Writing Good Python

But Python is already great!!!

- Readability
- Massive ecosystem – Libraries, Frameworks and Tools
- Vibrant community
- Many other things ...

“Writing” Good Python

Hello!

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Maintainability

$$\boldsymbol{M} \approx \frac{\mathbf{1}}{(\boldsymbol{T}) * (\boldsymbol{R})}$$

- M = Maintainability
- T = Amount of time it takes a developer to make a change
- R = Risk that change will break something.
- Cannot be strictly defined
- Can be judged by readability, coupling, consistency etc.

Example

```python
import os
import datetime
import sys


class calculator:
    def __init__(self):
        self.last_result = 0;
        pass

    def add(self, NUM1, NUM2):
        """"""
        result = NUM1 + NUM2
        self.last_result = result
        return result

    def SUB(self, x, y):
        result = x - y
        self.last_result = result
        return result

    def Div(self, num1, num2):
        if not not (0 == num2):
            return 0
        result = num1 / num2
        self.last_result = result
        return result
```

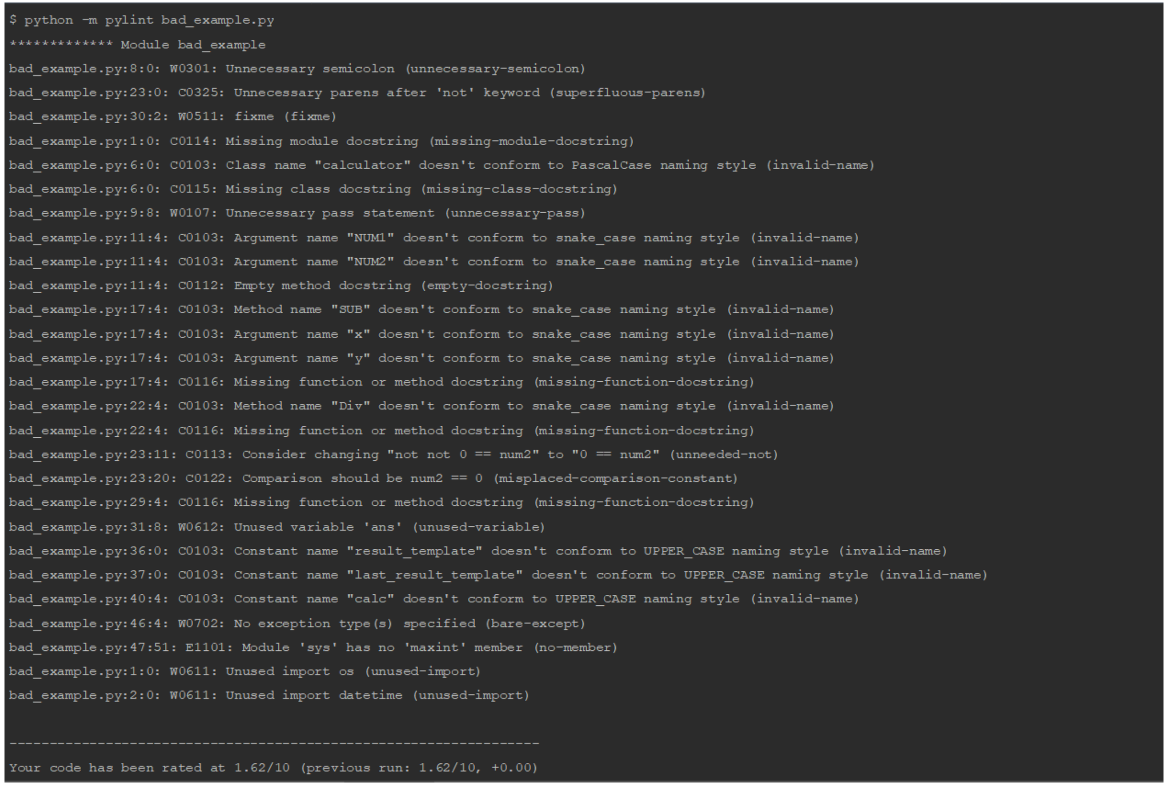
```python
    def mul(self, num1, num2):
        # fixme
        ans = num1 * num2
        self.last_result = num1 * num2
        return num1 * num2


result_template = "Result is:"
last_result_template = "Last result was:"

if __name__ == "__main__":
    calc = calculator()
    try:
        print(last_result_template, calc.last_result)
        print(result_template, calc.add(1, 2))
        print(last_result_template, calc.last_result)
        print(result_template, calc.sub(1, 2))
    except:
        print("Maximum value possible or number:", sys.maxint)
        print("Something bad happened!")
```

