Summary

The objective of this project was to extract data from websites and available APIs. The following datasets were then transformed by cleaning, joining, and filtering into nine tables. The object-relational database (PostgreSQL) was used to load the datasets into pgAdmin.

Extract

The following Data Sources were used below:

IMDb Website

- Method: Web Scraping
- Link: https://www.imdb.com/chart/top/?ref_=nv_mv_250
- Used for: Collecting the Top 250 IMDB rated movie list
- Description: We used the url and pandas code to get the HTML table on the webpage. The data contains a list of top 250 imdb movie titles along with imdb rank and imdb rating.

	Unnamed: 0	Rank & Title	IMDb Rating	Your Rating	Unnamed: 4
0	NaN	1. The Shawshank Redemption (1994)	9.2	12345678910 NOT YET RELEASED Seen	NaN
1	NaN	2. The Godfather (1972)	9.1	12345678910 NOT YET RELEASED Seen	NaN
2	NaN	3. The Godfather: Part II (1974)	9.0	12345678910 NOT YET RELEASED Seen	NaN
3	NaN	4. The Dark Knight (2008)	9.0	12345678910 NOT YET RELEASED Seen	NaN
4	NaN	5. 12 Angry Men (1957)	8.9	12345678910 NOT YET RELEASED Seen	NaN

OMDb API

- Method: API Extraction
- Link: http://www.omdbapi.com/
- Used for: Collecting IMDb id and other movie related details like actor, director, etc.
- Description: We used OMDB API to get the movie details by the title of the movie. The endpoint for the API took the title name and returned the data in JSON format. 250 requests were made to this API (one for each movie in the IMDb top 250 movie data) to get 250 json return files. We appended all the json files in one json file and used it to create a pandas dataframe containing the movie title, imdb id, year rating, actor, director, production, etc.

	Title	Year	Rated	Released	Runtime	Genre	Director	Writer	Actors	Plot	...	imdbRatir
0	The Shawshank Redemption	1994.0	R	14 Oct 1994	142 min	Drama	Frank Darabont	Stephen King (short story "Rita Hayworth and S...	Tim Robbins, Morgan Freeman, Bob Gunton, Willi...	Two imprisoned men bond over a number of years...	...	9.3
1	The Godfather	1972.0	R	24 Mar 1972	175 min	Crime, Drama	Francis Ford Coppola	Mario Puzo (screenplay by), Francis Ford Coppo...	Marlon Brando, Al Pacino, James Caan, Richard ...	The aging patriarch of an organized crime dyna...	...	9.2

Utelly API

- Method: API Extraction
- Link: https://rapidapi.com/utelly/api/utelly?endpoint=apiendpoint_3cad787b-ca7b-449a-84b4-23b40d64fd73
- Used For: Collecting streaming options for Top 250 IMDb movies
- Description: Utelly API is an API available on rapidapi.com. A personal account was created to get the api_key required to request data from this API. The API had limits on the number of requests that we can make in a day.

  The endpoint used was GET/idlookup and it took the imdb_id to return a JSON file for each movie. We used the imdb_id obtained from the OMDb API. 250 requests were made using this API to obtain 250 json files, one for each movie. The json files contained the streaming options that are available for a particular movie. The returned json files were searched to look for the information that we needed and it was saved in a pandas dataframe. The information was collected and saved in such a way that we could get the dataframe in first normal form.

	IMDb ID	Title	Streaming Service	Streaming URL
0	tt0111161	The Shawshank Redemption	Netflix	https://www.netflix.com/title/70005379
1	tt0111161	The Shawshank Redemption	Google Play	https://play.google.com/store/movies/details/T...
2	tt0111161	The Shawshank Redemption	Amazon Instant Video	https://www.amazon.com/gp/product/B001EBV0P8?c...
3	tt0111161	The Shawshank Redemption	iTunes	https://itunes.apple.com/us/movie/the-shawshan...
4	tt0068646	The Godfather	Google Play	https://play.google.com/store/movies/details/T...
...	...	...	...	...
694	tt0103639	Aladdin	Google Play	https://play.google.com/store/movies/details/A...
695	tt0103639	Aladdin	DisneyPlusIVAUS	https://www.disneyplus.com/movies/aladdin-1992...
696	tt2338151	PK	Netflix	https://www.netflix.com/title/70303496
697	tt0094625	Akira	Hulu	https://www.hulu.com/watch/64a5a8d0-1406-4178-...
698	tt0050613	Throne of Blood	iTunes	https://itunes.apple.com/us/movie/throne-of-bl...

uNoGS API

- Method: API Extraction
- Link: https://rapidapi.com/unogs/api/unogs/endpoints
- Used For: Collecting movies on Netflix in released in the United States which have an IMDb rating greater than or equal to 7
- Description: uNoGS (unofficial Netflix online Global Search) allows anyone to search the global Netflix catalog. Netflix no longer provides an API for its data. So an alternative Netflix API was used. This API is available on rapidapi.com. A personal account had to be created on rapidapi.com to get the api_key needed to extract data from this API.

