Using Python, Travis CI, and GitHub to Effectively Teach Programming

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Hi! My name is

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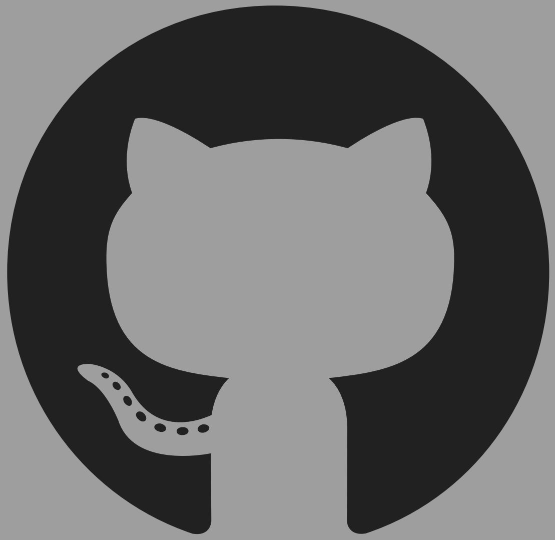
Roadmap for this Talk

Introduce strategies and tools for effectively teaching programming

USE INDUSTRY STANDARD SOFTWARE IN ALL COURSES

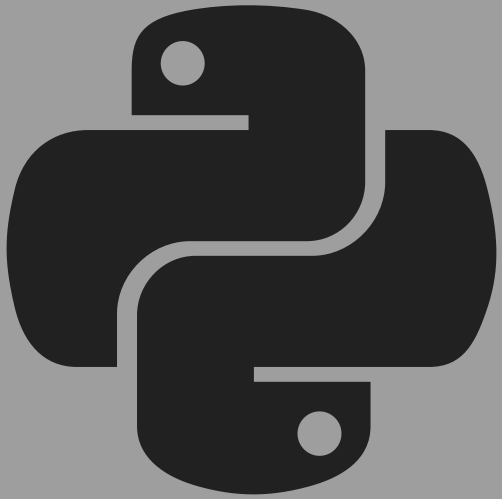
SUITABLE FOR INSTRUCTORS IN INDUSTRY OR ACADEMIA

Exploring Technologies



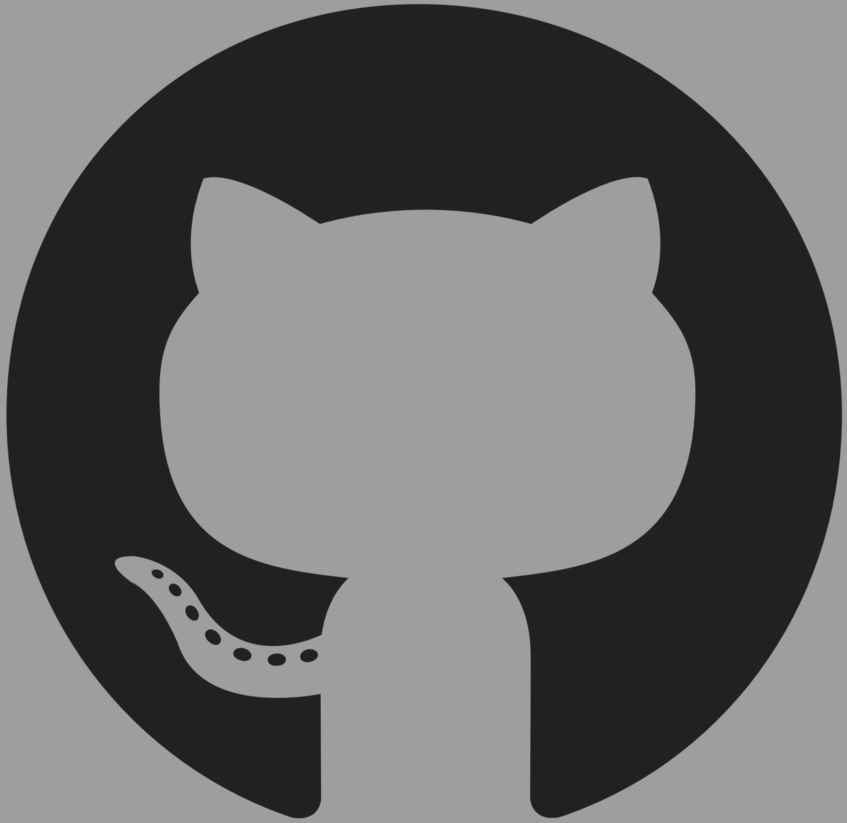
GitHub

Travis



Python

Discuss in greater detail!