Python Style Guide

- Batteries included principle
- PEP 8 - https://www.python.org/dev/peps/pep-0008/
- PEP 257 - https://www.python.org/dev/peps/pep-0257/

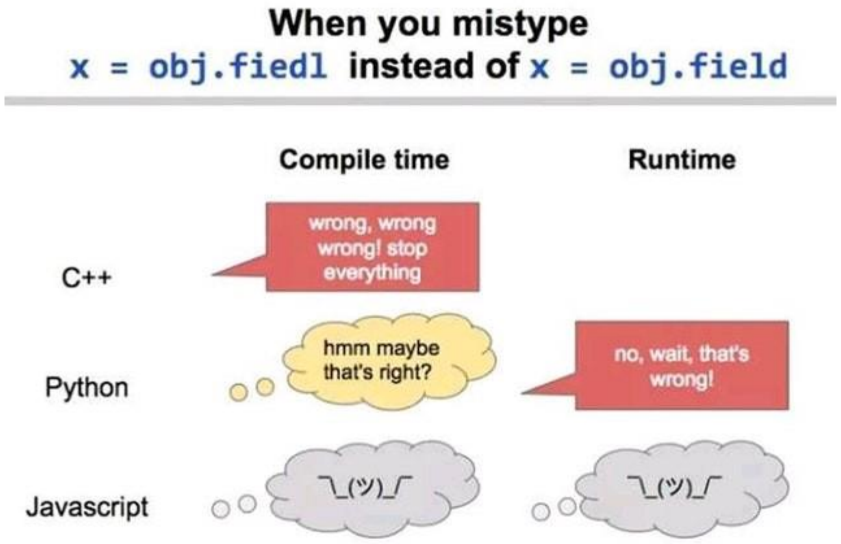
Pylint

- pip install pylint
- Coding standards
- Error detection
- Refactoring – Duplicated code
- Customizable – Configure which errors/conventions are important using pylintrc file. Can write plugins to add a personal feature
- https://www.pylint.org/



