Unit Testing and Python

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Test Driven Development (TDD)

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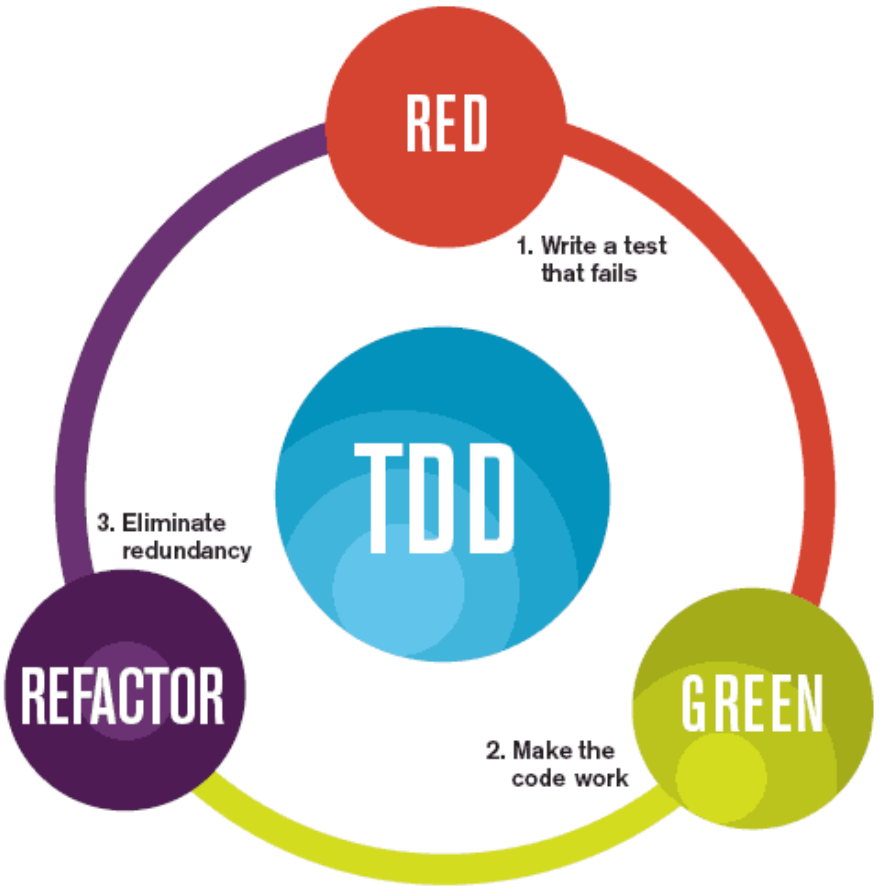

The mantra of Test-Driven Development (TDD) is "red, green, refactor."

TDD Methodology

"Strictly speaking"

1. Add a test
2. Run the test suite
    - Note: This should fail!
3. Write the minimum code to pass tests
4. Run test suite
5. Refactor & repeat

The pragmatist's view:

- Add tests
- Run tests
- Write/fix code

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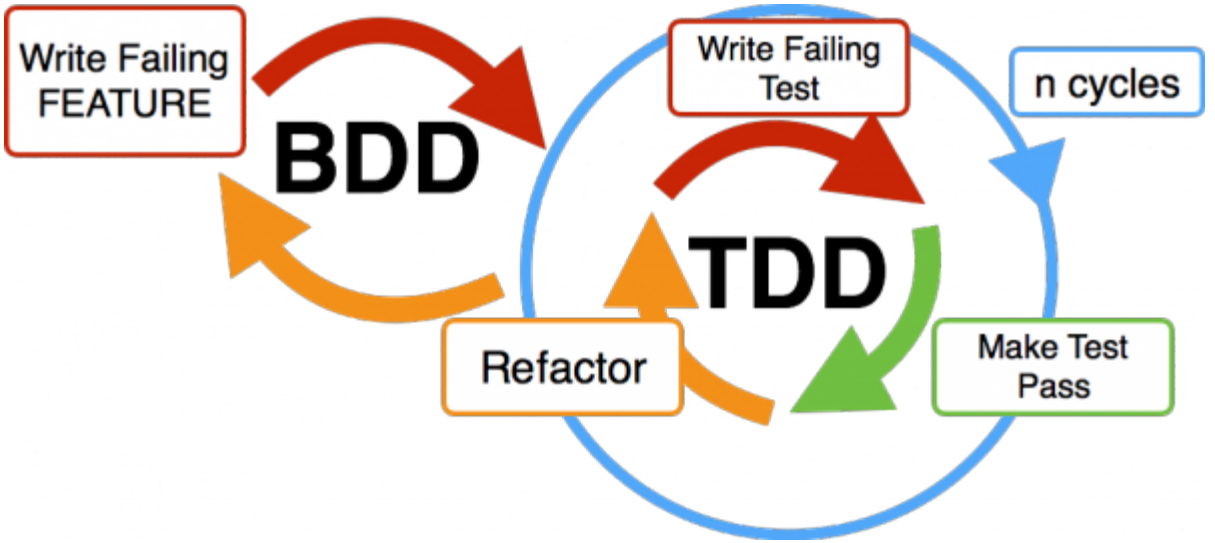
- TDD can unfairly focus on "micro-tests"
- More tests != better tests, and do mean more maintenance

