SOFTWARE ENGINEERING FOR DATA SCIENTISTS IN PYTHON

Documentation

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Machine Learning Engineer at Eastman

Documentation in Python

- Comments

```
# Square the number x
```

- Docstrings

```
    """Square the number x

    :param x: number to square
    :return: x squared

    >>> square(2)
    4
    """
```

Comments

```
# This is a valid comment
x = 2
```

```
y = 3  # This is also a valid comment
```

```
# You can't see me unless you look at the source code

# Hi future collaborators! 
```

Effective comments

Commenting 'what'

```python
# Define people as 5
people = 5

# Multiply people by 3
people * 3
```

Commenting 'why'

```python
# There will be 5 people attending the party
people = 5

# We need 3 pieces of pizza per person
people * 3
```

Docstrings

```
def function(x):
    """High level description of function

    Additional details on function
```

Docstrings

```
def function(x):
    """High level description of function

    Additional details on function

    :param x: description of parameter x
    :return: description of return value
```

Example webpage generated from a docstring in the Flask package.

Docstrings

```
def function(x):
    """High level description of function

    Additional details on function

    :param x: description of parameter x
    :return: description of return value

    >>> # Example function usage
    Expected output of example function usage
    """
    # function code
```

Example docstring

```python
def square(x):
    """Square the number x

    :param x: number to square
    :return: x squared

    >>> square(2)
    4
    """
    # `x * x` is faster than `x ** 2`
    # reference: https://stackoverflow.com/a/29055266/5731525
    return x * x
```

Example docstring output

```
help(square)
```

```
square(x)
    Square the number x

    :param x: number to square
    :return: x squared

    >>> square(2)
    4
```

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Let's Practice

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Readability counts

Adam Spannbauer
Machine Learning Engineer

The Zen of Python

```
import this

The Zen of Python, by Tim Peters (abridged)

Beautiful is better than ugly.
Explicit is better than implicit.
Simple is better than complex.
The complex is better than complicated.
Readability counts.
If the implementation is hard to explain, it's a bad idea.
If the implementation is easy to explain, it may be a good idea.
```

Descriptive naming

- Poor naming

```python
def check(x, y=100):
    return x >= y
```

- Descriptive naming

```python
def is_boiling(temp, boiling_point=100):
    return temp >= boiling_point
```

- Going overboard

```python
def check_if_temperature_is_above_boiling_point(
        temperature_to_check,
        celsius_water_boiling_point=100):
    return temperature_to_check >= celsius_water_boiling_point
```

Keep it simple

```
The Zen of Python, by Tim Peters (abridged)

Simple is better than complex.
Complex is better than complicated.
```

Making a pizza - complex

```python
def make_pizza(ingredients):
    # Make dough
    dough = mix(ingredients['yeast'],
                ingredients['flour'],
                ingredients['water'],
                ingredients['salt'],
                ingredients['shortening'])

    kneaded_dough = knead(dough)
    risen_dough = prove(kneaded_dough)

    # Make sauce
    sauce_base = sautee(ingredients['onion'],
                        ingredients['garlic'],
                        ingredients['olive oil'])

    sauce_mixture = combine(sauce_base,
                            ingredients['tomato_paste'],
                            ingredients['water'],
                            ingredients['spices'])

    sauce = simmer(sauce_mixture)
    ...
```

Making a pizza - simple

```
def make_pizza(ingredients):
    dough = make_dough(ingredients)
    sauce = make_sauce(ingredients)
    assembled_pizza = assemble_pizza(dough, sauce, ingredients)

    return bake(assembled_pizza)
```

When to refactor

- Function definition not fitting on screen
- Separable processes in single function
- Can't think of a good meaningful name for a function

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Testing

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Why testing?

