In [1]:

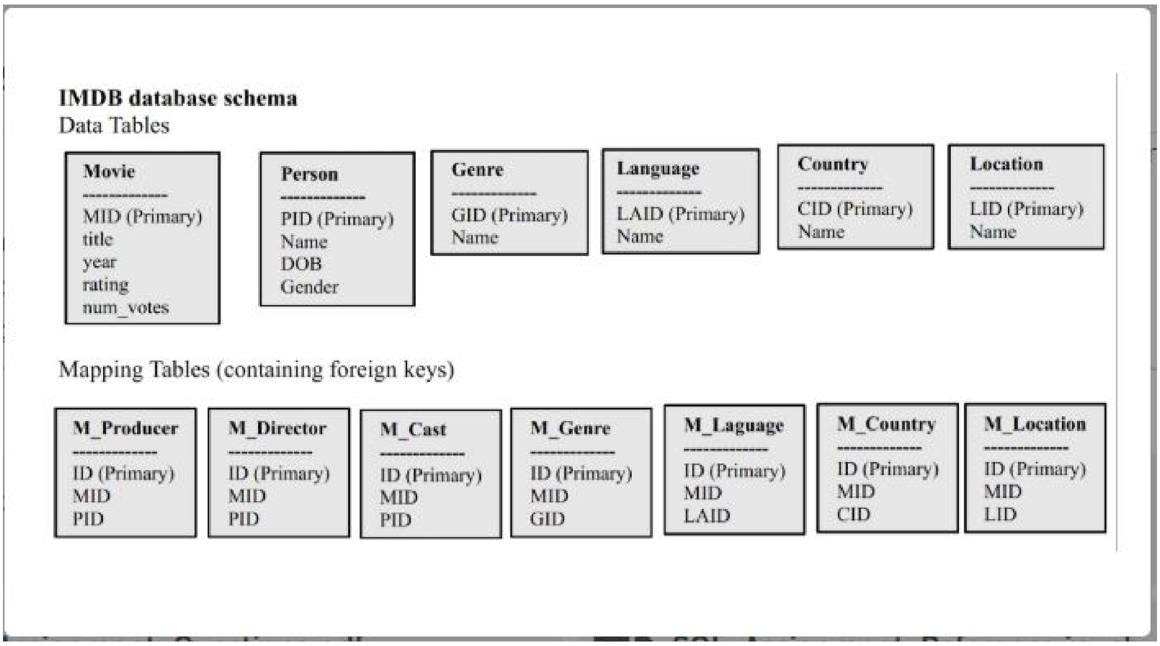
```
# Import packages & create database connection
import pandas as pd
import numpy as np
import sqlite3 as db
from datetime import datetime
from sqlalchemy import create_engine
import os

conn = db.connect('Db-IMDB-Assignment.db')
```

In [2]:

```
from IPython.display import Image
Image(filename='schema.jpg')
```

Out[2]:



IMDB database schema

Data Tables

```
Movie
-------------
MID (Primary)
title
year
rating
num_votes

Person
-------------
PID (Primary)
Name
DOB
Gender

Genre
-------------
GID (Primary)
Name

Language
-------------
LAID (Primary)
Name

Country
-------------
CID (Primary)
Name

Location
-------------
LID (Primary)
Name
```

Mapping Tables (containing foreign keys)

```
M_Producer
-------------
ID (Primary)
MID
PID

M_Director
-------------
ID (Primary)
MID
PID

M_Cast
-------------
ID (Primary)
MID
PID

M_Genre
-------------
ID (Primary)
MID
GID

M_Laguage
-------------
ID (Primary)
MID
LAID

M_Country
-------------
ID (Primary)
MID
CID

M_Location
-------------
ID (Primary)
MID
LID
```

