuura',
    'Arimi Suzuki, Yuu Matsuura',
    'Chiyako Koishikawa, Ginta Suou',
    'Chiyako Koishikawa, Jin Koishikawa',
    'Chiyako Koishikawa, Meiko Akizuki',
    'Chiyako Koishikawa, Miki Koishikawa',
```

'Chiyako Koishikawa, Namura',  
'Chiyako Koishikawa, Rumi Matsuura',  
'Chiyako Koishikawa, Ryoko Momoi',  
'Chiyako Koishikawa, Satoshi Miwa',  
'Chiyako Koishikawa, Takuji Kijima',  
'Chiyako Koishikawa, Tsutomu Rokutanda',  
'Chiyako Koishikawa, Youji Matsuura',  
'Chiyako Koishikawa, Yuu Matsuura',  
'Ginta Suou, Jin Koishikawa',  
'Ginta Suou, Meiko Akizuki',  
'Ginta Suou, Miki Koishikawa',  
'Ginta Suou, Namura',  
'Ginta Suou, Rumi Matsuura',  
'Ginta Suou, Ryoko Momoi',  
'Ginta Suou, Satoshi Miwa',  
'Ginta Suou, Takuji Kijima',  
'Ginta Suou, Tsutomu Rokutanda',  
'Ginta Suou, Youji Matsuura',  
'Ginta Suou, Yuu Matsuura',  
'Jin Koishikawa, Meiko Akizuki',  
'Jin Koishikawa, Miki Koishikawa',  
'Jin Koishikawa, Namura',  
'Jin Koishikawa, Rumi Matsuura',  
'Jin Koishikawa, Ryoko Momoi',  
'Jin Koishikawa, Satoshi Miwa',  
'Jin Koishikawa, Takuji Kijima',  
'Jin Koishikawa, Tsutomu Rokutanda',  
'Jin Koishikawa, Youji Matsuura',  
'Jin Koishikawa, Yuu Matsuura',  
'Meiko Akizuki, Miki Koishikawa',  
'Meiko Akizuki, Namura',  
'Meiko Akizuki, Rumi Matsuura',  
'Meiko Akizuki, Ryoko Momoi',  
'Meiko Akizuki, Satoshi Miwa',  
'Meiko Akizuki, Takuji Kijima',  
'Meiko Akizuki, Tsutomu Rokutanda',  
'Meiko Akizuki, Youji Matsuura',  
'Meiko Akizuki, Yuu Matsuura',  
'Miki Koishikawa, Namura',  
'Miki Koishikawa, Rumi Matsuura',  
'Miki Koishikawa, Ryoko Momoi',  
'Miki Koishikawa, Satoshi Miwa',  
'Miki Koishikawa, Takuji Kijima',  
'Miki Koishikawa, Tsutomu Rokutanda',  
'Miki Koishikawa, Youji Matsuura',  
'Miki Koishikawa, Yuu Matsuura',  
'Namura, Rumi Matsuura',

'Namura, Ryoko Momoi',  
 'Namura, Satoshi Miwa',  
 'Namura, Takuji Kijima',  
 'Namura, Tsutomu Rokutanda',  
 'Namura, Youji Matsuura',  
 'Namura, Yuu Matsuura',  
 'Rumi Matsuura, Ryoko Momoi',  
 'Rumi Matsuura, Satoshi Miwa',  
 'Rumi Matsuura, Takuji Kijima',  
 'Rumi Matsuura, Tsutomu Rokutanda',  
 'Rumi Matsuura, Youji Matsuura',  
 'Rumi Matsuura, Yuu Matsuura',  
 'Ryoko Momoi, Satoshi Miwa',  
 'Ryoko Momoi, Takuji Kijima',  
 'Ryoko Momoi, Tsutomu Rokutanda',  
 'Ryoko Momoi, Youji Matsuura',  
 'Ryoko Momoi, Yuu Matsuura',  
 'Satoshi Miwa, Takuji Kijima',  
 'Satoshi Miwa, Tsutomu Rokutanda',  
 'Satoshi Miwa, Youji Matsuura',  
 'Satoshi Miwa, Yuu Matsuura',  
 'Takuji Kijima, Tsutomu Rokutanda',  
 'Takuji Kijima, Youji Matsuura',  
 'Takuji Kijima, Yuu Matsuura',  
