作法

1. `df_total` 由(train,test,implicit)三組原始資料依照(原始分數,-1,0)合成
2. `gdf_user` 統計(User-ID,看過書的數量)並作圖
3. `gdf_book` 統計(ISBN,看過人數)並作圖

結論

1. `gdf_user`，`gdf_book` 看起來都像Exponential distribution
   - 排名前面的user看過非常多書，書也類似
2. 之後想寫的程式
   A. `as_lod` (dataframe as list of dict)
      - 對書被評分的序列之類資料做處理方便
   B. `list_to_stats` 方便把一條評分序列「壓扁」

l2r.plot.SimpleBar 好用語法

```
from learning2read.plot import SimpleBar
pobj = SimpleBar()
pobj.setup(dataframe)
pobj.add('x_axis_name','y_axis_name')
pobj # auto plot in jupyter
```

defaultdict 好用語法

```
from collections import defaultdict
book_rating_dict = defaultdict(lambda:{'num_user':0,'rating_list':[]})
book_rating_dict[ISBN]['num_user']+=1
```

pandas 好用語法

- Series
- DataFrame
  - `df.describe()`
  - `df['column_name']` to Series
  - `df.to_dict('record')` to List of Dict
  - `df.iloc[:100,:]` first 100 row
  - `df.loc[df['x']>5,:]` select rows that x gt 5
  - `df.apply(...)`
  - `df.concat(...)`
- DataFrameGroupBy
  - `dfg.describe`
  - `dfg.agg`

Load

In [59]:

```
import learning2read as l2r
l2r.reload_all() # for module developing
```

In [8]:

```
import pandas as pd
import numpy as np
import scipy
from learning2read.utils import DataLoader
```

In [9]:

```
def Data(key,**kwargs):
    return DataLoader(r"/Users/qtwu/Downloads/data").load(key,**kwargs)
raw_user=Data("user")
raw_book=Data("books")
raw_train=Data("brtrain")
raw_test=Data("brtest")
raw_implicit=Data("brimplicit")
raw_submit=Data("submit",index_col=None,header=None)
raw_user.shape, raw_book.shape, raw_train.shape, raw_test.shape, raw_implici
```

```
/Users/qtwu/Downloads/data/users.csv
/Users/qtwu/Downloads/data/books.csv
/Users/qtwu/Downloads/data/book_ratings_train.csv
/Users/qtwu/Downloads/data/book_ratings_test.csv
/Users/qtwu/Downloads/data/implicit_ratings.csv
/Users/qtwu/Downloads/data/submission.csv
```

Out[9]:

```
((278858, 3), (271379, 9), (260202, 3), (173469, 2), (716109, 3), (173469, 1))
```

Explore Train/Test/Implicit

df_total

- Train: $rating \geq 1$
- Implicit: $rating = 0$
- Test: $rating = -1$

In [10]:

```
df_test_neg1=raw_test.copy()
df_test_neg1['Book-Rating']=-1 # scalar as column
df_total=pd.concat([raw_train,raw_implicit,df_test_neg1],axis=0)
print(df_total.shape)
df_total.sample(5)
```

```
(1149780, 3)
```

Out[10]:

	Book-Rating	ISBN	User-ID
673094	0	0440005868	e6ecba7816
90586	-1	0312099436	578f9fa321
215660	8	0452268060	bf23af9e8c
538800	0	0824521331	add393bee0
313780	0	0340416386	d82588beb1

group by User-ID

users.csv intersection & union

> **Conclusion** user_with_rating⊆user_in_csv
> 提供的user有17萬筆沒出現在任何一種評分檔裡面，完全不知道來幹嘛的XD

In [11]:

```
user_with_rating = set(df_total['User-ID'].unique())
user_in_csv      = set(raw_user['User-ID'].unique())
len(user_with_rating), len(user_in_csv)
```

Out[11]:

```
(105283, 278858)
```

In [12]:

```
( len(set.intersection(user_with_rating,user_in_csv)),
len(set.union(user_with_rating,user_in_csv)) )
```

Out[12]:

```
(105283, 278858)
```

User's books

```
dfg_XXX # DataFrame -> DataFrameGroupBy
gdf_XXX # DataFrameGroupBy -> DataFrame (grouped data frame)
```

In [13]:

```
dfg_user=df_total.groupby('User-ID')
print(dfg_user.ngroups) # equals `len(df_total['User-ID'].unique())`
gdf_user=dfg_user.agg({'Book-Rating':['count','min','max']})
gdf_user.columns=['count','min','max'] # cancel multilevel index
gdf_user.sample(5)
```

```
105283
```

