DSC540 Project Milestone5

Name: Madhuri Basava

Date: 08/08/2023

Import the necessary packages

In [1]:
```
import pandas as pd
import requests
import json
```

Read the ISBN values from Books_excel.csv which was cleaned and saved in Milestone2 with `books_data.to_csv("Books_excel.csv", index=False))`

In [2]:
```
books_excel_df = pd.read_csv("Books_excel.csv", index_col=None)

books_excel_df.head(5)
```

Out[2]:

	isbn13	ISBN	title	subtitle	authors	categories	
0	9780002261982	0002261987	Spider's Web	A Novel	Charles Osborne;Agatha Christie	Detective and mystery stories	http://books.google
1	9780006380832	0006380832	Empires of the Monsoon	A History of the Indian Ocean and Its Invaders	Richard Hall	Africa, East	http://books.google
2	9780006470229	000647022X	The Gap Into Madness	Chaos and Order	Stephen R. Donaldson	Hyland, Morn (Fictitious character)	http://books.google
3	9780006499626	0006499627	Miss Marple	The Complete Short Stories	Agatha Christie	Detective and mystery stories, English	http://books.google
4	9780006551812	0006551815	'Tis	A Memoir	Frank McCourt	Ireland	http://books.google

Load Excel dataset into SQL Lite table(excel_table)

In [3]:

```
import sqlite3
conn = sqlite3.connect('database.db')

books_excel_df.to_sql('excel_table', conn, if_exists='replace', index=False)
c = conn.cursor()
```

In [4]:

```
excel_table = c.execute("SELECT * FROM excel_table")
names = [description[0] for description in excel_table.description]
print(names)  #print the headers of person table

# print the first row in excel_table
for row in excel_table:
    print(row)
    break
```

```
['isbn13', 'ISBN', 'title', 'subtitle', 'authors', 'categories', 'thumbnail', 'des
cription', 'published_year', 'average_rating', 'num_pages', 'ratings_count', 'Rati
ng', 'Average Ratings Count']
(9780002261982, '0002261987', "Spider's Web", 'A Novel', 'Charles Osborne;Agatha C
hristie', 'Detective and mystery stories', 'http://books.google.com/books/content?
id=gA5GPgAACAAJ&printsec=frontcover&img=1&zoom=1&source=gbs_api', "A new 'Christie
for Christmas' -- a full-length novel adapted from her acclaimed play by Charles O
sborne Following BLACK COFFEE and THE UNEXPECTED GUEST comes the final Agatha Chri
stie play novelisation, bringing her superb storytelling to a new legion of fans.
Clarissa, the wife of a Foreign Office diplomat, is given to daydreaming. 'Supposi
ng I were to come down one morning and find a dead body in the library, what shoul
d I do?' she muses. Clarissa has her chance to find out when she discovers a body
in the drawing-room of her house in Kent. Desperate to dispose of the body before
her husband comes home with an important foreign politician, Clarissa persuades he
r three house guests to become accessories and accomplices. It seems that the murd
ered man was not unknown to certain members of the house party (but which ones?),
and the search begins for the murderer and the motive, while at the same time tryi
ng to persuade a police inspector that there has been no murder at all... SPIDER'S
WEB was written in 1954 specifically for Margaret Lockwood and opened first at the
Theatre Royal Nottingham before moving to the Savoy Theatre in London on 14 Decemb
er 1954. With THE MOUSETRAP and WI", 2000.0, 3.83, 241.0, 5164.0, 'High Rating', 1
5300.78)
```

In [5]:

```
conn.close()   #Connection is closed
```

Read the `ISBN` values from Books_website.csv which was data scraped from website, cleaned and saved in Milestone3 with `books_website_df.to_csv("Books_website.csv", index=False)`

In [6]:

```
conn = sqlite3.connect('database.db')
books_website_df = pd.read_csv("Books_website.csv", index_col=None)
books_website_df.head(5)
```

Out[6]:

	ID	ISBN	Authors	Title	Publication YEAR	Average rating
0	1	439023483	Suzanne Collins	The Hunger Games	2008	4.43
1	2	439554934	J.K. Rowling, Mary GrandPré	Harry Potter and the Philosopher's Stone	1997	4.44
2	3	316015849	Stephenie Meyer	Twilight	2005	3.57
3	4	61120081	Harper Lee	To Kill a Mockingbird	1960	4.25
4	5	743273567	F. Scott Fitzgerald	The Great Gatsby	1925	3.89

Load website dataset into SQL Lite table(website_table)

In [7]:

```
books_website_df.to_sql('website_table', conn, if_exists='replace', index=False)
c = conn.cursor()
```

In [8]:

```
website_table = c.execute("SELECT * FROM website_table")
names = [description[0] for description in website_table.description]
print(names)  #print the headers of person table
for row in website_table:
    # print the first row in website_table
    print(row)
    break
```

```
['ID', 'ISBN', 'Authors', 'Title', 'Publication YEAR', 'Average rating']
(1, 439023483, 'Suzanne Collins', 'The Hunger Games', 2008, 4.43)
```

In [9]:

```
conn.close()   #Connection is closed
```

Read the data which came from calling APIs from openlibrary.org website, cleaned and saved in Milestone4 with `books_api_df.to_csv("Books_APIs_latest.csv", index=False)`