- Confirm code is working as intended
- Ensure changes in one function don't break another
- Protect against changes in a dependency

Testing in Python

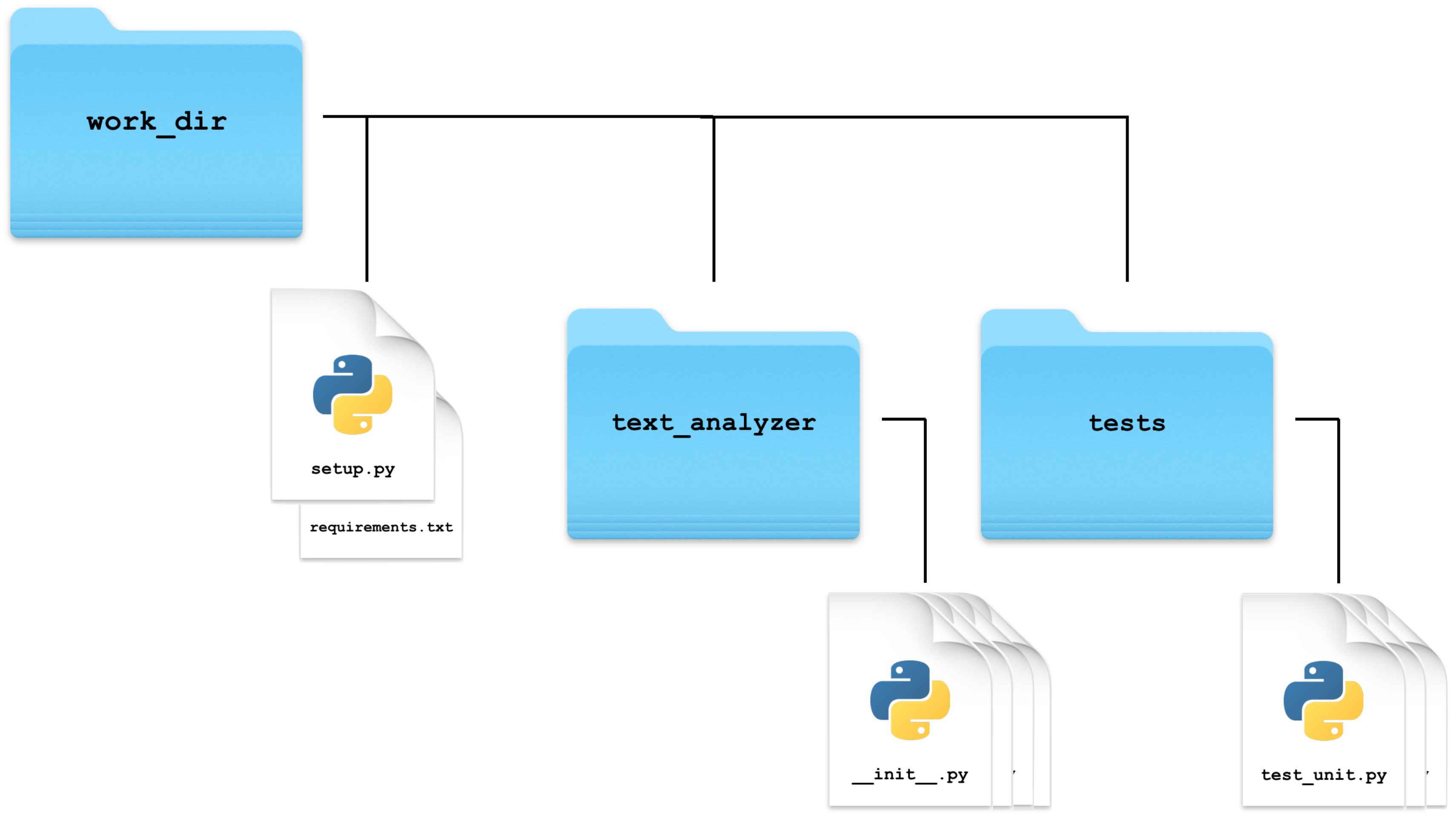
- `doctest`
- `pytest`

Using doctest

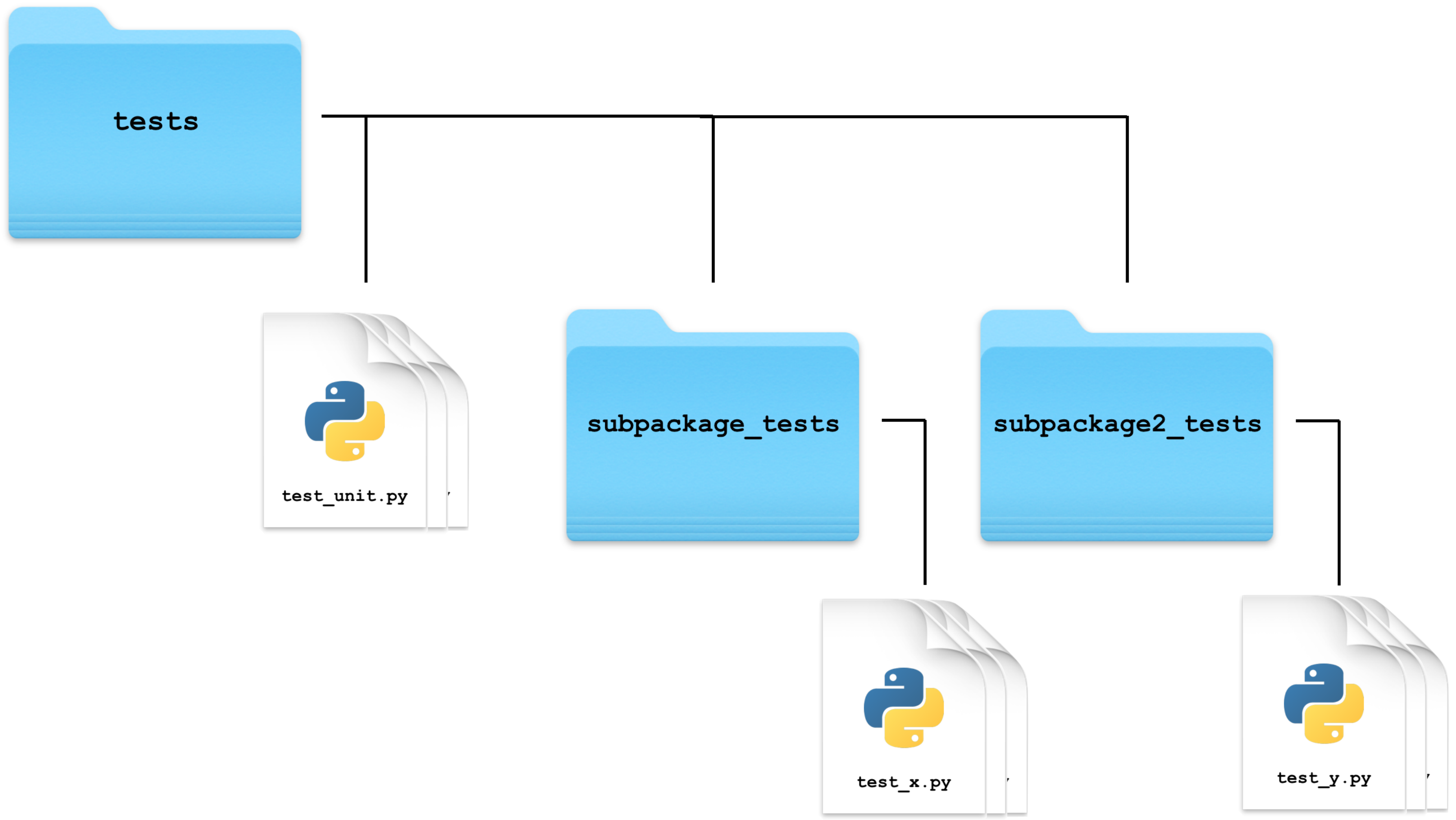
```
def square(x):
    """Square the number x

    :param x: number to square
    :return: x squared

    >>> square(3)
    9
    """
    return x ** x


import doctest
doctest.testmod()
```

```
Failed example:
    square(3)
Expected:
    9
Got:
    27
```

pytest structure



pytest structure



Writing unit tests

`workdir/tests/test_document.py`

```python
from text_analyzer import Document


# Test tokens attribute on Document object
def test_document_tokens():
    doc = Document('a e i o u')

    assert doc.tokens == ['a', 'e', 'i', 'o', 'u']


# Test edge case of blank document
def test_document_empty():
    doc = Document('')

    assert doc.tokens == []
    assert doc.word_counts == Counter()
```

