



# IMT 2200 - Introducción a Ciencia de Datos

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Instituto de Ingeniería Matemática y Computacional  
Semestre 2023-1

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## Clase 04: Trabajo con Datos Semi Estructurados

Este ejercicio busca que los estudiantes aprendan a usar librerías en Python para la gestión y exploración de datos semi estructurados.

### 1. Datos para los ejemplos

Usaremos dos conjuntos de datos para este Notebook:

1. Datos de Yelp sobre restaurantes de Santiago:  
Estos datos fueron proporcionados por la profesora Paula Aguirre y están en el archivo `restaurants.json` en la carpeta de `data`.
2. Datos de conciertos de la Filarmónica de NY:  
La orquesta filarmónica de Nueva York, ha puesto a disposición del público los datos de las más de 20,000 presentaciones que han hecho desde el 7 de diciembre de 1842, contando con una base de más de 180 años de presentaciones. La base de datos original puede ser accedida en forma interactiva en <https://archives.nyphil.org/performancehistory/#program.op> y la base completa está disponible en el sitio de GitHub de la Filarmónica: <https://github.com/nyphilarchive/PerformanceHistory>

### 2. Manipulación de datos en formato json

Uno de los formatos preferidos para datos semi estructurados es el formato json. Python cuenta con una librería especial para trabajar con este tipo de formato: <https://docs.python.org/3/library/json.html> y nos permite leer y escribir en este formato entre otras cosas.

A continuación cargaremos las librerías necesarias para este ejercicio.

```
In [1]: import matplotlib.pyplot as plt
import numpy as np
import pandas as pd
import json
```

```
In [2]: %cd data
```

```
C:\Users\rodri\OneDrive\Personal\UC\courses\IMC pregrado\imt2200 introducción a ciencia de datos\lectures\clase
04\data
```

### 3. Introducción a json

#### 3.1 Creando un set de datos simple

Armemos una lista de curso de alumnos en la universidad por generación, incorporando datos adicionales, como profesores y notas cuando estén estas disponibles. Comenzaremos con un `list` en Python para almacenar cada generación.

```
In [3]: json_list = [
    {
        'class': 'Year 1',
        'student count': 35,
        'room': 'A2',
        'info': {
            'teachers': {
                'math': 'Emmy Noether',
                'physics': 'Richard Feynman'
            }
        },
        'students': [
            {
                'name': 'Mary',
                'sex': 'F',
                'grades': { 'math': 75, 'physics': 98 }
            }
        ]
    }
]
```

```

        'name': 'James',
        'sex': 'M',
        'grades': { 'math': 80, 'physics': 78 }
    },
]
},
{
    'class': 'Year 2',
    'student count': 28,
    'room': 'A4',
    'info': {
        'teachers': {
            'math': 'Alan Turing',
            'physics': 'Vera Rubin'
        }
    },
    'students': [
        { 'name': 'Tony', 'sex': 'M' },
        { 'name': 'Jacqueline', 'sex': 'F' },
    ]
},
]

```

In [4]: `json_list[0]`

```

Out[4]: {'class': 'Year 1',
        'student count': 35,
        'room': 'A2',
        'info': {'teachers': {'math': 'Emmy Noether', 'physics': 'Richard Feynman'}},
        'students': [{'name': 'Mary',
                        'sex': 'F',
                        'grades': {'math': 75, 'physics': 98}},
                     {'name': 'James', 'sex': 'M', 'grades': {'math': 80, 'physics': 78}}]}

```

In [5]: `json_list[0].keys()`

```

Out[5]: dict_keys(['class', 'student count', 'room', 'info', 'students'])

```

In [6]: `json_list[0]['class']`

```

Out[6]: 'Year 1'

```

In [7]: `json_list[0]['students']`

```

Out[7]: [{'name': 'Mary', 'sex': 'F', 'grades': {'math': 75, 'physics': 98}},
         {'name': 'James', 'sex': 'M', 'grades': {'math': 80, 'physics': 78}}]

```

Usando Pandas podemos intentar transformar un archivo json en un DataFrame estructurado:

In [8]: `df = pd.DataFrame(json_list)`  
`df.head()`

```

Out[8]:
   class  student count  room  info  students
0  Year 1             35   A2  {'teachers': {'math': 'Emmy Noether', 'physics...  [{'name': 'Mary', 'sex': 'F', 'grades': {'math...
1  Year 2             28   A4  {'teachers': {'math': 'Alan Turing', 'physics...  [{'name': 'Tony', 'sex': 'M'}, {'name': 'Jacqu...

```

In [9]: `df['students']`

```

Out[9]:
0    [{'name': 'Mary', 'sex': 'F', 'grades': {'math...
1    [{'name': 'Tony', 'sex': 'M'}, {'name': 'Jacqu...
Name: students, dtype: object

```

In [10]: `df['students'][0]`

```

Out[10]: [{'name': 'Mary', 'sex': 'F', 'grades': {'math': 75, 'physics': 98}},
         {'name': 'James', 'sex': 'M', 'grades': {'math': 80, 'physics': 78}}]

```

In [11]: `df['students'][0][0]`

```

Out[11]: {'name': 'Mary', 'sex': 'F', 'grades': {'math': 75, 'physics': 98}}

```

## 3.2 Transformando un json en un DataFrame

El comando anterior no nos generó un DataFrame muy útil, pues muchos de los elementos son diccionarios adentro de una posición.