In [10]:

```
conn = sqlite3.connect('database.db')
books_api_df = pd.read_csv("Books_APIs_latest.csv", index_col=None)
books_api_df.head(5)
```

Out[10]:

	ISBN	url	key	title	
0	0002261987	https://openlibrary.org/books/OL22270808M/Spid...	/books/OL22270808M	Spider's web	
1	0006380832	https://openlibrary.org/books/OL774109M/Empire...	/books/OL774109M	Empires of the monsoon	S
2	000647022X	https://openlibrary.org/books/OL22597754M/Chao...	/books/OL22597754M	Chaos and order	St Do
3	0006499627	https://openlibrary.org/books/OL7259453M/Miss_...	/books/OL7259453M	Miss Marple	
4	0006551815	https://openlibrary.org/books/OL7260048M/'Tis	/books/OL7260048M	'Tis	

5 rows × 37 columns

Load API dataset into SQL Lite table(api_table)

In [11]:

```
books_api_df.to_sql('api_table', conn, if_exists='replace', index=False)
c = conn.cursor()
```

In [12]:

```
api_table = c.execute("SELECT * FROM api_table")
names = [description[0] for description in api_table.description]
print(names)  #print the headers of person table
```

```
['ISBN', 'url', 'key', 'title', 'authors', 'number_of_pages', 'pagination', 'by_st
atement', 'publishers', 'publish_places', 'publish_date', 'subjects', 'subject_pla
ces', 'ebooks', 'identifiers.goodreads', 'identifiers.librarything', 'identifiers.
isbn_10', 'identifiers.openlibrary', 'classifications.lc_classifications', 'cover.
small', 'cover.medium', 'cover.large', 'subtitle', 'notes', 'identifiers.lccn', 'i
dentifiers.oclc', 'classifications.dewey_decimal_class', 'subject_people', 'excerp
ts', 'identifiers.isbn_13', 'subject_times', 'links', 'identifiers.google', 'table
_of_contents', 'identifiers.amazon', 'identifiers.wikidata', 'weight']
```

In [13]:

```
for row in api_table:
    # print the first row in api_table
    print(row)
    break
```

```
('0002261987', "https://openlibrary.org/books/OL22270808M/Spider's_web", '/books/O
L22270808M', "Spider's web", 'Agatha Christie', 241.0, '241 p.', 'a novel / adapte
d by Charles Osborne from the play by Agatha Christie.', 'HarperCollins', 'Londo
n', '2000', '[{\'name\': "Diplomats\' spouses", \'url\': "https://openlibrary.org/
subjects/diplomats\'_spouses"}, {\'name\': \'Fiction\', \'url\': \'https://openlib
rary.org/subjects/fiction\'}, {\'name\': \'Detective and mystery stories\', \'url
\': \'https://openlibrary.org/subjects/detective_and_mystery_stories\'}, {\'name
\': \'English literature\', \'url\': \'https://openlibrary.org/subjects/english_li
terature\'}, {\'name\': \'Fiction, mystery & detective, general\', \'url\': \'http
s://openlibrary.org/subjects/fiction,_mystery_&_detective,_general\'}, {\'name\':
\'Crime, fiction\', \'url\': \'https://openlibrary.org/subjects/crime,_fiction
\'}]', "[{'name': 'Kent (England)', 'url': 'https://openlibrary.org/subjects/plac
e:kent_(england)'}]", '[{\'preview_url\': \'https://archive.org/details/spidersweb
0000chri\', \'availability\': \'borrow\', \'formats\': {}, \'borrow_url\': "http
s://openlibrary.org/books/OL22270808M/Spider\'s_web/borrow", \'checkedout\': Fals
e}]', "['16346']", "['191677']", "['0002261987']", "['OL22270808M']", "['PR6065.S1
65 S68 2000', 'PR6065.S15']", 'https://covers.openlibrary.org/b/id/11171222-S.jp
g', 'https://covers.openlibrary.org/b/id/11171222-M.jpg', 'https://covers.openlibr
ary.org/b/id/11171222-L.jpg', None, None, None, None, None, None, None, None, Non
e, None, None, None, None, None, None)
```

Merge the 3 dataframes into one dataframe.

In [14]:

```
combined_table = c.execute("SELECT * FROM excel_table LEFT JOIN api_table ON excel_
```