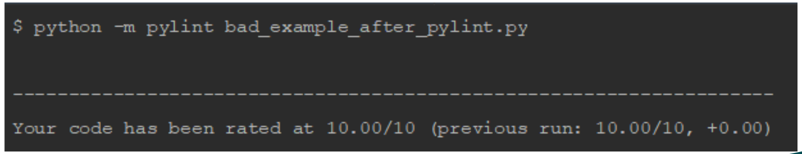
```
$ python -m pylint bad_example.py
************* Module bad_example
bad_example.py:8:0: W0301: Unnecessary semicolon (unnecessary-semicolon)
bad_example.py:23:0: C0325: Unnecessary parens after 'not' keyword (superfluous-parens)
bad_example.py:30:2: W0511: fixme (fixme)
bad_example.py:1:0: C0114: Missing module docstring (missing-module-docstring)
bad_example.py:6:0: C0103: Class name "calculator" doesn't conform to PascalCase naming style (invalid-name)
bad_example.py:6:0: C0115: Missing class docstring (missing-class-docstring)
bad_example.py:9:8: W0107: Unnecessary pass statement (unnecessary-pass)
bad_example.py:11:4: C0103: Argument name "NUM1" doesn't conform to snake_case naming style (invalid-name)
bad_example.py:11:4: C0103: Argument name "NUM2" doesn't conform to snake_case naming style (invalid-name)
bad_example.py:11:4: C0112: Empty method docstring (empty-docstring)
bad_example.py:17:4: C0103: Method name "SUB" doesn't conform to snake_case naming style (invalid-name)
bad_example.py:17:4: C0103: Argument name "x" doesn't conform to snake_case naming style (invalid-name)
bad_example.py:17:4: C0103: Argument name "y" doesn't conform to snake_case naming style (invalid-name)
bad_example.py:17:4: C0116: Missing function or method docstring (missing-function-docstring)
bad_example.py:22:4: C0103: Method name "Div" doesn't conform to snake_case naming style (invalid-name)
bad_example.py:22:4: C0116: Missing function or method docstring (missing-function-docstring)
bad_example.py:23:11: C0113: Consider changing "not not 0 == num2" to "0 == num2" (unneeded-not)
bad_example.py:23:20: C0122: Comparison should be num2 == 0 (misplaced-comparison-constant)
bad_example.py:29:4: C0116: Missing function or method docstring (missing-function-docstring)
bad_example.py:31:8: W0612: Unused variable 'ans' (unused-variable)
bad_example.py:36:0: C0103: Constant name "result_template" doesn't conform to UPPER_CASE naming style (invalid-name)
bad_example.py:37:0: C0103: Constant name "last_result_template" doesn't conform to UPPER_CASE naming style (invalid-name)
bad_example.py:40:4: C0103: Constant name "calc" doesn't conform to UPPER_CASE naming style (invalid-name)
bad_example.py:46:4: W0702: No exception type(s) specified (bare-except)
bad_example.py:47:51: E1101: Module 'sys' has no 'maxint' member (no-member)
bad_example.py:1:0: W0611: Unused import os (unused-import)
bad_example.py:2:0: W0611: Unused import datetime (unused-import)

------------------------------------------------------------------
Your code has been rated at 1.62/10 (previous run: 1.62/10, +0.00)
```

- List of pylint messages – https://github.com/janjur/readable-pylint-messages
- Alternatives – flake8, pyflakes etc.



Example after Pylint fixes

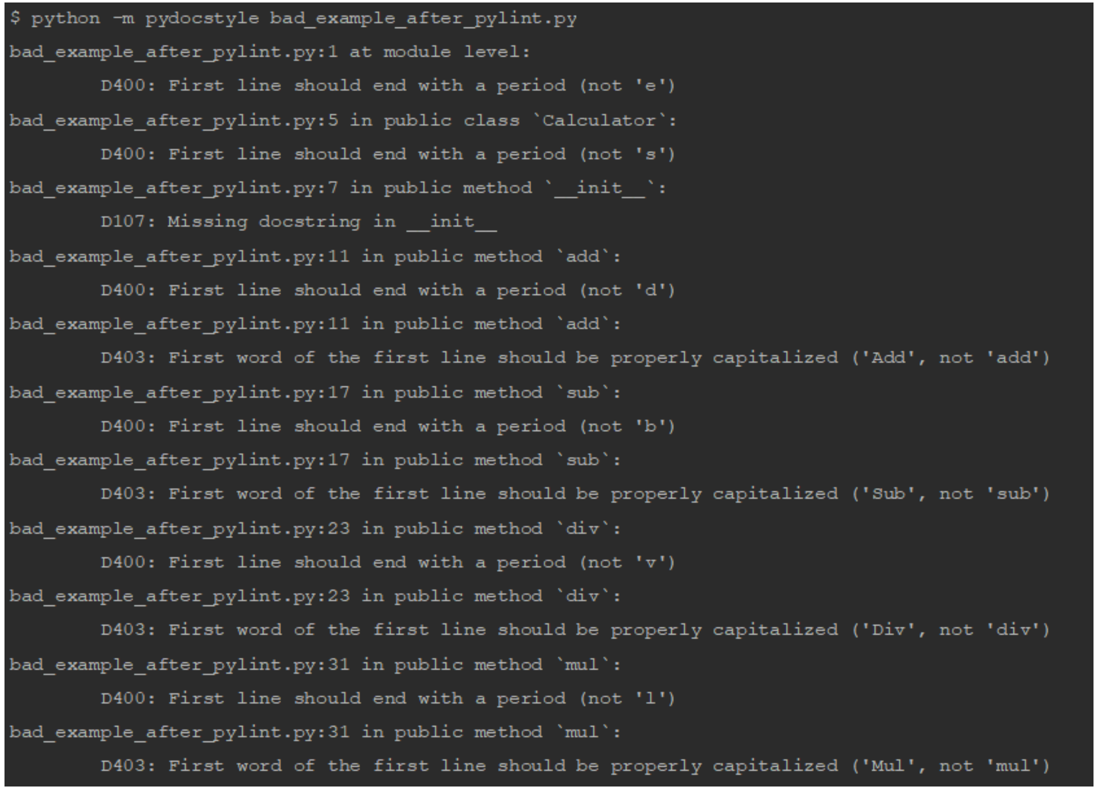
```python
"""calculator module"""


class Calculator:
    """calculator class"""

    def __init__(self):
        self.last_result = 0

    def add(self, num1, num2):
        """add"""
        result = num1 + num2
        self.last_result = result
        return result

    def sub(self, num1, num2):
        """sub"""
        result = num1 - num2
        self.last_result = result
        return result

    def div(self, num1, num2):
        """div"""
        if num2 == 0:
            return 0
        result = num1 / num2
        self.last_result = result
        return result

    def mul(self, num1, num2):
        """mul"""
        result = num1 * num2
        self.last_result = result
        return result


RESULT_TEMPLATE = "Result is:"
LAST_RESULT_TEMPLATE = "Last result was:"

if __name__ == "__main__":
    CALC = Calculator()
    try:
        print(LAST_RESULT_TEMPLATE, CALC.last_result)
        print(RESULT_TEMPLATE, CALC.add(1, "2"))
        print(LAST_RESULT_TEMPLATE, CALC.last_result)
        print(RESULT_TEMPLATE, CALC.sub(1, 2))

    except TypeError as exc:
        print("Invalid type of operands", str(exc))
```



```
$ python -m pylint bad_example_after_pylint.py


-------------------------------------------------------------------
Your code has been rated at 10.00/10 (previous run: 10.00/10, +0.00)
```