Una característica común del formato `json`, y es porque los usamos, es que pueden ser anidado: el valor de un atributo pueden ser un nuevo diccionario, o una lista de diccionarios. Este tipo de datos anidados es más conveniente de utilizar en formato "aplanado" o "flattened", de manera que pueda ser almacenado en un DataFrame. La librería `pandas` tiene la función `json_normalize()` que hace exactamente esto por nosotros. Pueden encontrar más detalles en: [https://pandas.pydata.org/pandas-docs/version/1.2.0/reference/api/pandas.json\\_normalize.html](https://pandas.pydata.org/pandas-docs/version/1.2.0/reference/api/pandas.json_normalize.html)

In [12]: `all_students = pd.json_normalize(json_list, sep=".")`

```
type(all_students)
```

```
Out[12]: pandas.core.frame.DataFrame
```

```
In [13]: all_students.head()
```

```
Out[13]:
```

	class	student count	room	students	info.teachers.math	info.teachers.physics
0	Year 1	35	A2	[{'name': 'Mary', 'sex': 'F', 'grades': {'math...	Emmy Noether	Richard Feynman
1	Year 2	28	A4	[{'name': 'Tony', 'sex': 'M'}, {'name': 'Jacqu...	Alan Turing	Vera Rubin

La función `json_normalize` expande automáticamente todos los diccionarios anidados. Si tenemos también listas de diccionarios (como ocurre con `students`), hay que usar el parámetro `path_record` para expandir los diccionarios contenidos dentro de la lista.

```
In [14]: all_students = pd.json_normalize(json_list, sep="_", record_path=['students'])
all_students.head()
```

```
Out[14]:
```

	name	sex	grades_math	grades_physics
0	Mary	F	75.0	98.0
1	James	M	80.0	78.0
2	Tony	M	NaN	NaN
3	Jacqueline	F	NaN	NaN

Esto nos permitió ordenar por alumno, pero nos quedó afuera mucha información asociada al alumno. Para agregarla debemos indicar, usando el parámetro `meta` la información adicional a copiar.

```
In [15]: all_students_grades = pd.json_normalize(json_list, sep="_", record_path=['students'], meta=['class', 'student co
all_students_grades.head()
```

```
Out[15]:
```

	name	sex	grades_math	grades_physics	class	student count	room	info
0	Mary	F	75.0	98.0	Year 1	35	A2	{'teachers': {'math': 'Emmy Noether', 'physics...
1	James	M	80.0	78.0	Year 1	35	A2	{'teachers': {'math': 'Emmy Noether', 'physics...
2	Tony	M	NaN	NaN	Year 2	28	A4	{'teachers': {'math': 'Alan Turing', 'physics...
3	Jacqueline	F	NaN	NaN	Year 2	28	A4	{'teachers': {'math': 'Alan Turing', 'physics...

Podemos expandir aún más la información, agregando los detalles por profesor.

```
In [16]: all_students_grades = pd.json_normalize(json_list, sep="_", record_path=['students'], meta=['class', 'student cou
all_students_grades.head()
```

```
Out[16]:
```

	name	sex	grades_math	grades_physics	class	student count	room	info_teachers_math	info_teachers_physics
0	Mary	F	75.0	98.0	Year 1	35	A2	Emmy Noether	Richard Feynman
1	James	M	80.0	78.0	Year 1	35	A2	Emmy Noether	Richard Feynman
2	Tony	M	NaN	NaN	Year 2	28	A4	Alan Turing	Vera Rubin
3	Jacqueline	F	NaN	NaN	Year 2	28	A4	Alan Turing	Vera Rubin

```
In [17]: # almacenar la información bajo este orden en un archivo json
all_students_grades.to_json('students.json')
```

## 4. Lectura de un archivo json

La librería `json` también nos permite leer este tipo de formato e importar directamente a nuestro código. Hagamos el ejemplo con los datos de restaurantes de santiago de Yelp.

```
In [18]: restaurantes = json.load(open('restaurants.json', 'r'))
type(restaurantes)
```

```
Out[18]: dict
```

```
In [19]: restaurantes
```

```
Out[19]: {'businesses': [{'id': '8N6Y3HsLXHBeFwhl00YxwQ',
  'alias': 'barrica-94-santiago',
  'name': 'Barrica 94',
  'image_url': 'https://s3-media2.fl.yelpcdn.com/bphoto/nuJa0DltnNB6J_ww3g-JyA/o.jpg',
  'is_closed': False,
  'url': 'https://www.yelp.com/biz/barrica-94-santiago?adjust_creative=GWOCZh9-BmZxtDsAjr7Gug&utm_campaign=yel
p_api_v3&utm_medium=api_v3_business_search&utm_source=GWOCZh9-BmZxtDsAjr7Gug',
  'review count': 72,
  'categories': [{'alias': 'wine_bars', 'title': 'Wine Bars'},
  {'alias': 'chilean', 'title': 'Chilean'}],
```

```

    {'alias': 'cocktailbars', 'title': 'Cocktail Bars'}],
    'rating': 4.5,
    'coordinates': {'latitude': -33.4342880070125,
    'longitude': -70.6352240592241},
    'transactions': [],
    'price': '$$',
    'location': {'address1': 'Bellavista 052',
    'address2': '',
    'address3': '',
    'city': 'Santiago',
    'zip_code': '8320000',
    'country': 'CL',
    'state': 'RM',
    'display_address': ['Bellavista 052', 'RM 8320000 Santiago', 'Chile']},
    'phone': '+5627324939',
    'display_phone': '+56 27324939',
    'distance': 1390.184857350938},
    {'id': 'KQ2D3gs9y0wIuTqoK0H04w',
    'alias': 'mestizo-santiago',
    'name': 'Mestizo',
    'image_url': 'https://s3-media3.fl.yelpcdn.com/bphoto/XBkpGrI0Rz7ZVn0Nu3TGhg/o.jpg',
    'is_closed': False,
    'url': 'https://www.yelp.com/biz/mestizo-santiago?adjust_creative=GW0CZh9-BmZxtsAjr7Gug&utm_campaign=yelp_a
pi_v3&utm_medium=api_v3_business_search&utm_source=GW0CZh9-BmZxtsAjr7Gug',
    'review_count': 52,
    'categories': [{'alias': 'chilean', 'title': 'Chilean'},
    {'alias': 'international', 'title': 'International'}],
    'rating': 4.5,
    'coordinates': {'latitude': -33.394083457956,
    'longitude': -70.600033248157},
    'transactions': [],
    'price': '$$$$ ',
    'location': {'address1': 'Av. del Bicentenario 4050',
    'address2': None,
    'address3': None,
    'city': 'Santiago',
    'zip_code': '8320000',
    'country': 'CL',
    'state': 'RM',
    'display_address': ['Av. del Bicentenario 4050',
    'RM 8320000 Santiago',
    'Chile']},
    'phone': '+56974776093',
    'display_phone': '+56 9 7477 6093',
    'distance': 6024.195624577105},
    {'id': 'y2FR-JBGie4wiW6RjtKLhg',
    'alias': 'aquí-está-coco-santiago',
    'name': 'Aquí Está Coco',
    'image_url': 'https://s3-media2.fl.yelpcdn.com/bphoto/6IkPzbpIYkumSEMofKiuFg/o.jpg',
    'is_closed': False,
    'url': 'https://www.yelp.com/biz/aqu%C3%AD-est%C3%A1-coco-santiago?adjust_creative=GW0CZh9-BmZxtsAjr7Gug&ut
m_campaign=yelp_api_v3&utm_medium=api_v3_business_search&utm_source=GW0CZh9-BmZxtsAjr7Gug',
    'review_count': 52,
    'categories': [{'alias': 'seafood', 'title': 'Seafood'}],
    'rating': 4.5,
    'coordinates': {'latitude': -33.42406349, 'longitude': -70.61662393},
    'transactions': [],
    'price': '$$$$ ',
    'location': {'address1': 'La Concepción 236',
    'address2': None,
    'address3': None,
    'city': 'Santiago',
    'zip_code': None,
    'country': 'CL',
    'state': 'RM',
    'display_address': ['La Concepción 236', 'RM Santiago', 'Chile']},
    'phone': '+5624106200',
    'display_phone': '+56 24106200',
    'distance': 2355.685975177847},
    {'id': 'FTnehJpfn5t3iq_eGcE6pg',
    'alias': 'galindo-santiago',
    'name': 'Galindo',
    'image_url': 'https://s3-media2.fl.yelpcdn.com/bphoto/GH0dcjiCfiH30f6T29sUoQ/o.jpg',
    'is_closed': False,
    'url': 'https://www.yelp.com/biz/galindo-santiago?adjust_creative=GW0CZh9-BmZxtsAjr7Gug&utm_campaign=yelp_a
pi_v3&utm_medium=api_v3_business_search&utm_source=GW0CZh9-BmZxtsAjr7Gug',
    'review_count': 57,
    'categories': [{'alias': 'chilean', 'title': 'Chilean'},
    {'alias': 'bars', 'title': 'Bars'}],
    'rating': 4.0,
    'coordinates': {'latitude': -33.433069, 'longitude': -70.634928},
    'transactions': [],
    'price': '$$',
    'location': {'address1': 'Dardignac 98',
    'address2': None,
    'address3': None,
    'city': 'Santiago',
    'zip_code': '7500000',
    'country': 'CL',