In [15]:

```
for row in combined_table:
    # print the first row in combined_table
    print(row)
    break
```

```
(9780002261982, '0002261987', "Spider's Web", 'A Novel', 'Charles Osborne;Agatha C
hristie', 'Detective and mystery stories', 'http://books.google.com/books/content?
id=gA5GPgAACAAJ&printsec=frontcover&img=1&zoom=1&source=gbs_api', "A new 'Christie
for Christmas' -- a full-length novel adapted from her acclaimed play by Charles O
sborne Following BLACK COFFEE and THE UNEXPECTED GUEST comes the final Agatha Chri
stie play novelisation, bringing her superb storytelling to a new legion of fans.
Clarissa, the wife of a Foreign Office diplomat, is given to daydreaming. 'Supposi
ng I were to come down one morning and find a dead body in the library, what shoul
d I do?' she muses. Clarissa has her chance to find out when she discovers a body
in the drawing-room of her house in Kent. Desperate to dispose of the body before
her husband comes home with an important foreign politician, Clarissa persuades he
r three house guests to become accessories and accomplices. It seems that the murd
ered man was not unknown to certain members of the house party (but which ones?),
and the search begins for the murderer and the motive, while at the same time tryi
ng to persuade a police inspector that there has been no murder at all... SPIDER'S
WEB was written in 1954 specifically for Margaret Lockwood and opened first at the
Theatre Royal Nottingham before moving to the Savoy Theatre in London on 14 Decemb
er 1954. With THE MOUSETRAP and WI", 2000.0, 3.83, 241.0, 5164.0, 'High Rating', 1
5300.78, '0002261987', "https://openlibrary.org/books/OL22270808M/Spider's_web",
'/books/OL22270808M', "Spider's web", 'Agatha Christie', 241.0, '241 p.', 'a novel
/ adapted by Charles Osborne from the play by Agatha Christie.', 'HarperCollins',
'London', '2000', '[{\'name\': "Diplomats\' spouses", \'url\': "https://openlibrar
y.org/subjects/diplomats\'_spouses"}, {\'name\': \'Fiction\', \'url\': \'https://o
penlibrary.org/subjects/fiction\'}, {\'name\': \'Detective and mystery stories\',
\'url\': \'https://openlibrary.org/subjects/detective_and_mystery_stories\'}, {\'n
ame\': \'English literature\', \'url\': \'https://openlibrary.org/subjects/english
_literature\'}, {\'name\': \'Fiction, mystery & detective, general\', \'url\': \'h
ttps://openlibrary.org/subjects/fiction,_mystery_&_detective,_general\'}, {\'name
\': \'Crime, fiction\', \'url\': \'https://openlibrary.org/subjects/crime,_fiction
\'}]', "[{'name': 'Kent (England)', 'url': 'https://openlibrary.org/subjects/plac
e:kent_(england)'}]", '[{\'preview_url\': \'https://archive.org/details/spidersweb
0000chri\', \'availability\': \'borrow\', \'formats\': {}, \'borrow_url\': "http
s://openlibrary.org/books/OL22270808M/Spider\'s_web/borrow", \'checkedout\': Fals
e}]', "['16346']", "['191677']", "['0002261987']", "['OL22270808M']", "['PR6065.S1
65 S68 2000', 'PR6065.S15']", 'https://covers.openlibrary.org/b/id/11171222-S.jp
g', 'https://covers.openlibrary.org/b/id/11171222-M.jpg', 'https://covers.openlibr
ary.org/b/id/11171222-L.jpg', None, None, None, None, None, None, None, None, Non
e, None, None, None, None, None, None, None, None, None, None, None, None)
```

In [16]:

```
#combined_df = pd.read_sql_query("SELECT * FROM excel_table LEFT JOIN api_table ON
# combine the three tables into one dataframe.
# Using is used to remove duplicate ISBN,title,and authors columns
# Distinct is used to remove any duplicate rows.
combined_df = pd.read_sql_query("SELECT DISTINCT * FROM excel_table LEFT JOIN api_t
```

In [17]:

```
combined_df
```

Out[17]:

	isbn13	ISBN	title	subtitle	authors	categories	
0	9780002261982	0002261987	Spider's Web	A Novel	Charles Osborne;Agatha Christie	Detective and mystery stories	http://book
1	9780006380832	0006380832	Empires of the Monsoon	A History of the Indian Ocean and Its Invaders	Richard Hall	Africa, East	http://book
2	9780006470229	000647022X	The Gap Into Madness	Chaos and Order	Stephen R. Donaldson	Hyland, Morn (Fictitious character)	http://book
3	9780006499626	0006499627	Miss Marple	The Complete Short Stories	Agatha Christie	Detective and mystery stories, English	http://book
4	9780006551812	0006551815	'Tis	A Memoir	Frank McCourt	Ireland	http://book
...	...	...	...	...	...	...	
2177	9783856305581	3856305580	C.G. Jung and Hermann Hesse	A Record of Two Friendships	Miguel Serrano	Psychology	http://book
2178	9784766113389	4766113381	How to Draw Manga	Girls' Life Illustration File	Kazuko Tadano	Art	http://book
2179	9784770028037	4770028032	日本語の感情表現集	Expressing Emotions in Japanese	村上真美子	Foreign Language Study	http://book
2180	9788185300535	8185300534	I Am that	Talks with Sri Nisargadatta Maharaj	Sri Nisargadatta Maharaj;Sudhakar S. Dikshit	Philosophy	http://book

	isbn13	ISBN	title	subtitle	authors	categories	
2181	9789042003408	9042003405	'I'm Telling You Stories'	Jeanette Winterson and the Politics of Reading	Helena Grice;Tim Woods	Literary Criticism	http://book

