assignment2

November 4, 2024

[ ]:

```
version = "REPLACE_PACKAGE_VERSION"
```

1 SIADS 515 Week 2 Homework (HW2)

A Pandas DataFrame can be populated with a generator:

[ ]:

```
def gen_three_data():
    '''
    Generate 3 dictionaries with keys A and B
    '''
    for i in range(3):
        yield {
            "A": i + 1, # simple
            "B": (i + 1) * 10, # some math
        }
```

[ ]:

```
import pandas as pd

pd.DataFrame(data=gen_three_data())
```

We can also add a parameter to the generator:

[ ]:

```
import numpy as np
def gen_some_data(n):
    '''
    Generate n dictionaries with keys A, B and C
    '''
    for i in range(n):
        yield {
            "A": i + 1, # simple
            "B": (i + 1) * 10, # some math
            "C": np.random.randn() # a random number drawn from a standard normal distribution
        }
```

[ ]:

```
import pandas as pd
```

```
pd.DataFrame(data=gen_some_data(10))
```

There are times when using this technique can be a nice way to solve problems that would be hard to solve in other ways.

1.1 Question 1

We need to get the data from the file `assets/companies_small_set.data` into a DataFrame. The problem is that the data on each line of the file is in either a JSON or Tab-separated values (TSV) format.

The JSON lines are in the correct format, they just need to be converted to native Python `dict`s.

The TSV lines need to be converted in to `dict`s that match the JSON format.

Write a generator `gen_fixed_data` that takes an iterator as an arguement. It should parse the values in the iterator and yield each value in the correct format: A `dict` with the keys:

- company
- catch_phrase
- phone
- timezone
- client_count

Note that your solution should be a generator function, it should not return a DataFrame.

[11]:

```
import json
import pandas as pd

def gen_fix_data(data_iterator):
    for line in data_iterator:
        line = line.strip()
        if line.startswith('{'):
            yield json.loads(line)
        else:
            fields = line.split('\t')
            yield {
                "company": fields[0],
                "catch_phrase": fields[1],
                "phone": fields[2],
                "timezone": fields[3],
                "client_count": int(fields[4])
            }

        # YOUR CODE HERE
    #raise NotImplementedError()
```

If the generator is correctly fixing the data formats, we should be able to use it to populate a DataFrame...

[12]:
```
with open('assets/companies_small_set.data', 'r') as broken_data:
    df = pd.DataFrame(data=gen_fix_data(broken_data))
df.head()
```

[12]:
```
             company                                    catch_phrase  \
0        Watkins Inc                Integrated radical installation
1  Bennett and Sons  Persistent contextually-based standardization
2    Ferguson-Garner                 Multi-layered tertiary neural-net
3     Pennington PLC                     Future-proofed tertiary frame
4          Perry PLC                 Managed full-range secured line

                 phone                      timezone  client_count
0           7712422719              America/New_York           442
1         018.666.0600           America/Los_Angeles           492
2  (086)401-8955x53502           America/Los_Angeles           528
3  +1-312-296-2956x137  America/Indiana/Indianapolis           638
4      825-403-2850x005               America/Chicago           474
```

[15]:
```
# This cell runs a series of assert statements to grade your solution.

with open('assets/companies_small_set.data', 'r') as broken_data:
    gen = gen_fix_data(broken_data)

    # Let's make sure gen_fix_data is a generator function...
    from types import GeneratorType
    assert type(gen) == GeneratorType, 'wrong type, should be a generator'


    # Check the first entry from companies_small_set.data...
    entry1 = next(gen)
    assert entry1['company'] == "Watkins Inc", 'incorrect value for␣
 ↪entry1["company"]'
    assert entry1['catch_phrase'] == "Integrated radical installation", \
        'incorrect value for entry1["catch_phrase"]'
    assert entry1['phone'] == '7712422719', 'incorrect value for␣
 ↪entry1["phone"]'
    assert entry1['timezone'] == "America/New_York", 'incorrect value for␣
 ↪entry1["timezone"]'
    assert type(entry1['client_count']) == int, 'entry1["client_count"] is not␣
 ↪an int'
    assert entry1['client_count'] == 442, 'incorrect value for␣
 ↪entry1["client_count"]'

    # Check the second entry from companies_small_set.data...
    entry2 = next(gen)
    assert entry2['company'] == "Bennett and Sons", 'incorrect value for␣
 ↪entry2["company"]'
    assert entry2['catch_phrase'] == "Persistent contextually-based␣
 ↪standardization", \
        'incorrect value for entry2["catch_phrase"]'
    assert entry2['phone'] == "018.666.0600", 'incorrect value for␣
 ↪entry2["phone"]'
    assert entry2['timezone'] == "America/Los_Angeles", 'incorrect value for␣
 ↪entry2["timezone"]'
    assert type(entry2['client_count']) == int, 'entry2["client_count"] is not␣
 ↪an int'
    assert entry2['client_count'] == 492, 'incorrect value for␣
 ↪entry2["client_count"]'
```