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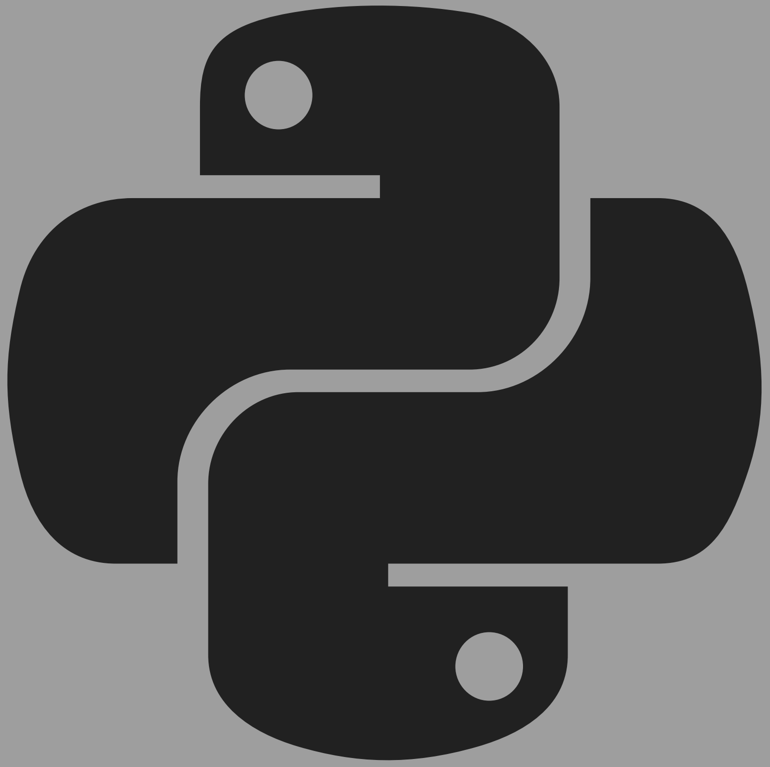


Python

Important Goals

Clear Status

Key Ideas

Fast Grading

HELP STUDENTS AND TEACHERS EFFECTIVELY COLLABORATE

Deliverables to Check

- Source Code
- Technical Writing
- Commit Counts
- Commit Messages
- Program Output
- Data Files

LEVERAGE EXISTING TOOLS WHENEVER POSSIBLE

Tools to Support Checks

- Source code linting
- Markdown linting
- Prose checking
- JUnit test suite
- Pytest test suite
- Automated build tools

DEVELOP NEW SOLUTIONS IN PYTHON WHEN NECESSARY

Benefits of Python

Tools

Packages

Testing

Tools for Development

- Black
- Flake8
- Pipenv
- Pylint
- Pytest
- Pytest Plugins (e.g., Codecov)

DESIGN PRINCIPLES THAT GUIDED DEVELOPMENT

Inspired by John Ousterhout's
A Philosophy of Software Design

Design Principles

- Working code is not sufficient: aim for simplicity
- Code that hasn't been executed does not work
- Simple interfaces over simple implementations
- Great documentation encourages contributions