Out[13]:

User-ID	count	min	max
27b440431d	1	7	7
565294a2a5	1	10	10
2e6a19bd8c	1	0	0
9554c8625b	1	-1	-1
a356a60fea	6	0	0

less than 10 books

In [90]:

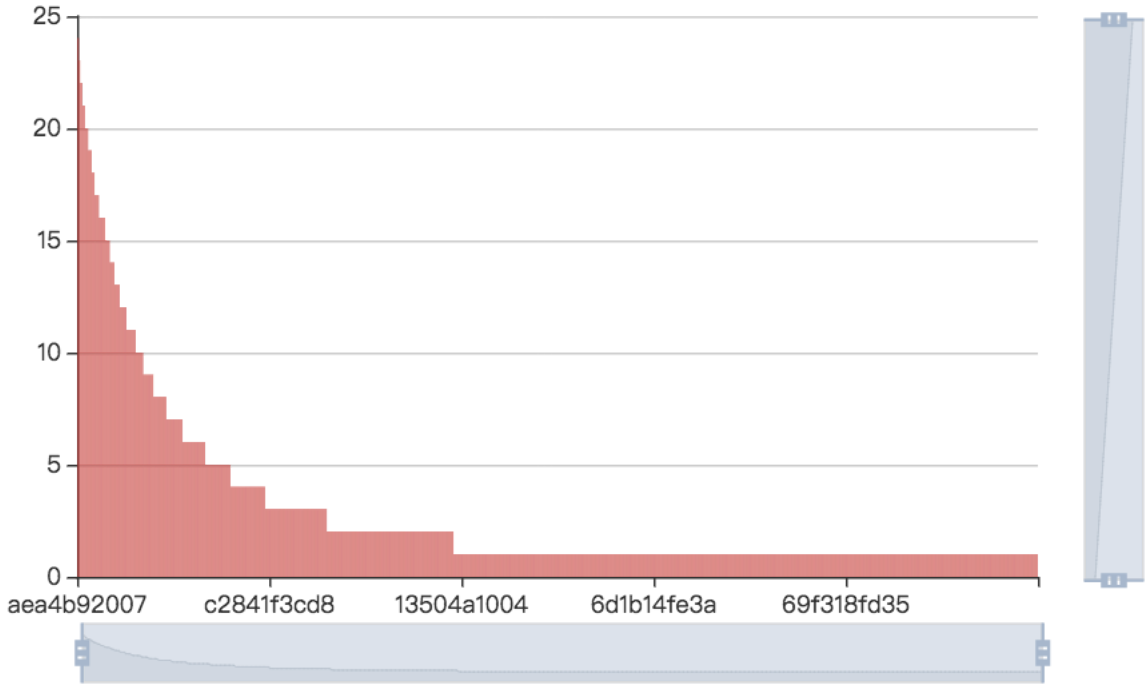
```
from learning2read.utils import as_lod
from learning2read.plot import SimpleBar

def plot_user_bar(df):
    plot=SimpleBar()
    plot.setup(as_lod(df),use_slider=True)
    plot.add(fvalue=lambda r:[r['index'],r['count']],
             ftooltip=lambda r:{
                 'formatter':'<br>'.join([
                     'User-ID: %s'%(r['index']),
                     'count: %d'%(r['count']),
                     'min: %d'%(r['min']),
                     'max: %d'%(r['max']),
                 ])
             },)
    return plot
```

In [91]:

```
gdf_user_less_books=gdf_user.loc[gdf_user['count']<25, :]

print(gdf_user_less_books.shape)
gdf_user_less_books=gdf_user_less_books.sample(5000)
gdf_user_less_books=gdf_user_less_books.sort_values('count',ascending=False)
plot_user_bar(gdf_user_less_books)
```

```
(99138, 3)
```

Out[91]:



靜態圖 ***[...]***

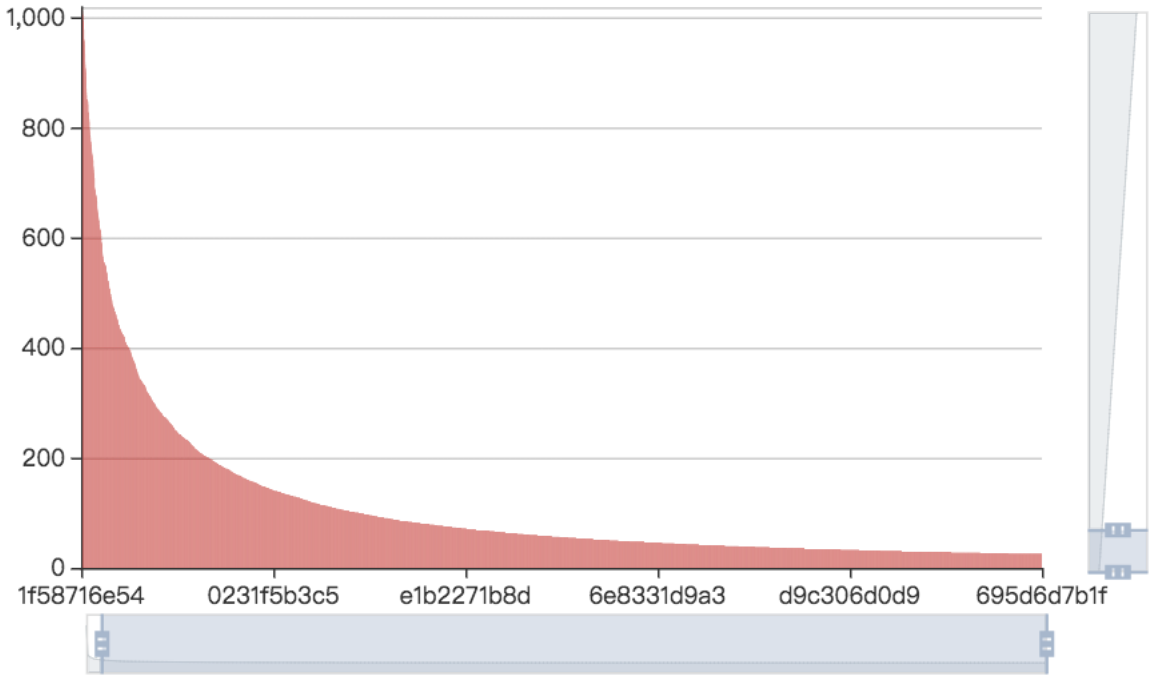
≥ 25 books

In [92]:

```
gdf_user_more_books=gdf_user.loc[gdf_user['count']>=25, :]

print(gdf_user_more_books.shape)
# gdf_user_more_books=gdf_user_more_books.sample(3000)
gdf_user_more_books=gdf_user_more_books.sort_values('count',ascending=False)
plot_user_bar(gdf_user_more_books)
```

```
(6145, 3)
```

Out[92]:



靜態圖 *[...]*

group by ISBN

In [96]:

```
dfg_book=df_total.groupby('ISBN')
gdf_book=dfg_book.agg({'Book-Rating':['count','min','max']})
gdf_book.columns=['count','min','max'] # cancel multilevel index
gdf_book.sort_values('count',ascending=False).iloc[:5,:]
```

Out[96]:

ISBN	count	min	max
0971880107	2502	-1	10
0316666343	1295	-1	10
0385504209	883	-1	10
0060928336	732	-1	10
0312195516	723	-1	10

In [98]:

```
# from learning2read.utils import as_lod
# from collections import defaultdict
# book_rating_dict = defaultdict(lambda:{'num_user':0,'rating_list':[]})
# for r in as_lod(df_total):
#     book_rating_dict[r['ISBN']]['num_user']+=1
#     book_rating_dict[r['ISBN']]['rating_list'].append(r['Book-Rating'])
```

In [99]:

```
def plot_book_bar(df):
    plot=SimpleBar()
    plot.setup(as_lod(df),use_slider=True)
    plot.add(fvalue=lambda r:[r['index'],r['count']],
             ftooltip=lambda r:{
                 'formatter':'<br>'.join([
                     'ISBN: %s'%(r['index']),
                     'count: %d'%(r['count']),
                     'min: %d'%(r['min']),
                     'max: %d'%(r['max']),
                 ])
             },)
    return plot
```