2182 rows × 51 columns

Save the combined data into `CombinedBooksData_excel.csv` file

```
In [18]: combined_df.to_csv("CombinedBooksData_excel.csv", index=False)
```

```
In [19]: combined_df.columns
```

```
Out[19]: Index(['isbn13', 'ISBN', 'title', 'subtitle', 'authors', 'categories',
               'thumbnail', 'description', 'published_year', 'average_rating',
               'num_pages', 'ratings_count', 'Rating', 'Average Ratings Count', 'url',
               'key', 'number_of_pages', 'pagination', 'by_statement', 'publishers',
               'publish_places', 'publish_date', 'subjects', 'subject_places',
               'ebooks', 'identifiers.goodreads', 'identifiers.librarything',
               'identifiers.isbn_10', 'identifiers.openlibrary',
               'classifications.lc_classifications', 'cover.small', 'cover.medium',
               'cover.large', 'subtitle', 'notes', 'identifiers.lccn',
               'identifiers.oclc', 'classifications.dewey_decimal_class',
               'subject_people', 'excerpts', 'identifiers.isbn_13', 'subject_times',
               'links', 'identifiers.google', 'table_of_contents',
               'identifiers.amazon', 'identifiers.wikidata', 'weight', 'ID',
               'Publication YEAR', 'Average rating'],
              dtype='object')
```

```
In [20]: combined_df.describe()
```

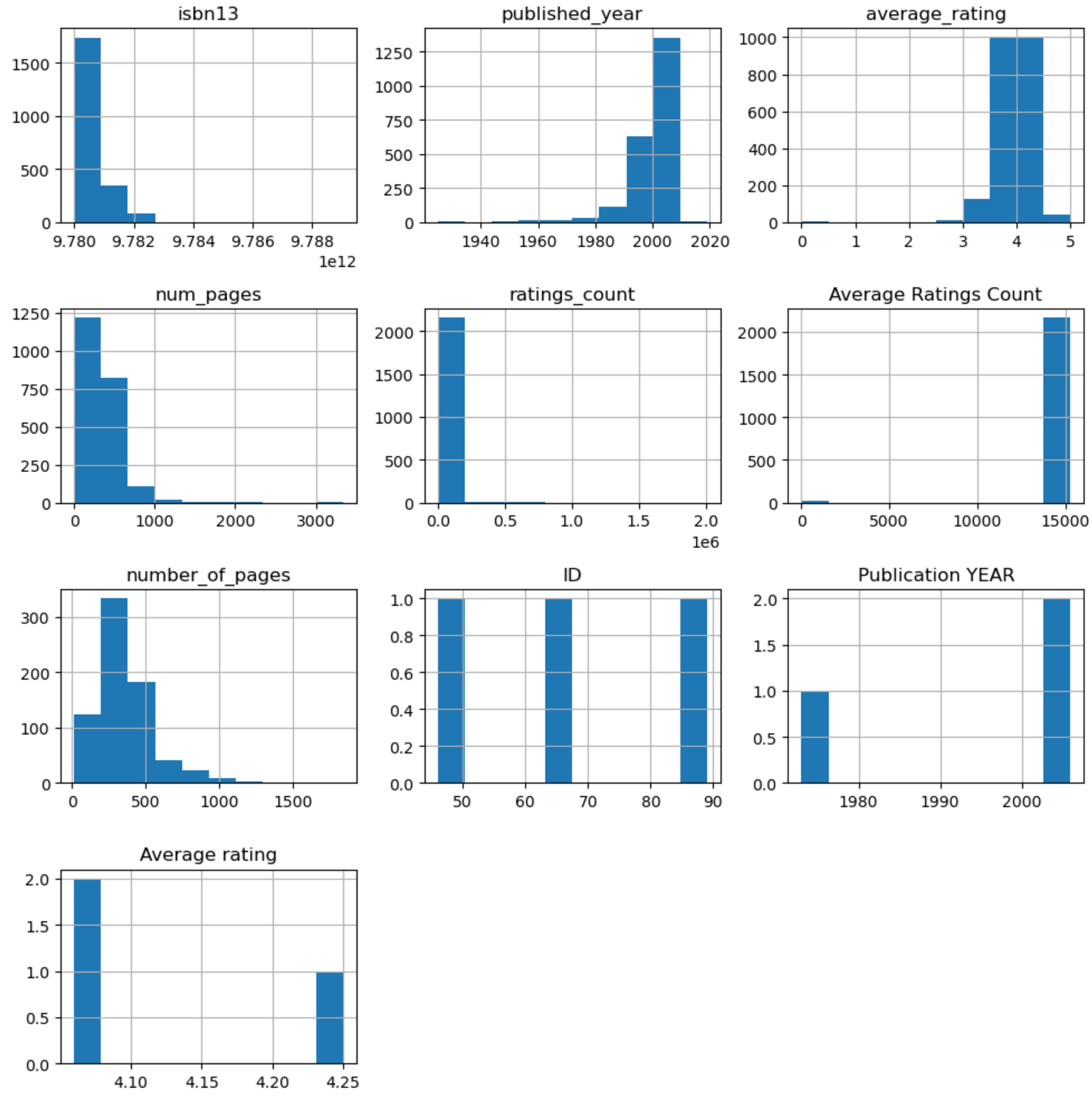
Out[20]:

	isbn13	published_year	average_rating	num_pages	ratings_count	Average Ratings Count	nu
count	2.182000e+03	2182.000000	2182.000000	2182.000000	2.182000e+03	2182.000000	
mean	9.780698e+12	1999.900092	3.945761	352.815307	1.516779e+04	15167.797062	
std	5.807179e+08	8.613783	0.331848	238.069494	8.548850e+04	1419.211210	
min	9.780002e+12	1925.000000	0.000000	0.000000	0.000000e+00	3.670000	
25%	9.780313e+12	1998.000000	3.770000	224.000000	1.202500e+02	15300.780000	
50%	9.780618e+12	2002.000000	3.980000	310.000000	6.665000e+02	15300.780000	
75%	9.780819e+12	2005.000000	4.150000	416.750000	4.653500e+03	15300.780000	
max	9.789042e+12	2019.000000	5.000000	3342.000000	2.009749e+06	15300.780000	