In [3]:

```
from IPython.display import display
```

In [35]:

```
reference - https://github.com/santhoshse7en/Applied_Machine_Learning_Online_Course_Solutions
cursor = conn.cursor()
cursor.execute('UPDATE Movie SET year = REPLACE(year, "I", "");')
cursor.execute('UPDATE Movie SET year = REPLACE(year, "V", "");')
cursor.execute('UPDATE Movie SET year = REPLACE(year, "X ", "");')
cursor.execute('UPDATE Movie SET title = LTRIM(title);')
cursor.execute('UPDATE Movie SET year = RTRIM(LTRIM(year));')
cursor.execute('UPDATE Movie SET rating = RTRIM(LTRIM(rating));')
cursor.execute('UPDATE Movie SET num_votes = RTRIM(LTRIM(num_votes));')

cursor.execute('UPDATE M_Producer SET pid = RTRIM(LTRIM(pid));')
cursor.execute('UPDATE M_Producer SET mid = RTRIM(LTRIM(mid));')

cursor.execute('UPDATE M_Director SET pid = RTRIM(LTRIM(pid));')
cursor.execute('UPDATE M_Director SET mid = RTRIM(LTRIM(mid));')

cursor.execute('UPDATE M_Cast SET pid = RTRIM(LTRIM(pid));')
cursor.execute('UPDATE M_Cast SET mid = RTRIM(LTRIM(mid));')

cursor.execute('UPDATE M_Genre SET gid = RTRIM(LTRIM(gid));')
cursor.execute('UPDATE M_Genre SET mid = RTRIM(LTRIM(mid));')

cursor.execute('UPDATE Genre SET gid = RTRIM(LTRIM(gid));')
cursor.execute('UPDATE Genre SET name = RTRIM(LTRIM(name));')

cursor.execute('UPDATE Person SET name = RTRIM(LTRIM(name));')
cursor.execute('UPDATE Person SET pid = RTRIM(LTRIM(pid));')
cursor.execute('UPDATE Person SET gender = RTRIM(LTRIM(gender));')


conn.commit()
```

In [4]:

```
tables = pd.read_sql_query("SELECT name FROM sqlite_master WHERE type='table' ;", conn)
tables
```

Out[4]:

	name
0	Movie
1	Genre
2	Language
3	Country
4	Location
5	M_Location
6	M_Country
7	M_Language
8	M_Genre
9	Person
10	M_Producer
11	M_Director
12	M_Cast

1. List all the directors who directed a 'Comedy' movie in a leap year. (You need to check that the genre is 'Comedy’ and year is a leap year) Your query should return director name, the movie name, and the year.

In [37]:

```
%%time

query = """
        SELECT p.Name AS Director_Name,
               m.title AS Movie_Name,
               m.year AS Release_Year
        FROM Movie m

        JOIN M_Director m_d ON m_d.MID = m.MID
        JOIN Person p ON p.PID = m_d.PID
        JOIN M_Genre m_g ON m_g.MID = m.MID
        JOIN Genre g ON g.GID = m_g.GID

        WHERE
        g.Name LIKE '%Comedy%'
        AND
        m.year%4=0
        AND
        m.year%100!=0
        OR
        m.year%4=0
        AND
        m.year%100=0
        AND
        m.year%400=0

        """
ans = pd.read_sql_query(query, conn)
#print(ans.shape)
#d.DataFrame(ans)
display(ans)
```

	Director_Name	Movie_Name	Release_Year
0	Milap Zaveri	Mastizaade	2016
1	Danny Leiner	Harold & Kumar Go to White Castle	2004
2	Anurag Kashyap	Gangs of Wasseypur	2012
3	Frank Coraci	Around the World in 80 Days	2004
4	Griffin Dunne	The Accidental Husband	2008
...	...	...	...
275	Siddharth Anand Kumar	Let's Enjoy	2004
276	Amma Rajasekhar	Sathyam	2008
277	Oliver Paulus	Tandoori Love	2008
278	Raja Chanda	Le Halua Le	2012
279	K.S. Prakash Rao	Raja Aur Rangeeli	1996

280 rows × 3 columns

```
Wall time: 81.8 ms
```

2. List the names of all the actors who played in the movie 'Anand' (1971)

In [19]:

```
%%time
query = """
        SELECT Name Actor from Person p \
        JOIN M_Cast c ON TRIM(p.PID) = TRIM(c.PID) WHERE MID IN \
        (SELECT MID from Movie WHERE title = 'Anand')

        """

ans = pd.read_sql_query(query, conn)
display(ans)
```

