Book Recommendation System with Machine Learning

In [31]:
```
import numpy as np
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
from sklearn.cluster import KMeans
from sklearn import neighbors
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import MinMaxScaler
import warnings
warnings.filterwarnings('ignore')
df = pd.read_csv(r'D:\BOOK\archive\books.csv',error_bad_lines = False)
df.head()
```

```
Skipping line 3350: expected 12 fields, saw 13
Skipping line 4704: expected 12 fields, saw 13
Skipping line 5879: expected 12 fields, saw 13
Skipping line 8981: expected 12 fields, saw 13
```

Out[31]:

	bookID	title	authors	average_rating	isbn	isbn13	language_code	num_pages	ratings_count	text_re
0	1	Harry Potter and the Half-Blood Prince (Harry ...	J.K. Rowling/Mary GrandPré	4.57	0439785960	9780439785969	eng	652	2095690	
1	2	Harry Potter and the Order of the Phoenix (Har...	J.K. Rowling/Mary GrandPré	4.49	0439358078	9780439358071	eng	870	2153167	
2	4	Harry Potter and the Chamber of Secrets (Harry...	J.K. Rowling	4.42	0439554896	9780439554893	eng	352	6333	
3	5	Harry Potter and the Prisoner of Azkaban (Harr...	J.K. Rowling/Mary GrandPré	4.56	043965548X	9780439655484	eng	435	2339585	
4	8	Harry Potter Boxed Set Books 1-5 (Harry Potte...	J.K. Rowling/Mary GrandPré	4.78	0439682584	9780439682589	eng	2690	41428	

Data Exploration

In [2]:
```
df.isnull().sum()
```

Out[2]:
```
bookID                0
title                 0
authors               0
average_rating        0
isbn                  0
isbn13                0
language_code         0
  num_pages           0
ratings_count         0
text_reviews_count    0
publication_date      0
publisher             0
dtype: int64
```