```

```

    'state': 'RM',
    'display_address': ['Dardignac 98', 'RM 7500000 Santiago', 'Chile']],
    'phone': '+56227770116',
    'display_phone': '+56 2 2777 0116',
    'distance': 1480.4705689071582},
  {'id': 'CAFL80wAGOMcPrE06uMnKA',
   'alias': 'fuente-alemana-santiago-2',
   'name': 'Fuente Alemana',
   'image_url': 'https://s3-media1.fl.yelpcdn.com/bphoto/BqZVmt0AeW8VfMvCQ8B0og/o.jpg',
   'is_closed': False,
   'url': 'https://www.yelp.com/biz/fuente-alemana-santiago-2?adjust_creative=GWOCZh9-BmZxtsAjr7Gug&utm_campaign=yelp_api_v3&utm_medium=api_v3_business_search&utm_source=GWOCZh9-BmZxtsAjr7Gug',
   'review_count': 55,
   'categories': [{'alias': 'sandwiches', 'title': 'Sandwiches'}],
   'rating': 4.5,
   'coordinates': {'latitude': -33.4375198417072,
                   'longitude': -70.6360235448149},
   'transactions': [],
   'price': '$$',
   'location': {'address1': 'Av. Libertador Bernardo O'Higgins 58',
                 'address2': None,
                 'address3': None,
                 'city': 'Santiago',
                 'zip_code': '8320000',
                 'country': 'CL',
                 'state': 'RM',
                 'display_address': ['Av. Libertador Bernardo O'Higgins 58',
                                     'RM 8320000 Santiago',
                                     'Chile']},
   'phone': '+5626393231',
   'display_phone': '+56 26393231',
   'distance': 1197.179790269262},
  {'id': '2K3dN-x3HovHld_MPh9NIw',
   'alias': 'in-pasta-santiago',
   'name': 'In Pasta',
   'image_url': 'https://s3-media2.fl.yelpcdn.com/bphoto/1Z1phb9F8d-6zmA2WFntKQ/o.jpg',
   'is_closed': False,
   'url': 'https://www.yelp.com/biz/in-pasta-santiago?adjust_creative=GWOCZh9-BmZxtsAjr7Gug&utm_campaign=yelp_api_v3&utm_medium=api_v3_business_search&utm_source=GWOCZh9-BmZxtsAjr7Gug',
   'review_count': 8,
   'categories': [{'alias': 'italian', 'title': 'Italian'}],
   'rating': 5.0,
   'coordinates': {'latitude': -33.4466879406616,
                   'longitude': -70.626129307522},
   'transactions': [],
   'price': '$$',
   'location': {'address1': 'Sta. Isabel 0395',
                 'address2': '',
                 'address3': '',
                 'city': 'Santiago',
                 'zip_code': '8150000',
                 'country': 'CL',
                 'state': 'RM',
                 'display_address': ['Sta. Isabel 0395', 'RM 8150000 Santiago', 'Chile']},
   'phone': '+56226347575',
   'display_phone': '+56 2 2634 7575',
   'distance': 316.2550555844538},
  {'id': 'ioWH5y3-c9AmZAsVabDwAA',
   'alias': 'la-burguesia-santiago',
   'name': 'La Burguesía',
   'image_url': 'https://s3-media2.fl.yelpcdn.com/bphoto/KWRy8w8X5nrufsgQa5NW3w/o.jpg',
   'is_closed': False,
   'url': 'https://www.yelp.com/biz/la-burguesia-santiago?adjust_creative=GWOCZh9-BmZxtsAjr7Gug&utm_campaign=yelp_api_v3&utm_medium=api_v3_business_search&utm_source=GWOCZh9-BmZxtsAjr7Gug',
   'review_count': 31,
   'categories': [{'alias': 'burgers', 'title': 'Burgers'},
                  {'alias': 'sandwiches', 'title': 'Sandwiches'}],
   'rating': 4.5,
   'coordinates': {'latitude': -33.420414, 'longitude': -70.609573},
   'transactions': [],
   'price': '$$',
   'location': {'address1': 'Santa Magdalena 99',
                 'address2': '',
                 'address3': '',
                 'city': 'Santiago',
                 'zip_code': '7510038',
                 'country': 'CL',
                 'state': 'RM',
                 'display_address': ['Santa Magdalena 99', 'RM 7510038 Santiago', 'Chile']},
   'phone': '+56222313407',
   'display_phone': '+56 2 2231 3407',
   'distance': 3003.568410528073},
  {'id': 'Qtni8AS93H71AfyDIisjZg',
   'alias': 'casaluz-santiago-4',
   'name': 'Casaluz',
   'image_url': 'https://s3-media4.fl.yelpcdn.com/bphoto/ilrP85Bexen0WGwL_BvS2w/o.jpg',
   'is_closed': False,
   'url': 'https://www.yelp.com/biz/casaluz-santiago-4?adjust_creative=GWOCZh9-BmZxtsAjr7Gug&utm_campaign=yelp_api_v3&utm_medium=api_v3_business_search&utm_source=GWOCZh9-BmZxtsAjr7Gug',