People study development methodologies, here's one just published that says TDD provides marginal benefit.

Takeaway? There is no "magic" way of doing things that will make your code bug-free.

Behavior Driven Development



Writing unit tests in Python

Python??

Getting started, create `rpn.py`

```
#!/usr/bin/env python3

def calculate(arg):
    pass

def main():
    while True:
        calculate(input("rpn calc> "))

if __name__ == '__main__': # Note: that's "underscore underscore n a m e ..."
    main()
```

```
$ python3 rpn.py
rpn calc> type anything here and hit enter
rpn calc>
```

Quick refresher on RPN calculators

Also a "stack-based" calculator

```
rpn calc> 1 1 +
2.0
rpn calc> 1 1 + 2 *
4.0
rpn calc> 1 2 3 +
Error: Malformed expression
```

Create `test_rpn.py`

```
import unittest
import rpn

class TestBasics(unittest.TestCase):
    def test_add(self):
        result = rpn.calculate("1 1 +")
        self.assertEqual(2, result)
```

- The name matters! Note that `test_rpn.py` tests `rpn.py`

```
$ python3 -m unittest
F
======================================================================
FAIL: test_add (test_rpn.TestBasics)
----------------------------------------------------------------------
Traceback (most recent call last):
  File "/home/marcus/rpn_calc/test_rpn.py", line 8, in test_add
    self.assertEqual(2, result)
AssertionError: 2 != None

----------------------------------------------------------------------
```

Don't forget `git`!

```
$ wc -l *py
      11 rpn.py
       8 test_rpn.py
      19 total

# This is 19 lines of quality code here!
```

- Yes, we're committing *before anything works*
  - The structure is good
  - The *test harness works*

And let's not forget `make` while we're at it

Because why type 19 letters when you could type 4?

```
test:
	python3 -m unittest

.PHONY: test
```

Did this just give away a homework question? Why yes, yes it did.

Live coding

PLEASE stop me and ask questions if you're confused

PLEASE yell at me to slow down if I go too fast

- Implement add
  - Need a stack for the calculator
  - Need to tokenize the input
  - Need to process tokens

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- Implement add
  - Need a stack for the calculator
  - Need to tokenize the input
  - Need to process tokens
- Add test for subtract
- Implement subtract
- Tests can expect failure: malformed input
- On your own: Tests and implementation for multiply, divide

Some fancy Python and the big refactor

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- Gets worse as more operands are added
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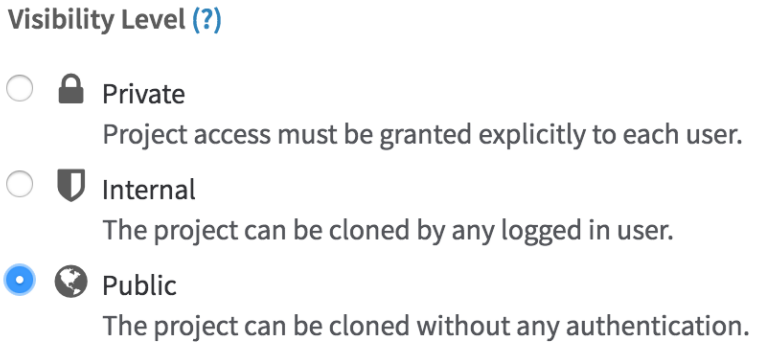
Goal: Simplify parser code

- Is it a number? Then add to stack
- Else look up operator and execute

Attendance: Push your code to gitlab

1. Go to https://gitlab.eecs.umich.edu
2. Click "New Project"
3. Name your project **exactly**: `c4cs-f18-rpn`
4. Set your project to **publically visible**



5. Scroll down and follow the directions for **existing folder or Git repository**
   - You shouldn't need to create a repo (we already did that)
   - **Make sure you've committed all your changes!**
   - `git remote add .....`
   - `git push -u origin master`
   - Your username is your uniqname, and password is your umich.edu password