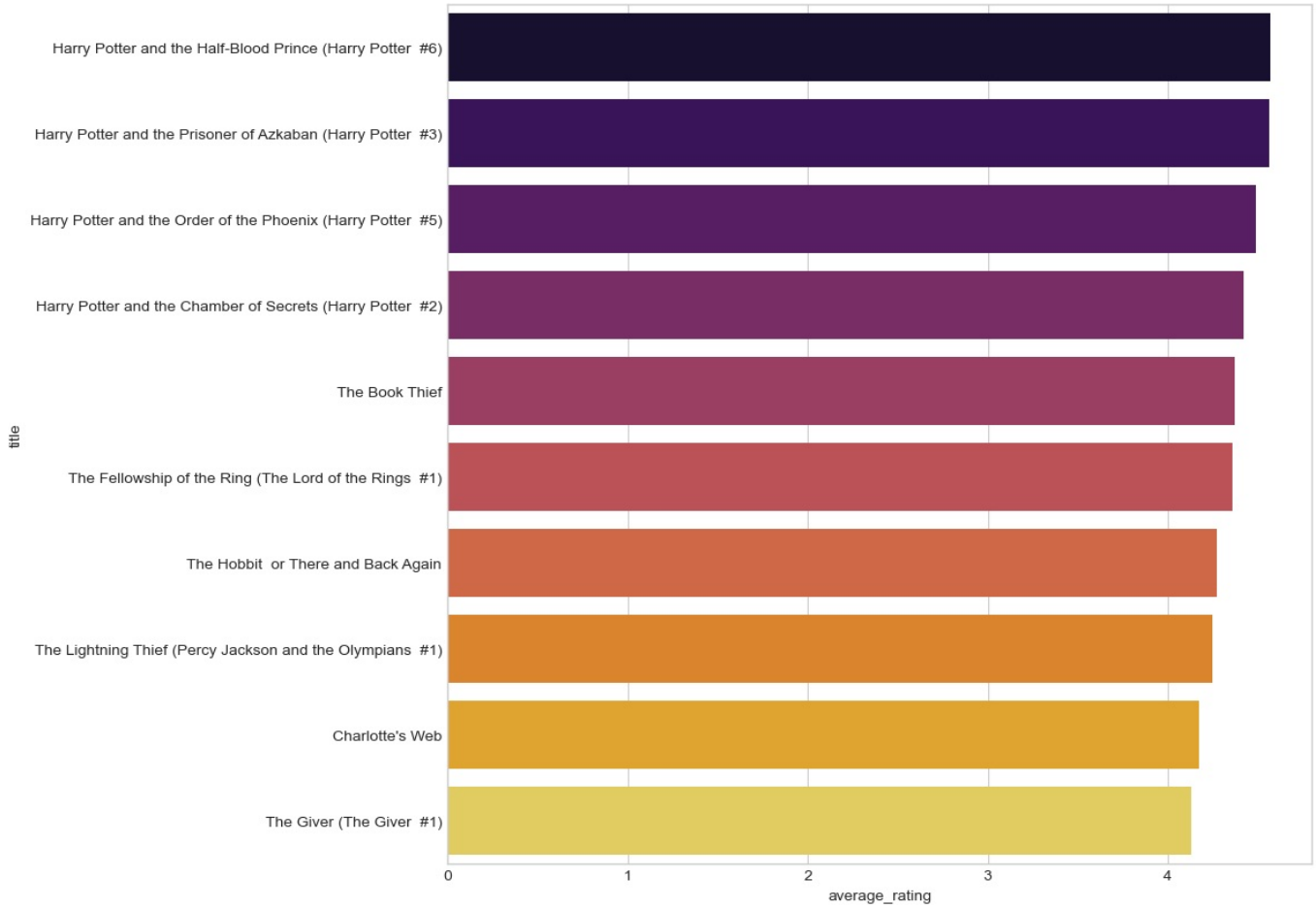
In [3]:
```
df.describe()
```

Out[3]:

	bookID	average_rating	isbn13	num_pages	ratings_count	text_reviews_count
count	11123.000000	11123.000000	1.112300e+04	11123.000000	1.112300e+04	11123.000000
mean	21310.856963	3.934075	9.759880e+12	336.405556	1.794285e+04	542.048099
std	13094.727252	0.350485	4.429758e+11	241.152626	1.124992e+05	2576.619589
min	1.000000	0.000000	8.987060e+09	0.000000	0.000000e+00	0.000000
25%	10277.500000	3.770000	9.780345e+12	192.000000	1.040000e+02	9.000000
50%	20287.000000	3.960000	9.780582e+12	299.000000	7.450000e+02	47.000000
75%	32104.500000	4.140000	9.780872e+12	416.000000	5.000500e+03	238.000000
max	45641.000000	5.000000	9.790008e+12	6576.000000	4.597666e+06	94265.000000