```

```

'review_count': 26,
'categories': [{ 'alias': 'spanish', 'title': 'Spanish'},
{ 'alias': 'bars', 'title': 'Bars'}],
'rating': 4.5,
'coordinates': { 'latitude': -33.442185, 'longitude': -70.626424},
'transactions': [],
'price': '$$$',
'location': { 'address1': 'Av. Italia 805',
'address2': '',
'address3': '',
'city': 'Santiago',
'zip_code': '7501184',
'country': 'CL',
'state': 'RM',
'display_address': ['Av. Italia 805', 'RM 7501184 Santiago', 'Chile']},
'phone': '+56229187204',
'display_phone': '+56 2 2918 7204',
'distance': 202.71734071977343},
{ 'id': 'FcQ0WD5LiJTxCZ0kGH2yww',
'alias': 'silvestre-bistró-santiago',
'name': 'Silvestre Bistró',
'image_url': 'https://s3-media1.fl.yelpcdn.com/bphoto/f1Fc26Wou2DE5IGHzkYJRA/o.jpg',
'is_closed': False,
'url': 'https://www.yelp.com/biz/silvestre-bistr%C3%B3-santiago?adjust_creative=GWOCZh9-BmZxtsAjr7Gug&utm_campaign=yelp_api_v3&utm_medium=api_v3_business_search&utm_source=GWOCZh9-BmZxtsAjr7Gug',
'review_count': 15,
'categories': [{ 'alias': 'signature_cuisine',
'title': 'Signature Cuisine'}],
'rating': 4.5,
'coordinates': { 'latitude': -33.448243, 'longitude': -70.6236202},
'transactions': [],
'price': '$$',
'location': { 'address1': 'Caupolicán 511',
'address2': '',
'address3': '',
'city': 'Santiago',
'zip_code': '',
'country': 'CL',
'state': 'RM',
'display_address': ['Caupolicán 511', 'RM Santiago', 'Chile']},
'phone': '+56991569974',
'display_phone': '+56 9 9156 9974',
'distance': 519.4119376281693},
{ 'id': 'LGwEqYL0reUsRdtqE44ITQ',
'alias': 'chipe-libre-república-independiente-del-pisco-santiago-2',
'name': 'Chipe Libre - República Independiente del Pisco',
'image_url': 'https://s3-media3.fl.yelpcdn.com/bphoto/ZXTniS5ztC85xXcerJDDZg/o.jpg',
'is_closed': False,
'url': 'https://www.yelp.com/biz/chipe-libre-rep%C3%BAblica-independiente-del-pisco-santiago-2?adjust_creative=GWOCZh9-BmZxtsAjr7Gug&utm_campaign=yelp_api_v3&utm_medium=api_v3_business_search&utm_source=GWOCZh9-BmZxtsAjr7Gug',
'review_count': 62,
'categories': [{ 'alias': 'bars', 'title': 'Bars'},
{ 'alias': 'peruvian', 'title': 'Peruvian'},
{ 'alias': 'chilean', 'title': 'Chilean'}],
'rating': 4.5,
'coordinates': { 'latitude': -33.4383392, 'longitude': -70.6411438},
'transactions': [],
'price': '$$$',
'location': { 'address1': 'José Victorino Lastarria 282',
'address2': '',
'address3': '',
'city': 'Santiago',
'zip_code': '8320156',
'country': 'CL',
'state': 'RM',
'display_address': ['José Victorino Lastarria 282',
'RM 8320156 Santiago',
'Chile']},
'phone': '+56226640584',
'display_phone': '+56 2 2664 0584',
'distance': 1567.3269069210853},
{ 'id': '9L7D68rsmWKp3ynU8xA4TQ',
'alias': 'la-mar-santiago',
'name': 'La Mar',
'image_url': 'https://s3-media4.fl.yelpcdn.com/bphoto/XU67DRi_Ep-6vPATIYaQeQ/o.jpg',
'is_closed': False,
'url': 'https://www.yelp.com/biz/la-mar-santiago?adjust_creative=GWOCZh9-BmZxtsAjr7Gug&utm_campaign=yelp_api_v3&utm_medium=api_v3_business_search&utm_source=GWOCZh9-BmZxtsAjr7Gug',
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        'zip_code': '7500000',
        'country': 'CL',
        'state': 'RM',
        'display_address': ['Constitución 136', 'RM 7500000 Santiago', 'Chile']],
    'phone': '',
    'display_phone': '',
    'distance': 1498.5204503845584},
    {'id': 'W0SMv9eCeFn2p3HhqJDzNg',
    'alias': 'la-piojera-santiago',
    'name': 'La Piojera',
    'image_url': 'https://s3-media4.fl.yelpcdn.com/bphoto/k3wRKjie3qftMI0_iEco-w/o.jpg',
    'is_closed': False,
    'url': 'https://www.yelp.com/biz/la-piojera-santiago?adjust_creative=GW0CZh9-BmZxtsAjr7Gug&utm_campaign=yelp_api_v3&utm_medium=api_v3_business_search&utm_source=GW0CZh9-BmZxtsAjr7Gug',
    'review_count': 17,
    'categories': [{'alias': 'chilean', 'title': 'Chilean'}],
    'rating': 4.0,
    'coordinates': {'latitude': -33.4335604326272,
        'longitude': -70.6519935938484},
    'transactions': [],
    'price': '$',
    'location': {'address1': 'Aillavillú 1030',
        'address2': None,
        'address3': None,
        'city': 'Santiago',
        'zip_code': '',
        'country': 'CL',
        'state': 'RM',
        'display_address': ['Aillavillú 1030', 'RM Santiago', 'Chile']],
    'phone': '+5626981682',
    'display_phone': '+56 26981682',
    'distance': 2703.52581305034},
    {'id': 'bj89DyCaI801-LPZ6QFcug',
    'alias': 'sarita-colonia-santiago-2',
    'name': 'Sarita Colonia',
    'image_url': 'https://s3-media2.fl.yelpcdn.com/bphoto/6pr2c_s5KeqJk_SisK9B6Q/o.jpg',
    'is_closed': False,
    'url': 'https://www.yelp.com/biz/sarita-colonia-santiago-2?adjust_creative=GW0CZh9-BmZxtsAjr7Gug&utm_campaign=yelp_api_v3&utm_medium=api_v3_business_search&utm_source=GW0CZh9-BmZxtsAjr7Gug',
    'review_count': 14,
    'categories': [{'alias': 'peruvian', 'title': 'Peruvian'}],
    'rating': 4.5,
    'coordinates': {'latitude': -33.4330661, 'longitude': -70.6425858},
    'transactions': [],
    'price': '$$$$',
    'location': {'address1': 'Loreto 40',
        'address2': '',
        'address3': '',
        'city': 'Santiago',
        'zip_code': '',
        'country': 'CL',
        'state': 'RM',
        'display_address': ['Loreto 40', 'RM Santiago', 'Chile']],
    'phone': '+56228813937',
    'display_phone': '+56 2 2881 3937',
    'distance': 1981.451753264516},
    {'id': 'jRi_FMiE3dbNZ9iL-jw40g',
    'alias': 'hansoban-santiago',
    'name': 'Hansoban',
    'image_url': 'https://s3-medial.fl.yelpcdn.com/bphoto/VCaF6DBiqrUZs1ABF5SfAw/o.jpg',
    'is_closed': False,
    'url': 'https://www.yelp.com/biz/hansoban-santiago?adjust_creative=GW0CZh9-BmZxtsAjr7Gug&utm_campaign=yelp_api_v3&utm_medium=api_v3_business_search&utm_source=GW0CZh9-BmZxtsAjr7Gug',
    'review_count': 14,