  The API provides several API endpoints. Each of the endpoints were analysed using sample requests to figure out the API that could be most useful for the purpose of the project. The endpoint used was GET Advanced Search. This endpoint provided an option to build an advanced custom query. Search could be based on a number of different parameters including netflix country list, movie/ series type, genre, subtitles, audio, imdb rating, dates on which the movie became available on Netflix and some other parameters.

  The parameters that we used for this search were

  1. Movie or Series: We used to code only to get a list of movies
  2. Country code: We used the code to get only the movies that are available in the United States (country code: 78 on API found using a different query)
  3. IMDb rating: We used to code to get only the movies that had the IMDb rating between 7 and 10.
  4. Movie year range was year 1900 to 2020 to get almost all the movies that satisfy the above conditions.
  5. No filtering was done for genre, subtitles, audio, etc.

     The API has a limit to return only 100 results per page per request. The return results of the query returned around 925 total results. Hence the request was made 10 times (ie, to get 10 pages of result) to get all the results that satisfy all the conditions listed above. The data obtained was in json format. The data on all the pages was combined in a json file and was loaded in a pandas dataframe using pd.read_json()

Code reference jupyter notebook: netflix_high_imdb_rated(uNoGS api)

	netflixid	title	image	synopsis	rating	type	released	runtime	largeimage
0	80192064	Luciano Mellera: Infantiloide	http://occ-0-2851-38.1.nflxso.net/dnm/api/v6/e...	Argentina's Luciano Mellera emphasizes the...	9.6	movie	2018	1h6m	
1	81206389	Oththa Seruppu Size 7	https://occ-0-2851-38.1.nflxso.net/dnm/api/v6/...	Taken into custody, a murder suspect's the...	9.4	movie	2019	1h43m	
2	553500	The Good, the Bad and the Ugly	https://occ-0-1091-300.1.nflxso.net/dnm/api/v6...	While the Civil War rages between the Union an...	8.8	movie	1966	2h58m	http://cdn1.nflxim

Google Search Engine

- Method: Web Scraping
- Link: A custom link was generated for each movie

  The titles of the movies (top 250 imdb movies) were converted to lowercase and the space between any two words in the movie title was replaced by '+'. Also the string '+watch+movie' was appended at the end of the url to get the data that we need.

- Used for: Collecting viewing Streaming Service availability and price.
- Description: Beautiful Soup library was used to scrape the data using css class names. Google has a limitation on the number of requests that can be made per hour. It was found through 'Google Search' that this number is 8 requests per hour per IP address. There is a possibility that if the number of requests exceed 10, Google will block the IP address. So scraping the data involved a lot of effort in running the code in sets of 8, multiple times during the day. The data obtained was transformed in pandas data frame.

Title	Streaming On	Price
The Shawshank Redemption	YouTube	3.99
The Shawshank Redemption	iTunes	3.99
The Shawshank Redemption	Google Play Movies & TV	3.99
The Shawshank Redemption	Vudu	3.99
The Shawshank Redemption	Amazon Prime Video	3.99
The Shawshank Redemption	Philo	Subscription
The Godfather	YouTube	2.99
The Godfather	Google Play Movies & TV	2.99
The Godfather	Vudu	2.99
The Godfather	Amazon Prime Video	2.99
The Godfather: Part Ii	YouTube	2.99
The Godfather: Part Ii	Google Play Movies & TV	2.99
The Godfather: Part Ii	Vudu	2.99
The Godfather: Part Ii	Amazon Prime Video	2.99
The Dark Knight	YouTube	3.99
The Dark Knight	Google Play Movies & TV	3.99

Transform

- Data extracted were formatted in CSV and JSON files
- The data formatted files were manipulated in pandas to clean, join, and filter nine tables