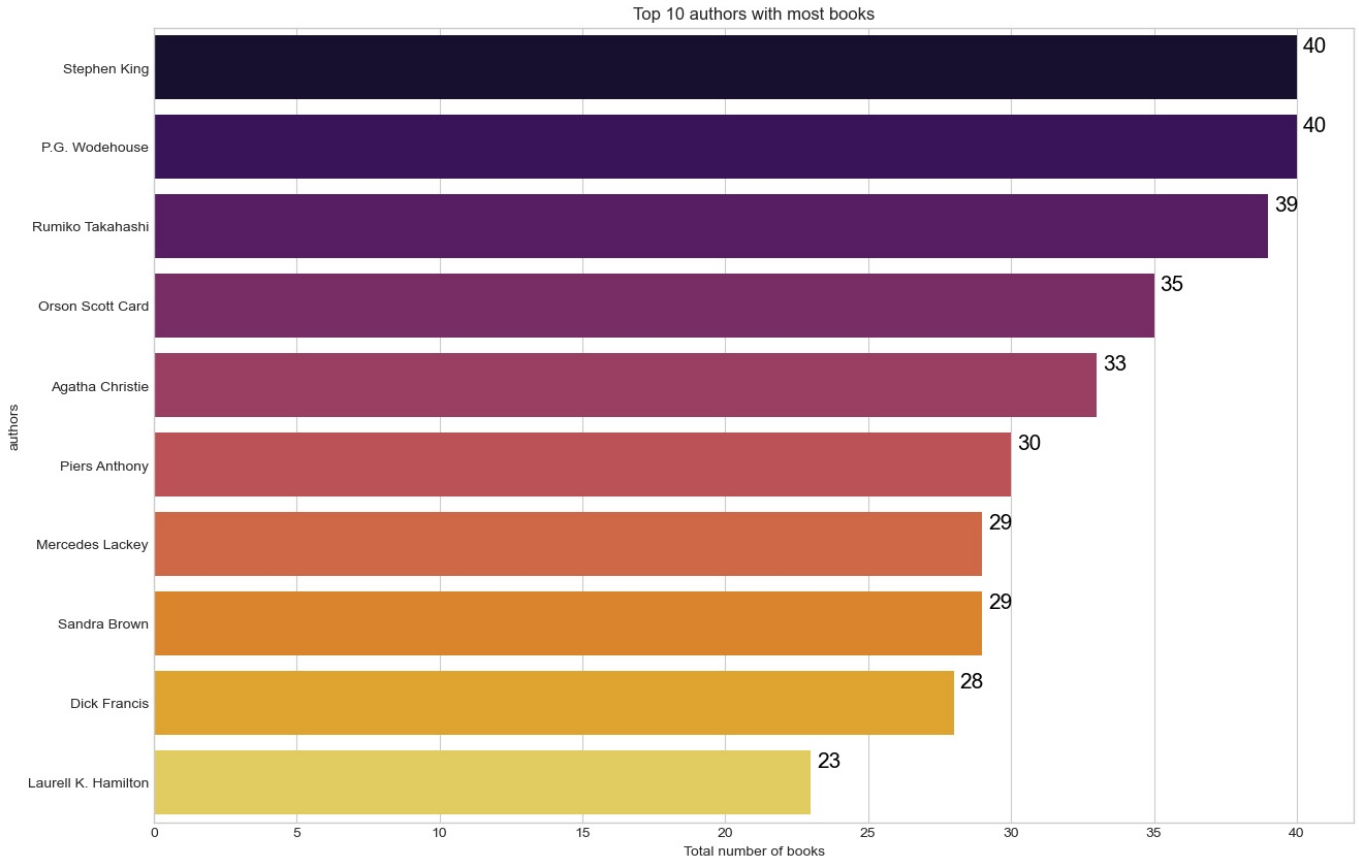
In [32]:
```
top_ten = df[df['ratings_count'] > 1000000]
top_ten.sort_values(by='average_rating', ascending=False)
plt.style.use('seaborn-whitegrid')
plt.figure(figsize=(10, 10))
data = top_ten.sort_values(by='average_rating', ascending=False).head(10)
sns.barplot(x="average_rating", y="title", data=data, palette='inferno')
```