```

```

'categories': [{ 'alias': 'korean', 'title': 'Korean' }],
'rating': 4.0,
'coordinates': { 'latitude': -33.4310893, 'longitude': -70.6433972 },
'transactions': [],
'price': '$$$',
'location': { 'address1': 'Rio de Janeiro 248',
'address2': '',
'address3': '',
'city': 'Santiago',
'zip_code': '8420413',
'country': 'CL',
'state': 'RM',
'display_address': [ 'Rio de Janeiro 248', 'RM 8420413 Santiago', 'Chile' ] },
'phone': '+568420413',
'display_phone': '+56 8420413',
'distance': 2178.497886272044 }],
'total': 2200,
'region': { 'center': { 'longitude': -70.6256103515625,
'latitude': -33.44387694471913 } }

```

```
In [20]: restaurantes.keys()
```

```
Out[20]: dict_keys(['businesses', 'total', 'region'])
```

```
In [21]: restaurantes['total']
```

```
Out[21]: 2200
```

```
In [22]: restaurantes['region']
```

```
Out[22]: {'center': {'longitude': -70.6256103515625, 'latitude': -33.44387694471913}}
```

```
In [23]: restaurantes['businesses'][0]
```

```

Out[23]: {'id': '8N6Y3HsLXHBeFwhl00YxwQ',
'alias': 'barrica-94-santiago',
'name': 'Barrica 94',
'image_url': 'https://s3-media2.fl.yelpcdn.com/bphoto/nuJaODltnNB6J_wv3g-JyA/o.jpg',
'is_closed': False,
'url': 'https://www.yelp.com/biz/barrica-94-santiago?adjust_creative=GW0CZh9-BmZxtDsAjr7Gug&utm_campaign=yelp_api_v3&utm_medium=api_v3_business_search&utm_source=GW0CZh9-BmZxtDsAjr7Gug',
'review_count': 72,
'categories': [{ 'alias': 'wine_bars', 'title': 'Wine Bars' },
{ 'alias': 'chilean', 'title': 'Chilean' },
{ 'alias': 'cocktailbars', 'title': 'Cocktail Bars' } ],
'rating': 4.5,
'coordinates': { 'latitude': -33.4342880070125,
'longitude': -70.6352240592241 },
'transactions': [],
'price': '$$',
'location': { 'address1': 'Bellavista 052',
'address2': '',
'address3': '',
'city': 'Santiago',
'zip_code': '8320000',
'country': 'CL',
'state': 'RM',
'display_address': [ 'Bellavista 052', 'RM 8320000 Santiago', 'Chile' ] },
'phone': '+5627324939',
'display_phone': '+56 27324939',
'distance': 1390.184857350938 }

