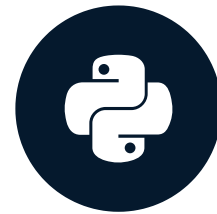


Introduction to fixtures

INTRODUCTION TO TESTING IN PYTHON



Alexander Levin
Data Scientist

What is a fixture

- Fixture - a prepared environment that can be used for a test execution
- Fixture Setup - a process of preparing the environment and setting up resources that are required by one or more tests

Imagine preparation for a picnic:

1. **Invite our friends and prepare the food** (that's what **fixtures** do)
2. Have fun!
3. Clean up

Why do we need fixture

Fixtures help:

- To make test setup easier
- To isolate the test of the environmental preparation
- To make the fixture code reusable

Fixture example: overview

Assume we have:

- a Python `list` variable named `data`
- `data = [0, 1, 1, 2, 3, 5, 8, 13, 21]`

And we want to test, that:

- It contains 9 elements
- It contains the elements `5` and `21`

Fixture example: code

```
import pytest

# Fixture decorator
@pytest.fixture
# Fixture for data initialization
def data():
    return [0, 1, 1, 2, 3, 5, 8, 13, 21]

def test_list(data):
    assert len(data) == 9
    assert 5 in data
    assert 21 in data
```

Fixture example: output

Output of the example:

```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL powershell + v [ ] [ ] ... ^ X

PS > pytest .\slides.py
===== test session starts =====
platform win32 -- Python 3.11.2, pytest-7.2.2, pluggy-1.0.0
benchmark: 4.0.0 (defaults: timer=time.perf_counter disable_gc=False min_rounds=5 min_time=0.000005 max_time=1.0 calibration_precision=10 w
armup=False warmup_iterations=100000)
rootdir: 
plugins: benchmark-4.0.0
collected 1 item

slides.py . [100%]

===== 1 passed in 0.02s =====
PS > 
```

How to use fixtures

To use the fixture we have to do the following:

1. Prepare software and tests
2. Find "environment preparation"
3. Create a fixture:
 - Declare the `@pytest.fixture` decorator
 - Implement the fixture function
4. Use the created fixture:
 - Pass the fixture name to the test function
 - Run the tests!

Summary

We learned about testing fixtures:

- Fixture - a prepared environment that can be used for a test execution
- We use fixtures to make test setup easier and isolated from the test functions
- Simple example: preparation of a Python `list`
- Define a `pytest` fixture by declaring `@pytest.fixture`
 - followed by a fixture function
- Fixture names are used in the tests as variables

Let's practice!

INTRODUCTION TO TESTING IN PYTHON

Chain Fixtures Requests

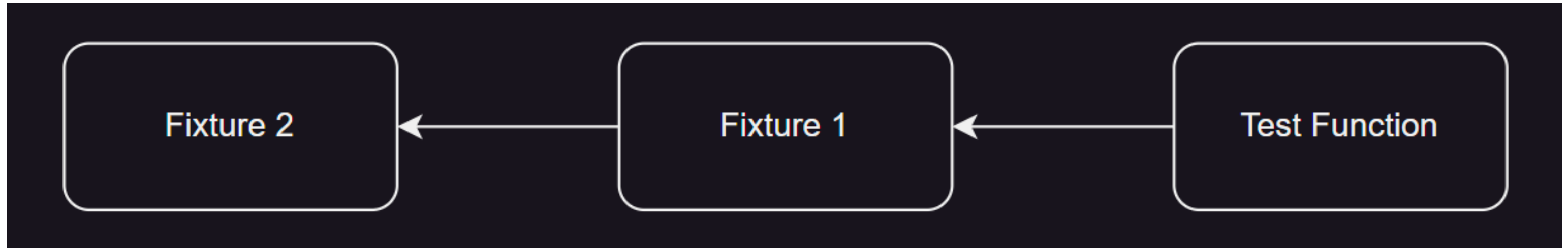
INTRODUCTION TO TESTING IN PYTHON



Alexander Levin
Data Scientist

What is a chain request

- Chain fixtures requests - a pytest feature, that allows a fixture to use another fixture
- Creates a composition of fixtures



Why and when to use

Chain fixtures requests help to:

- **Establish dependencies** between fixtures
- Keep the code **modular**

When it can be useful:

- When we have several fixtures that **depend on each other**

Example of chain requests

```
# Fixture that is requested by the other fixture
@pytest.fixture
def setup_data():
    return "I am a fixture!"
```

```
# Fixture that is requested by the test function
@pytest.fixture
def process_data(setup_data):
    return setup_data.upper()
```

```
# The test function
def test_process_data(process_data):
    assert process_data == "I AM A FIXTURE!"
```

How to use chain requests

1. Prepare the program we want to test
2. Prepare the testing functions
3. Prepare the `pytest` fixtures
4. Pass the fixture name to the other fixture signature

```
# Fixture requesting other fixture
@pytest.fixture
def process_data(setup_data):
    return setup_data.upper()
```

Summary

- Chain fixture requests - is a feature that allows a fixture to use another fixture (creating fixture compositions)
- It helps to divide the code by functions and keep it modular
- Example use case: the steps of data pipeline
- To use chain fixture requests pass the fixture name to the other fixture signature

Let's practice!

