515 HOMEWORK 2: EARTHQUAKE DATA

Your assignment is to use a combination of two APIs to collect and store realtime earthquake data. The United States Geological Survey (USGS) maintains a public JSON API with information on all earthquakes affecting the United States in the past hour, located at "https://earthquake.usgs.gov/earthquakes/feed/v1.0/summary/all_hour.geojson". The information for each earthquake is embedded within a JSON array. The information of interest for each earthquake is:

- Earthquake magnitude, which measures the relative size of the earthquake. The "mag" field contains the earthquake magnitude.

- Earthquake coordinates, which indicate the geographic position of the earthquake. The "coordinates" field contains the longitude, latitude, and elevation of each earthquake. Elevation is not relevant to this assignment, but record the longitude and latitude.

- Earthquake time, which indicates when the earthquake occurred. The "time" field contains the earthquake time. The "time" field is stored in Unix epoch time format, which measures time as the number of milliseconds since January 1, 1970. This format can be converted to a human-interpretable format as follows:

```
# Unix epoch time on September 1, 2022
orig_time = 1662015600000

# Convert milliseconds to seconds
orig_time_sec = orig_time / 1000

# Convert Unix epoch time to datetime object
import datetime
datetime_timestamp = datetime.datetime.utcfromtimestamp(orig_time_sec)

# Subtract 7 hours to adjust for time zone difference
datetime_adj_timestamp = datetime_timestamp - datetime.timedelta(hours = 7)

# Convert to human-interpretable string
# String would say: "September 01, 2022 at 12:00:00 AM"
time_str = datetime_adj_timestamp.strftime("%B %d, %Y at %I:%M:%S %p")
```

Next, use a second API to obtain more information about the location of each earthquake. The OpenCage API provides a free service the converts from latitude and longitude coordinates to county and state. To avoid the API being overloaded with too many requests, OpenCage requires that each user sign up for their own unique "key" for their application. Signing up is free, and each key entitles the user to 2,500 requests per day, which should be more than enough for this assignment. You can sign up for a key here. You *must* obtain your own API key. After signing up, your API key can be found here.

After completing the OpenCage signup, you can obtain geographic data about each earthquake location using "https://api.opencagedata.com/geocode/v1/xml?q=**lat+long**&key=**yourkey**". Replace **lat** in the URL with the latitude of your earthquake; replace **long** in the URL with the longitude of your earthquake; and replace **yourkey** in the URL with your API key. The API will return results in XML format. The information of interest for each earthquake is:

- The county corresponding to the latitude and longitude. The "county" field contains the county.

- The state corresponding to the latitude and longitude. The "state" field contains the state.

For each earthquake, show a printout that reflects the complete information you have obtained; for example:

```
Magnitude 0.51 earthquake on September 20, 2021 at 06:33:18 AM and located at
(33.6101667, -116.7991667) in Riverside County, California.
Magnitude 1.71 earthquake on September 20, 2021 at 06:20:33 AM and located at
(33.307, -116.343) in San Diego County, California.
```

Occasionally, an earthquake will not correspond to a location in the United States because it occurred in the Ocean off the coast of the United States. In these cases, the OpenCage API will not return a "county" or "state" field. Handle the potential error in your code (try-except is a good strategy) and instead show an appropriate printout; for example:

```
Magnitude 5.1 earthquake on September 20, 2021 at 06:12:03 AM and located at (-
36.7685, -74.004) in the Ocean.
```

Finally, output the data for each earthquake to a CSV file named "earthquakes.csv". The CSV file should have columns for time, magnitude, latitude, longitude, county, and state. For example:

September 20, 2021 at 06:33:18 AM	0.51	33.6101667	-116.7991667	Riverside County	California
September 20, 2021 at 06:20:33 AM	1.71	33.307	-116.343	San Diego County	California
September 20, 2021 at 06:12:03 AM	5.1	-36.7685	-74.004	N/A	N/A

Ensure that your program overwrites the output CSV file each time that it runs.

Some considerations as you write your code:

- Consider the possibility that, when attempting connection to each API, some connection issue occurs (that is, a status code other than 200). Ensure that your code handles this case and provides the user with a helpful printout if it does occur.

- Ensure that your output is crisp, professional, and well-formatted. For example, ensure that you have used spaces appropriately and checked your spelling.

- Adding comments in your code is encouraged. You may decide how best to comment your code. At minimum, please use a comment at the start of your code to describe its basic functionality.