```

```
In [24]: df = pd.DataFrame(restaurantes['businesses'])
df.head()
```

Out[24]:		id	alias	name	image_url	is_closed	url	review
0	8N6Y3HsLXHBeFwhlO0YxwQ		barrica-94-santiago	Barrica 94	media2.fl.yelpcdn.com/bphoto/nuJaOD...	https://s3-	False	https://www.yelp.com/biz/barrica-94-santiago?a...
1	KQ2D3gs9y0wluTqoKOHO4w		mestizo-santiago	Mestizo	media3.fl.yelpcdn.com/bphoto/XBkpGr...	https://s3-	False	https://www.yelp.com/biz/mestizo-santiago?adju...
2	y2FR-JBGie4wiW6RjtKLhg		aquí-está-coco-santiago	Aquí Está Coco	media2.fl.yelpcdn.com/bphoto/6lkPzb...	https://s3-	False	https://www.yelp.com/biz/aqu%C3%AD-est%C3%A1-c...
3	FTnehJpfn5t3iq_eGcE6pg		galindo-santiago	Galindo	media2.fl.yelpcdn.com/bphoto/GHOdcj...	https://s3-	False	https://www.yelp.com/biz/galindo-santiago?adju...
4	CAFL80wAGOMcPrEO6uMnkA		fuelle-alemana-santiago-2	Fuente Alemana	media1.fl.yelpcdn.com/bphoto/BqZVmt...	https://s3-	False	https://www.yelp.com/biz/fuente-alemana-santia...

## 5. Conciertos de la Filarmónica de NY

Revisemos ahora un archivo JSON más grande, con los datos de los conciertos de la Orquesta Filarmónica de Nueva York.

