John Mathews (http://johnmathews.eu/)

This is a work in progress

Books

2017-02-04 (http://johnmathews.eu/?p=1514) John (http://johnmathews.eu/author/jm/)

A friend of mine has collected books for many years and has recently begun to catalogue them. In this post I do some simple analysis of the catalogue and query an ISBN database to fill in some missing data.

Contents [show]

Set-up and data preparation

Set some settings and import some command libraries

In [1]:

```
# Display plot results inline, not in a separate window
%matplotlib inline
%pylab inline

# Set the size of all figures
pylab.rcParams['figure.figsize'] = (14, 5)

import pandas as pd
import re
import bibtexparser

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

```
Populating the interactive namespace from numpy and matplotlib
```

Load the catalogue file

In [2]:

```
table = pd.read_excel('Library.xlsx')
table = table[0:9188]
df = table
orig_rows = (df.shape[0])

print("There are %d rows in the catalogue" % (df.shape[0]) )
```

```
    There are 9187 rows in the catalogue
```

Data formatting and tidying

View the top 5 rows to see how the data is arranged and how many cells are complete.

In [3]:

```
df.head()
```

Out[3]:

	Location	Subject	Title	Author	Publisher	ISBN?	Shelf	Pages	Price	Value	Date
0	HR	Islam	The Islamic Invasion	R Morey	Harvest HP 1960	0 89081 983 1	17cm	221	3	8	2008-04-01 00:00:00
1	HR	Word lists	New Testament Word Lists	Morrison & Barnes	Erdmans 1975	0 8028 1141 8	NaN	125	3	NaN	2008-04-01 00:00:00
2	HR	Theology: Salvation	The Triumph of the crucified	E Sauer	Paternoster 1952	NaN	NaN	207	3	10	2008-04-01 00:00:00
3	HR	Early Fathers	Ante-Nicene Christian Library	Ed Menzies	T&T Clark 1897	NaN	NaN	533	9	NaN	2010-03-01 00:00:00
4	HR	Apologetics	Earth’s earliest ages	G.H. Pember	H & S 1895	NaN	NaN	494	3	NaN	2008-04-01 00:00:00

Set float format to two decimal places (currency). Not all rows can become a float.

In [4]:

```
pd.options.display.float_format = '{:,.2f}'.format

def to_number(s):
    try:
        s1 = round(float(s),2)
        return s1
    except ValueError:
        return s

df.Price = df.Price.map(lambda f : to_number(f))
df.Value = df.Value.map(lambda f : to_number(f))
```

Find and remove blank rows

In [5]:

```
# How many rows are all NaN values
df = df.dropna(how='all')              # drop a row only if ALL columns are NaN
print('%d row removed ' % (orig_rows - df.shape[0]) ) # 1 row contained all NaN and has been removed
```

```
    1 row removed
```

List the number of rows in each column which are empty

In [6]:

```
# How many rows in each column are NaN
df.isnull().sum().sort_values()
```

Out[6]:

```
Location       29
Title          34
Publisher     175
Shelf         336
Pages         540
Author        915
Price        3611
ISBN?        4770
Date         5712
Subject      6208
Value        9179
dtype: int64
```

Based on these results, title and publisher are the most complete columns

Split a column containing two types of data

The "Publisher" column contains both the publisher and the year it was published. This should be split into two columns.

In [7]:

```
pd.options.mode.chained_assignment = None  # default='warn'
df['PubYear'] = df['Publisher'].str.extract('(\d\d\d\d)', expand=True)          # regex is confusing
df['Publisher'] = df['Publisher'].str.extract('(((?!\d).)*)', expand=True)
```

Improve the format of the 'Date' column

In [8]:

```
df['Date'] = pd.to_datetime(df['Date'], errors='coerce')
```

The data frame is now in the columns I want it to be in, and the top 5 rows are:

In [9]:

