Effective Programming Practices for Economists

Software engineering

What does pytest do?

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Example

consider this hypothetical survey about a programming course

```
>>> raw = pd.read_csv("survey.csv")
>>> raw
```

	Q001	Q002	Q003
0	strongly disagree	agree	python
1	strongly agree	strongly agree	Python
2	-77	disagree	R
3	agree	-77	Python
4	-99	-99	Python
5	nan	strongly agree	Python
6	neutral	strongly agree	Python
7	disagree	agree	python
8	strongly disagree	-99	PYTHON
9	-77	-99	Ypthon

From the metadata you know

- Q001: I am a coding genius
- Q001: I learned a lot
- Q003: What is your favourite language

- -77 not readable
- -99 no reply

Two functions in clean_data.py

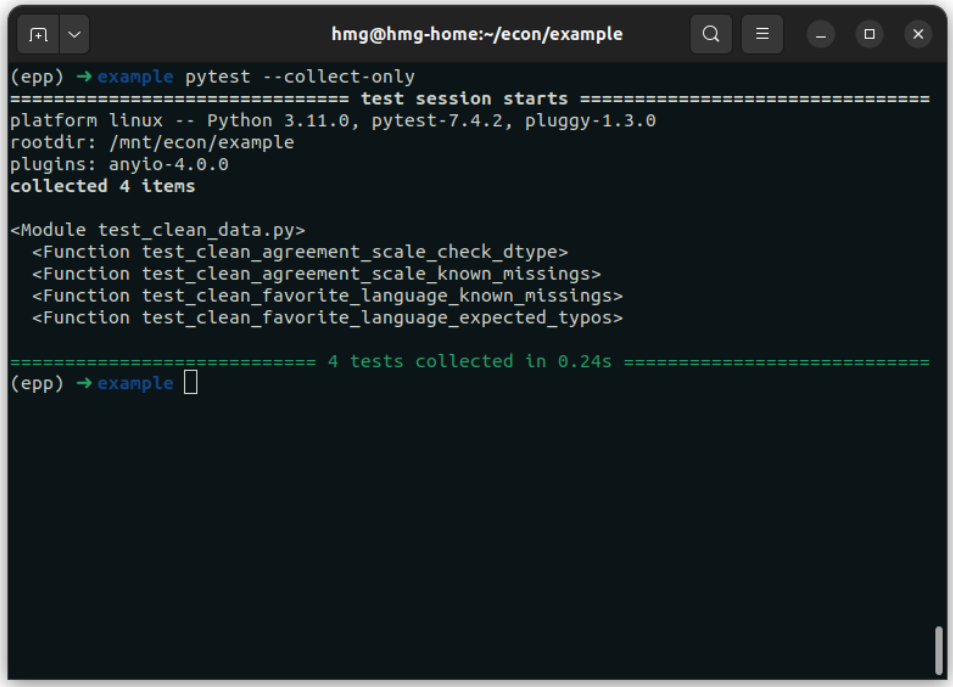
```
def _clean_agreement_scale(sr):
    sr = sr.replace({"-77": pd.NA, "-99": pd.NA})
    categories = ["strongly disagree", "disagree", "neutral", "agree", "strongly agree"]
    dtype = pd.CategoricalDtype(categories=categories, ordered=True)
    return sr.astype(dtype)


def _clean_favorite_language(sr):
    sr = sr.replace({"-77": pd.NA, "-99": pd.NA})
    sr = sr.str.lower().str.strip()
    sr = sr.replace("ypthon", "python")
    return sr.astype(pd.CategoricalDtype())
```

New module: test_clean_data.py

- 4 assertions whether actual results match our expectation
- Will look at syntax in subsequent screencast