[17]:

```
# This cell runs a series of assert statements to grade your solution against␣
 ↪different data.
import io

test_data = io.StringIO(
    'Chang, Fisher and Green        Open-architected foreground␣
 ↪productivity        759.382.4219        '
        'America/Los_Angeles        770\n'
    'Patel, Thornton and Guzman        Customizable asynchronous␣
 ↪approach        +1-578-156-5938x77840        '
        'America/Los_Angeles        418\n'
    'Smith-Cortez        Integrated solution-oriented␣
 ↪moratorium        7535139332        '
        'America/Los_Angeles        634\n'
    '{"company": "Miller-Flores", "catch_phrase": "Object-based user-facing␣
 ↪array", "phone": "(185)839-8947x19659", '
        '"timezone": "America/New_York", "client_count": 634}\n'
)
generated = pd.DataFrame(gen_fix_data(test_data))

correct = pd.DataFrame([{'company': 'Chang, Fisher and Green',
  'catch_phrase': 'Open-architected foreground productivity',
  'phone': '759.382.4219',
  'timezone': 'America/Los_Angeles',
  'client_count': 770},
 {'company': 'Patel, Thornton and Guzman',
  'catch_phrase': 'Customizable asynchronous approach',
  'phone': '+1-578-156-5938x77840',
  'timezone': 'America/Los_Angeles',
  'client_count': 418},
 {'company': 'Smith-Cortez',
  'catch_phrase': 'Integrated solution-oriented moratorium',
  'phone': '7535139332',
  'timezone': 'America/Los_Angeles',
  'client_count': 634},
 {'company': 'Miller-Flores',
  'catch_phrase': 'Object-based user-facing array',
  'phone': '(185)839-8947x19659',
  'timezone': 'America/New_York',
  'client_count': 634},
])

assert len(generated) == len(correct), 'wrong number of rows'
assert all(g == c for g, c in zip(generated.columns.sort_values(), correct.
 ↪columns.sort_values())), \
    'columns names do not match'

for col in generated.columns:
    for i in range(len(generated)):
        assert generated[col][i] == correct[col][i], \
            f'wrong value at column "{col}", index "{i}", {generated[col][i]} !
 ↪= {correct[col][i]}'
```

1.2 Question 2

The data in `assets/server_metrics.csv` represents the time it take to handle requests in a start-up company's web application. Let's imagine we are asked to write some code that gives us a DataFrame that just contains the entries where `processing_time` is greater than 160 milliseconds.

We could solve that problem like this...

[20]:

```
df = pd.read_csv('assets/server_metrics.csv')
```

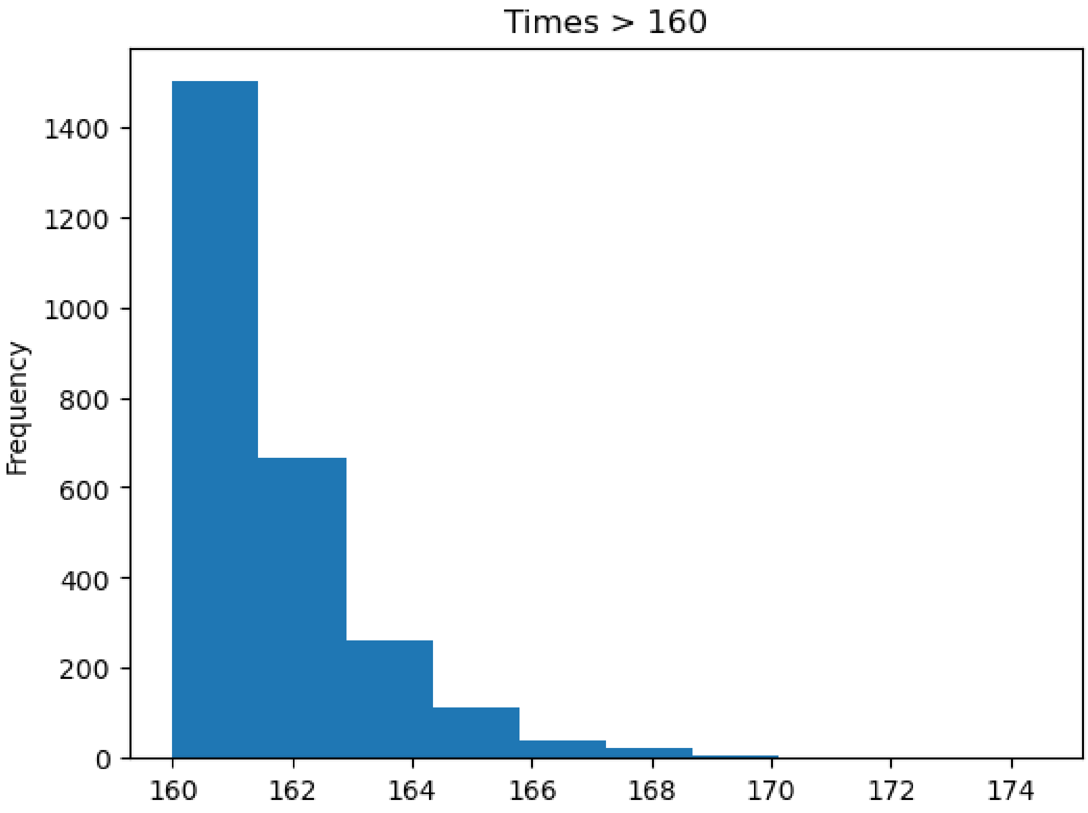
[21]:

```
outliers = df[df['processing_time'] > 160]
```

