

5-minute intro to property-based testing in Python with `hypothesis`

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Property-based testing vs. example-based testing

Example-based testing: assert that a property is true for *some* values.

- ▶ Are list appends associative?
- ▶ Write some *examples*

```
def test_list_append_associative_example1():
```

```
    x, y, z = [2], [3, 4, 5], [6, 7]
```

```
    assert (x + y) + z == x + (y + z)
```

```
def test_list_append_associative_example2():
```

```
    x, y, z = [2, 3], [], [6, 7]
```

```
    assert (x + y) + z == x + (y + z)
```

```
# ...
```

Better: reduce boilerplate with parameters

`pytest` allows parameterization of arguments in tests.

- Rewrite multiple examples as a *single example*

```
import pytest
```

```
@pytest.mark.parametrize (("x", "y", "z"), [
    ([2], [3, 4, 5], [6, 7]),
    ([2, 3], [], [6, 7])
])
```

```
def test_list_append_associative_parametrized(x, y, z):
    assert (x + y) + z == x + (y + z)
```

Introduction to property-based hypothesis testing

```
from hypothesis.testdecorators import given

@given ([int], [int], [int])
def test_list_append_associative(x, y, z):
    assert (x + y) + z == x + (y + z)
```

- ▶ Passes!
- ▶ hypothesis *generates* a “large” number of examples
- ▶ Generation
 - ▶ Based on the *type* of the argument
 - ▶ Not exhaustive: failure to *falsify* does not mean true!
 - ▶ **Default generators provided**
 - ▶ You can write your own generators

A sample falsified hypothesis

```
@given (int, int)
def test_multiply_then_divide_is_same(x, y):
    assert (x * y) / y == x
```

Result:

```
... falsifying_example = ((0, 0), {})
```

Some links

- ▶ `hypothesis` [documentation](#)
- ▶ [pytest-quickcheck](#)
- ▶ [My Pittsburgh Scala meetup talk on property-based testing using ScalaCheck](#)
- ▶ [Nat Pryce's blog post on June 23, 2013](#)

Conclusion

- ▶ Property-based testing is a useful addition to your toolbox
- ▶ Try it out in Python!
- ▶ All materials for this talk available at <https://github.com/franklinchen/lightning-talk-on-hypothesis>
- ▶ Will write more about property-based testing on new blog <http://ConscientiousProgrammer.com/>