El `json` de la filarmónica tiene el siguiente formato:

```
{
  "programs": [
    {
      "id": "38e072a7-8fc9-4f9a-8eac-3957905c0002", // GUID
      "programID": "3853", // NYP Local ID
      "orchestra": "New York Philharmonic",
      "season": "1842-43",
      "concerts": [
        {
          "eventType": "Subscription Season",
          "Location": "Manhattan, NY",
          "Venue": "Apollo Rooms",
          "Date": "1842-12-07T05:00:00Z",
          "Time": "8:00PM"
        },
        /* A program can have multiple concerts */
      ],
      "works": [
        {
          "ID": "8834*4", // e.g. "1234*1" - first part is the Work ID, second part is the NYP
          Movement ID
          "composerName": "Weber, Carl Maria Von",
          "workTitle": "OBERON",
          "movement": "\"Ozean, du Ungeheuer\" (Ocean, thou mighty monster), Reiza (Scene and
          Aria), Act II",
          "conductorName": "Timm, Henry C.",
          "soloists": [
            {
              "soloistName": "Otto, Antoinette",
              "soloistInstrument": "Soprano",
              "soloistRoles": "S"
            },
            /* more soloists, if applicable. If no soloists, this will be an empty array */
          ],
          /* a program will usually have multiple works */
        },
        {
          "ID": "0*",
          "interval": "Intermission",
          "soloists": []
        },
        /* Intermissions will also appear in the works array */
      ],
    }
  ],
}
```

```
        /* more programs */  
    ]  
}
```

```
In [25]: datos_raw = json.load(open('complete.json', 'r', encoding='UTF-8'))  
         type(datos_raw)
```

```
Out[25]: dict
```

```
In [26]: datos_raw['programs'][0].keys()
```

```
Out[26]: dict_keys(['id', 'programID', 'orchestra', 'season', 'concerts', 'works'])
```

```
In [27]: datos_raw['programs'][0]
```

```

Out[27]: {'id': '00646b9f-fec7-4ffb-9fb1-faae410bd9dc-0.1',
'programID': '3853',
'orchestra': 'New York Philharmonic',
'season': '1842-43',
'concerts': [{'eventType': 'Subscription Season',
'Location': 'Manhattan, NY',
'Venue': 'Apollo Rooms',
'Date': '1842-12-07T05:00:00Z',
'Time': '8:00PM'}],
'works': [{'ID': '52446*',
'composerName': 'Beethoven, Ludwig van',
'workTitle': 'SYMPHONY NO. 5 IN C MINOR, OP.67',
'conductorName': 'Hill, Ureli Corelli',
'soloists': []},
{'ID': '8834*4',
'composerName': 'Weber, Carl Maria Von',
'workTitle': 'OBERON',
'movement': '"Ozean, du Ungeheuer" (Ocean, thou mighty monster), Reiza (Scene and Aria), Act II',
'conductorName': 'Timm, Henry C.',
'soloists': [{'soloistName': 'Otto, Antoinette',
'soloistInstrument': 'Soprano',
'soloistRoles': 'S'}]},
{'ID': '3642*',
'composerName': 'Hummel, Johann',
'workTitle': 'QUINTET, PIANO, D MINOR, OP. 74',
'soloists': [{'soloistName': 'Scharfenberg, William',
'soloistInstrument': 'Piano',
'soloistRoles': 'A'},
{'soloistName': 'Hill, Ureli Corelli',
'soloistInstrument': 'Violin',
'soloistRoles': 'A'},
{'soloistName': 'Derwort, G. H.',
'soloistInstrument': 'Viola',
'soloistRoles': 'A'},
{'soloistName': 'Boucher, Alfred',
'soloistInstrument': 'Cello',
'soloistRoles': 'A'},
{'soloistName': 'Rosier, F. W.',
'soloistInstrument': 'Double Bass',
'soloistRoles': 'A'}]},
{'ID': '0*', 'interval': 'Intermission', 'soloists': []},
{'ID': '8834*3',
'composerName': 'Weber, Carl Maria Von',
'workTitle': 'OBERON',
'movement': 'Overture',
'conductorName': 'Etienne, Denis G.',
'soloists': []},
{'ID': '8835*1',
'composerName': 'Rossini, Gioachino',
'workTitle': 'ARMIDA',
'movement': 'Duet',
'conductorName': 'Timm, Henry C.',
'soloists': [{'soloistName': 'Otto, Antoinette',
'soloistInstrument': 'Soprano',
'soloistRoles': 'S'},
{'soloistName': 'Horn, Charles Edward',
'soloistInstrument': 'Tenor',
'soloistRoles': 'S'}]},
{'ID': '8837*6',
'composerName': 'Beethoven, Ludwig van',
'workTitle': 'FIDELIO, OP. 72',
'movement': '"In Des Lebens Fruhlingstagen...0 spur ich nicht linde," Florestan (aria)',
'conductorName': 'Timm, Henry C.',
'soloists': [{'soloistName': 'Horn, Charles Edward',
'soloistInstrument': 'Tenor',
'soloistRoles': 'S'}]},
{'ID': '8336*4',
'composerName': 'Mozart, Wolfgang Amadeus',
'workTitle': 'ABDUCTION FROM THE SERAGLIO, THE, K.384',
'movement': '"Ach Ich liebte," Konstanze (aria)',
'conductorName': 'Timm, Henry C.',
'soloists': [{'soloistName': 'Otto, Antoinette',
'soloistInstrument': 'Soprano',
'soloistRoles': 'S'}]},
{'ID': '5543*',
'composerName': 'Kalliwoda, Johann W.',
'workTitle': 'OVERTURE NO. 1, D MINOR, OP. 38',
'conductorName': 'Timm, Henry C.',
'soloists': []}]}
```

```
In [28]: datos_raw['programs'][0]['concerts']
```

```
Out[28]: [{'eventType': 'Subscription Season',
'Location': 'Manhattan, NY',
'Venue': 'Apollo Rooms',
'Date': '1842-12-07T05:00:00Z',
'Time': '8:00PM'}]
```

```
In [29]: datos_raw['programs'][0]['works']
```

```

Out[29]: [{"ID": '52446*',
  'composerName': 'Beethoven, Ludwig van',
  'workTitle': 'SYMPHONY NO. 5 IN C MINOR, OP.67',
  'conductorName': 'Hill, Ureli Corelli',
  'soloists': []},
{"ID": '8834*4',
  'composerName': 'Weber, Carl Maria Von',
  'workTitle': 'OBERON',
  'movement': '"Ozean, du Ungeheuer" (Ocean, thou mighty monster), Reiza (Scene and Aria), Act II',
  'conductorName': 'Timm, Henry C.',
  'soloists': [{'soloistName': 'Otto, Antoinette',
    'soloistInstrument': 'Soprano',
    'soloistRoles': 'S'}]},
{"ID": '3642*',
  'composerName': 'Hummel, Johann',
  'workTitle': 'QUINTET, PIANO, D MINOR, OP. 74',
  'soloists': [{'soloistName': 'Scharfenberg, William',
    'soloistInstrument': 'Piano',
    'soloistRoles': 'A'},
  {'soloistName': 'Hill, Ureli Corelli',
    'soloistInstrument': 'Violin',
    'soloistRoles': 'A'},
  {'soloistName': 'Derwort, G. H.',
    'soloistInstrument': 'Viola',
    'soloistRoles': 'A'},
  {'soloistName': 'Boucher, Alfred',
    'soloistInstrument': 'Cello',
    'soloistRoles': 'A'},
  {'soloistName': 'Rosier, F. W.',
    'soloistInstrument': 'Double Bass',
    'soloistRoles': 'A'}]},
{"ID": '0*', 'interval': 'Intermission', 'soloists': []},
{"ID": '8834*3',
  'composerName': 'Weber, Carl Maria Von',
  'workTitle': 'OBERON',
  'movement': 'Overture',
  'conductorName': 'Etienne, Denis G.',
  'soloists': []},
{"ID": '8835*1',
  'composerName': 'Rossini, Gioachino',
  'workTitle': 'ARMIDA',
  'movement': 'Duet',
  'conductorName': 'Timm, Henry C.',
  'soloists': [{'soloistName': 'Otto, Antoinette',
    'soloistInstrument': 'Soprano',
    'soloistRoles': 'S'},
  {'soloistName': 'Horn, Charles Edward',
    'soloistInstrument': 'Tenor',
    'soloistRoles': 'S'}]},
{"ID": '8837*6',
  'composerName': 'Beethoven, Ludwig van',
  'workTitle': 'FIDELIO, OP. 72',
  'movement': '"In Des Lebens Fruhlingstagen...0 spur ich nicht linde," Florestan (aria)',
  'conductorName': 'Timm, Henry C.',
  'soloists': [{'soloistName': 'Horn, Charles Edward',
    'soloistInstrument': 'Tenor',
    'soloistRoles': 'S'}]},
{"ID": '8336*4',
  'composerName': 'Mozart, Wolfgang Amadeus',
  'workTitle': 'ABDUCTION FROM THE SERAGLIO, THE, K.384',
  'movement': '"Ach Ich liebte," Konstanze (aria)',
  'conductorName': 'Timm, Henry C.',
  'soloists': [{'soloistName': 'Otto, Antoinette',
    'soloistInstrument': 'Soprano',
    'soloistRoles': 'S'}]},
{"ID": '5543*',
  'composerName': 'Kalliwoda, Johann W.',
  'workTitle': 'OVERTURE NO. 1, D MINOR, OP. 38',
  'conductorName': 'Timm, Henry C.',
  'soloists': []}]

```

```

In [30]: # tratemos de crear un DataFrame
nycphil = pd.json_normalize(datos_raw['programs'])
nycphil.head()

