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Unit Testing and Development Pipeline

Objectives for today:

- Create documentation in markdown
- Apply a style guide to your code
- Setup and use an automated style checker
- Describe the 4 levels of testing
- Create a testing plan for given code
- Write a simple unit test

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README Files

README.md

- It is common practice to include README files with code projects.
    - Github automatically renders README.md files on repository pages.

- What would you include for someone trying to use your project?

- What are some items you’ve seen other developers include in their README files?

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README.md

- It is common practice to include README files with code projects.
    - Github automatically renders README.md files on repository pages.

- Some things to include:
    - Requirements/dependencies
    - How to setup the project
    - Any usage instructions
    - Badges for workflows
    - Licensing
    - Contact information

Markdown

- Readme files are written in markdown which is a markup language

- Some other markup languages include:
  - HTML
  - YAML
  - MD
  - XML

- Markup languages format text – bold, underline, insert images, etc.
  - Markup languages are not compiled and run like programming languages

Markdown

- Readme files are written in markdown which is a markup language

- Some other markup languages include:
  - HTML
  - YAML
  - MD
  - XML

Some Markdown flavors are more extensive than others - check out GitLab's Markdown capabilities!

Writing Markdown

- **Headers**:
  - # Title / H1
  - ## Subtitle / H2
- **Emphasis**:
  - **bold**
  - *italic*
  - > quote
- [Text of link](http://google.com)
- ![alt text](path/to/image_file.jpg)

- **Bullet list:**

  - Can use hyphen
  * Or asterisk

- **Numbered list:**

  1. This is one
  2. This is two
  3. Markdown handles counting
  4. To ease re-ordering!

- **Emojis:**
  :sparkles:
  :octocat:

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Using MarkDown

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Development Pipeline

Development Pipeline

- When code is pushed, typically it doesn’t just go live –
  - What do you think might happen?

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Development Pipeline

- When code is pushed, typically it doesn't just go live:
  - Automated Run of Static Analysis tools
    - Style Checker
    - Bug Checker
    - Security Checker
  - Automated Run of Tests
  - Code Review by another developer
  - Manual test by QA

Style Guide

- Python has a style guide called PEP 8
  - https://www.python.org/dev/peps/pep-0008/

- Why would a group of developers want to follow a style guide?

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Style Guide | In-class Activity

Head to: https://www.python.org/dev/peps/pep-0008/

1. What is the naming convention for a class name?
2. What is the naming convention for constant variables (AKA constants?)
3. How often/When should you use inline comments?
4. Ideally, what should be the maximum character length for a line of code?

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Style Guide

- Python has a style guide called PEP 8
  - https://www.python.org/dev/peps/pep-0008/

- Why would a group of developers want to follow a style guide?
  - Makes large code bases easier to read
  - Gives developers consistent experience (ex. maximum line length)
  - Agreed upon rules make code reviews faster/easier

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Style Checker

- There is a static analysis tool to check that the style guide is followed
  - pycodestyle - https://pypi.org/project/pycodestyle/

- Running on terminal:
  - `pycodestyle --first file_name.py`

- Example output:

```
codio@lakerider:~/workspace$ pycodestyle --first file_name.py
file_name.py: line#: character#: Style issue description
file_name.py:   11:   1:   W293 blank line contains whitespace
file_name.py:   27:   5:   W292 no newline at end of file
```

Automation

Have computers consistently run programs against your code, instead of doing it ourselves manually

- We can create programs (or markup files) to verify behavior of other programs or check styling of every file you add or edit.