Create Visualizations

1) Visualization: Histograms

```
In [21]: import numpy as np
         import seaborn as sns
         import matplotlib.pylab as plt

         # creating a basic histogram
         combined_df.hist(figsize=(10, 10))
         plt.tight_layout()
         plt.show()
```

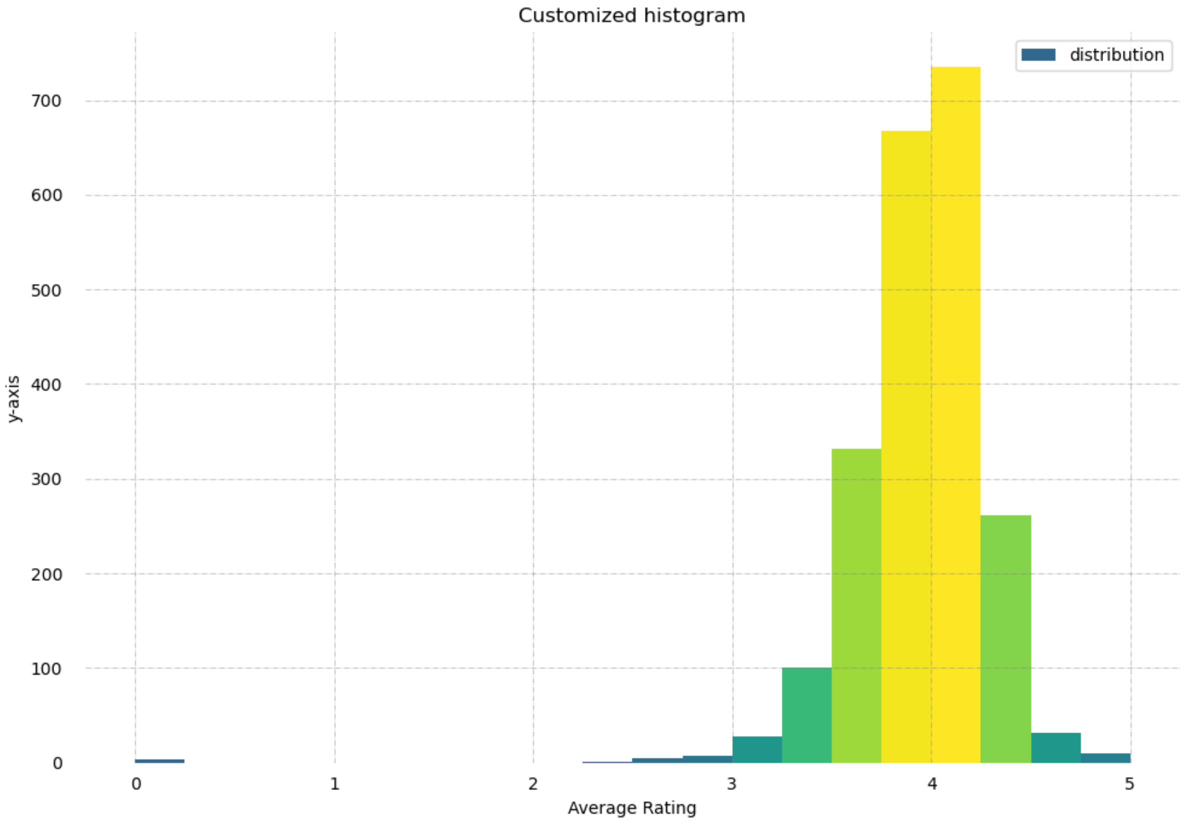


2) Visualization: Customized Histogram of Average Rating

```
In [22]: from matplotlib import colors
         from matplotlib.ticker import PercentFormatter
```

```python


# Assigning dataset points and nnumber of bins
N_points = 2182
n_bins = 20

# Creating distribution
x = combined_df['average_rating']

legend = ['distribution']

# Creating histogram
fig, axs = plt.subplots(1, 1,
    figsize =(10, 7),
    tight_layout = True)


# Removing axes splines
for s in ['top', 'bottom', 'left', 'right']:
    axs.spines[s].set_visible(False)

# Removing x, y ticks
axs.xaxis.set_ticks_position('none')
axs.yaxis.set_ticks_position('none')

# Adding padding between the axes and labels
axs.xaxis.set_tick_params(pad = 5)
axs.yaxis.set_tick_params(pad = 10)

# Adding x, y gridlines
axs.grid(b = True, color ='grey',
        linestyle ='-.', linewidth = 0.5,
        alpha = 0.6)



# Creating histogram
N, bins, patches = axs.hist(x, bins = n_bins)

# Setting color
fracs = ((N**(1 / 5)) / N.max())
norm = colors.Normalize(fracs.min(), fracs.max())

for thisfrac, thispatch in zip(fracs, patches):
    color = plt.cm.viridis(norm(thisfrac))
    thispatch.set_facecolor(color)

# Adding extra features
plt.xlabel("Average Rating")
plt.ylabel("y-axis")
plt.legend(legend)
plt.title('Customized histogram')

# Show plot
plt.show()
```