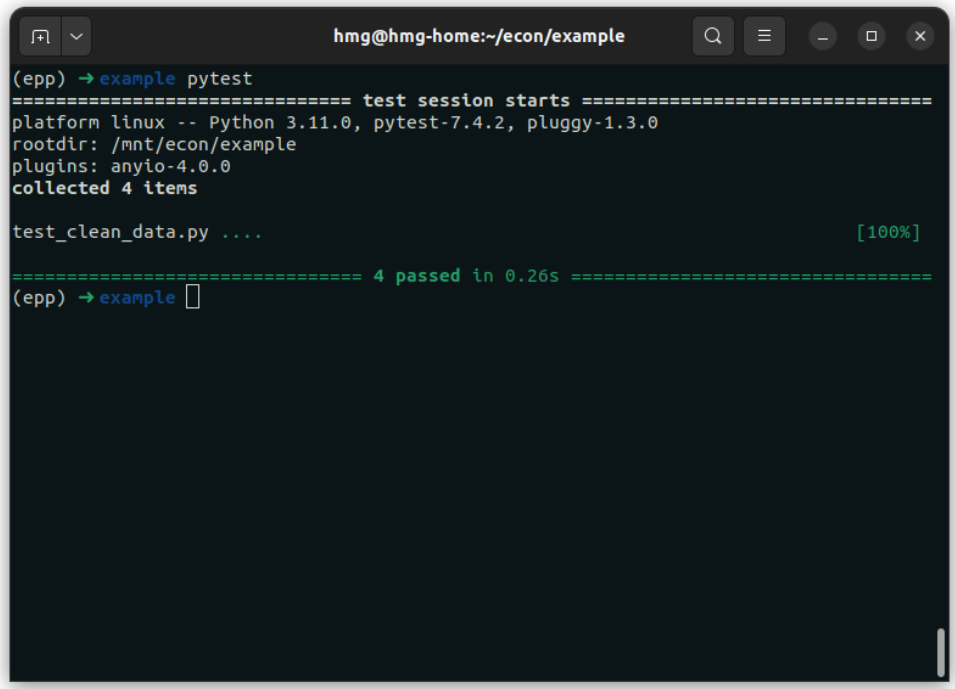
Step 1: Collection

- Go through all folders in working directory
- Collect all files with name `test_XXX.py`
- Go through those files and collect all functions that start with `test_`
- All these test functions will be executed (fine-grained control possible)