Writing unit tests

```
# Create 2 identical Document objects
doc_a = Document('a e i o u')
doc_b = Document('a e i o u')

# Check if objects are ==
print(doc_a == doc_b)

# Check if attributes are ==
print(doc_a.tokens == doc_b.tokens)
print(doc_a.word_counts == doc_b.word_counts)
```

```
False

True
True
```

Running pytest

terminal

```
datacamp@server:~/work_dir $ pytest
```

```
collected 2 items

tests/test_document.py ..

========== 2 passed in 0.61 seconds ==========
```

Running pytest

terminal

```
datacamp@server:~/work_dir $ pytest tests/test_document.py
```

```
collected 2 items

tests/test_document.py ..

========== 2 passed in 0.61 seconds ==========
```

Failing tests

terminal

```
datacamp@server:~/work_dir $ pytest
```

```
collected 2 items

tests/test_document.py F.

============== FAILURES ==============
________ test_document_tokens ________

def test_document_tokens(): doc = Document('a e i o u')

assert doc.tokens == ['a', 'e', 'i', 'o']
E AssertionError: assert ['a', 'e', 'i', 'o', 'u'] == ['a', 'e', 'i', 'o']
E Left contains more items, first extra item: 'u'
E Use -v to get the full diff

tests/test_document.py:7: AssertionError
====== 1 failed in 0.57 seconds ======
```

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Let's Practice

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Documentation & testing in practice

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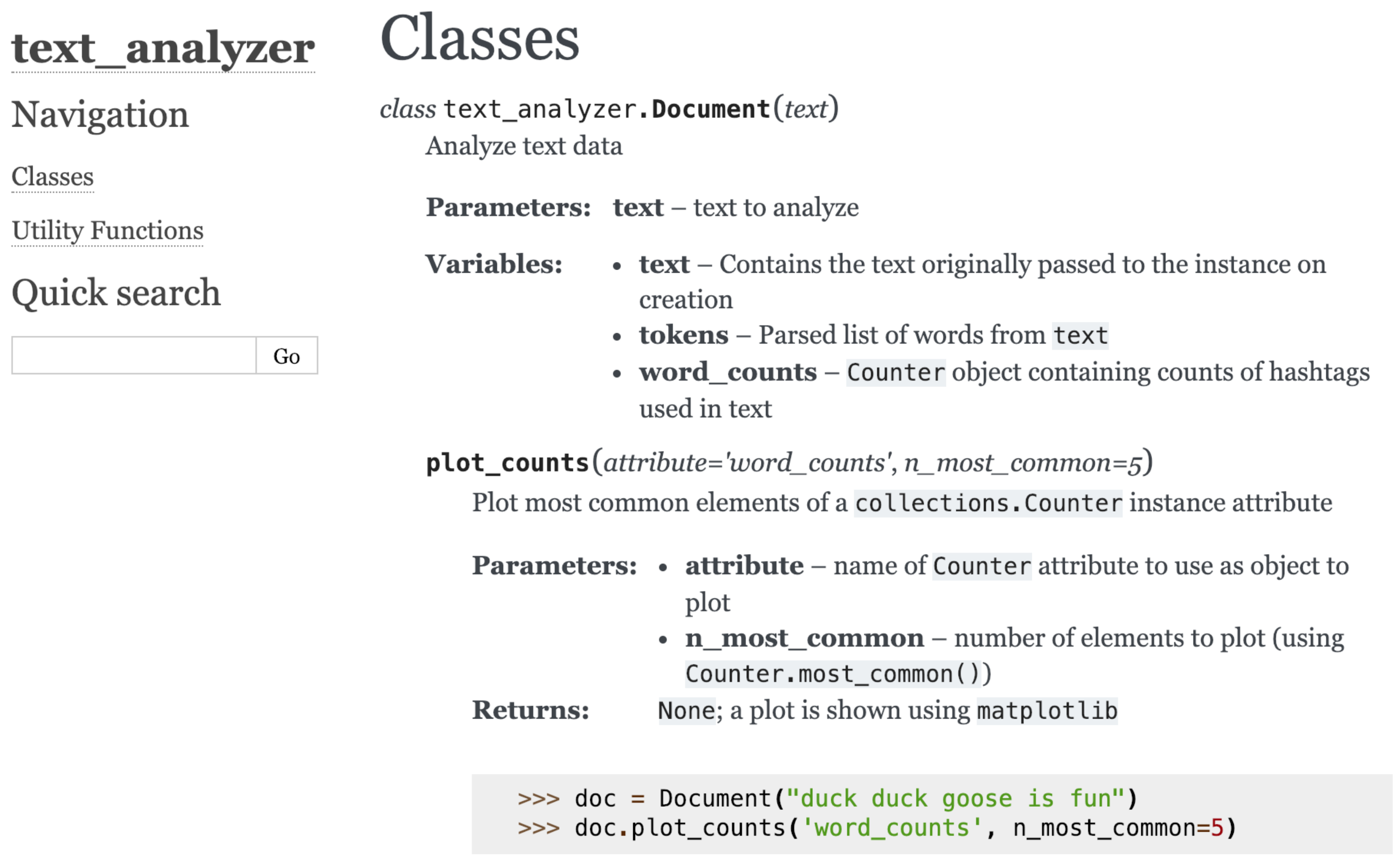
Machine Learning Engineer at Eastman