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Tables

top_imdb

	imdb_id	title
0	tt0111161	The Shawshank Redemption
1	tt0068646	The Godfather
2	tt0071562	The Godfather: Part II
3	tt0468569	The Dark Knight
4	tt0050083	12 Angry Men
...	...	...
245	tt0064115	Butch Cassidy and the Sundance Kid
246	tt0103639	Aladdin
247	tt2338151	PK
248	tt0094625	Akira
249	tt0050613	Throne of Blood

Transformation steps:

- The data table obtained from the IMDb website link has IMDb rank, Movie title and Year of Release in a single column. These were converted in separate columns to get the list of movies. This list was then used as an input for the OMDb API.
- Displayed just the IMDb ID and movie title from the OMDb API data
- Saved the DataFrame to a csv file

movie

	imdb_id	imdb_rank	title	year	runtime	rated	imdb_rating	production
0	tt0111161	0	The Shawshank Redemption	1994	142	R	9.3	Columbia Pictures
1	tt0068646	1	The Godfather	1972	175	R	9.2	Paramount Pictures
2	tt0071562	2	The Godfather: Part II	1974	202	R	9.0	Paramount Pictures
3	tt0468569	3	The Dark Knight	2008	152	PG-13	9.0	Warner Bros. Pictures/Legendary
4	tt0050083	4	12 Angry Men	1957	96	Approved	8.9	Criterion Collection

Transformation steps:

- Displayed IMDb ID, movie title, year, release year, runtime, movie rating, IMDB rating, and production from the OMDb API data
- Reset the index to make the IMDB rank column
- Transformed the decimal significant figure from 1 to 0
- Split the runtime string to only include the number
- Renamed columns of the runtime data frame to drop the unwanted string from runtime
- Renamed the columns of the movie data frame to include only meaningful names
- Combined runtime and movie data frame
- Displayed IMDb ID, movie title, year, release year, runtime, movie rating, IMDB rating, and production from movie data frame
- Saved the DataFrame to a csv file

movie_actor

	imdb_id	actor
0	tt0111161	Tim Robbins
1	tt0111161	Morgan Freeman
2	tt0111161	Bob Gunton
3	tt0111161	William Sadler
4	tt0068646	Marlon Brando
...	...	...
972	tt0094625	Tesshô Genda
973	tt0050613	Toshirô Mifune
974	tt0050613	Isuzu Yamada
975	tt0050613	Takashi Shimura
976	tt0050613	Akira Kubo

Transformation steps:

- Displayed IMDb ID, and actors from the OMDb API data
- Dropped any N/A values
- Creating an actor list to set up a conversion into a DataFrame
- Iterated through actors dataframe to clean up data into a dictionary
- Converted actor list into a Dataframe
- Saved the DataFrame to a csv file

movie_director

	imdb_id	director
0	tt0111161	Frank Darabont
1	tt0068646	Francis Ford Coppola
2	tt0071562	Francis Ford Coppola
3	tt0468569	Christopher Nolan
4	tt0050083	Sidney Lumet
...	...	...
265	tt0103639	Ron Clements
266	tt0103639	John Musker
267	tt2338151	Rajkumar Hirani
268	tt0094625	Katsuhiro Ôtomo
269	tt0050613	Akira Kurosawa

Transformation steps:

- Displayed IMDb ID, and directors from the OMDb API data
- Dropped any N/A values
- Creating a director list to set up a conversion into a DataFrame
- Iterated through directors dataframe to clean up data into a dictionary
- Converted director list into a Dataframe
- Saved the DataFrame to a csv file

utelly_streaming_service

	service_id	service_name
0	ss_1	Amazon Instant Video
1	ss_2	Amazon Prime Video
2	ss_3	AtomTickets
3	ss_4	DisneyPlus
4	ss_5	FandangoMovies
5	ss_6	Google Play
6	ss_7	HBO
7	ss_8	Hulu
8	ss_9	Netflix
9	ss_10	iTunes

Transformation steps:

- Displayed streaming services from the Utelly API data
- Renamed column header to have meaningful names
- Filtered to see unique values in Streaming service column of dataframe to set up for a unique service id
- Splitting service name column by splitting string
- Grouped Streaming services
- Renamed columns to meaningful names
- Dropping unwanted column that did not include streaming name
- Declared a list for unique service id column
- Created a service id column and added to the service_id list
- Show service_id and service_name of the utelly_streaming_Service table
- Saved the DataFrame to a csv file

google_streaming_service

	service_id	service_name
0	gg_1	Amazon Prime Video
1	gg_2	Cinemax
2	gg_3	Crackle
3	gg_4	Disney+
4	gg_5	Google Play Movies & TV
5	gg_6	HBO Now
6	gg_7	Hulu
7	gg_8	Netflix
8	gg_9	Philo
9	gg_10	Showtime
10	gg_11	Sling TV
11	gg_12	Starz
12	gg_13	Tubi
13	gg_14	Vudu
14	gg_15	YouTube
15	gg_16	fuboTV
16	gg_17	iTunes