	Actor
0	Rajesh Khanna
1	Amitabh Bachchan
2	Sumita Sanyal
3	Ramesh Deo
4	Seema Deo
5	Asit Kumar Sen
6	Dev Kishan
7	Atam Prakash
8	Lalita Kumari
9	Savita
10	Brahm Bhardwaj
11	Gurnam Singh
12	Lalita Pawar
13	Durga Khote
14	Dara Singh
15	Johnny Walker
16	Moolchand

```
Wall time: 101 ms
```

3. List all the actors who acted in a film before 1970 and in a film after 1990. (That is: < 1970 and > 1990.)

```
In [22]:
```

```
%%time
query = """
        select name as Actor from person where trim (pid) in
        (select trim(pid) from m_cast where mid in
        (select mid from movie m where m.year> 1990)and pid in
        (select pid from m_cast where mid in
        (select mid from movie n where n.year < 1970)))

        """

ans = pd.read_sql_query(query, conn)
display(ans)
```

	Actor
0	Rishi Kapoor
1	Amitabh Bachchan
2	Asrani
3	Zohra Sehgal
4	Parikshat Sahni
...	...
328	Poonam
329	Jamila Massey
330	K.R. Vijaya
331	Sethi
332	Suryakantham

333 rows × 1 columns

```
Wall time: 92.8 ms
```

4. List all directors who directed 10 movies or more, in descending order of the number of movies they directed. Return the directors' names and the number of movies each of them directed.

In [24]:

```
%%time
query = """
        select a.name, count(b.mid) num_movies from person a
        left join m_director b on a.pid=b.pid group by a.pid having
        num_movies>10 order by num_movies desc

        """

ans = pd.read_sql_query(query, conn)
display(ans)
```

	Name	num_movies
0	David Dhawan	39
1	Mahesh Bhatt	35
2	Priyadarshan	30
3	Ram Gopal Varma	30
4	Vikram Bhatt	29
5	Hrishikesh Mukherjee	27
6	Yash Chopra	21
7	Basu Chatterjee	19
8	Shakti Samanta	19
9	Subhash Ghai	18
10	Shyam Benegal	17
11	Abbas Alibhai Burmawalla	17
12	Rama Rao Tatineni	17
13	Manmohan Desai	16
14	Gulzar	16
15	Raj N. Sippy	16
16	Raj Kanwar	15
17	Mahesh Manjrekar	15
18	Indra Kumar	14
19	Raj Khosla	14
20	Rahul Rawail	14
21	Rajkumar Santoshi	14
22	Rakesh Roshan	13
23	Dev Anand	13
24	Vijay Anand	13
25	Harry Baweja	13
26	Anurag Kashyap	13
27	Ananth Narayan Mahadevan	13
28	K. Raghavendra Rao	13
29	Anees Bazmee	12
30	Guddu Dhanoa	12
31	Prakash Jha	12
32	Satish Kaushik	12
33	Nagesh Kukunoor	12

	Name	num_movies
34	Prakash Mehra	12
35	Umesh Mehra	12
36	Anil Sharma	12
37	Madhur Bhandarkar	12
38	Rohit Shetty	12
39	Pramod Chakravorty	11
40	Sanjay Gupta	11
41	Nasir Hussain	11
42	Ketan Mehta	11
43	Govind Nihalani	11
44	Mohit Suri	11

```
Wall time: 58.9 ms
```

5. This question has two parts:

a. For each year, count the number of movies in that year that had only female actors.

b. Now include a small change: report for each year the percentage of movies in that year with only female actors, and the total number of movies made that year. For example, one answer will be: 1990 31.81 13522 meaning that in 1990 there were 13,522 movies, and 31.81% had only female actors. You do not need to round your answer.