Documenting projects with Sphinx



text_analyzer

Navigation

Classes

Utility Functions

Quick search

Go

Classes

class `text_analyzer.Document`(*text*)

Analyze text data

Parameters: **text** – text to analyze

Variables:
- **text** – Contains the text originally passed to the instance on creation
- **tokens** – Parsed list of words from `text`
- **word_counts** – `Counter` object containing counts of hashtags used in text

`plot_counts`(*attribute='word_counts', n_most_common=5*)

Plot most common elements of a `collections.Counter` instance attribute

Parameters:
- **attribute** – name of `Counter` attribute to use as object to plot
- **n_most_common** – number of elements to plot (using `Counter.most_common()`)

Returns: `None`; a plot is shown using `matplotlib`

```
>>> doc = Document("duck duck goose is fun")
>>> doc.plot_counts('word_counts', n_most_common=5)
```

GitHub	GitLab

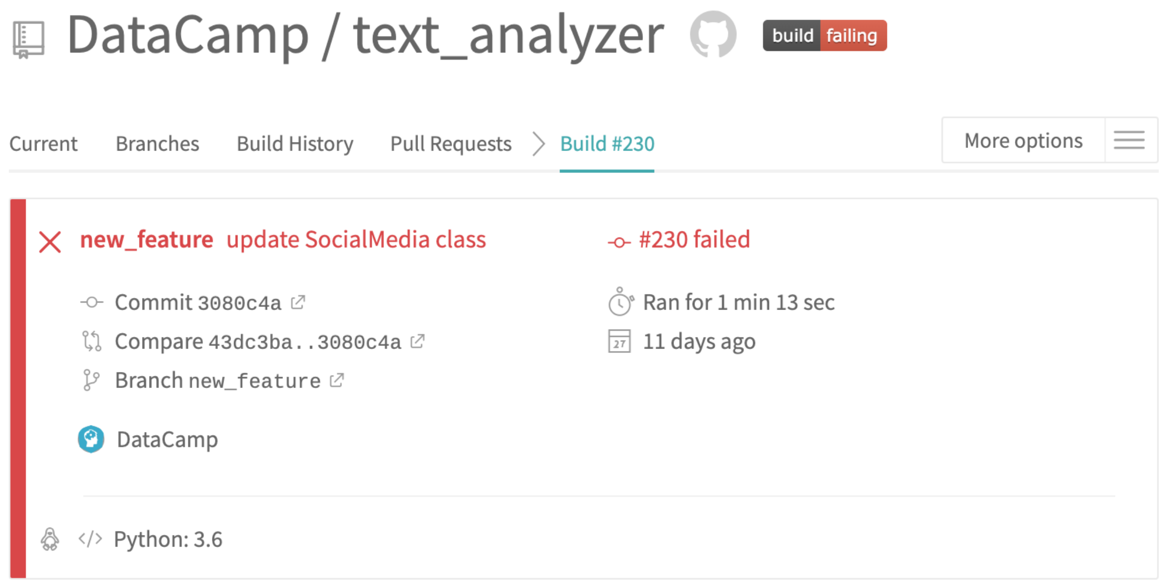
Documenting classes

```
class Document:
    """Analyze text data

    :param text: text to analyze

    :ivar text: text originally passed to the instance on creation
    :ivar tokens: Parsed list of words from text
    :ivar word_counts: Counter containing counts of hashtags used in text
    """
    def __init__(self, text):
        ...
```