Transformation steps:

- Displayed streaming services from the Google web scraped data
- Renamed column header to have meaningful names
- Filtered to see unique values in Streaming service column of dataframe to set up for a unique service id
- Grouped Streaming services
- Renamed columns to meaningful names
- Dropping unwanted column that did not include streaming name
- Declared a list for unique service id column
- Created a service id column and added to the service_id list
- Show service_id and service_name of the google_streaming_service table
- Saved the DataFrame to a csv file

utelly_movie_streaming

	imdb_id	service_id
0	tt0111161	ss_9
1	tt0111161	ss_6
2	tt0111161	ss_1
3	tt0111161	ss_10
4	tt0068646	ss_6
...	...	...
694	tt0103639	ss_6
695	tt0103639	ss_4
696	tt2338151	ss_9
697	tt0094625	ss_8
698	tt0050613	ss_10

Transformation steps:

- Displayed streaming services from the Utelly API data
- Transformed streaming service column by splitting string
- Dropped unwanted column that does not include important information for service dataframe
- Renamed columns to meaningful names
- Combined rename dataframe with service dataframe
- Created a blank series for the service_id column
- Ran a for loop and assigning values to service_id series
- Inserted new column from the service_id values
- Showed service id and IMDB id of the utelly_movie_streaming table
- Saved the DataFrame to a csv file

google_movie_streaming

	title	google_service_id	price
0	The Shawshank Redemption	gg_17	3.99
1	The Shawshank Redemption	gg_9	3.99
2	The Shawshank Redemption	gg_6	3.99
3	The Shawshank Redemption	gg_16	3.99
4	The Shawshank Redemption	gg_1	3.99
...	...	...	...
1171	Akira	gg_16	2.99
1172	Akira	gg_9	5.99
1173	Akira	gg_7	Subscription
1174	Throne Of Blood	gg_9	3.99
1175	Throne Of Blood	gg_1	3.99

Transformation steps:

- Displayed streaming services from the Google web scraped data
- Renamed column header to have meaningful names
- Filtered to see unique values in Streaming service column of dataframe to set up for a unique service id
- Created a blank series for the service_id column
- Ran a for loop and assigning values to service_id series
- Inserted new column from the service_id values
- Showed movie title, google service id and price of the google_movie_streaming table
- Saved the DataFrame to a csv file

netflix_movie

	netflix_id	imdb_id	title
2	553500	tt0060196	The Good, the Bad and the Ugly
3	70131314	tt1375666	Inception
8	20557937	tt0133093	The Matrix
17	60010110	tt0088763	Back to the Future
18	60031884	tt0064116	Once Upon a Time in the West
...	...	...	...
863	70114021	tt1019452	A Serious Man
864	80017021	tt2937898	A Most Violent Year
866	70130432	tt0081494	Return To The 36th Chamber
867	80025390	tt3007512	The Water Diviner
868	80046694	tt4178092	The Gift

Transformation steps:

- Displayed Netflix ID, IMDB ID, and movie title from the Rapid API data
- Renames columns into meaningful names
- Saved the DataFrame to a csv file

Load

- The object-relational database (PostgreSQL) was used to load the datasets into pgAdmin
- We selected a relational database as the data was in a structured format