What about PEP 257?

Pydocstyle



```
$ python -m pydocstyle bad_example_after_pylint.py
bad_example_after_pylint.py:1 at module level:
        D400: First line should end with a period (not 'e')
bad_example_after_pylint.py:5 in public class `Calculator`:
        D400: First line should end with a period (not 's')
bad_example_after_pylint.py:7 in public method `__init__`:
        D107: Missing docstring in __init__
bad_example_after_pylint.py:11 in public method `add`:
        D400: First line should end with a period (not 'd')
bad_example_after_pylint.py:11 in public method `add`:
        D403: First word of the first line should be properly capitalized ('Add', not 'add')
bad_example_after_pylint.py:17 in public method `sub`:
        D400: First line should end with a period (not 'b')
bad_example_after_pylint.py:17 in public method `sub`:
        D403: First word of the first line should be properly capitalized ('Sub', not 'sub')
bad_example_after_pylint.py:23 in public method `div`:
        D400: First line should end with a period (not 'v')
bad_example_after_pylint.py:23 in public method `div`:
        D403: First word of the first line should be properly capitalized ('Div', not 'div')
bad_example_after_pylint.py:31 in public method `mul`:
        D400: First line should end with a period (not 'l')
bad_example_after_pylint.py:31 in public method `mul`:
        D403: First word of the first line should be properly capitalized ('Mul', not 'mul')
```