Continuous integration testing


DataCamp / text_analyzer build failing

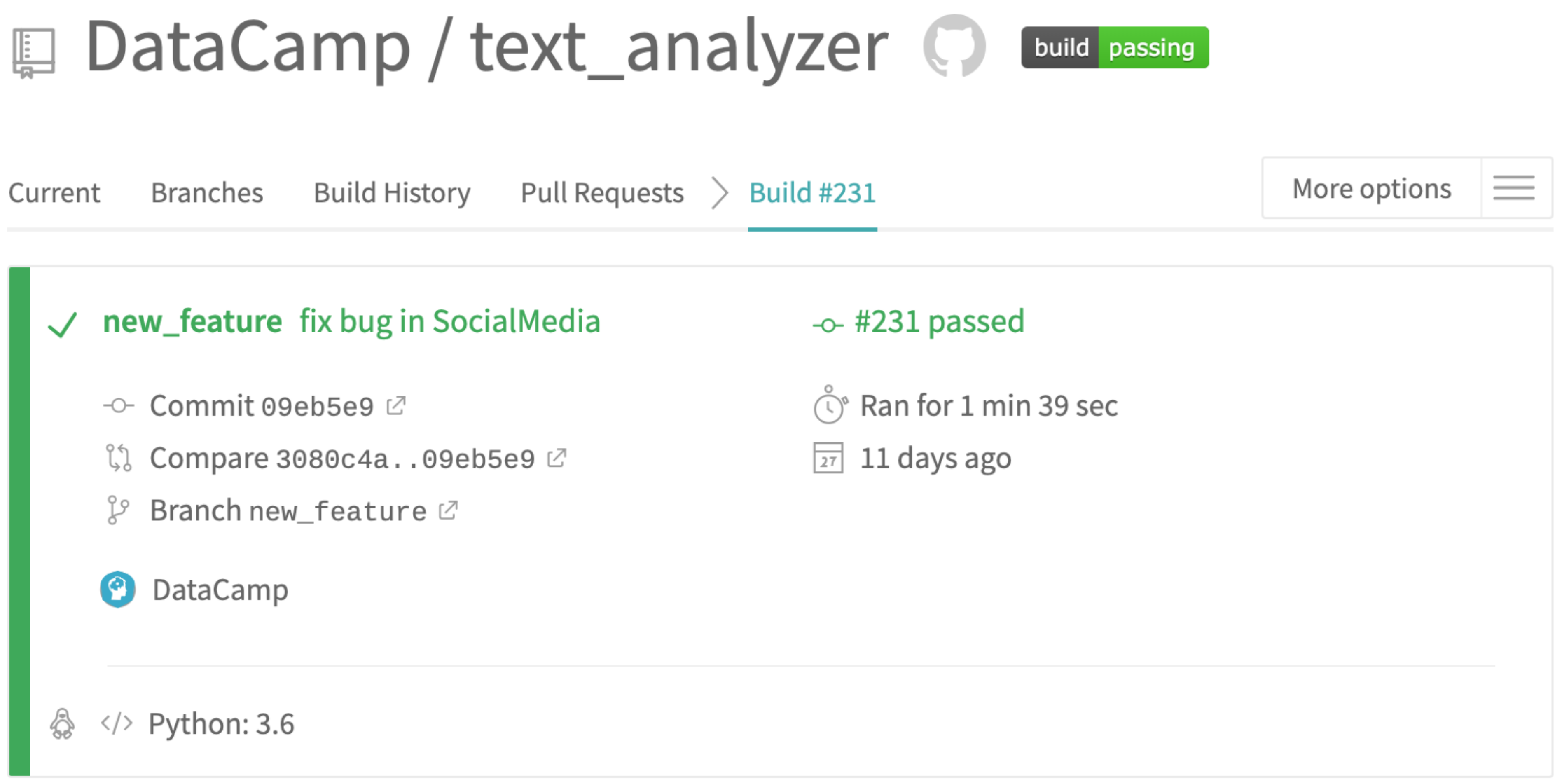
new_feature update SocialMedia class #230 failed