 'Tsutomu Rokutanda, Youji Matsuura',  
 'Tsutomu Rokutanda, Yuu Matsuura',  
 'Youji Matsuura, Yuu Matsuura',  
 'Arimi Suzuki, Chiyako Koishikawa, Ginta Suou',  
 'Arimi Suzuki, Chiyako Koishikawa, Jin Koishikawa',  
 'Arimi Suzuki, Chiyako Koishikawa, Meiko Akizuki',  
 'Arimi Suzuki, Chiyako Koishikawa, Miki Koishikawa',  
 'Arimi Suzuki, Chiyako Koishikawa, Namura',  
 'Arimi Suzuki, Chiyako Koishikawa, Rumi Matsuura',  
 'Arimi Suzuki, Chiyako Koishikawa, Ryoko Momoi',  
 'Arimi Suzuki, Chiyako Koishikawa, Satoshi Miwa',  
 'Arimi Suzuki, Chiyako Koishikawa, Takuji Kijima',  
 'Arimi Suzuki, Chiyako Koishikawa, Tsutomu Rokutanda',  
 'Arimi Suzuki, Chiyako Koishikawa, Youji Matsuura',  
 'Arimi Suzuki, Chiyako Koishikawa, Yuu Matsuura',  
 'Arimi Suzuki, Ginta Suou, Jin Koishikawa',  
 'Arimi Suzuki, Ginta Suou, Meiko Akizuki',  
 'Arimi Suzuki, Ginta Suou, Miki Koishikawa',  
 'Arimi Suzuki, Ginta Suou, Namura',  
 'Arimi Suzuki, Ginta Suou, Rumi Matsuura',  
 'Arimi Suzuki, Ginta Suou, Ryoko Momoi',  
 'Arimi Suzuki, Ginta Suou, Satoshi Miwa',  
 'Arimi Suzuki, Ginta Suou, Takuji Kijima',

'Arimi Suzuki, Ginta Suou, Tsutomu Rokutanda',  
'Arimi Suzuki, Ginta Suou, Youji Matsuura',  
'Arimi Suzuki, Ginta Suou, Yuu Matsuura',  
'Arimi Suzuki, Jin Koishikawa, Meiko Akizuki',  
'Arimi Suzuki, Jin Koishikawa, Miki Koishikawa',  
'Arimi Suzuki, Jin Koishikawa, Namura',  
'Arimi Suzuki, Jin Koishikawa, Rumi Matsuura',  
'Arimi Suzuki, Jin Koishikawa, Ryoko Momoi',  
'Arimi Suzuki, Jin Koishikawa, Satoshi Miwa',  
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[24]: {x:sorted_dict[x]for x in relations if x in sorted_dict.keys()}
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[25]: final_dict = {k: v for k, v in sorted({x:sorted_dict[x] for x in relations if x_
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'Meiko Akizuki, Yuu Matsuura': 3,
'Miki Koishikawa, Namura': 3,
'Arimi Suzuki, Ginta Suou, Miki Koishikawa': 3,
'Arimi Suzuki, Miki Koishikawa, Yuu Matsuura': 3,
'Ginta Suou, Meiko Akizuki, Miki Koishikawa': 3,
'Miki Koishikawa, Takuji Kijima, Yuu Matsuura': 3,
'Chiyako Koishikawa, Miki Koishikawa': 2,
'Chiyako Koishikawa, Rumi Matsuura': 2,
'Miki Koishikawa, Rumi Matsuura': 2,
'Miki Koishikawa, Takuji Kijima': 2,
'Ginta Suou, Tsutomu Rokutanda, Yuu Matsuura': 2,
'Jin Koishikawa, Miki Koishikawa, Rumi Matsuura': 2,
'Ginta Suou, Namura': 1,
'Namura, Yuu Matsuura': 1,
'Satoshi Miwa, Yuu Matsuura': 1,
'Takuji Kijima, Tsutomu Rokutanda': 1,
'Arimi Suzuki, Ginta Suou, Yuu Matsuura': 1,
'Chiyako Koishikawa, Jin Koishikawa, Rumi Matsuura': 1,