```
df.head()
```

Out[9]:

	Location	Subject	Title	Author	Publisher	ISBN?	Shelf	Pages	Price	Value	Date	PubYear
0	HR	Islam	The Islamic Invasion	R Morey	Harvest HP	0 89081 983 1	17cm	221	3.00	8.00	2008-04-01	1960
1	HR	Word lists	New Testament Word Lists	Morrison & Barnes	Erdmans	0 8028 1141 8	NaN	125	3.00	NaN	2008-04-01	1975
2	HR	Theology: Salvation	The Triumph of the crucified	E Sauer	Paternoster	NaN	NaN	207	3.00	10.00	2008-04-01	1952
3	HR	Early Fathers	Ante-Nicene Christian Library	Ed Menzies	T&T Clark	NaN	NaN	533	9.00	NaN	2010-03-01	1897
4	HR	Apologetics	Earth's earliest ages	G.H. Pember	H & S	NaN	NaN	494	3.00	NaN	2008-04-01	1895

Insights

Distribution of books by year published

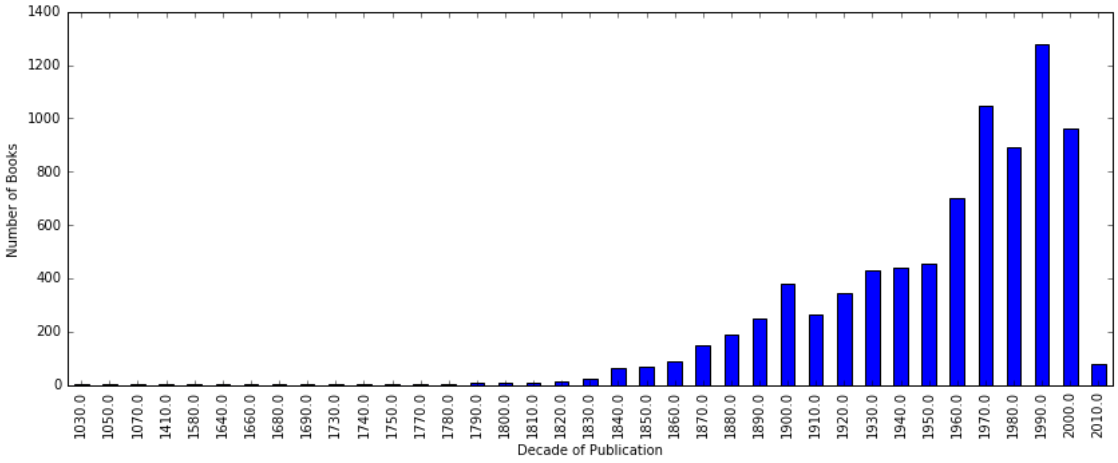
The bar chart below shows how many books in the library were published in a given decade. The list below shows the 5 oldest books.

In [10]:

```
pd.options.display.float_format = '{:,}'.format
df.PubYear = pd.to_numeric(df.PubYear, errors='ignore')
fig = df.groupby(df.PubYear // 10 * 10).size().plot(kind='bar', xlim=[1000,2016], logy = False)
fig.set_xlabel("Decade of Publication")
fig.set_ylabel("Number of Books")
fig
```

Out[10]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x112e007b8>
```



View the 5 oldest titles:

In [11]:

```
df['PubYear'] = df['PubYear'].fillna(0.0).astype(int)
df2 = df[df['PubYear'] != 0.0]
df2.sort_values(by='PubYear').head()
```

Out[11]:

	Location	Subject	Title	Author	Publisher	ISBN?	Shelf	Pages	Price	Value	Date	PubYear
4753	Lib	NaN	In Christ's own country	Dom Ernest Graf	Burns Oates	NaN	Sh.4.5	302	Gift	NaN	1999-07-30	1037
3043	StM	NaN	The First Epistle of Peter	C.E.B. Cranfield	SCM Press	interesting	Sh.5.5	128	NaN	NaN	NaT	1050
4574	Lib	Music Score	Easy-Play Speed Music; waltz clas	NaN	Sight & Sound	NaN	Sh.4.4	47	99P	NaN	NaT	1076
7184	25A	NaN	The Noble Qur'an	transl Al-Hilali & Khan	Madinah	NaN	Sh.3.6	956	3.0	NaN	2010-12-10	1417
3296	Lib	NaN	Chained Bible	NaN	Chris Barker	Very incomplete	Sh.1.1	NaN	NaN	NaN	NaT	1585

Location

List the number of books in each location:

In [12]:

```
df3 = df
df3["Location"] = df3["Location"].astype(str).map(str.strip).str.upper().str.slice(0,5)
df3.groupby(df3.Location).size().sort_values(ascending=False)
```

Out[12]:

```
Location
25A      3411
LIB      2457
CH       1088
ST9      1000
STM       886
HR        305
NAN        29
ST.M        3
HR          2
ST M        1
SA          1
LB          1
CH          1
:LIB        1
dtype: int64
```