Commit 3080c4a
Compare 43dc3ba..3080c4a
Branch new_feature
DataCamp

Ran for 1 min 13 sec
11 days ago

Python: 3.6

Continuous integration testing



DataCamp / text_analyzer build passing

Current Branches Build History Pull Requests > Build #231 More options

✓ new_feature fix bug in SocialMedia

#231 passed

Commit 09eb5e9

Compare 3080c4a..09eb5e9

Branch new_feature

DataCamp

Ran for 1 min 39 sec

11 days ago

Python: 3.6

Links and additional tools

- Sphinx - Generate beautiful documentation
- Travis CI - Continuously test your code
- GitHub & GitLab - Host your projects with git
- Codecov - Discover where to improve your projects tests
- Code Climate - Analyze your code for improvements in readability

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Final Thoughts

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Looking Back

- Modularity

```python
def function()
    ...

class Class:
    ...
```

Looking Back

- Modularity
- Documentation

```
"""docstrings"""
```

```
# Comments
```

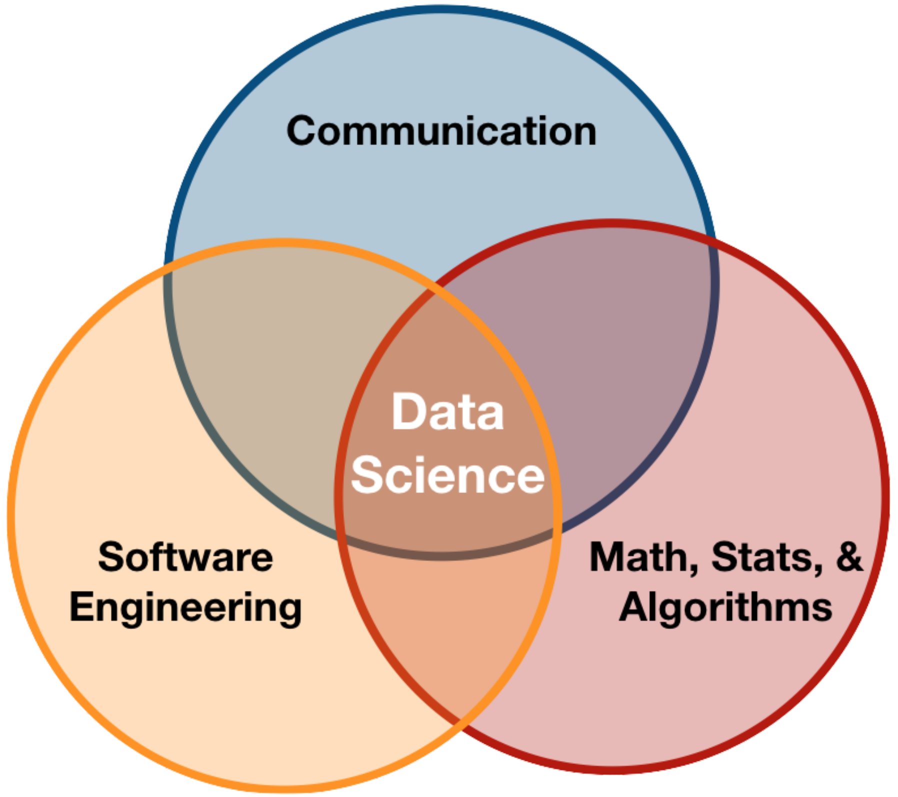
SPHINX
Python Documentation Generator

Looking Back

- Modularity
- Documentation
- Automated testing

```
def f(x):
    """
    >>> f(x)
    expected output
    """
    ...
```

Data Science & Software Engineering



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Good Luck!