Part 1 :

In [38]:

```
%%time
query =     """
            SELECT count(m.year) mov_cnt, m.year as mov_yr
            FROM Movie m where m.MID not in
            (SELECT mc.MID FROM Person p JOIN M_Cast mc ON trim(p.PID)=trim(mc.PID) WHE
RE p.Gender='Male')
            GROUP BY mov_yr
            ORDER BY mov_cnt DESC

            """

ans = pd.read_sql_query(query, conn)
display(ans)
```

	mov_cnt	mov_yr
0	2	2018
1	1	1939
2	1	1999
3	1	2000
4	1	2009
5	1	2012

```
Wall time: 5min 3s
```

Part 2 :

In [39]:

```
%%time
query = """
        SELECT y.allMov as 'movie_count', x.year as movie_year, ((x.Movies_Cnt*100.0)/
y.allMov) as Percent FROM
        (SELECT count(*) Movies_Cnt , m.year
        FROM Movie m where m.MID not in
        (SELECT mc.MID FROM Person p JOIN M_Cast mc ON trim(p.PID) = trim(mc.PID) WHERE
p.Gender='Male')
        GROUP BY m.year) x INNER JOIN
        (SELECT count(*) allMov, m.year
        FROM Movie m
        GROUP BY m.year) y on x.year=y.year
        """

ans = pd.read_sql_query(query, conn)
display(ans)
```

	movie_count	movie_year	Percent
0	2	1939	50.000000
1	66	1999	1.515152
2	64	2000	1.562500
3	110	2009	0.909091
4	111	2012	0.900901
5	104	2018	1.923077

```
Wall time: 4min 46s
```

6. Find the film(s) with the largest cast. Return the movie title and the size of the cast. By "cast size" we mean the number of distinct actors that played in that movie: if an actor played multiple roles, or if it simply occurs multiple times in casts, we still count her/him only once.

In [33]:

```
%%time
query = """
        SELECT m.title Movie_Name,count(distinct(c.PID)) Cast_Size
        FROM Movie m JOIN M_Cast c ON c.MID = m.MID
        GROUP BY m.MID ORDER BY Cast_Size desc limit 30

        """

ans = pd.read_sql_query(query, conn)
display(ans)
```

	Movie_Name	Cast_Size
0	Ocean's Eight	238
1	Apaharan	233
2	Gold	215
3	My Name Is Khan	213
4	Captain America: Civil War	191
5	Geostorm	170
6	Striker	165
7	2012	154
8	Pixels	144
9	Yamla Pagla Deewana 2	140
10	The Avengers	138
11	Housefull 3	129
12	Fan	127
13	Split Wide Open	126
14	Bajrangi Bhaijaan	124
15	Train Station	122
16	Daddy	121
17	Million Dollar Arm	117
18	Octopussy	116
19	Dhoom:3	115
20	Miss Lovely	113
21	Jab Tak Hai Jaan	110
22	Love Aaj Kal	108
23	Mubarakan	108
24	Hey Ram	107
25	Midnight's Children	106
26	Judwaa 2	106
27	The Day the Earth Stood Still	105
28	Corporate	104
29	Oye Lucky! Lucky Oye!	104

```
Wall time: 175 ms
```

7. A decade is a sequence of 10 consecutive years. For example, say in your database you have movie information starting from 1965. Then the first decade is 1965, 1966, ..., 1974; the second one is 1967, 1968, ..., 1976 and so on. Find the decade D with the largest number of films and the total number of films in D.

In [37]:

```
%%time
query = """
        SELECT d.year Start, d.year+9 End, count(*) no_of_films FROM
        (SELECT DISTINCT year from Movie) d JOIN Movie m ON m.year >= Start and m.year<
= End
        GROUP BY End ORDER BY no_of_films desc LIMIT 30)

        """

ans = pd.read_sql_query(query, conn)
display(ans)
```