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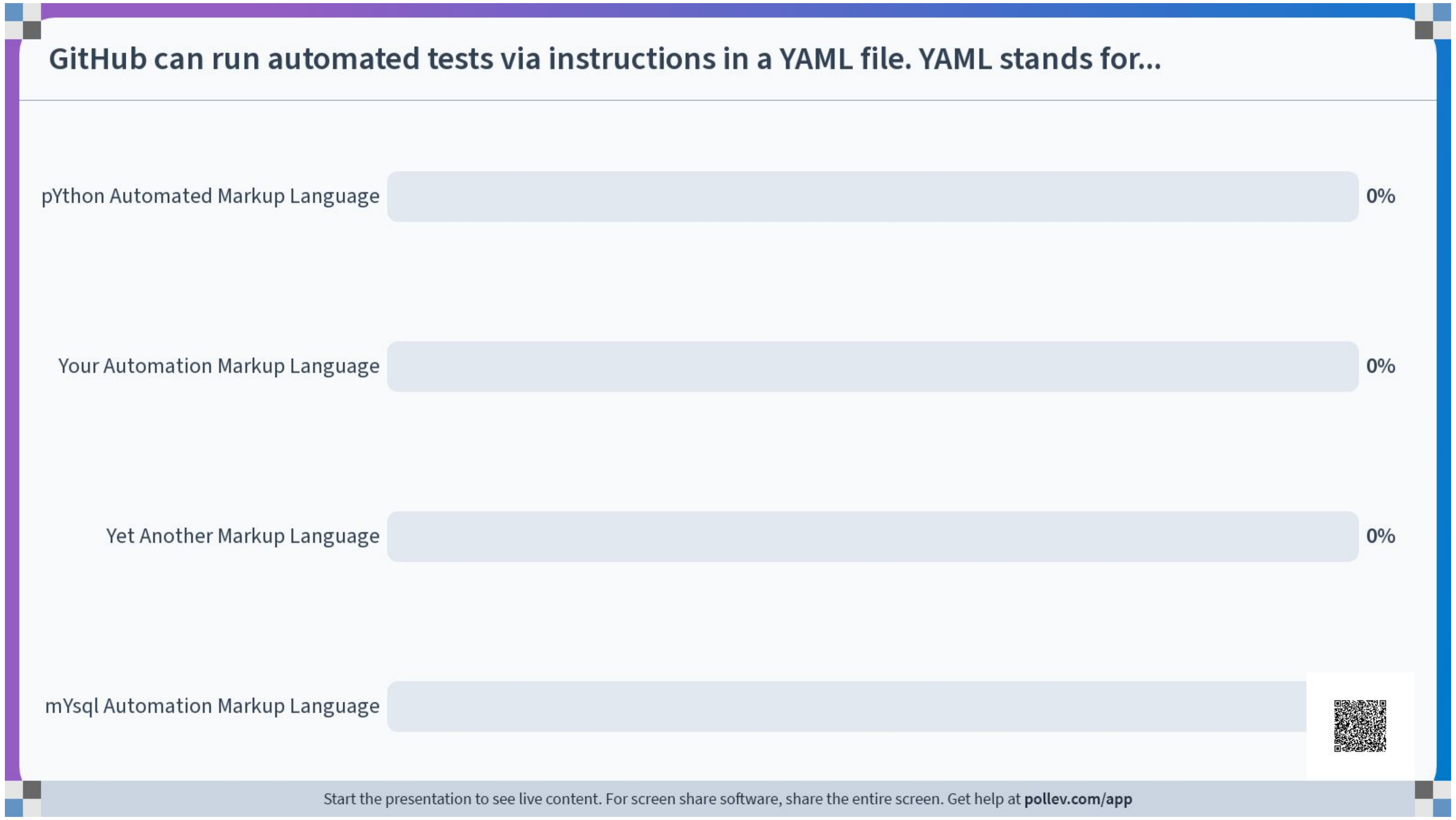

GitHub can run automated tests via instructions in a YAML file. YAML stands for...

pYthon Automated Markup Language 0%

Your Automation Markup Language 0%

Yet Another Markup Language 0%

mYsql Automation Markup Language

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Automating Style Checker

- GitHub Actions
  - Automates tasks
  - Specified in YAML – Yet Another Markup Language
    - White space matters like python!

- Create .github/workflows/style.yaml
  - Name workflow
  - Install python and pycodestyle
  - Run pycodestyle

```yaml
# style.yml
name: Check Style
on: push

jobs:
  check-style:
    runs-on: ubuntu-latest
    steps:
      - uses: actions/checkout@v3

      - name: Setup python
        uses: actions/setup-python@v2
        with:
          python-version: 3.11.3

      - name: Install tools
        run: python -m pip install
             --upgrade pip pycodestyle

      - name: Check Style
        run: pycodestyle --first *.py
```

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Automating Style Checker

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Testing

Levels of Testing

- **Acceptance Testing** - testing done generally by client to ensure it meets their needs
- **System Testing** - testing the entire system end-to-end
- **Integration Testing** - test integrated components such as classes
- **Unit Testing** - testing individual components such as methods

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When and Who Writes Tests?

- This depends a lot on the organization, but generally you (the developer) should write tests for any new code **before** committing it.

- There are some organizations who have dedicated test engineers who entire job is to create tests. This role can sometimes be called a QA or Quality Assurance engineer (though generally QAs have less experience than test engineers).

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Testing Plans

- When designing the structure of code, you should consider modularizing your code in a way that makes sense and is reusable, but also that each module has a discrete, testable function.

- As you are breaking your code into methods, think about (write in comments) a few test cases for each method.

- For example, if your method includes a conditional, your test cases should "cover" both branches

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Unit Testing

Unit Tests

| the simplest type of test available

- These are tests that verify expected behavior of functions or classes in isolation
- They're useful for checking over complicated functions

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UnitTest – Python Library

- Actual check or test is done with assert methods:
  - assertEqual(a, b)
  - assertNotEqual(a, b)
  - assertTrue(a)
  - assertFalse(a)
  - assertRaises(a)
  - assertAlmostEqual(a, b)
  - assertNotAlmostEqual(a, b)

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Unit Test – Example

```
import unittest
from yourCodeFileName import function1, function2

class TestFileName(unittest.TestCase):

 def test_function1(self):
   self.assertEqual(function1(1), 0)

 def test_function2(self):
   self.assertEqual(function2(2,1), 3)
   self.assertEqual(function2(2.1, 1.2), 3.3)
```