[22]:

```
%matplotlib inline
import matplotlib.pyplot as plt

_ = outliers['processing_time'].plot.hist(title="Times > 160")
```



But imagine that instead of dealing with millions of rows, we have to deal with billions or trillions and the set is too big to fit comfortably in memory, or that the data is coming to us not in a local file, but is being read over the network. Generators can be a nice way to help in that situation.

Here is a generator that yields a `dict` for each line in `assets/server_metrics.csv`.

Note that your solution should be a generator function, it should not return a DataFrame.

[23]:

```
def metrics_stream():
    '''
    Generate dictionaries from each line in assets/server_metrics.csv
    '''
    import csv

    with open('assets/server_metrics.csv', 'r') as stream:
        csv_stream = csv.DictReader(stream, ['job_id', 'processing_time',␣
  ↪'instance_id'])
        next(csv_stream) # throw away header row
        for entry in csv_stream:
            entry['processing_time'] = float(entry['processing_time'])
            yield dict(entry)
```

For this problem, write a generator that can be used to create a DataFrame like the `outliers` one above. Its first parameter should be the iterable we get from the `metrics_stream()` generator function. Its second (optional) parameter should be called `lower_bound` and be used to filter out entries whose “processing_time” is less than or equal to this parameter.

[26]:

```
def gen_outliers(metrics_iterable, lower_bound=160):
    for metric in metrics_iterable:
        if metric['processing_time'] > lower_bound:
            yield metric
    # YOUR CODE HERE
    # raise NotImplementedError()
```

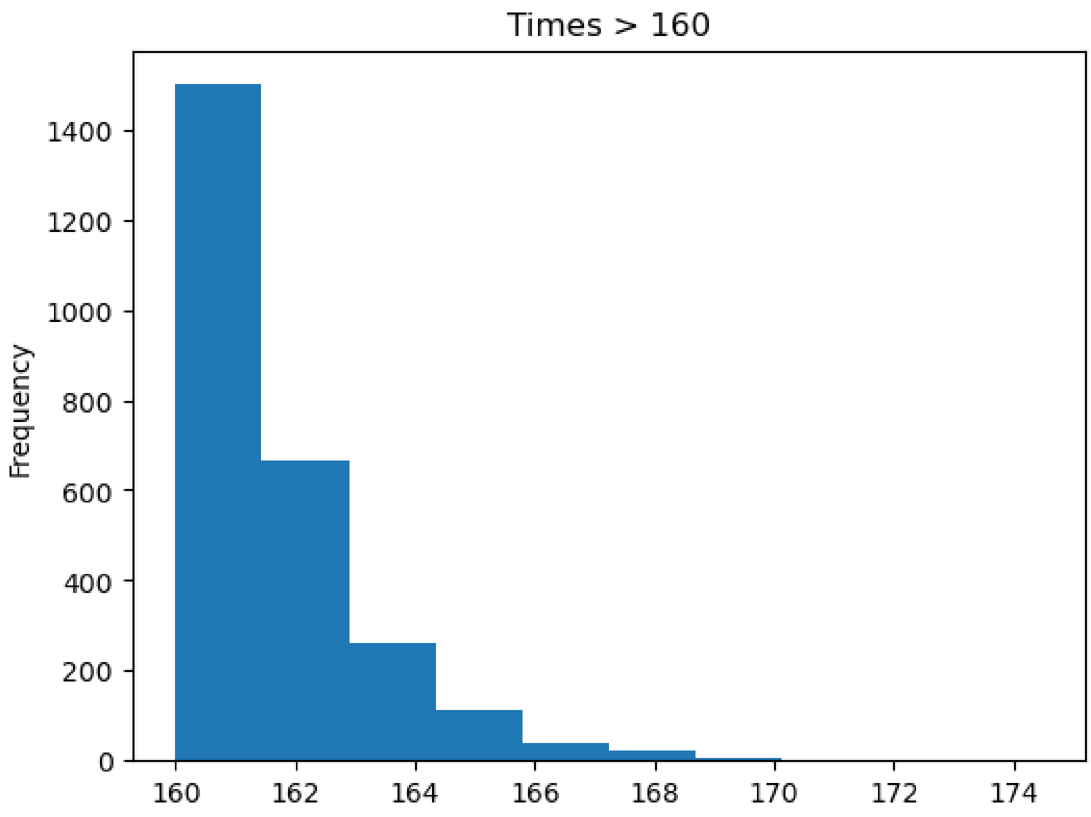
[27]:

```
metrics_gen = metrics_stream()

generated_outliers = pd.DataFrame(gen_outliers(metrics_gen))
```