```

Out[30]:

		id	programID		orchestra	season		concerts		works
0		00646b9f-fec7-4ffb-9fb1-faae410bd9dc-0.1	3853		New York Philharmonic	1842-43		[{'eventType': 'Subscription Season', 'Locatio...		[{'ID': '52446*', 'composerName': 'Beethoven, ...
1		1118e84e-eb59-46cc-9119-d903375e65e6-0.1	5178		New York Philharmonic	1842-43		[{'eventType': 'Subscription Season', 'Locatio...		[{'ID': '52437*', 'composerName': 'Beethoven, ...
2		08536612-27c3-437e-9b44-def21034b06c-0.1	10785		Musicians from the New York Philharmonic	1842-43		[{'eventType': 'Special', 'Location': 'Manhatt...		[{'ID': '52364*1', 'composerName': 'Beethoven,...
3		81a3b8de-1737-4c9e-9318-b839f7c7c4c0-0.1	5887		New York Philharmonic	1842-43		[{'eventType': 'Subscription Season', 'Locatio...		[{'ID': '52434*', 'composerName': 'Beethoven, ...
4		09581bb7-8855-4965-b302-fc54cc669041-0.1	305		New York Philharmonic	1843-44		[{'eventType': 'Subscription Season', 'Locatio...		[{'ID': '52453*', 'composerName': 'Beethoven, ...

Vemos dos columnas que tienen datos anidados. Usemos la función `json_normalize` para desempacar la columna de conciertos en un nuevo DataFrame

In [31]:

```
concert_data = pd.json_normalize(data=datos_raw['programs'], record_path='concerts', meta=['id', 'orchestra'], p
concert_data.head()
```

Out[31]:

	eventType	Location	Venue	Date	Time		id	orchestra	programID	season
0	Subscription Season	Manhattan, NY	Apollo Rooms	1842-12-07T05:00:00Z	8:00PM		00646b9f-fec7-4ffb-9fb1-faae410bd9dc-0.1	New York Philharmonic	3853	1842-43
1	Subscription Season	Manhattan, NY	Apollo Rooms	1843-02-18T05:00:00Z	8:00PM		1118e84e-eb59-46cc-9119-d903375e65e6-0.1	New York Philharmonic	5178	1842-43
2	Special	Manhattan, NY	Apollo Rooms	1843-04-07T05:00:00Z	8:00PM		08536612-27c3-437e-9b44-def21034b06c-0.1	Musicians from the New York Philharmonic	10785	1842-43
3	Subscription Season	Manhattan, NY	Apollo Rooms	1843-04-22T05:00:00Z	8:00PM		81a3b8de-1737-4c9e-9318-b839f7c7c4c0-0.1	New York Philharmonic	5887	1842-43
4	Subscription Season	Manhattan, NY	Apollo Rooms	1843-11-18T05:00:00Z	None		09581bb7-8855-4965-b302-fc54cc669041-0.1	New York Philharmonic	305	1843-44

¿Cuántos conciertos han realizado desde el 7 de diciembre de 1842?

In [32]:

```
len(concert_data)
```

Out[32]: 22525

**Desafío:** Convierta el archivo `json` en un DataFrame aplanado centrado en `works` y conteste: ¿cuál es el compositor del que más piezas ha tocado la Filarmónica de NY en estos 181 años de datos? **Las tres primeras respuestas correctas tienen +0.1 en la Tarea 1.**

Posible forma de abordar el problema

La siguiente es la respuesta entregada por Benjamín Ubilla a esta pregunta, mostrando que el compositor más tocado por la Orquesta es Richard Wagner:

In [33]:

```
table = pd.json_normalize(datos_raw["programs"], record_path="works")
table
```

Out[33]:

	ID	composerName	workTitle	conductorName	soloists	movement	interval	movement._	movement.em	workTitle
0	52446*	Beethoven, Ludwig van	SYMPHONY NO. 5 IN C MINOR, OP.67	Hill, Ureli Corelli		NaN	NaN	NaN	NaN	NaN
1	8834*4	Weber, Carl Maria Von	OBERON	Timm, Henry C.	[{'soloistName': 'Otto, Antoinette', 'soloistI...	"Ozean, du Ungeheuer" (Ocean, thou mighty mons...	NaN	NaN	NaN	NaN
2	3642*	Hummel, Johann	QUINTET, PIANO, D MINOR, OP. 74	NaN	[{'soloistName': 'Scharfenberg, William', 'sol...	NaN	NaN	NaN	NaN	NaN
3	0*	NaN	NaN	NaN		NaN	Intermission	NaN	NaN	NaN
4	8834*3	Weber, Carl Maria Von	OBERON	Etienne, Denis G.		Overture	NaN	NaN	NaN	NaN
...	...	...	...	...	...	...	...	...	...	...
86003	3461*	Brahms, Johannes	TRIO, PIANO, VIOLIN, CELLO, NO. 2, C MAJOR, OP...	NaN	[{'soloistName': 'Ge, Quan', 'soloistInstrumen...	NaN	NaN	NaN	NaN	NaN
86004	50159*	Berio, Luciano	LA RITIRATA NOTTURNA DI MADRID	Salonen, Esa-Pekka		NaN	NaN	NaN	NaN	NaN
86005	13404*	Salonen, Esa-Pekka	KINEMA	Salonen, Esa-Pekka	[{'soloistName': 'McGill, Anthony', 'soloistIn...	NaN	NaN	NaN	NaN	NaN
86006	0*	NaN	NaN	NaN		NaN	Intermission	NaN	NaN	NaN
86007	52453*	Beethoven, Ludwig van	SYMPHONY NO. 7 IN A MAJOR, OP.92	Salonen, Esa-Pekka		NaN	NaN	NaN	NaN	NaN

86008 rows × 11 columns

In [34]: table["composerName"].value\_counts()

Out[34]: Wagner, Richard 4985  
Beethoven, Ludwig van 4643  
Tchaikovsky, Pyotr Ilyich 3793  
Mozart, Wolfgang Amadeus 2751  
Brahms, Johannes 2611  
...  
Redman, Donald Matthew 1  
Oliveros, Pauline 1  
Bowles, Paul 1  
Loeb, John Jacob 1  
Wyner, Yehudi 1  
Name: composerName, Length: 3017, dtype: int64

In [35]: table["composerName"].value\_counts().idxmax()

Out[35]: 'Wagner, Richard'