INTRODUCTION TO TESTING IN PYTHON

Fixtures autouse

INTRODUCTION TO TESTING IN PYTHON



Alexander Levin
Data Scientist

Autouse argument

- An optional boolean argument of a fixture
- Can be passed to the fixture decorator
- When `autouse=True` the fixture function is executing regardless of a request
- Helps to reduce the amount of redundant fixture calls

When to use

In case we need to apply certain environment preparations or modifications **for all tests**.

For example, when we want to guarantee, that all tests:

- Have the same data
- Have the same connections (data, API, etc.)
- Have the same environment configuration
- Have a monitor, logging, or profiling

All such cases should be addressed with an **"autouse"** argument.

Autouse example

Example of an "autoused" fixture:

```
import pytest
import pandas as pd

# Autoused fixture
@pytest.fixture(autouse=True)
def set_pd_options():
    pd.set_option('display.max_columns', 5000)

# Test function
def test_pd_options():
    assert pd.get_option('display.max_columns') == 5000
```

Autouse incorrect example

Incorrect example of an "autoused" fixture:

```
import pytest
import pandas as pd

# Wrong autoused fixture
@pytest.fixture(autouse=True)
def wrong_fixture():
    return [1,2,3,4,5]

# Test function
def test_type():
    assert type(wrong_fixture) == list
```

Corrected example of the fixture:

```
import pytest
import pandas as pd

# Wrong autoused fixture
@pytest.fixture
def correct_fixture():
    return [1,2,3,4,5]

# Test function
def test_type(correct_fixture):
    assert type(correct_fixture) == list
```

Autouse example: output

Output of the example:

```
lesson2.3-autouse>pytest .\read_csv_autouse.py
===== test session starts =====
platform win32 -- Python 3.11.2, pytest-7.2.2, pluggy-1.0.0
benchmark: 4.0.0 (defaults: timer=time.perf_counter disable_gc=False min_rounds=5 min_time=0.00005 max_time=1.0
calibration_precision=10 warmup=False warmup_iterations=100000)
rootdir: \lesson2.3-autouse
plugins: benchmark-4.0.0
collected 1 item

read_csv_autouse.py . [100%]

===== 1 passed in 0.20s =====
lesson2.3-autouse>
```

Summary

- **Definition of `autouse`** : An optional boolean argument of a fixture decorator
- **Usage:** `@pytest.fixture(autouse=True)`
- **Advantage:** Helps to reduce the number of redundant fixture calls, thus makes the code simpler
- **Feature:** `autouse=True` the fixture function is executing regardless of a request
- **When to use:** in case we need to apply certain environment preparations or modifications
- **Use cases examples:**
 - Reading and preparing data for all tests
 - Configuring connections and environment parameters
 - Implementing a monitor, a logger, or a profiler

Let's practice!

INTRODUCTION TO TESTING IN PYTHON

Fixtures Teardowns

INTRODUCTION TO TESTING IN PYTHON



Alexander Levin
Data Scientist

What is a fixture teardown

- **Fixture Teardown** - a process of cleaning up ("tearing down") resources that were allocated or created during the setup of a testing environment.

Recall the "picnic" analogy:

1. Invite our friends and prepare the food
2. Have fun!
3. **Clean up** - that's the teardown

Why to use teardowns

It is important to **clean the environment** at the end of a test. If one does not use **teardown**, it can lead to significant issues:

- Memory leaks
- Low speed of execution and performance issues
- Invalid test results
- Pipeline failures and errors

When to use

When to use:

- Big objects
- More than one test
- Usage of `autouse`

When it is not necessary to use:

- One simple script with one test

Lazy evaluation in Python

- `yield` - is a Python keyword, which allows to create generators

```
# Example of generator function
```

```
def lazy_increment(n):
```

```
    for i in range(n):
```

```
        yield i
```

```
f = lazy_increment(5)
```

```
next(f) # 0
```

```
next(f) # 1
```

```
next(f) # 2
```

How to use

How to use:

- Replace `return` by `yield`
- Place the teardown code after `yield`
- Make sure that the setup code is only before `yield`

Teardown example

```
@pytest.fixture
def init_list():
    return []

@pytest.fixture(autouse=True)
def add_numbers_to_list(init_list):
    # Fixture Setup
    init_list.extend([i for i in range(10)])
    # Fixture output
    yield init_list
    # Teardown statement
    init_list.clear()

def test_9(init_list):
    assert 9 in init_list
```

Summary

- **Definition:** Fixture Teardown - is a process of cleaning up resources that were allocated during the setup.
- **Usage:**
 - The `yield` keyword instead of `return`
 - Teardown code after `yield`
- **Advantages:**
 - Prevents software failures
 - Prevents potential drops of performance
- **When to use:** Always, when you have more than one test!

Let's practice!

INTRODUCTION TO TESTING IN PYTHON