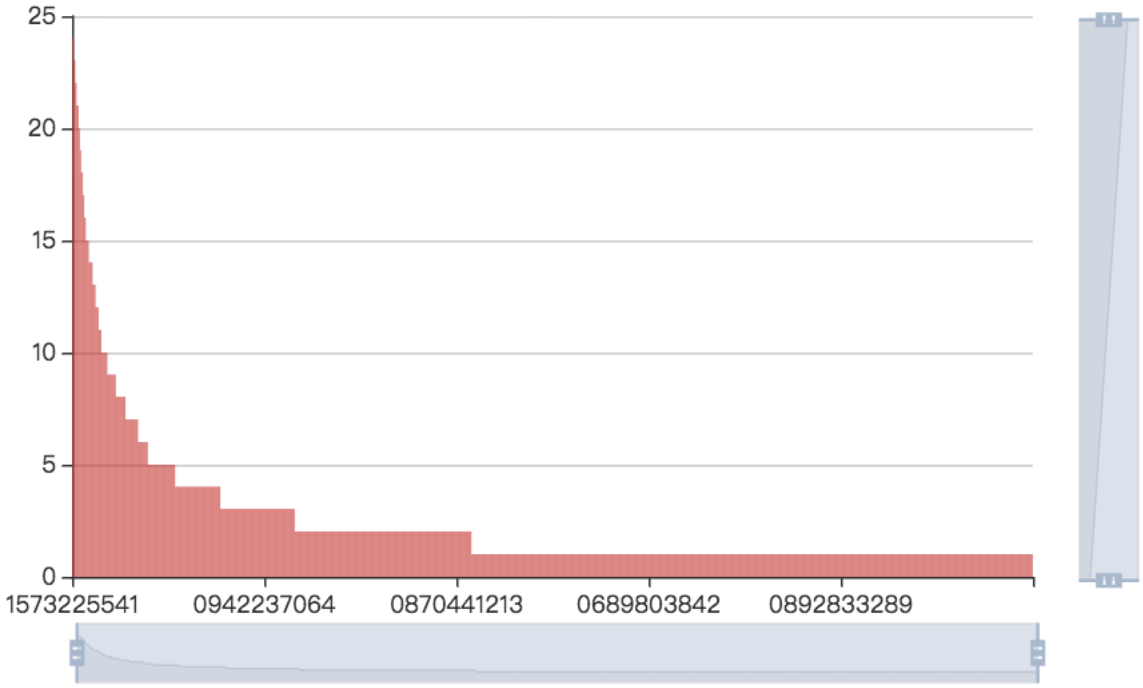
< 25 users

In [105]:

```
gdf_book_sub = gdf_book.loc[gdf_book['count']<25, :]
print(gdf_book_sub.shape)

gdf_book_sub = gdf_book_sub.sample(3000)
gdf_book_sub = gdf_book_sub.sort_values('count', ascending=False)
plot_book_bar(gdf_book_sub)
```

```
(334945, 3)
```

Out[105]:



靜態圖 ***[...]***

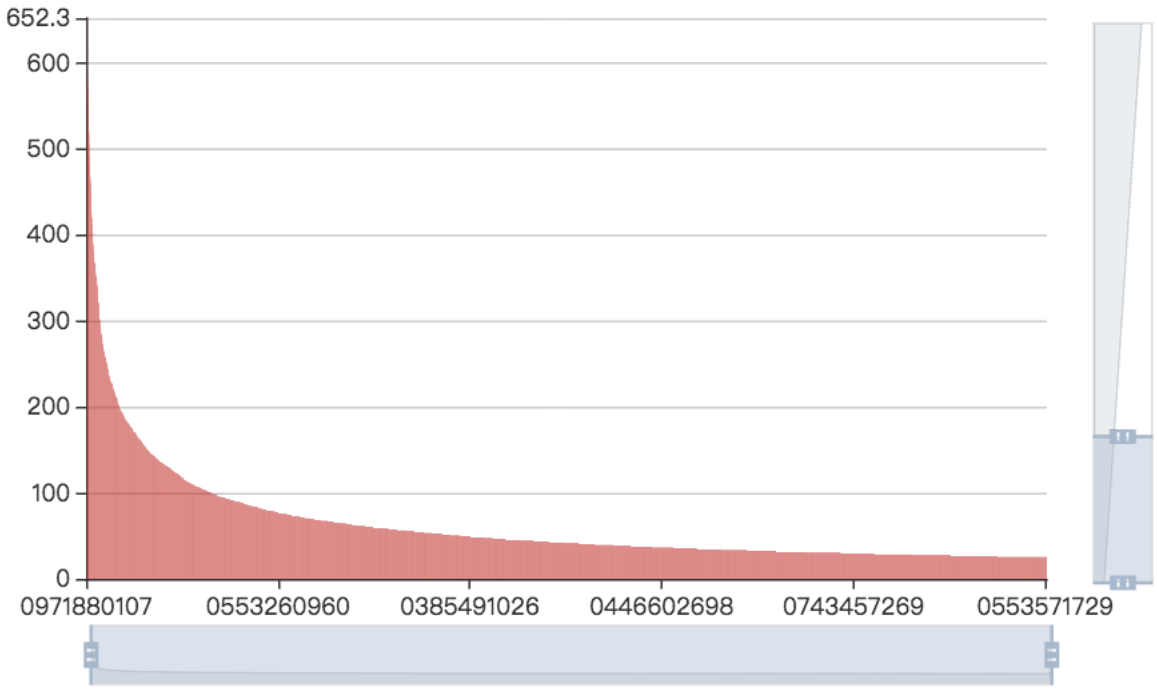
≥ 25 users

In [103]:

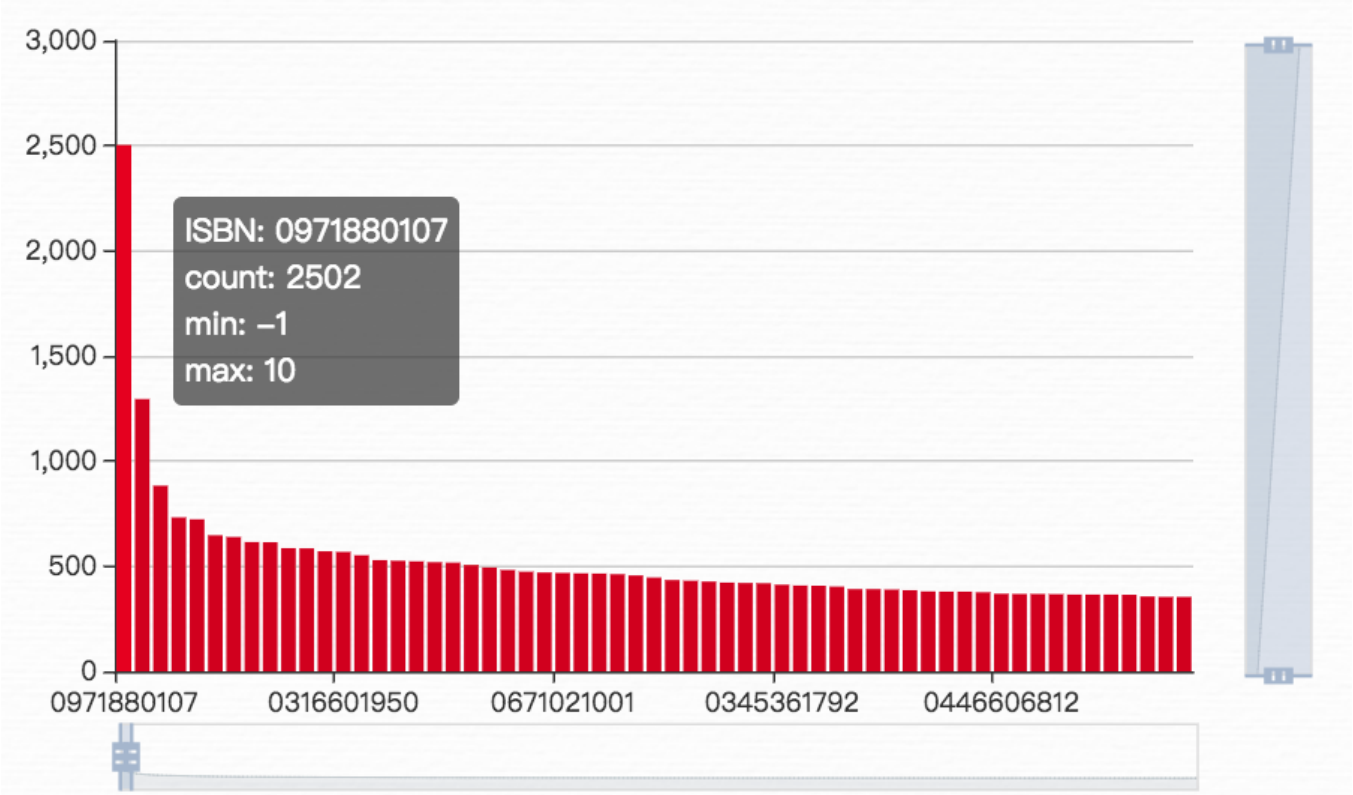
```
gdf_book_sub = gdf_book.loc[gdf_book['count']>=25, :]
print(gdf_book_sub.shape)

gdf_book_sub=gdf_book_sub.sort_values('count',ascending=False)
plot_book_bar(gdf_book_sub)
```