Subjects

Create a list of the differnet subjects, order the list by the most frequent subjects:

In [13]:

```
df4 = df
df4["Subject"] = df4["Subject"].astype(str).map(str.strip).str.upper()
df4.groupby(df4.Subject).size().sort_values(ascending=False).head(50)
```

Out[13]:

```
Subject
NAN                            6208
COMMENTARY                       61
LOCAL HISTORY                    58
SERMONS                          41
THE CENTURY BIBLE                37
THEOLOGY                         36
CHRISTIAN BIOGRAPHY              34
BIOGRAPHY                        31
NT COMMENTARY                    31
HEBREW GRAMMAR                   30
SACRED BOOKS OF THE EAST         30
POETRY                           29
CLARK'S FOREIGN THEOL LIB        28
GENERAL EDIT ANTONIA FRAZER      25
NOVEL                            24
WRITERS AND THEIR WORK           24
CATALOGUE                        22
AUTOBIOGRAPHY                    20
OT COMMENTARY                    19
GREEK                            19
THE EXPOSITOR'S BIBLE            18
SRIMAD BHAGAVATAM                18
THE BABYLONIAN TALMUD            18
PHOTOGRAPHS                      17
GREAT MUSEUMS OF T WORLD         15
CHURCH HISTORY                   14
DAILY READINGS                   14
CHRISTIAN LECTURES               14
NOTES ON THE CATHEDRALS          14
INTERNATIONAL CRITICAL COMM      13
ARAMAIC                          13
THE CLARENDON BIBLE              13
FICTION - CADFAEL                13
CLARK'S FOREIGN THEOL LIB.       13
APOLOGETICS                      12
PSALMS                           12
THE CAMBRIDGE BIBLE              12
PRAYER                           12
LIFE LIBRARY OF PHOTOGRAPHY      11
COMMENTARY ON HOLY SCRIPT        11
THE MASTERPIECE LIBRARY          11
COMMENTARY ON THE O.T.           10
HYMNS                            10
POEMS                            10
MYSTICISM                        10
DICTIONARY OF THE BIBLE          10
EXHIBITION CATALOGUE             10
POETICAL WORKS OF TENNYSON       10
DICTIONARY                       10
HISTORY                          10
dtype: int64
```

Author

Create a list of authors in the library. Order the list by number of books.

In [14]:

```
df5 = df
df5["Author"] = df5["Author"].astype(str).map(str.strip).str.upper() #.str.slice(0,20)
df5.groupby(df5.Author).size().sort_values(ascending=False).head(50)
```

Out[14]:

```
Author
NAN                     915
VARIOUS                  31
BHAKTIVEDANTA S PRAB     19
C.H. SPURGEON            19
ELLIS PETERS             17
ED. RABBI I. EPSTEIN     17
LESLIE WEATHERHEAD       15
ED CARLO RAGGHIANTI      15
ALBERT BARNES            14
JAMES HASTINGS           13
GEORGE ADAM SMITH        13
WILLIAM TEMPLE           12
JAMES MOFFATT            11
ED J A HAMMERTON         11
KEIL & DELITZSCH         11
WILLIAM BARCLAY          10
SHAKESPEARE              10
PETER ACKROYD            10
IAN WILSON                9
CHARLES DICKENS           9
BERNHARD WEISS            9
J.B. PHILLIPS             9
ED QUENNELL & HODGE       8
CHARLES GORE              8
H.V. MORTON               8
M.F. SADLER               8
VARIOUS AUTHORS           8
ED ANDREW LANG            8
GEZA VERMES               8
S.R. DRIVER               8
EVELYN UNDERHILL          8
"                         8
HENRY ALFORD              7
ALDOUS HUXLEY             7
ED JAMES HASTINGS         7
ED ARTHUR MEE             7
ROY STRONG                7
ALEXANDER MACLAREN        7
MARCUS DODS               7
JOACHIM JEREMIAS          6
THOMAS WRIGHT             6
ED R. CROMARTY            6
SUSAN GLYN                6
DAVID FOUNTAIN            6
WILLIAM WHISTON           6
C.S. LEWIS                6
BARRIE TRINDER            6
DAVID TRUMPER             6
G. CAMPBELL MORGAN        6
ALISTER MCGRATH           6
dtype: int64
```

Distribution of book length by number of pages

In [15]:

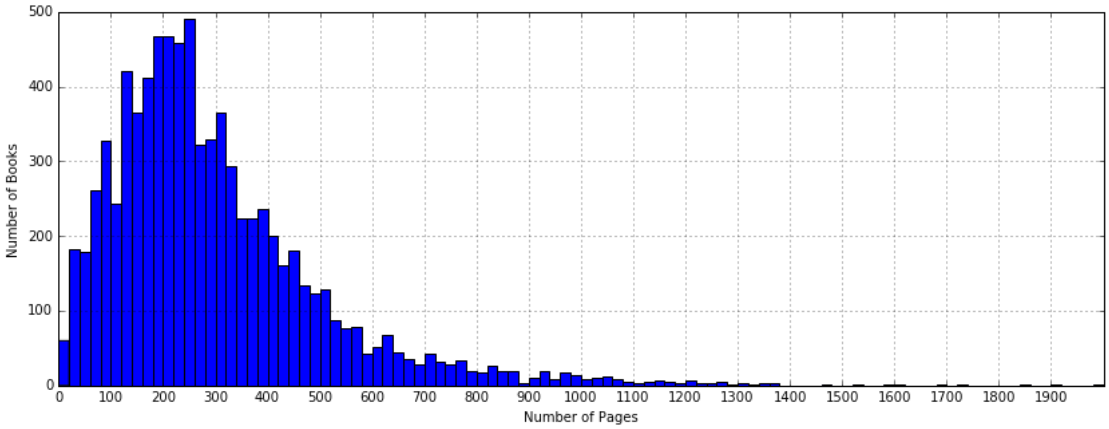
```
def blank_or_number(s):
    try:
        s1 = round(float(s),2)
        return s1
    except ValueError:
        return ''


df.Pages = df.Pages.map(lambda f : blank_or_number(f))
df6 = df.Pages[df.Pages != '']

plt.xticks(np.arange(0, 2000, 100.0))
fig = df6.hist(bins=100, range=[0, 2000])
fig.set_xlabel("Number of Pages")
fig.set_ylabel("Number of Books")
```

Out[15]:

```
<matplotlib.text.Text at 0x112c68e80>
```



Query an ISBN database to find missing data

Lastly, I thought it would be a fun challenge to fill in gaps in the data. The table below shows rows with ISBN number but missing either Author, Title or Publisher.

It turns out that there are only 10 rows that meet this criteria, and in all cases it is the publisher that is missing.

In [16]:

```
df7 = df[(df['ISBN?'].notnull()) & ((df['Author'] == '') | (df['Title'] == '') | (df['Publisher'] == ''))]
df7
```

Out[16]:

	Location	Subject	Title	Author	Publisher	ISBN?	Shelf	Pages	Price	Value	Date	PubYear
1430	ST9	BIOGRAPHY OF SCIENTIST	Longitude (John Harrison)	DAVA SOBEL		1 85702 571 7	Sh.1.2	184.0	5.99	NaN	NaT	1998
2707	STM	DEVOTIONAL!	Romans: Momentous News	DAVID COOK		978 1 906173241	Sh.3.4	55.0	1.0	NaN	2011-07-28	2011
3874	LIB	NAN	Annie's Box – Darwin's daughter	RANDAL KEYNES		1 84115 060 6	Sh.2.4	331.0	3.99	NaN	2002-07-20	2001
4705	LIB	HISTORICAL NOVEL	Galileo's Daughter	DAVA SOBEL		1 85702 861 9	Sh.4.5	429.0	NaN	NaN	2002-09-27	1999
5949	25A	NAN	Short Life Long Times of Mrs Beeton	KATHRYN HUGHES		1 84115 373 7	Sh.1.4	525.0	£2.50P	NaN	2012-02-09	2005
6008	25A	NAN	Signs in the Sky (Birth of a New Age	ADRIAN GILBERT		0 609 80793 5	Sh.1.5	329.0	4.0	NaN	2012-03-07	2001
6097	25A	NAN	Isaac Newton, the last Sorcerer	MICHAEL WHITE		1 85702 706 X	Sh.1.6	403.0	£1.50P	NaN	2012-02-09	1997
6663	25A	NAN	Live Wires – powerful stories of cha	D. J. CARSWELL		978 1 906173 13 5	Sh.2.7	124.0	1.0	NaN	2011-06-29	2010
8640	25A	KING ARTHUR QUINCENTENARY	One in Specyal	ED SIDNEY HART		0 948485 00 0	Sh.5.9	145.0	£2.49P	NaN	2003-06-28	1985
8845	25A	NAN	The Order of St John – a short history	E L EDMONDS		0 947718 07 9	Sh.5.7b	35.0	£3.75P	NaN	NaT	1986