Out[32]:
```
<Axes: xlabel='average_rating', ylabel='title'>
```



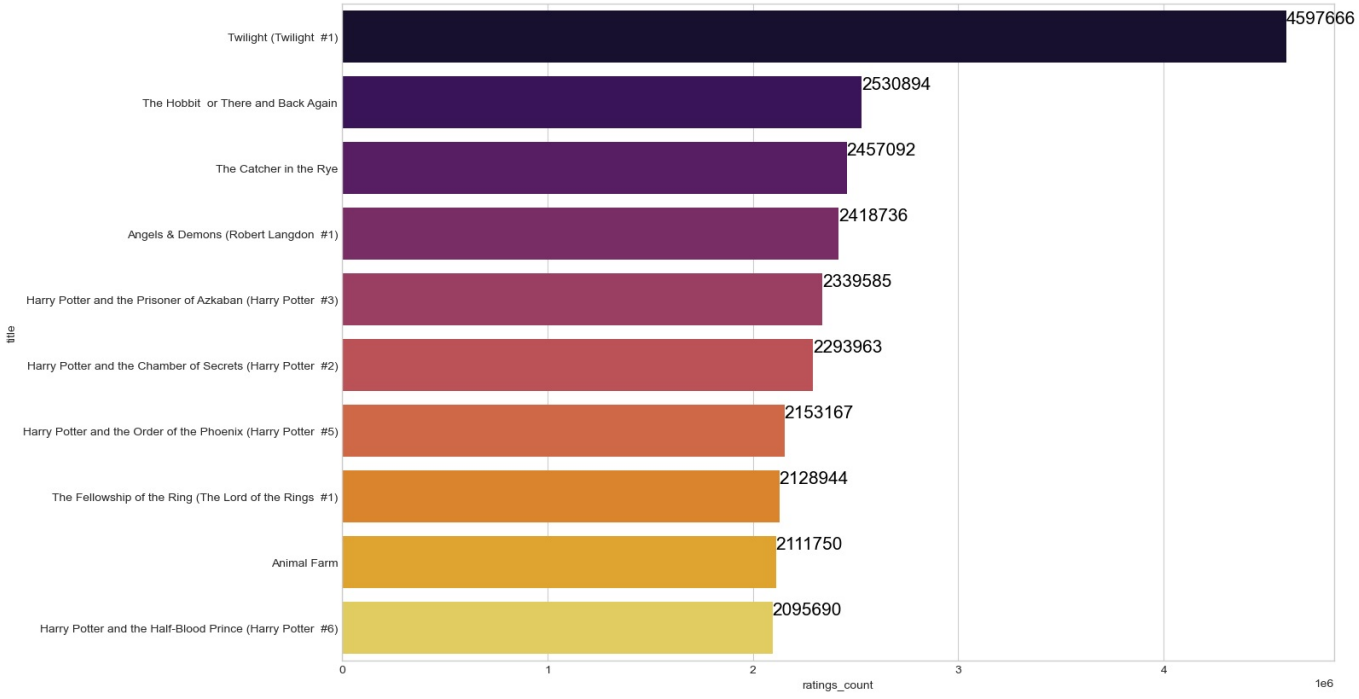
The results above show us the top 10 books in our data. We saw that the max score in our data was 5.0 but we don't see any books in the above result with a score of 5.0. Indeed, we have filtered these books according to the number of notes. We've made sure that all of the books we have in the above results have a decent rating.

In [8]:
```
most_books = df.groupby('authors')['title'].count().reset_index().sort_values('title', ascending=False).head(10
plt.figure(figsize=(15,10))
ax = sns.barplot(x=most_books['title'], y=most_books.index, palette='inferno')
ax.set_title("Top 10 authors with most books")
ax.set_xlabel("Total number of books")
totals = []
for i in ax.patches:
    totals.append(i.get_width())
total = sum(totals)
for i in ax.patches:
    ax.text(i.get_width()+.2, i.get_y()+.2,str(round(i.get_width())), fontsize=15,color='black')
plt.show()
```



from the above chart, Stephen King and P.G. Wodehouse have the most books in the data. Both authors have 40 books in our dataset followed by Rumiko Takahashi and Orson Scott Card.

