In [20]:
```python
import requests
import json
```

In [21]:
```python
'''
All roasters : https://classes.cornell.edu/api/2.0/config/rosters.json
All subs in Fall 14 : https://classes.cornell.edu/api/2.0/config/subjects.j
roster=FA14

All Math classes in Fall 2014, use method search/classes
Link : https://classes.cornell.edu/api/2.0/search/classes.json?roster=FA14&
roster=FA14
subject=MATH
'''

response_roasters = requests.get("https://classes.cornell.edu/api/2.0/confi
```

In [22]:
```python
print(response_roasters.status_code)
data = response_roasters.json()

pretty_json = json.dumps(data, indent=4)
```

```
200
```

In [23]:
```python
print(pretty_json)
```

```
{
    "status": "success",
    "data": {
        "rosters": [
            {
                "slug": "FA14",
                "isDefaultRoster": "N",
                "strm": "2573",
                "descr": "Fall 2014",
                "descrshort": "2014FA",
                "attributeSrc": "CATALOG",
                "defaultSessionCode": "1",
                "defaultCampus": "MAIN",
                "defaultLocation": "ITH",
                "defaultInstructionMode": "P",
                "sharing": "N",
                "archiveMode": "Y",
                "version": {
                    "status": "COMPLETE",
```

In [24]:
```python
import time
```

In [32]:
```python
BASE_URL = "https://classes.cornell.edu/api/2.0"


def fetch_rosters():
    """
    This function accesses Cornell API and returns the JSON response.

    Args:

    Returns: Returns the JSON of all the rosters.
        type: JSON object.
    """
    endpoint = "/config/rosters.json"
    response = requests.get(BASE_URL + endpoint)
    print(response.status_code)
    time.sleep(1)
    return response.json()  # Assuming API returns JSON. Use .text if XML.

def fetch_subjects(roster):
    """
    This function accesses particular roster and returns the JSON response.

    Args: Roster

    Returns: Returns the JSON of all subjects in particular roster.
        type: JSON object.
    """
    endpoint = f"/config/subjects.json?roster={roster}"
    response = requests.get(BASE_URL + endpoint)
    return response.json()

def fetch_classes_with_description(roster, subject):
    """
    This function accesses the particular roster and subject and return the

    Args: Roster, Subject

    Returns: Returns the JSON of all classes in particular roster and subje
        type: JSON object.
    """
    endpoint = f"/search/classes.json?roster={roster}&subject={subject}"
    response = requests.get(BASE_URL + endpoint)
    return response.json()

def add_subjects_to_roster_in_json(data,subjects,term):
    """
    This function updates the final JSON object to add subjects to Roster.

    Args: JSON Object, subjects, term

    Returns:
    """
    if isinstance(data, dict):
        for item in data["data"]:
            if item.get("Term")==term:
                subject_array = subjects["data"]["subjects"]
                new_json = {
                    "subjects": subject_array
                }
                item.update(new_json)
```

```python
def get_class_info(description):
    """
    This function builds the classes array.

    Args: Description

    Returns: Returns the classes array.
        type: JSON object.
    """
    targetJSON ={
        "classes":[]
    }
    for class_info in description["data"]["classes"]:
        course_data={
            "titleShort": class_info["titleShort"],
            "titleLong": class_info["titleLong"],
            "description": class_info["description"]
        }
        targetJSON["classes"].append(course_data)
    return targetJSON


def add_classes_to_subjects_in_corrosponding_roster3(data,roster,subject_pa
    """
    This function updates the final JSON object

    Args: Initial JSON object, roster, subject_passed, description

    Returns:
    """
    for item in data['data']:
        if item['Term']==roster:
            for subject in item["subjects"]:
                if subject["value"]==subject_passed:
                    subject.update(description)




if __name__ == "__main__":
    rosters = fetch_rosters()
    #print(rosters)
    data={
        "data" :[]
    }
    counter=0;
    for roster in rosters['data']['rosters']:
        data["data"].append({
            "Year" : roster['descr'][-4:],          #basically accessing the
            "Term" :roster['slug'],
            "Term Description" : roster['descr']
        })

        subjects = fetch_subjects(roster['slug'])     #bascially the name of
        add_subjects_to_roster_in_json(data,subjects,roster['slug'])

    #Building the JSON File
    for roster in data["data"]:
        for subject in roster["subjects"]:
```

```
                    json_description = fetch_classes_with_description(roster["T
                    class_data = get_class_info(json_description)
                    add_classes_to_subjects_in_corrosponding_roster3(data,roste
        with open('output.json', 'w') as f:
            json.dump(data, f, indent=4)
```