	Start	End	no_of_films
0	2008	2017	1128
1	2009	2018	1118
2	2005	2014	1115
3	2007	2016	1114
4	2004	2013	1100
5	2006	2015	1096
6	2003	2012	1074
7	2002	2011	1050
8	2010	2019	1018
9	2001	2010	1012
10	2000	2009	959
11	1999	2008	925
12	2011	2020	901
13	1998	2007	876
14	1997	2006	826
15	2012	2021	792
16	1996	2005	785
17	1995	2004	713
18	2013	2022	683
19	1994	2003	670
20	1993	2002	632
21	1992	2001	603
22	1991	2000	573
23	2014	2023	556
24	1990	1999	551
25	1989	1998	529
26	1988	1997	512
27	1987	1996	490
28	1986	1995	462
29	2015	2024	438

```
Wall time: 71.8 ms
```

8. Find all the actors that made more movies with Yash Chopra than any other director.

In [46]:

```
%%time
query = """
        select name from
        (select pa.name,count(d.mid) as yash_total from
        person pd join m_director d on
        d.pid=pd.pid inner join
        m_cast on d.mid=m_cast.mid
        join person pa on
        pa.pid=m_cast.pid
        where pd.name='Yash Chopra'
        group by pd.name,pa.name
        having not exists(
        select count(d_1.mid) as other_directors from
        person pd_1 join
        m_director d_1 on
        d_1.pid=pd_1.pid inner join
        m_cast on d_1.mid=m_cast.mid
        join person pa_1 on
        pa_1.pid=m_cast.pid
        where pd_1.name!='Yash Chopra'
        group by pd_1.name,pa_1.name
        having pa.pid=pa_1.pid and yash_total<other_directors
        )
        )

        """
ans = pd.read_sql_query(query, conn)
display(ans)
```

	name
0	Abbie Murphy
1	Achala Sachdev
2	Akhtar Mirza
3	Akhtar-Ul-Iman
4	Aloka Mukherjee
...	...
237	Vinod Negi
238	Waheeda Rehman
239	Yash Chopra
240	Yashodra Katju
241	Yasin Khan

242 rows × 1 columns

```
Wall time: 1min 18s
```

9. The Shahrukh number of an actor is the length of the shortest path between the actor and Shahrukh Khan in the "co-acting" graph. That is, Shahrukh Khan has Shahrukh number 0; all actors who acted in the same film as Shahrukh have Shahrukh number 1; all actors who acted in the same film as some actor with Shahrukh number 1 have Shahrukh number 2, etc. Return all actors whose Shahrukh number is 2.

In [61]:

```
%%time

query = """
        SELECT DISTINCT TRIM(name) Name
        FROM Person p INNER JOIN M_Cast c on p.PID = TRIM(c.PID)
        INNER JOIN Movie m ON m.MID = c.MID AND TRIM(p.Name)!='Shah Rukh Khan'
        and m.title in (SELECT DISTINCT title FROM Person p3
        INNER JOIN M_Cast c3 on p3.PID = TRIM(c3.PID) AND TRIM(p3.Name) = p3.Name
        INNER JOIN Movie m3 ON m3.MID = c3.MID AND p3.Name IN
        (SELECT DISTINCT Name FROM Person p2 INNER JOIN M_Cast c2 ON p2.PID = TRIM(c2.P
ID)
        INNER JOIN Movie m2 ON m2.MID = c2.MID AND TRIM(p2.Name)!='Shah Rukh Khan' AND
 m2.title IN
        (SELECT DISTINCT title FROM Person p3 INNER JOIN M_Cast c3 ON p3.PID = TRIM(c3.
PID) AND
        TRIM(p3.Name) = 'Shah Rukh Khan' INNER JOIN Movie m3 ON m3.MID = c3.MID))) ORDE
R BY Name
        """

ans = pd.read_sql_query(query, conn)
display(ans)
```

	Name
0	'Ganja' Karuppu
1	'Musafir' Radio Performing
2	'Nandha' Saravanan
3	'Om' Rakesh Chaturvedi
4	A'Ali de Sousa
...	...
27022	Zurab Kapianidze
27023	Zuri Echea
27024	Zuzanna Zajac
27025	Àaron Brewster
27026	Ócsai Krisztián

27027 rows × 1 columns

```
Wall time: 830 ms
```