'Chiyako Koishikawa, Miki Koishikawa, Yuu Matsuura': 1,
'Ginta Suou, Meiko Akizuki, Yuu Matsuura': 1,
'Ginta Suou, Miki Koishikawa, Namura': 1,
'Ginta Suou, Miki Koishikawa, Tsutomu Rokutanda': 1,
```

```
'Ginta Suou, Miki Koishikawa, Yuu Matsuura': 1,
'Miki Koishikawa, Namura, Yuu Matsuura': 1,
'Namura, Ryoko Momoi, Takuji Kijima': 1}
```

```
[26]: x = final_dict.copy()
for key in x.keys():
    keys = key.split(' ')
    if len(keys)==3:
        if keys[0]+' '+keys[1] in x.keys():
            final_dict[keys[0]+' '+keys[1]] +=1
        else:
            final_dict[keys[0]+' '+keys[1]]=1

        if keys[0]+' '+keys[2] in x.keys():
            final_dict[keys[0]+' '+keys[2]] +=1
        else:
            final_dict[keys[0]+' '+keys[2]]=1

        if keys[1]+' '+keys[2] in x.keys():
            final_dict[keys[1]+' '+keys[2]] +=1
        else:
            final_dict[keys[1]+' '+keys[2]]=1
```

```
[27]: #Importación de la libreria Networkx para el dibujado de grafos

import networkx as nx
plt.figure(figsize=(25,20))
G = nx.Graph()
i=1
list_d = final_dict.keys()
for key in list_d:
    if len(key.split(' '))==2:
        key1,key2 = key.split(' ')
        key1,key2 = key1.strip(),key2.strip()
        G.add_edge(key1.strip(), key2.strip(), weight=final_dict[key])
        i+=1

options = {"edgecolors": "tab:blue", "node_size": 30000, "alpha": 0.75}

# Se declaran dos tipos de bordes según su orden de importancia
elarge = [(u, v) for (u, v, d) in G.edges(data=True) if d['weight'] > 10]
esmall = [(u, v) for (u, v, d) in G.edges(data=True) if d['weight'] <= 10]

# Posiciones para todos los nodos
pos = nx.spring_layout(G)

# Nodos
```

```

nx.draw_networkx_nodes(G, pos, node_color=range(13), **options)

# Dibujo de los bordes
nx.draw_networkx_edges(G, pos, edgelist=esmall, width=4, alpha=1,
    ↪edge_color='blue')
nx.draw_networkx_edges(G, pos, edgelist=elarge, width=4, alpha=1,
    ↪edge_color='green')

all_weights=[]
for (node1,node2,data) in G.edges(data=True):
    all_weights.append(data['weight'])
unique_weights = list(set(all_weights))
for weight in unique_weights:
    #4 d. Se forma una lista filtrada
    weighted_edges = [(node1,node2) for (node1,node2,edge_attr) in G.
    ↪edges(data=True) if edge_attr['weight']==weight]
    width = weight*len(sorted_chars)*4.0/sum(all_weights)
    nx.draw_networkx_edges(G,pos,edgelist=weighted_edges,width=width)

# Etiquetas
nx.draw_networkx_labels(G, pos, font_size=18,
    ↪font_family='verdana',font_weight='bold',font_color='white')

ax = plt.gca()
ax.margins(0.001)

plt.tight_layout()
plt.axis('off')

plt.show()

```