Flexible Checking

Local

Travis

See GatorGrader and GatorGradle in the GatorEducator organization on GitHub

CREATE TWO REPOSITORIES FOR EACH ASSIGNMENT

Using Travis CI

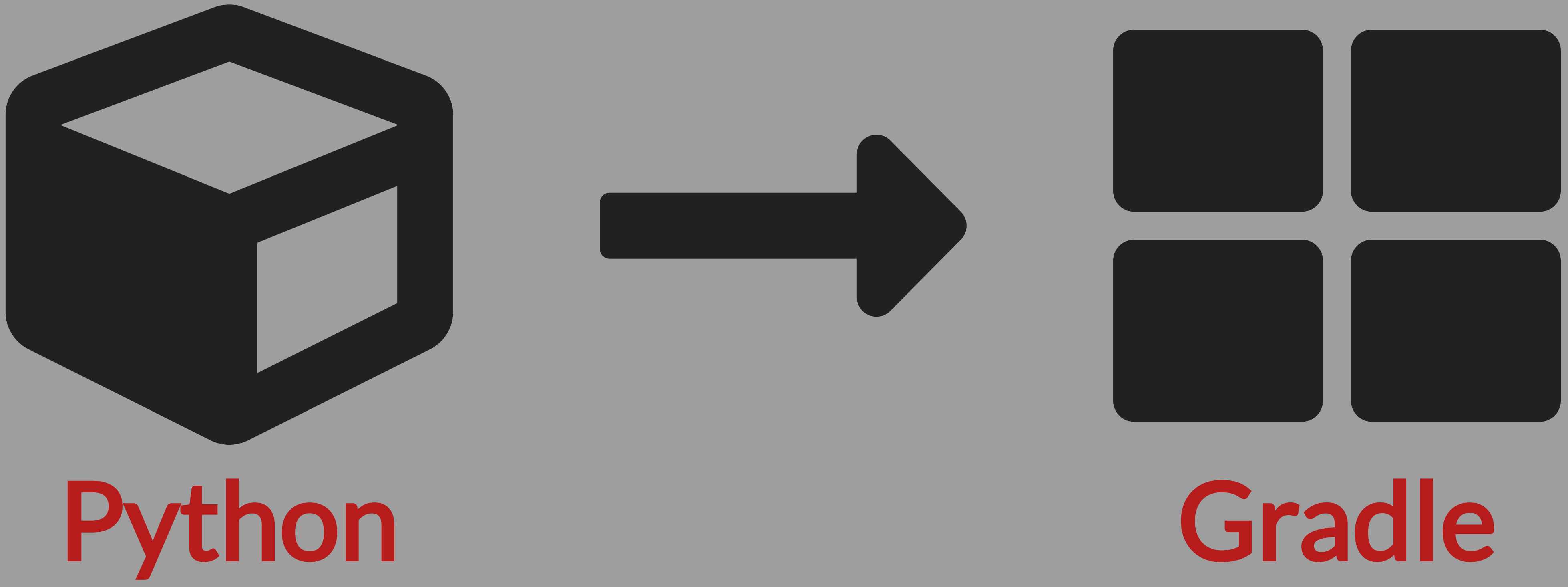
Solution

Starter

Check

THE STARTER REPOSITORY SHOULD *NOT* PASS THE TESTS

Efficient Project Grading



Python

Gradle

Supporting different programming languages, the Gradle plugin runs GatorGrader checks in parallel

Let's Configure Travis CI!

```
# use Java and non-root
dist: trusty
sudo: false
language: Java
jdk: oraclejdk8

# ignore the virtualenv that Travis creates
env:
  global:
```

Travis CI runs private builds for every student

Let's Configure GatorGrader!

```
---
name: cmpsc-100-fall-2018-lab3
break: true
indent: 4
---
# --- check the source code for various characteristics
# note that without an "--exact" the check is an "at least"
```

Configure GatorGrader for use through Gradle

GatorGrader's Output

```
✘  Repository has at least 14 commit(s)
➔ Found 9 commit(s) in the Git repository

✘  The writing has at least 100 word(s)
➔ Found 12 word(s) in a paragraph

✘  The output has one of the '28.75'
➔ Found 0 fragment(s) in the output

Passed 6/13 (46%) of checks for f2018-lab3
```

Courses and Topics

- Computational Expression
- Data Abstraction
- Software Engineering
- Web Development
- Artificial Intelligence

Different topics, goals, languages, and levels

Used during laboratory, practical, and class

GatorGrader is like having a constant coach! I liked receiving feedback on the quality of my source code and writing before turning in the final version of my lab.

- ANNA YEAGER

Ideas for Experiments

Deliverables

Insights

WHAT CODE AND CONCEPTS CAUSE STUDENT FRUSTRATION?

Let's Collaborate

New Checks

Bug Reports

See GatorGrader and GatorGradle in the GatorEducator organization on GitHub