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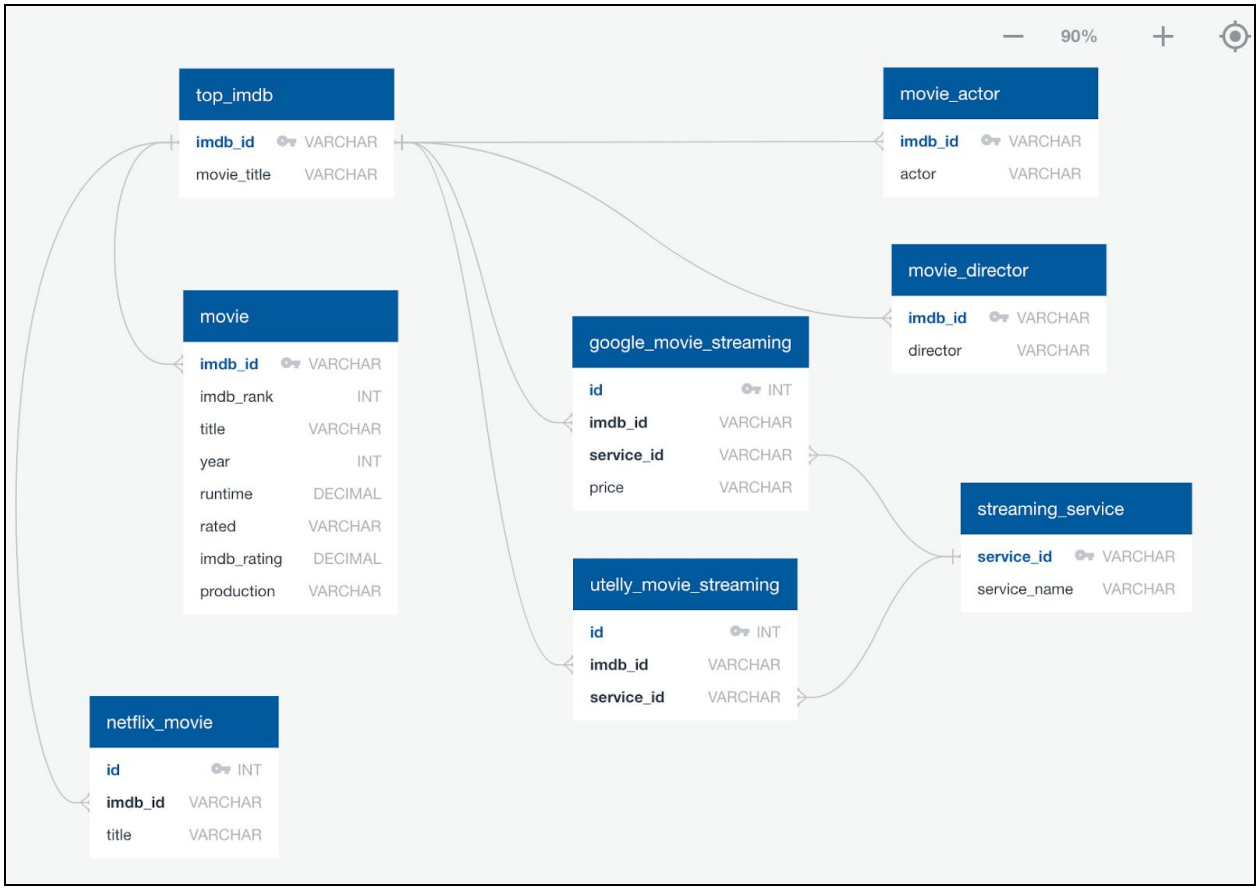
Table Schema was generated and sqlalchemy engine was used to load the data into the SQL tables

- Code Reference: SQL_Tables.ipynb

ERD Diagram



ERD Text

```
top_imdb
-
   imdb_id  VARCHAR  PK
movie_title  VARCHAR

movie
-
   imdb_id  VARCHAR  PK FK >- top_imdb.imdb_id
 imdb_rank  INT
     title  VARCHAR
      year  INT
   runtime  DECIMAL
     rated  VARCHAR
imdb_rating  DECIMAL
production   VARCHAR

movie_actor
-
   imdb_id  VARCHAR  PK FK >- top_imdb.imdb_id
     actor  VARCHAR

movie_director
-
    imdb_id  VARCHAR  PK FK >- top_imdb.imdb_id
   director  VARCHAR

streaming_service
-
 service_id  VARCHAR  PK
service_name  VARCHAR

google_movie_streaming
-
      title  VARCHAR  FK >- top_imdb.imdb_id
 service_id  VARCHAR  FK >- streaming_service.service_id
      price  VARCHAR

utelly_movie_streaming
-
    imdb_id  VARCHAR  FK >- top_imdb.imdb_id
 service_id  VARCHAR  FK >- streaming_service.service_id

netflix_movie
-
        id  INT      PK
   imdb_id  VARCHAR  FK >- top_imdb.imdb_id
     title  VARCHAR
```