200

In [ ]:
```python
import json
```

In [ ]:
```python
with open('output.json', 'r') as f:
    json_data = json.load(f)
```

In [10]:
```python
import pandas as pd
from pandas import json_normalize
```

In [11]:
```python
# Normalize the top level
df_data = json_normalize(json_data, 'data')
df_data.head()
```

Out[11]:

	Year	Term	Term Description	subjects
0	2014	FA14	Fall 2014	[{'value': 'AAS', 'descr': 'Asian American Stu...
1	2015	WI15	Winter 2015	[{'value': 'AEM', 'descr': 'Applied Economics ...
2	2015	SP15	Spring 2015	[{'value': 'AAS', 'descr': 'Asian American Stu...
3	2015	SU15	Summer 2015	[{'value': 'AEM', 'descr': 'Applied Economics ...
4	2015	FA15	Fall 2015	[{'value': 'AAS', 'descr': 'Asian American Stu...

In [12]:
```python
# Normalize subjects (including nested classes)
df_subjects = json_normalize(json_data, record_path=['data','subjects'],
                             meta=[['data', 'Year'], ['data', 'Term'], ['da

df_subjects.head()
```

Out[12]:

	value	descr	descrformal	classes	data.Year	data.Term	data.Term Description
0	AAS	Asian American Studies	Asian American Studies	[{'titleSort': 'Intro To Asian American Hist',...	2014	FA14	Fall 2014
1	AEM	Applied Economics & Management	Applied Economics & Management	[{'titleShort': 'FWS:Fd Systems in Devlpng Wrl...	2014	FA14	Fall 2014
2	AEP	Applied & Engineering Physics	Applied & Engineering Physics	[{'titleShort': 'Laser & Photonics', 'titleLon...	2014	FA14	Fall 2014
3	AGSCI	Agriculture Sciences	Agricultural Sciences	[{'titleShort': 'Exploring AGSCI Careers', 'ti...	2014	FA14	Fall 2014
4	AIRS	Air Force Science	Aerospace Studies	[{'titleShort': 'Foundations of US Air Force I...	2014	FA14	Fall 2014

In [14]:
```python
# Normalize classes
df_classes = json_normalize(json_data, record_path=['data', 'subjects', 'cl
                            meta=[['data', 'Year'], ['data', 'Term'], ['dat
df_classes.head(100)
```

Out[14]:

	titleSort	titleLonitleShg	description	titleShort	titleLong	data.Yea
0	Intro To Asian American Hist	Introduction to Asian American History	An introductory history of Chinese, Japanese, ...	NaN	NaN	2014
1	NaN	NaN	The common perception of ethnicity is that it ...	Asians in the Americas	Asians in the Americas: A Comparative Perspective	2014
2	NaN	NaN	This course examines the experiences and repre...	Asian American Women's Hist	Asian American Women's History	2014
3	NaN	NaN		Independent Study	Independent Study	2014
4	NaN	NaN	What is it like to be a subsistence farmer in ...	FWS:Fd Systems in Devlpng Wrld	FWS:Food Systems In The Developing World: Heal...	2014
...	...	...	...	...	...	.
95	NaN	NaN	Laboratory or theoretical work in any branch o...	Independent Study for Honors	Independent Study for Honors	2014
96	NaN	NaN	Topics include wave propagation in dielectrics...	Applied Electrodynamics	Applied Electrodynamics	2014
97	NaN	NaN	Topics include plasma state; motion of charged...	Introduction to Plasma Physics	Introduction to Plasma Physics	2014
98	NaN	NaN	Graduate-level introduction to the tools used ...	Nanocharacterization	Nanocharacterization	2014
99	NaN	NaN	Upper-level undergraduate and graduate-level c...	Nanobiotechnology	Nanobiotechnology	2014