In [17]:

```
from isbnlib import *
from isbnlib.config import *
from isbnlib.registry import *
import bibtexparser

def has_isbn(isbn):
    SERVICE = 'isbndb'
    APIKEY = 'IZXL3ESD'  # YOUR key
    add_apikey(SERVICE, APIKEY) # register your key
    bibtex = bibformatters['bibtex']
    isbn = clean(isbn)
    try:
        a = bibtex(meta(EAN13(isbn), SERVICE))
        return a
    except:
        return 'isbn is invalid'
```

In [18]:

```
def get_pub(isbn):
    bibtex_str = has_isbn(isbn)
    try:
        bib_db = bibtexparser.loads(bibtex_str)
        dic = bib_db.entries[0]
        return dic['publisher']
    except:
        return
```

In [19]:

```
df7['ISBN?'] = df7['ISBN?'].astype(str)
df7.Publisher = df7['ISBN?'].map(lambda f : get_pub(f))
```

The table below shows the results of the isbnlib query. I thought it odd that all the 'missing' publishers names began with a number. It turns out that the regex method I used to split publisher name and year of publication into separate columns doesnt work when there are numbers in the publishers name. Rather than go back and correct this, I'll leave the script as it is to show how to use the isbnlib library.

In [20]:

```
df7
```

Out[20]:

	Location	Subject	Title	Author	Publisher	ISBN?	Shelf	Pages	Price	Value	Date	PubYea
1430	ST9	BIOGRAPHY OF SCIENTIST	Longitude (John Harrison)	DAVA SOBEL	Fourth Estate	1 85702 571 7	Sh.1.2	184.0	5.99	NaN	NaT	1998
2707	STM	DEVOTIONAL!	Romans: Momentous News	DAVID COOK	10Publishing	978 1 906173241	Sh.3.4	55.0	1.0	NaN	2011-07-28	2011
3874	LIB	NAN	Annie's Box – Darwin's daughter	RANDAL KEYNES	4th Estate	1 84115 060 6	Sh.2.4	331.0	3.99	NaN	2002-07-20	2001
4705	LIB	HISTORICAL NOVEL	Galileo's Daughter	DAVA SOBEL	Fourth Estate	1 85702 861 9	Sh.4.5	429.0	NaN	NaN	2002-09-27	1999
5949	25A	NAN	Short Life Long Times of Mrs Beeton	KATHRYN HUGHES	None	1 84115 373 7	Sh.1.4	525.0	£2.50P	NaN	2012-02-09	2005
6008	25A	NAN	Signs in the Sky (Birth of a New Age	ADRIAN GILBERT	Three Rivers Press	0 609 80793 5	Sh.1.5	329.0	4.0	NaN	2012-03-07	2001
6097	25A	NAN	Isaac Newton, the last Sorcerer	MICHAEL WHITE	Fourth Estate	1 85702 706 X	Sh.1.6	403.0	£1.50P	NaN	2012-02-09	1997

	Location	Subject	Title	Author	Publisher	ISBN?	Shelf	Pages	Price	Value	Date	PubYea
6663	25A	NAN	Live Wires – powerful stories of cha	D. J. CARSWELL	None	978 1 906173 13 5	Sh.2.7	124.0	1.0	NaN	2011-06-29	2010
8640	25A	KING ARTHUR QUINCENTENARY	One in Specyal	ED SIDNEY HART	Three Golden Crowns	0 948485 00 0	Sh.5.9	145.0	£2.49P	NaN	2003-06-28	1985
8845	25A	NAN	The Order of St John – a short history	E L EDMONDS	s.n	0 947718 07 9	Sh.5.7b	35.0	£3.75P	NaN	NaT	1986

Spotify song history (http://johnmathews.eu/spotify/)
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In "Data Analysis"

FakeGL - A synthetic General Ledger and Trial Balance (http://johnmathews.eu/fakegl-a-synthetic-general-ledger-and-trial-balance/)
2017-01-06
In "Finance"

Reconciliation of a Trial Balance to a General Ledger (http://johnmathews.eu/reconciliation/)
2017-01-03
In "Data Analysis"

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