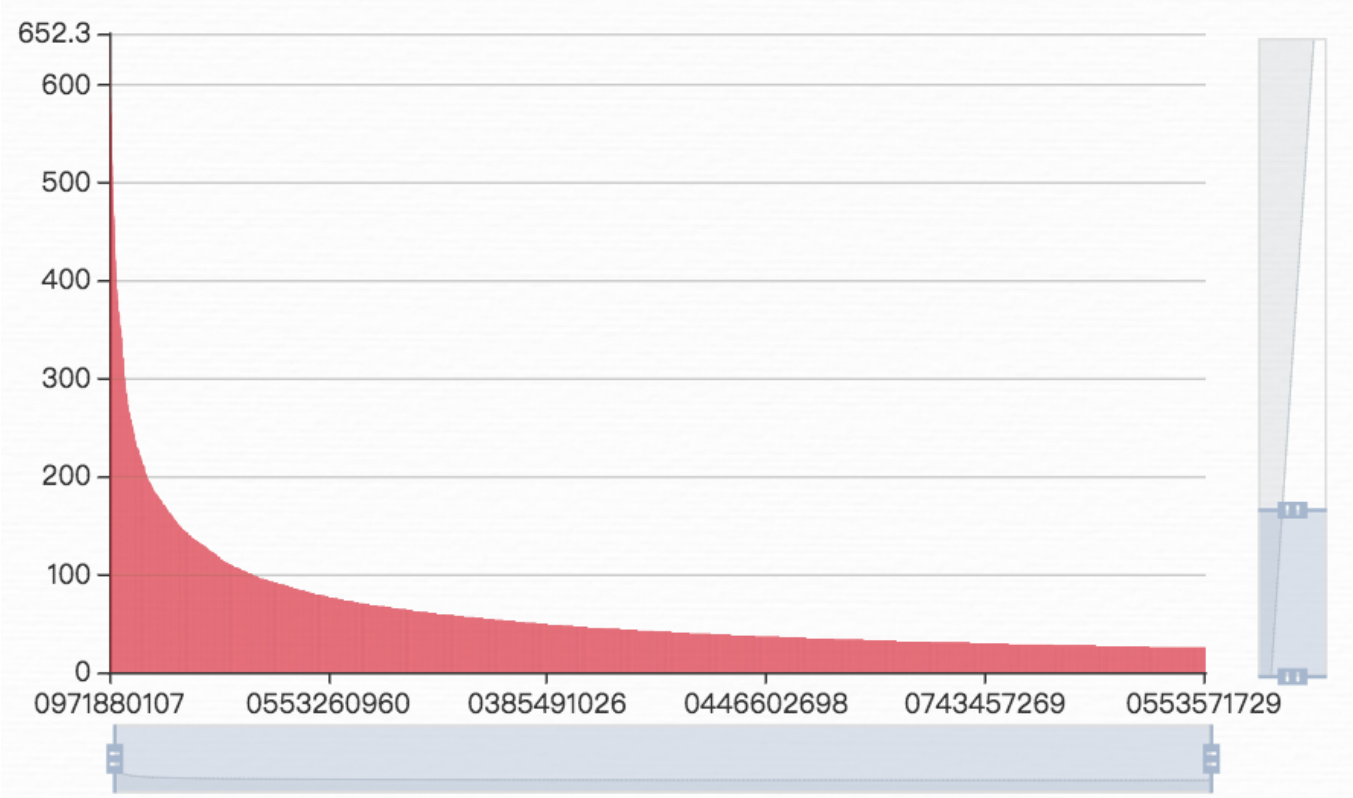
```
(5611, 3)
```

Out[103]:



靜態圖





之後詳細寫，按publisher分組

In [ ]:

```
# st=pd.get_option('display.max_colwidth')
# pd.set_option('display.max_colwidth',-1)
# # area
# raw_book.loc[:,:'Publisher'].sample(100)
```

In [106]:

```
# pd.set_option('display.max_rows',300)
# dfg=raw_book.groupby("Publisher")
# gdf=dfg.agg({'ISBN':'count'})
# gdf.columns=['count']
# # gdf=gdf.loc[gdf['count']>1,:]
# gdf=gdf.sort_values('count',ascending=False)
# gdf.iloc[:10,:]
```

homework 我自己本機讓jupyter變漂亮的套件 :p（請註解之）

In [108]:

```
import homework
from homework import *
reload(homework)
pass
```