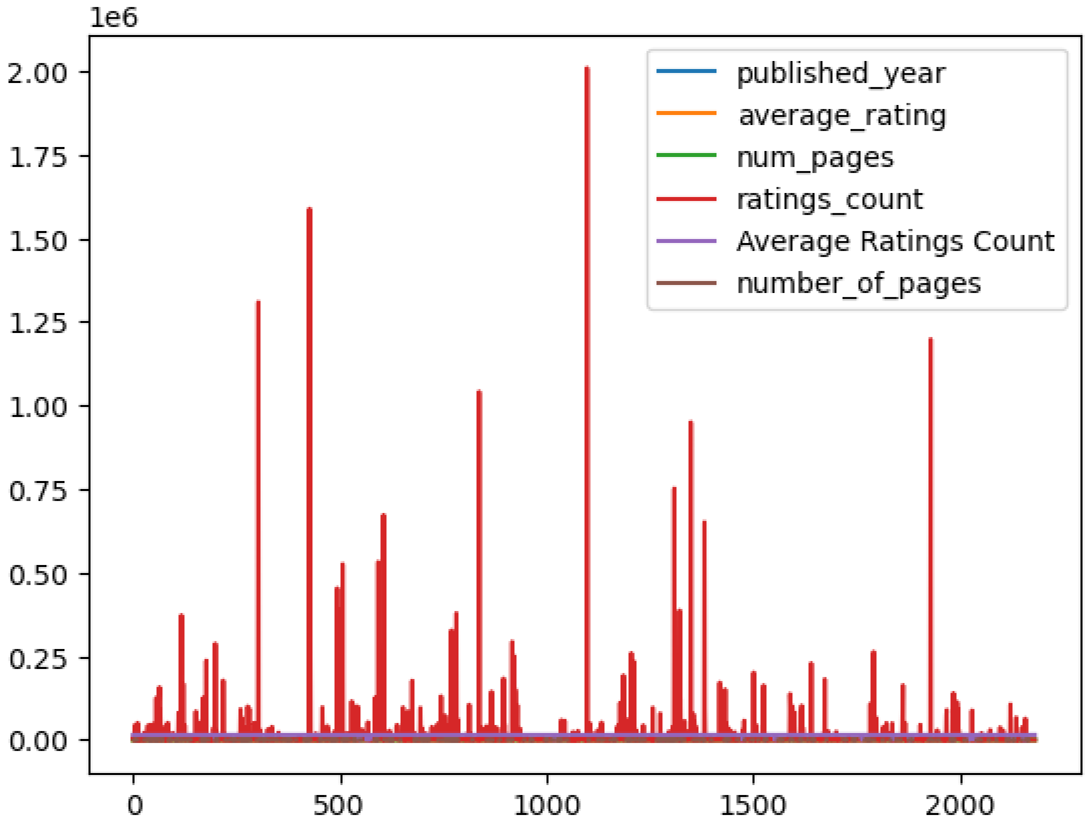
```
C:\Users\madhu\AppData\Local\Temp\ipykernel_13220\1289783236.py:33: MatplotlibDepr
ecationWarning: The 'b' parameter of grid() has been renamed 'visible' since Matpl
otlib 3.5; support for the old name will be dropped two minor releases later.
  axs.grid(b = True, color ='grey',
```



3) Visualization: Plot

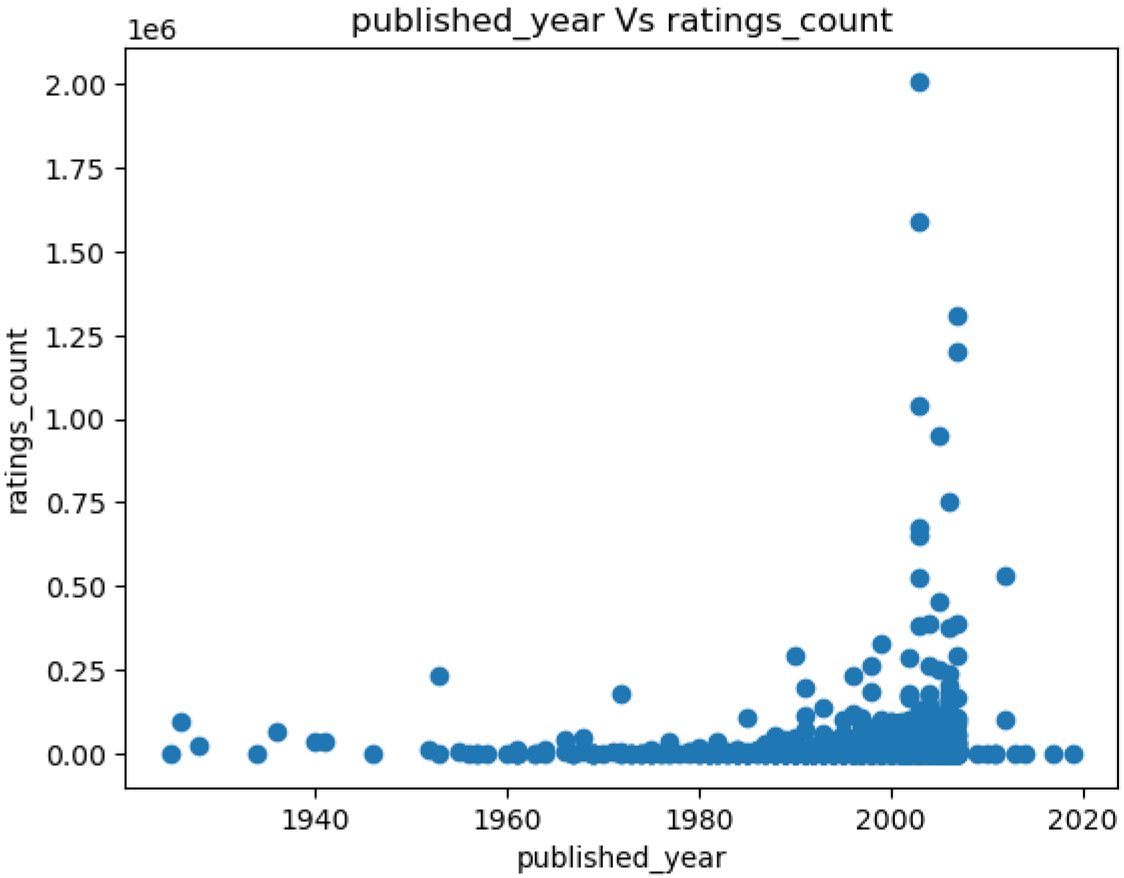
In [23]:

```
# Import the necessary packages
import pandas as pd
import matplotlib.pyplot as plt

# Take the subset of dataframe
combined_df1= combined_df[['published_year', 'average_rating',
        'num_pages', 'ratings_count', 'Average Ratings Count',
        'number_of_pages']]

# Plot the new dataframe
combined_df1.plot()
plt.show()
```