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```
python3 -m unittest testFileName.py
```

Automating Unit Testing

- GitHub Actions
  - Automates tasks
  - Specified in YAML – Yet Another Markup Language
    - White space matters like python!
- Create .github/workflows/tests.yaml
  - Name workflow
  - Install python and unittest
  - Run unittest

```yaml
name: Tests
on: push

jobs:
  check-style:
    runs-on: ubuntu-latest
    steps:
      - uses: actions/checkout@v3

      - name: Setup python
        uses: actions/setup-python@v2
        with:
          python-version: 3.11.3

      - name: Install tools
        run: python -m pip install
             --upgrade pip pytest

      - name: Test with unittest
        run: python3 -m unittest test.py
```

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Using Unit Tests

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Unit Testing Vocabulary

- A fake can refer to either a mock or a stub - any piece of code that is pretending to be fully implemented, production code.
  - A mock is a fake object that mimics an actual object
  - A stub can replace an object that isn't built yet
  - A stub will never fail a unit test, but a mock can.
    A stub could be replaced when the functionality is added.
- A spy is an observation point to check if code calls a component
- A dummy is an object that is passed around but never used

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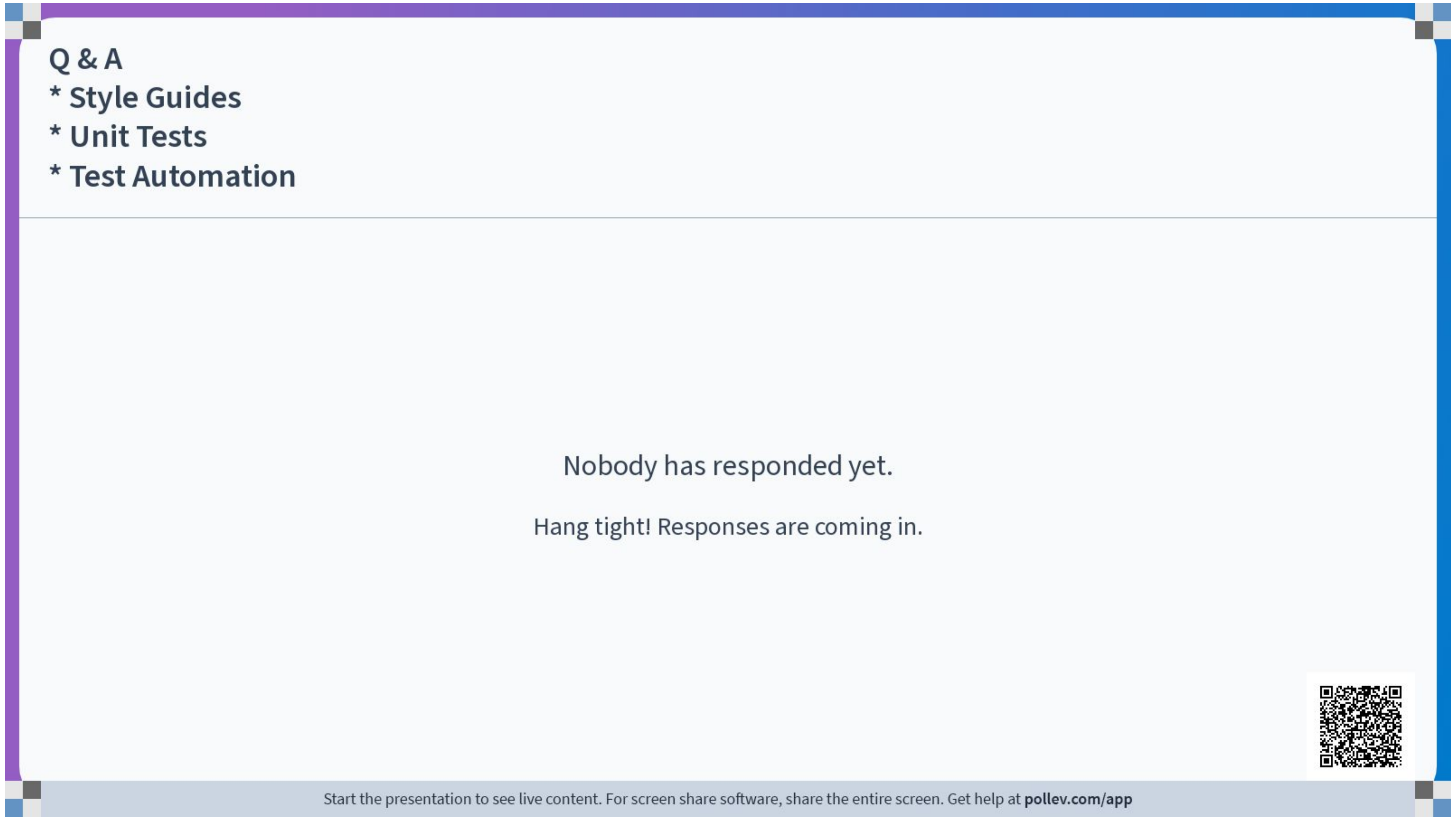

Q & A
* Style Guides
* Unit Tests
* Test Automation

Nobody has responded yet.

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Thank you!