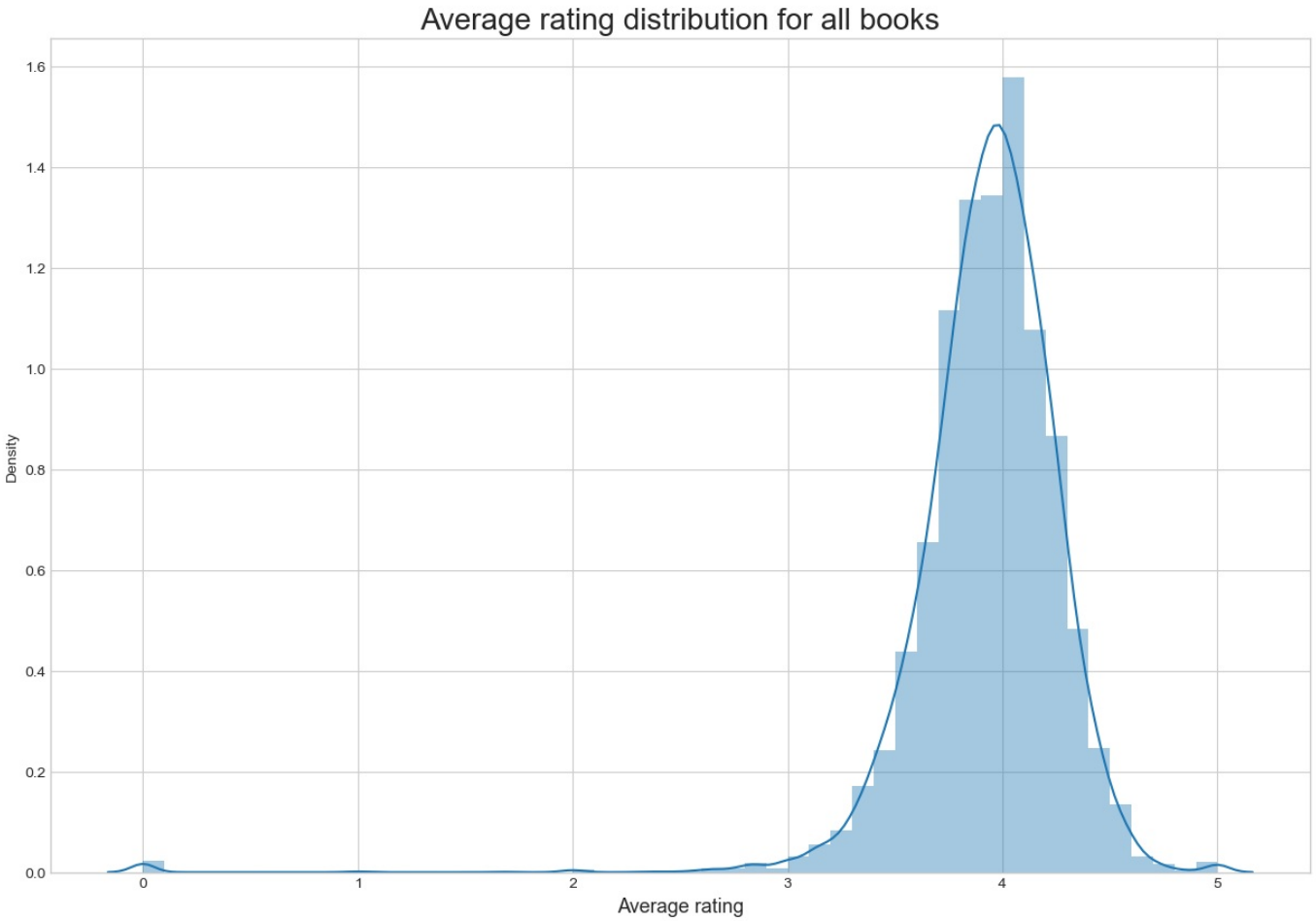
In [30]:
```
most_rated = df.sort_values('ratings_count', ascending = False).head(10).set_index('title')
plt.figure(figsize=(15,10))
ax = sns.barplot(x=most_rated['ratings_count'], y=most_rated.index, palette = 'inferno')
totals = []
for i in ax.patches:
    totals.append(i.get_width())
total = sum(totals)
for i in ax.patches:
    ax.text(i.get_width()+.2, i.get_y()+.2,str(round(i.get_width())), fontsize=15,color='black')
plt.show()
```



We can see that Twilight has been rated more times than any other book! Also, these ratings are all in the millions! So that means Twilight has been reviewed over 4 million times, followed by The Hobbit or There and Back Again and The Catcher in the Rye which has been reviewed over 2 million times.