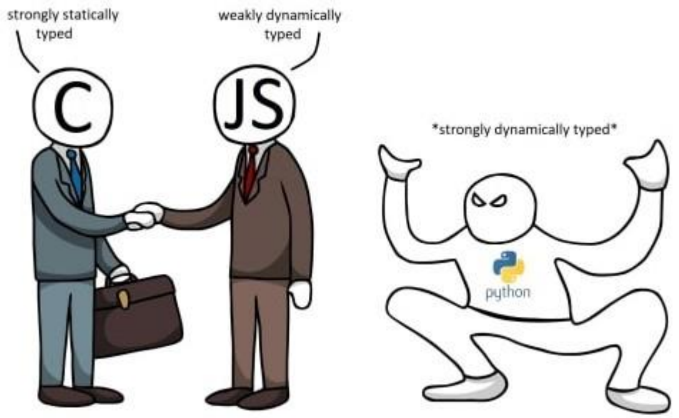
- pip install pydocstyle
- If we use consistent docstrings then there are several tools which can generate automatic documentation from code.

```python
RESULT_TEMPLATE = "Result is:"
LAST_RESULT_TEMPLATE = "Last result was:"

if __name__ == "__main__":
    CALC = Calculator()
    try:
        print(LAST_RESULT_TEMPLATE, CALC.last_result)
        print(RESULT_TEMPLATE, CALC.add(1, "2"))
        print(LAST_RESULT_TEMPLATE, CALC.last_result)
        print(RESULT_TEMPLATE, CALC.sub(1, 2))

    except TypeError as exc:
        print("Invalid type of operands", str(exc))
```

```
Last result was: 0
Invalid type of operands unsupported operand type(s) for +: 'int' and 'str'
```

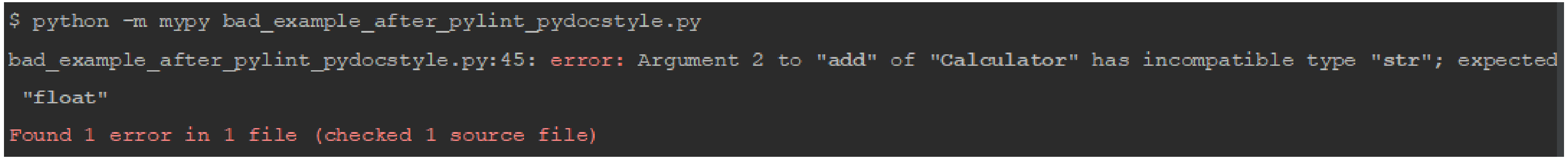
Mypy

- pip install mypy
- Optional static typing for Python
- PEP 484
- No runtime overload



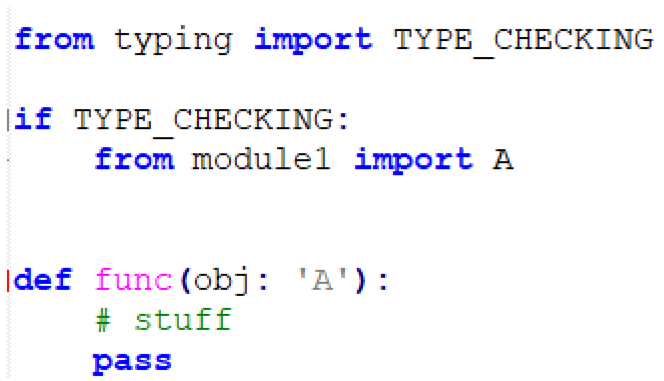
He's a special boy

```python
def add(self, num1: float, num2: float) -> float:
    """Add two numbers."""
    result = num1 + num2
    self.last_result = result
    return result
```



```
$ python -m mypy bad_example_after_pylint_pydocstyle.py
bad_example_after_pylint_pydocstyle.py:45: error: Argument 2 to "add" of "Calculator" has incompatible type "str"; expected
 "float"
Found 1 error in 1 file (checked 1 source file)
```

- How to type hint types other than primitives?
- typing module – Any, Union, Tuple, Callable, List etc.
- Can create our own types
- typing.TYPE_CHECKING – A special constant that is assumed to be True by 3rd party static type checkers. It is False at runtime.



```python
from typing import TYPE_CHECKING

if TYPE_CHECKING:
    from module1 import A


def func(obj: 'A'):
    # stuff
    pass
```

Bandit and Black

Icing on the Cake

Bandit

- pip install bandit
- Can detect security issues in the Python code
- https://github.com/PyCQA/bandit/tree/master/examples

Black

- pip install black
- Code formatter

Where to ensure?