100 rows × 9 columns

In [12]:
```python
# Merging df_data and df_subjects
df_merged = pd.merge(df_data, df_subjects, left_on=['Year', 'Term', 'Term D

# Dropping redundant columns resulted from merging
df_merged = df_merged.drop(columns=['data.Year', 'data.Term', 'data.Term De

# Merging df_merged and df_classes
df_final = pd.merge(df_merged, df_classes, left_on=['Year', 'Term', 'Term D

# Dropping redundant columns resulted from merging
df_final = df_final.drop(columns=['data.Year', 'data.Term', 'data.Term Desc

df_final.head(15)
```

Out[12]:

	Year	Term	Term Description	subjects	value	descr	descrformal	classes	
0	2014	FA14	Fall 2014	[{'value': 'AAS', 'descr': 'Asian American Stu...	AAS	Asian American Studies	Asian American Studies	[{'titleShort': 'Intro To Asian American Hist'...	
1	2014	FA14	Fall 2014	[{'value': 'AAS', 'descr': 'Asian American Stu...	AAS	Asian American Studies	Asian American Studies	[{'titleShort': 'Intro To Asian American Hist'...	
2	2014	FA14	Fall 2014	[{'value': 'AAS', 'descr': 'Asian American Stu...	AAS	Asian American Studies	Asian American Studies	[{'titleShort': 'Intro To Asian American Hist'...	A:
3	2014	FA14	Fall 2014	[{'value': 'AAS', 'descr': 'Asian American Stu...	AAS	Asian American Studies	Asian American Studies	[{'titleShort': 'Intro To Asian American Hist'...	Indep
4	2014	FA14	Fall 2014	[{'value': 'AAS', 'descr': 'Asian American Stu...	AEM	Applied Economics & Management	Applied Economics & Management	[{'titleShort': 'FWS:Fd Systems in Devlpng Wrl...	FWS:F
5	2014	FA14	Fall 2014	[{'value': 'AAS', 'descr': 'Asian American Stu...	AEM	Applied Economics & Management	Applied Economics & Management	[{'titleShort': 'FWS:Fd Systems in Devlpng Wrl...	Foundat
6	2014	FA14	Fall 2014	[{'value': 'AAS', 'descr': 'Asian American Stu...	AEM	Applied Economics & Management	Applied Economics & Management	[{'titleShort': 'FWS:Fd Systems in Devlpng Wrl...	Econ
7	2014	FA14	Fall 2014	[{'value': 'AAS', 'descr': 'Asian American Stu...	AEM	Applied Economics & Management	Applied Economics & Management	[{'titleShort': 'FWS:Fd Systems in Devlpng Wrl...	Cont Co
8	2014	FA14	Fall 2014	[{'value': 'AAS', 'descr': 'Asian American Stu...	AEM	Applied Economics & Management	Applied Economics & Management	[{'titleShort': 'FWS:Fd Systems in Devlpng Wrl...	
9	2014	FA14	Fall 2014	[{'value': 'AAS', 'descr': 'Asian American Stu...	AEM	Applied Economics & Management	Applied Economics & Management	[{'titleShort': 'FWS:Fd Systems in Devlpng Wrl...	Introduc

	Year	Term	Term Description	subjects	value	descr	descrformal	classes	
10	2014	FA14	Fall 2014	[{'value': 'AAS', 'descr': 'Asian American Stu...	AEM	Applied Economics & Management	Applied Economics & Management	[{'titleShort': 'FWS:Fd Systems in Devlpng Wrl...	Mngmnt
11	2014	FA14	Fall 2014	[{'value': 'AAS', 'descr': 'Asian American Stu...	AEM	Applied Economics & Management	Applied Economics & Management	[{'titleShort': 'FWS:Fd Systems in Devlpng Wrl...	Financ
12	2014	FA14	Fall 2014	[{'value': 'AAS', 'descr': 'Asian American Stu...	AEM	Applied Economics & Management	Applied Economics & Management	[{'titleShort': 'FWS:Fd Systems in Devlpng Wrl...	Financ
13	2014	FA14	Fall 2014	[{'value': 'AAS', 'descr': 'Asian American Stu...	AEM	Applied Economics & Management	Applied Economics & Management	[{'titleShort': 'FWS:Fd Systems in Devlpng Wrl...	
14	2014	FA14	Fall 2014	[{'value': 'AAS', 'descr': 'Asian American Stu...	AEM	Applied Economics & Management	Applied Economics & Management	[{'titleShort': 'FWS:Fd Systems in Devlpng Wrl...	