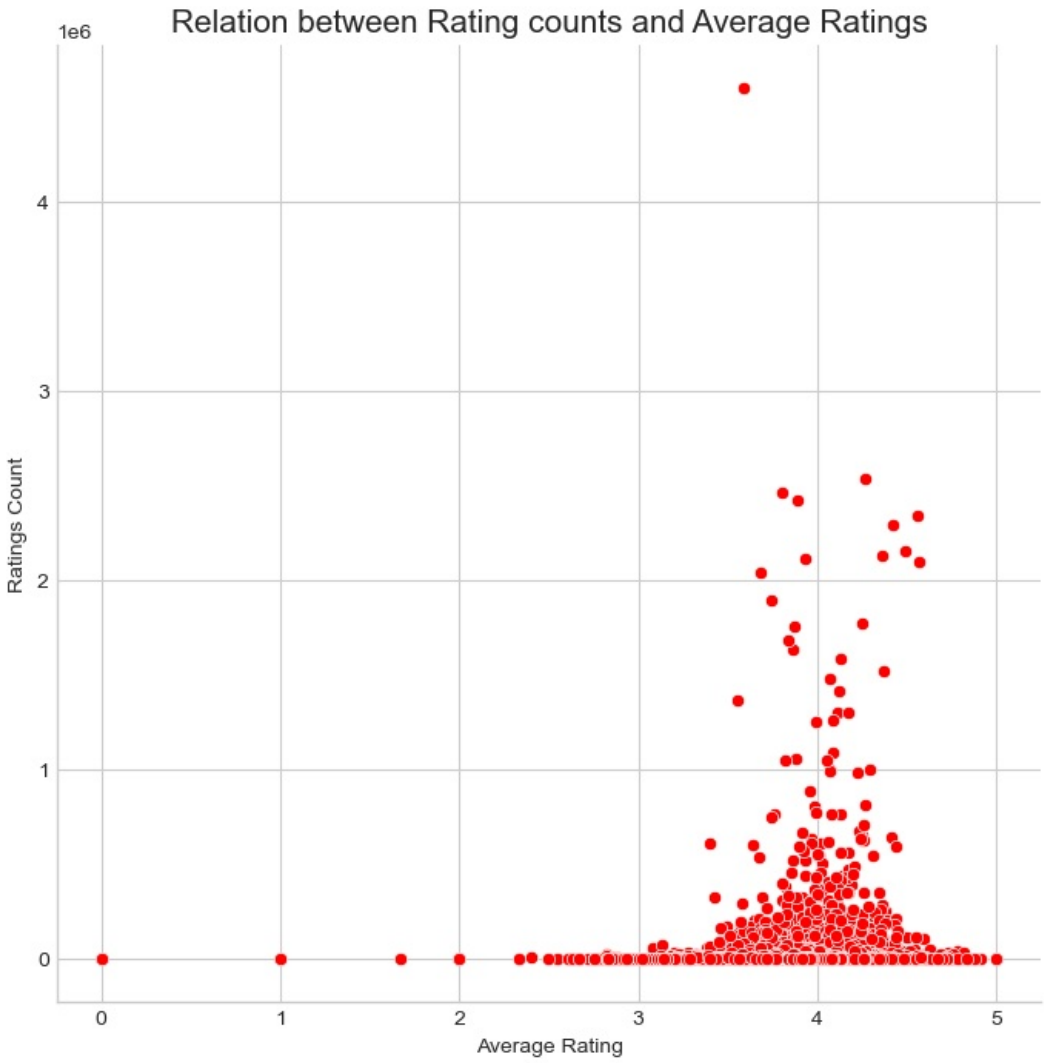
In [33]:
```
df.average_rating = df.average_rating.astype(float)
fig, ax = plt.subplots(figsize=[15,10])
sns.distplot(df['average_rating'],ax=ax)
ax.set_title('Average rating distribution for all books',fontsize=20)
ax.set_xlabel('Average rating',fontsize=13)
```