4) Visualization: Scatter Plot of published_year Vs Ratings count

In [24]:
```
plt.scatter(combined_df['published_year'],combined_df['ratings_count'])
plt.title("published_year Vs ratings_count")
plt.xlabel("published_year")
plt.ylabel("ratings_count")
plt.show()
```



The above scatterplot shows that in the years around 2000-2005, ratings count are high.

In [25]:

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


# Required columns
required_data=combined_df[["ISBN","authors","title","average_rating"]]

#sort_values in Descending order
required_data=required_data.sort_values(by="average_rating",ascending=False)
required_data=required_data.reset_index()

#top 15 ratings only (from 0 to 15th, since it's sorted in descending order)
required_data=required_data[0:15]
required_data
```

Out[25]:

	index	ISBN	authors	title	average_rating
0	1287	0739844326	Sara Barton-Wood	Bill Gates	5.00
1	1881	1551052709	Christopher D. Jiggins	Ecuador Nature Guide	5.00
2	2145	1930901356	Keith Donohue	The Irish Anatomist	5.00
3	2153	1932206086	Frederick Lenz	Insights	5.00
4	2132	1890995525	John Diamond	The Diamond Color Meditation	5.00
5	437	0310249872	Christopher J. H. Wright	Fanning the Flame	5.00
6	871	0439682584	J. K. Rowling	Harry Potter	4.78
7	1381	0751517208	Bill Watterson	It's a Magical World	4.76
8	1400	076032963X	Don Macmillan;Wayne G. Broehl	The John Deere Two-Cylinder Tractor Encyclopedia	4.75
9	1889	1556434952	Régis Debray	Empire 2.0	4.75
10	874	0439827604	J. K. Rowling	The Harry Potter Collection	4.73
11	1667	0836217691	Bill Watterson	Homicidal Psycho Jungle Cat	4.72
12	443	0310929555	Kenneth L. Barker;Donald W. Burdick	Zondervan NIV Study Bible	4.70
13	525	0312643063	James Baldwin	The Price of the Ticket	4.70
14	890	0446578274	Joyce Meyer	The Everyday Life Bible	4.70

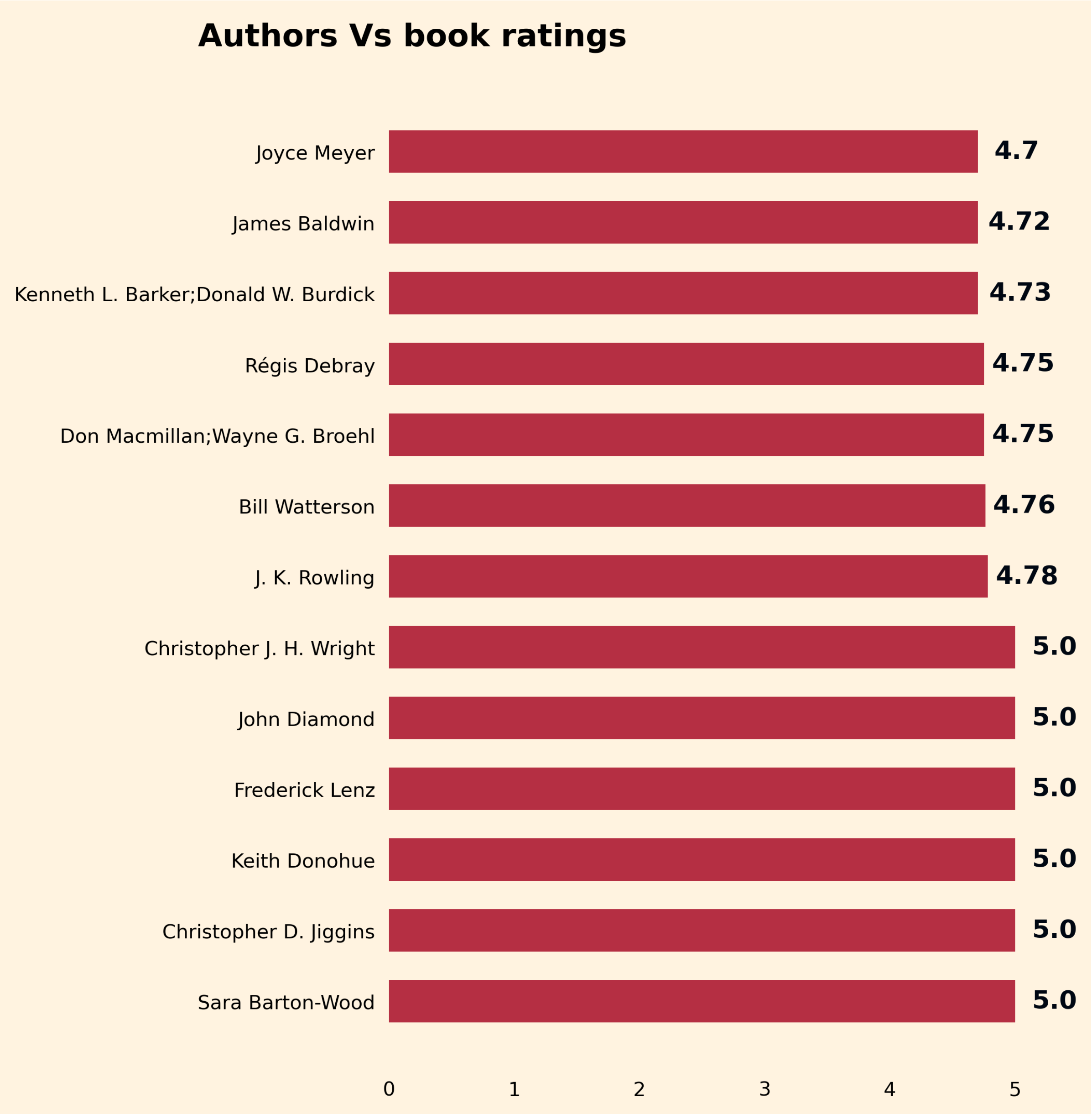
5) Visualization : Bar Graph

In [26]:

```
#creating a figure
# pip install highlight_text
fig = plt.figure(facecolor = "#fff3e0",figsize=(6,9), dpi=300)

#creating an axes
ax = plt.subplot(111,facecolor = "#fff3e0")

# specify the height of the bars
height= 0.6

# Making the horizontal barplot on the Axes
ax.barh(
    required_data["authors"],
    required_data["average_rating"],
    height=height,
    color="#b52f43"
    )
# Removing the spines
ax.spines["top"].set(visible = False)
ax.spines["bottom"].set(visible = False)
ax.spines["left"].set_visible(False)
ax.spines["right"].set_visible(False)
```

```python
#removing the ticks
ax.xaxis.set_ticks_position('none')
ax.yaxis.set_ticks_position('none')

# Annotating the bars
for index,gp90 in enumerate(required_data["average_rating"]):
      ax.annotate(
        xy = (gp90 , index),
        text = f"{gp90}",
        xytext = (20, 0),
        size = 13,
        textcoords = "offset points",
        color = "#000712",
        ha = "center",
        va = "center",
        weight = "bold"
    )
# adding fig_text import from highlight_text which was installed before
from highlight_text import fig_text

# Heading
fig_text(
        x=-0.1,y=0.93,
        s="Authors Vs book ratings",
        size=16,
        color="black",
        weight="bold",
        annotationbbox_kw={"xycoords": "figure fraction"})
```

```
Out[26]: <highlight_text.htext.HighlightText at 0x1fc236bd2e0>
```



Authors with high book ratings can be found in the above bar chart

Ethical Implications of the books data

The original book.xsls that I downloaded from the website had very large data. So, I truncated the data to get only 6810 rows to be easy for analysis. Also, I deleted many rows with NA. I would have missed many important books (for analysis). So, this book's info may be biased.

The data in the website has only 98 rows which has only 98 records of book data whose ratings are more than 3. So, the website does not contain data for low-rating or average-rating books. So, the data seems to be biased since it shows only books with higher ratings. Many other books' data is not available on this website which may be relevant for analysis. Customers may have different tastes in reading books despite low ratings. So, here we are missing the opportunity to provide these books' data.

This open Library does not have the endpoint to get all the book info at once. There is only one book data returned based on the book ISBN given as the input parameter. So, needed to make an API call for each and every book. So, I ended up making around 2000 API calls. So, I have taken the ISBN info from the previous 2 milestones and made API calls. This way, I may not have made API calls and could not have pulled other important book info which may lead to bias.

Also, I had to make around 2000 API calls which may not be a good option. Rather, I should have taken an API to return all book data simultaneously. But I chose this option because this way, I called the API with the ISBNs I already have from Excel data and website data. So, merging the three datasets got easier, and getting all the data for some ISBNs made sense. The disadvantage with this is that I would have left many other books data that customers may like.