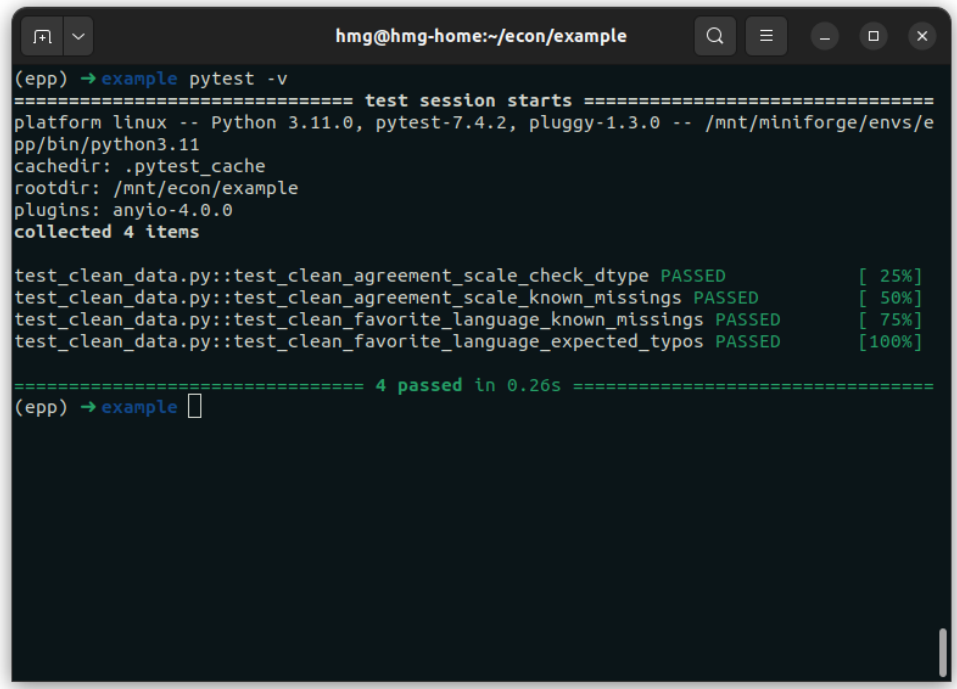
Step 2: Execute the tests

- All test functions are executed
- A report is printed to the screen

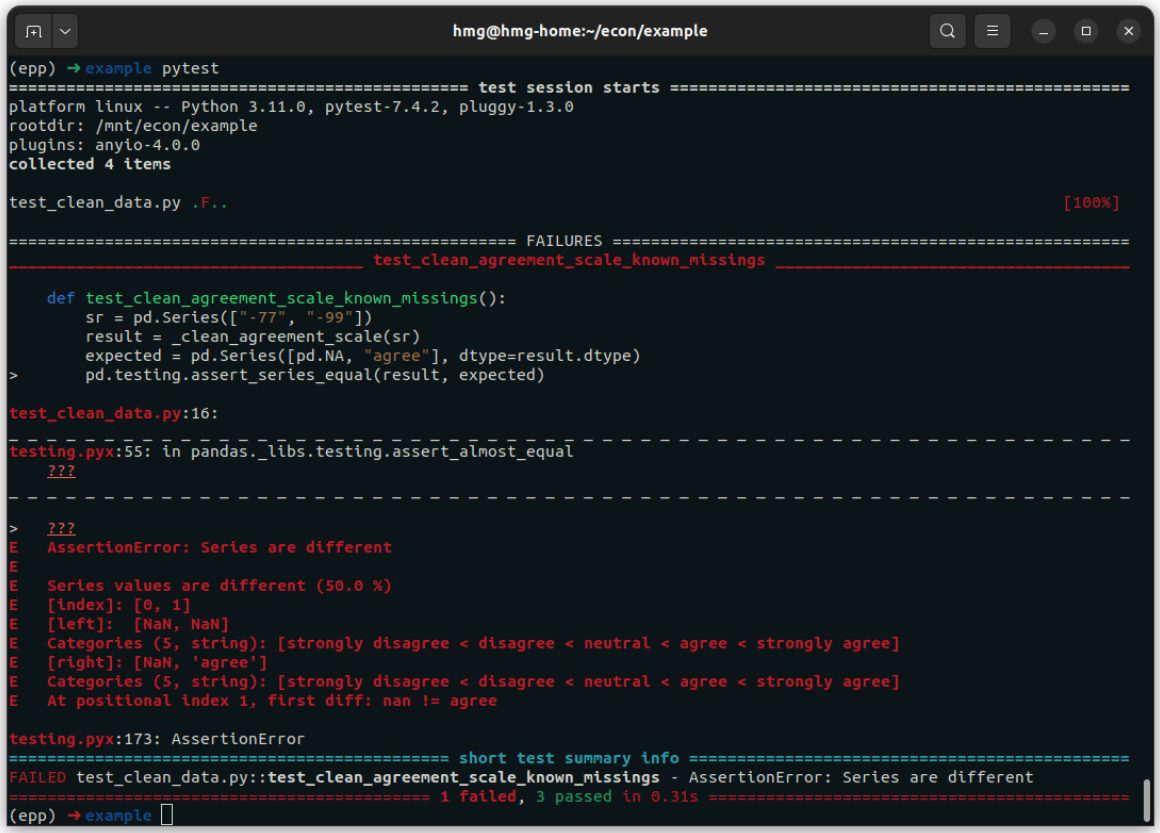


Step 2: Execute the tests

- `pytest -v` gives more detailed progress reports
- Can be very helpful for long-running tests



Step 3: Inspect failures



Step 3: Inspect failures with pdb

pytest --pdb

```
(epp) ➜ example pytest --pdb
============================================ test session starts =============================================
platform linux -- Python 3.11.0, pytest-7.4.2, pluggy-1.3.0
rootdir: /mnt/econ/example
plugins: anyio-4.0.0
collected 4 items

test_clean_data.py .F
>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>> traceback >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

    def test_clean_agreement_scale_known_missings():
        sr = pd.Series(["-77", "-99"])
        result = _clean_agreement_scale(sr)
        expected = pd.Series([pd.NA, "agree"], dtype=result.dtype)
>       pd.testing.assert_series_equal(result, expected)

test_clean_data.py:16:
_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
testing.pyx:55: in pandas._libs.testing.assert_almost_equal
    ???
_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

>   ???
E   AssertionError: Series are different
E
E   Series values are different (50.0 %)
E   [index]: [0, 1]
E   [left]:  [NaN, NaN]
E   Categories (5, string): [strongly disagree < disagree < neutral < agree < strongly agree]
E   [right]: [NaN, 'agree']
E   Categories (5, string): [strongly disagree < disagree < neutral < agree < strongly agree]
E   At positional index 1, first diff: nan != agree

testing.pyx:173: AssertionError
>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>> entering PDB >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>> PDB post_mortem (IO-capturing turned off) >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
> /mnt/econ/example/testing.pyx(173)pandas._libs.testing.assert_almost_equal()
(Pdb)
```