

A Hands-On Guide to Teaching Programming with GitHub, Travis CI, and Python

Gregory M. Kapfhammer

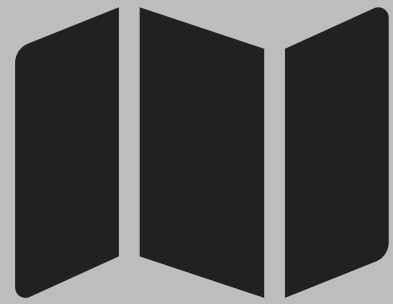
July 28 at PyOhio 2018

Hi! My name is

GREGORY M. KAPFHAMMER

 @GregKapfhammer

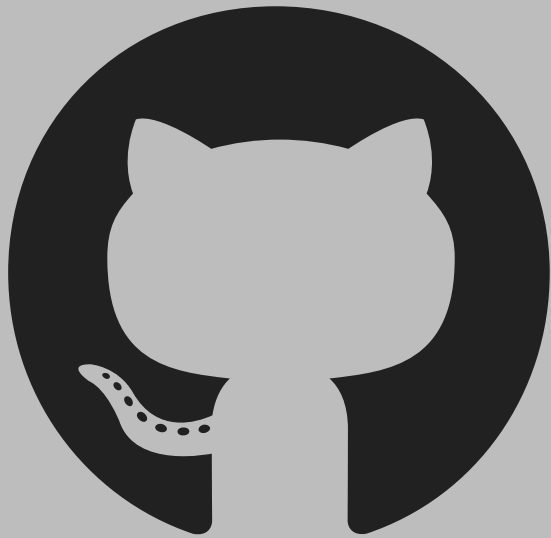
 www.gregorykapfhammer.com



Roadmap for this Talk

Ask and answer questions
about effective instruction in
the programming field

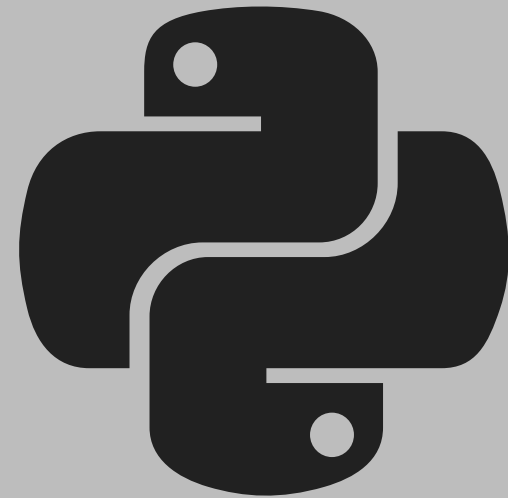
Exploring Technologies



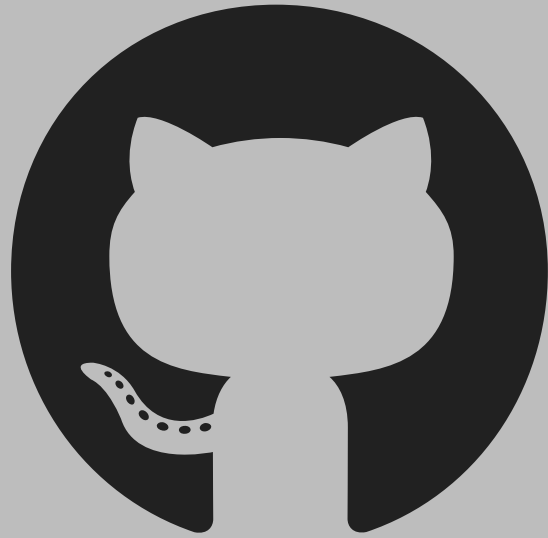
GitHub



Travis



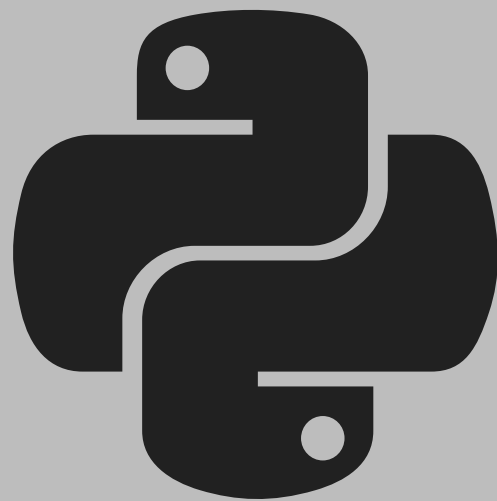
Python



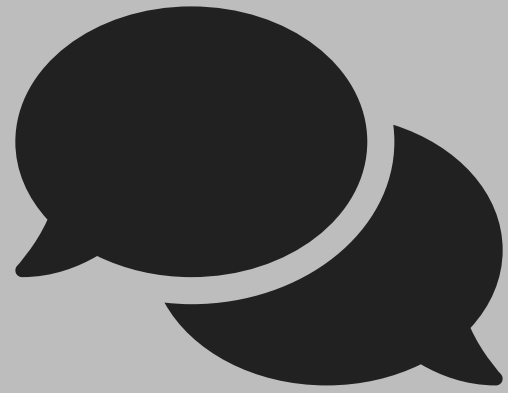
GitHub



Travis



Python



Why would I

DECIDE TO USE

GITHUB AND

TRAVIS CI?