While Writing

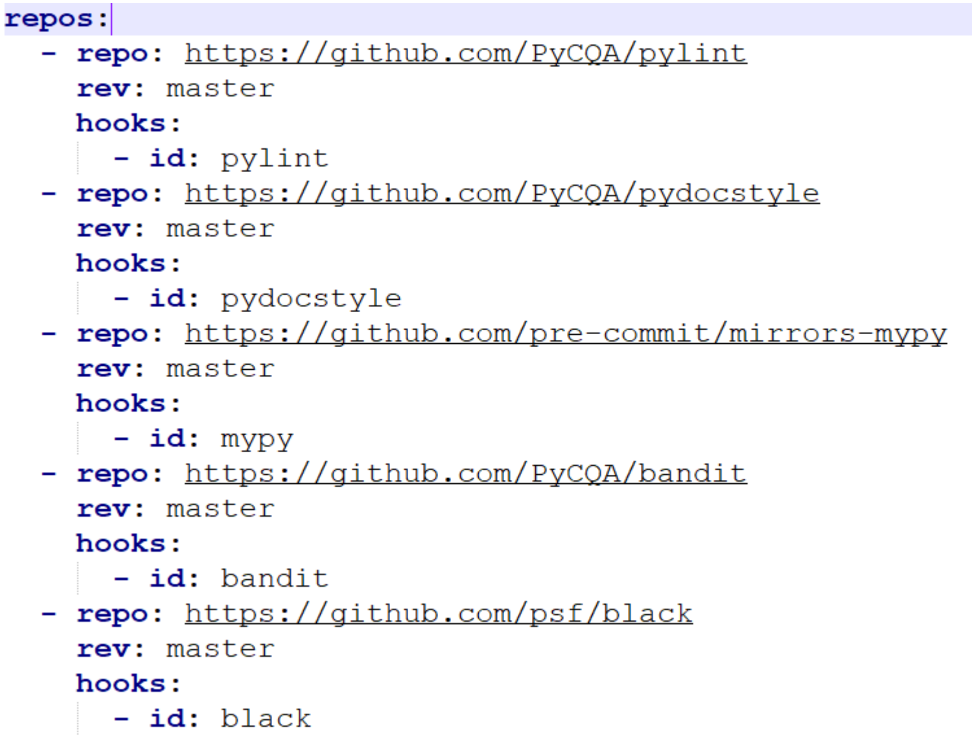
Before Commit

After Push

Pre-commit

- pip install pre-commit
- https://pre-commit.com/
- It is a multi-language package manager for pre-commit hooks. You specify a list of hooks you want and it manages the installation and execution.
- Configured using .pre-commit-config.yaml
- List of available hooks – https://pre-commit.com/hooks.html