[28]:

```
# This should generate the same plot as the plot above
_ = generated_outliers['processing_time'].plot.hist(title="Times > 160")
```



[29]:

```
# This cell runs a series of assert statements to grade your solution.
```

```
gen = gen_outliers(metrics_stream())

# Let's make sure gen_fix_data is a generator function...
from types import GeneratorType
assert type(gen) == GeneratorType, 'wrong type, should be a generator'

# check that data matches

outliers_160 = pd.DataFrame(gen_outliers(metrics_stream(), lower_bound=160))
assert len(outliers_160) == 2615, 'wrong number of entries for lower_bound=160'

outliers_150 = pd.DataFrame(gen_outliers(metrics_stream(), lower_bound=150))
assert len(outliers_150) == 556826, 'wrong number of entries for␣
 ↪lower_bound=150'

outliers_170 = pd.DataFrame(gen_outliers(metrics_stream(), lower_bound=170))
assert len(outliers_170) == 9, 'wrong number of entries for lower_bound=170'
```

[30]:

```
# This cell runs a series of assert statements to grade your solution against␣
 ↪different data.
import io

test_data = [
    {
        'job_id': '336',
        'processing_time': 150.83086863345971,
        'instance_id': '1346846',
    },
    {
        'job_id': '337',
        'processing_time': 168.37830864466645,
        'instance_id': '1349783',
    },
    {
         'job_id': '338',
         'processing_time': 148.8572313268281,
         'instance_id': '1345472',
    },
    {
        'job_id': '339',
        'processing_time': 148.39006806562258,
        'instance_id': '1347784',
    },
]


outliers_160 = pd.DataFrame(gen_outliers(test_data, lower_bound=160))
```

```
assert len(outliers_160) == 1, 'wrong number of entries for lower_bound=160'

outliers_150 = pd.DataFrame(gen_outliers(test_data, lower_bound=150))
assert len(outliers_150) == 2, 'wrong number of entries for lower_bound=150'

outliers_170 = pd.DataFrame(gen_outliers(test_data, lower_bound=170))
assert len(outliers_170) == 0, 'wrong number of entries for lower_bound=170'
```

1.3 Question 3

Write a decorator called `as_json` that converts the wrapped function's return value to a JSON encoded string. - You can assume that this will only be used on functions whose return values can be converted to JSON. - This will be easiest if you use the standard library's `json` package.

[31]:

```
import json
from functools import wraps

def as_json(func):
    @wraps(func)
    def wrapper(*args, **kwargs):
        result = func(*args, **kwargs)
        return json.dumps(result)
    return wrapper

#raise NotImplementedError()
```

[32]:

```
@as_json
def simple_json_string():
    return "hello"

assert simple_json_string() == '"hello"', "Did not get the expected output"
```

[33]:

```
@as_json
def simple_json_list():
    return [1, 2, 3, 4]

assert simple_json_list() == "[1, 2, 3, 4]", "Did not get the expected output"
```

[34]:

```
@as_json
def string_test():
    return "string"

assert isinstance(string_test(), str), "Functions wrapped with @as_json should␣
 ↪return a str type"
```

[35]:

```
@as_json
def func_with_args(name="World"):
    return f"Hello, {name}!"
```

[36]:

```
assert func_with_args() == '"Hello, World!"', "Did not handle default argument"
```

[37]:

```
assert func_with_args("Samantha") == '"Hello, Samantha!"', "Did not handle␣
 ↪position argument"
```

[38]:

```
assert func_with_args(name="Omar") == '"Hello, Omar!"', "Did not handle key␣
 ↪word argument"
```