Out[33]:
```
Text(0.5, 0, 'Average rating')
```



In [12]:
```
ax = sns.relplot(data=df, x="average_rating", y="ratings_count", color = 'red', sizes=(100, 200), height=7, marl
plt.title("Relation between Rating counts and Average Ratings",fontsize = 15)
ax.set_axis_labels("Average Rating", "Ratings Count")
```

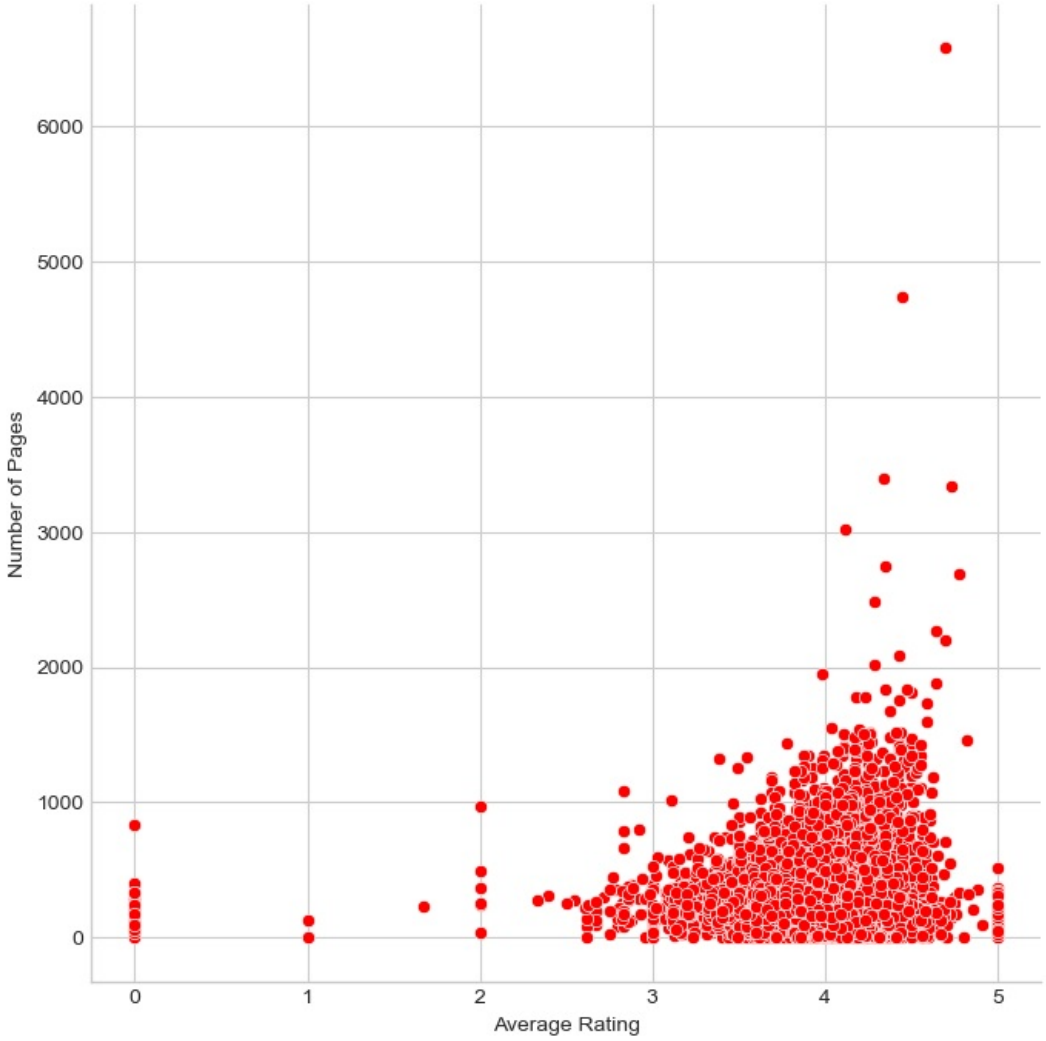
Out[12]:
```
<seaborn.axisgrid.FacetGrid at 0x23d9a9ce810>
```