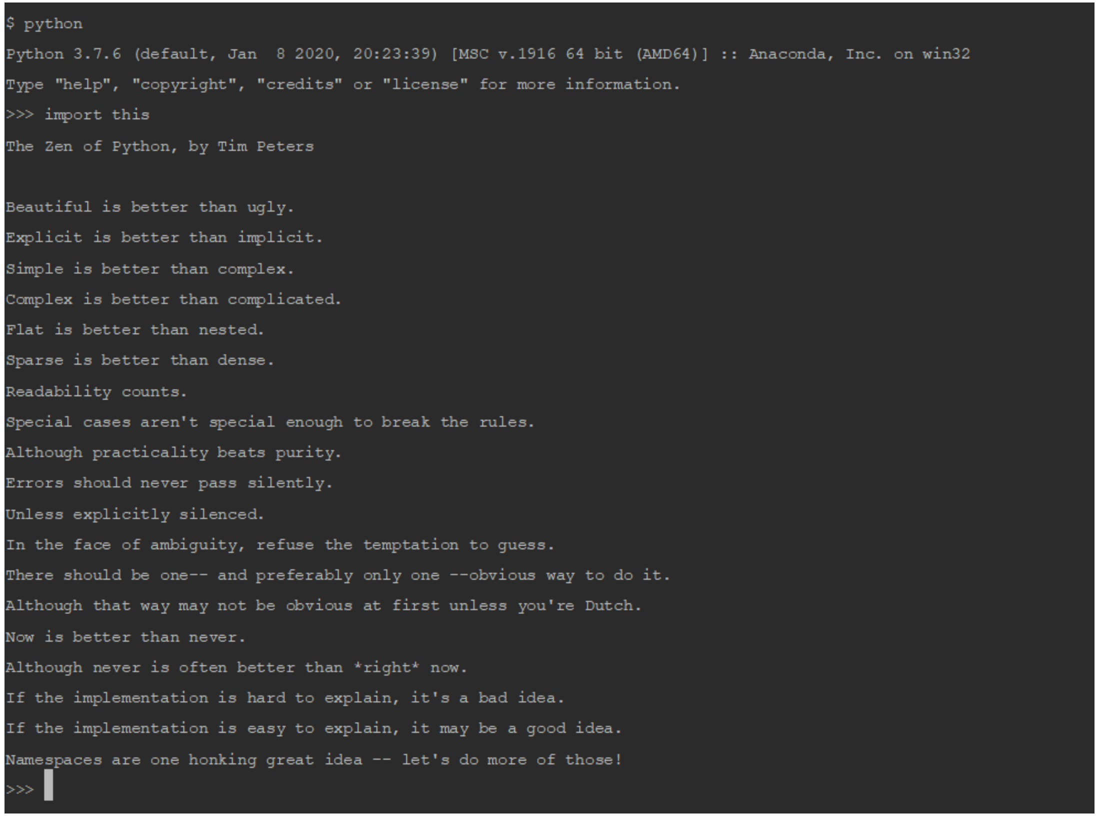
Sample configuration



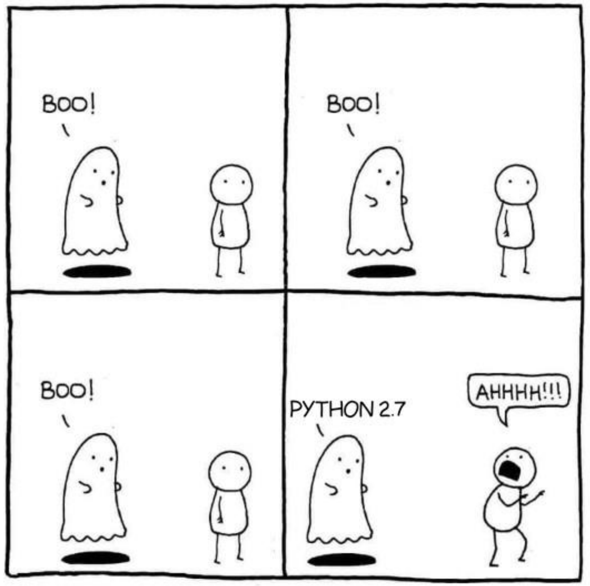
```yaml
repos:
  - repo: https://github.com/PyCQA/pylint
    rev: master
    hooks:
      - id: pylint
  - repo: https://github.com/PyCQA/pydocstyle
    rev: master
    hooks:
      - id: pydocstyle
  - repo: https://github.com/pre-commit/mirrors-mypy
    rev: master
    hooks:
      - id: mypy
  - repo: https://github.com/PyCQA/bandit
    rev: master
    hooks:
      - id: bandit
  - repo: https://github.com/psf/black
    rev: master
    hooks:
      - id: black
```

- pre-commit install
- pre-commit run

The Zen of Python



```
$ python
Python 3.7.6 (default, Jan  8 2020, 20:23:39) [MSC v.1916 64 bit (AMD64)] :: Anaconda, Inc. on win32
Type "help", "copyright", "credits" or "license" for more information.
>>> import this
The Zen of Python, by Tim Peters

Beautiful is better than ugly.
Explicit is better than implicit.
Simple is better than complex.
Complex is better than complicated.
Flat is better than nested.
Sparse is better than dense.
Readability counts.
Special cases aren't special enough to break the rules.
Although practicality beats purity.
Errors should never pass silently.
Unless explicitly silenced.
In the face of ambiguity, refuse the temptation to guess.
There should be one-- and preferably only one --obvious way to do it.
Although that way may not be obvious at first unless you're Dutch.
Now is better than never.
Although never is often better than *right* now.
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.
Namespaces are one honking great idea -- let's do more of those!
>>>
```



Thanks!

Any questions?

You can find me at https://linkedin.com/in/pc9795