SQL Schema

```
DROP TABLE IF EXISTS top_imdb;
DROP TABLE IF EXISTS movie;
DROP TABLE IF EXISTS movie_actor;
DROP TABLE IF EXISTS movie_director;
DROP TABLE IF EXISTS streaming_service;
DROP TABLE IF EXISTS netflix_movie;

create table top_imdb(
       imdb_id  VARCHAR  not null,
   movie_title  VARCHAR  not null,
   PRIMARY KEY  (imdb_id)
);

create table movie(
       imdb_id  VARCHAR  not null,
     imdb_rank  INT      not null,
         title  VARCHAR  not null,
          year  INT      not null,
       runtime  DECIMAL  not null,
         rated  VARCHAR  not null,
   imdb_rating  DECIMAL  not null,
   production   VARCHAR  not null,
   PRIMARY KEY  (imdb_id),
   FOREIGN KEY  (imdb_id) REFERENCES top_imdb (imdb_id)
);

create table movie_actor(
       imdb_id  VARCHAR  not null,
         actor  VARCHAR  not null,
   FOREIGN KEY  (imdb_id) REFERENCES top_imdb (imdb_id)
);


create table movie_director(
       imdb_id  VARCHAR  not null,
      director  VARCHAR  not null,
   FOREIGN KEY  (imdb_id) REFERENCES top_imdb (imdb_id)
);


create table streaming_service(
    service_id  VARCHAR  not null,
  service_name  VARCHAR  not null,
   PRIMARY KEY  (service_id)
);

create table google_movie_streaming(
          id  INT       not null,
      imdb_id  VARCHAR   not null,
```

```
   service_id  VARCHAR   not null,
        price  VARCHAR   not null,
  PRIMARY KEY  (id,imdb_id),
  FOREIGN KEY  (imdb_id)    REFERENCES top_imdb (imdb_id),
  FOREIGN KEY  (service_id) REFERENCES streaming_service (service_id)
);

create table utelly_movie_streaming(
           id  INT       not null,
      imdb_id  VARCHAR   not null,
   service_id  VARCHAR   not null,
  PRIMARY KEY  (id,imdb_id),
  FOREIGN KEY  (imdb_id)    REFERENCES top_imdb (imdb_id),
  FOREIGN KEY  (service_id) REFERENCES streaming_service (service_id)
);

create table netflix_movie(
            id  INT not null,
       imdb_id  VARCHAR not null,
         title  VARCHAR not null,
   PRIMARY KEY  (id),
   FOREIGN KEY  (imdb_id) REFERENCES top_imdb (imdb_id)
);
```

Sample Queries

Query: Joining movie table with google_movie_streaming table

```
101  select * from movie
102  join google_movie_streaming
103  on lower(movie.title) = lower(google_movie_streaming.title)
104  join google_streaming_service
105  on google_movie_streaming.service_id = google_streaming_service.service_id
106
```

Data Output | Explain | Messages | Notifications

	imdb_id character varying	imdb_rank integer	title character varying	year integer	runtime numeric	rated character varying	imdb_rating numeric
1	tt0050083	5	12 Angry Men	1957	96	Approved	
2	tt0050083	5	12 Angry Men	1957	96	Approved	
3	tt0050083	5	12 Angry Men	1957	96	Approved	
4	tt0050083	5	12 Angry Men	1957	96	Approved	
5	tt0050083	5	12 Angry Men	1957	96	Approved	
6	tt2024544	202	12 Years a Slave	2013	134	R	
7	tt2024544	202	12 Years a Slave	2013	134	R	
8	tt2024544	202	12 Years a Slave	2013	134	R	
9	tt2024544	202	12 Years a Slave	2013	134	R	
10	tt2024544	202	12 Years a Slave	2013	134	R	
11	tt0062622	90	2001: A Space Odyssey	1968	149	G	
12	tt0062622	90	2001: A Space Odyssey	1968	149	G	
13	tt0062622	90	2001: A Space Odyssey	1968	149	G	
14	tt0062622	90	2001: A Space Odyssey	1968	149	G	
15	tt0062622	90	2001: A Space Odyssey	1968	149	G	

Query: Specific movie title, streaming service availability, price

Query in google_movie_streaming table for movie (“Inception”), streaming service available, and price

Query Editor | Query History

```
1  select google_movie_streaming.title, google_streaming_service.service_name, google_movie_streaming.price
2  from google_movie_streaming
3  join google_streaming_service
4  on google_movie_streaming.service_id = google_streaming_service.service_id
5  where title = 'Inception';
```

Data Output | Explain | Messages | Notifications

	title character varying	service_name character varying	price character varying
1	Inception	Amazon Prime Video	3.99
2	Inception	HBO Now	3.99
3	Inception	Philo	3.99
4	Inception	Showtime	Subscription
5	Inception	fuboTV	3.99
6	Inception	iTunes	3.99