In [13]:
```
plt.figure(figsize=(15,10))
ax = sns.relplot(x="average_rating", y="  num_pages", data = df, color = 'red',sizes=(100, 200), height=7, mark
ax.set_axis_labels("Average Rating", "Number of Pages")
```

Out[13]: <seaborn.axisgrid.FacetGrid at 0x23d9a94ec90>

<Figure size 1500x1000 with 0 Axes>



In [14]:
```
df2 = df.copy()
```

Data Preparation

In [15]:
```
df2.loc[ (df2['average_rating'] >= 0) & (df2['average_rating'] <= 1), 'rating_between'] = "between 0 and 1"
df2.loc[ (df2['average_rating'] > 1) & (df2['average_rating'] <= 2), 'rating_between'] = "between 1 and 2"
df2.loc[ (df2['average_rating'] > 2) & (df2['average_rating'] <= 3), 'rating_between'] = "between 2 and 3"
df2.loc[ (df2['average_rating'] > 3) & (df2['average_rating'] <= 4), 'rating_between'] = "between 3 and 4"
df2.loc[ (df2['average_rating'] > 4) & (df2['average_rating'] <= 5), 'rating_between'] = "between 4 and 5"
```

In [29]:
```
rating_df = pd.get_dummies(df2['rating_between'])
language_df = pd.get_dummies(df2['language_code'])
```

We are now going to concatenate these two data frames into one and name it as features. This DataFrame will be the functionality that we provide to the Book Recommendation System with Machine Learning.

It will contain the values of rating_df and language_df and will also have the values of average grade and number of grades

In [25]:
```
features = pd.concat([rating_df,

                      language_df,

                      df2['average_rating'],

                      df2['ratings_count']], axis=1)
```

Book Recommendation System

The algorithm will find the median for all and equalize it

In [26]:
```
from sklearn.preprocessing import MinMaxScaler
min_max_scaler = MinMaxScaler()
features = min_max_scaler.fit_transform(features)
```

We have reduced the features and we now can use the KNN algorithm to build our Book Recommendation system with Machine Learning using Python

In [27]:
```
model = neighbors.NearestNeighbors(n_neighbors=6, algorithm='ball_tree')
model.fit(features)
dist, idlist = model.kneighbors(features)
```

In [28]:
```
def BookRecommender(book_name):
    book_list_name = []
    book_id = df2[df2['title'] == book_name].index
    book_id = book_id[0]
    for newid in idlist[book_id]:
        book_list_name.append(df2.loc[newid].title)
    return book_list_name

BookNames = BookRecommender('Harry Potter and the Half-Blood Prince (Harry Potter  #6)')
BookNames
```

Out[28]:
```
['Harry Potter and the Half-Blood Prince (Harry Potter  #6)',
 'Harry Potter and the Order of the Phoenix (Harry Potter  #5)',
 'The Fellowship of the Ring (The Lord of the Rings  #1)',
 'Harry Potter and the Chamber of Secrets (Harry Potter  #2)',
 'Harry Potter and the Prisoner of Azkaban (Harry Potter  #3)',
 'The Lightning Thief (Percy Jackson and the Olympians  #1)']
```

As we can see, our model shows a pretty decent result