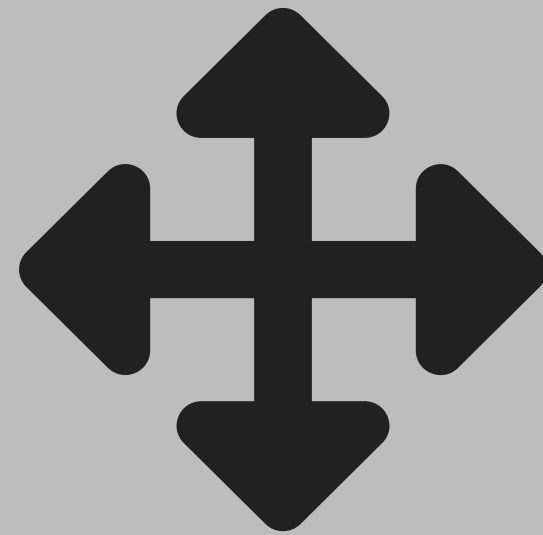
Important Goals



**Clear
Status**



**Key
Ideas**



**Fast
Grading**

**HELP STUDENTS
AND FACULTY
EFFECTIVELY
COLLABORATE**

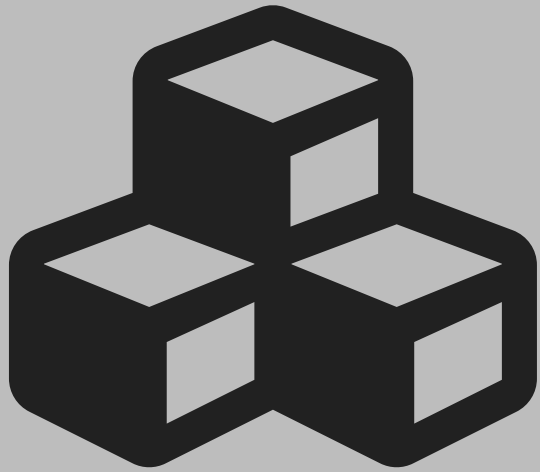
Deliverables to Check

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

**USE INDUSTRY
STANDARD
TOOLS IN ALL
COURSE WORK**

**DEVELOP NEW
SOLUTIONS IN
PYTHON WHEN
NECESSARY**

Benefits of Python



Tools



Options



Testing



How should I

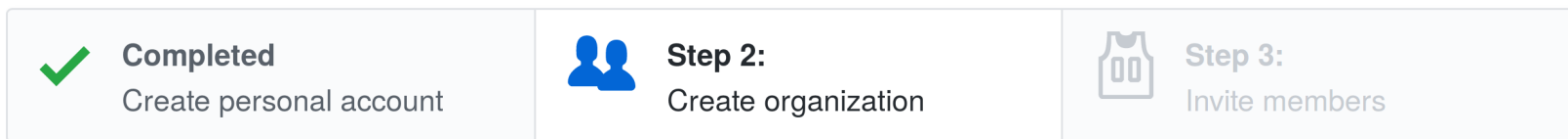
SETUP AND USE

GITHUB

CLASSROOM?

Create a GitHub organization for your course

Sign up your team



Create an organization account

Organization name

This will be your organization name on <https://github.com/Allegheny-Computer-Science-111-F2018>.

Billing email

We'll send receipts to this inbox.


Organization accounts allow your team to plan, build, review, and ship software — all while tracking bugs and discussing ideas.

Choose your plan

Now you have an empty organization

The screenshot shows the GitHub interface for an organization. At the top, there is a navigation bar with the GitHub logo, a search bar, and links for Pull requests, Issues, Marketplace, and Explore. The organization's name is 'Computer Science 111 Fall 2018 at Allegheny College', with a logo 'C1' and location 'Pennsylvania, USA'. Below the organization name, there are tabs for Repositories (0), People (1), Teams (0), Projects (0), and Settings. The main content area features a message: 'This organization has no repositories.' with a green button 'Create a new repository'. On the right, there is a 'People' section with one member listed: 'gkapfham' (Gregory M. Kapfhammer) and an 'Invite someone' button.

Search or jump to... / Pull requests Issues Marketplace Explore


 **Computer Science 111 Fall 2018 at Allegheny College**
Computer Science 111 Fall 2018
Pennsylvania, USA

Repositories 0 **People** 1 **Teams** 0 **Projects** 0 **Settings**

This organization has no repositories.







[Create a new repository](#)

People 1 >


 **gkapfham**
Gregory M. Kapfhammer

[Invite someone](#)


Let GitHub Classroom access the organization

GitHub Classroom GitHub Education      


Select an organization for your new classroom




C1
@Allegheny...




C8
@Allegheny...



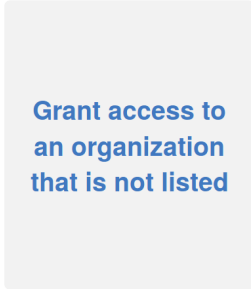
C6
@Allegheny...




C3
@Allegheny...




C2
@Allegheny...









Grant access to an organization that is not listed

 **ProTip!** Don't see your organization? You need to [grant us access](#) first.

 with ❤️ by **GitHub**
GitHub Classroom is [open source](#).

Create a student roster for the Classroom

GitHub Classroom GitHub Education      

Add students

Next, let's set up a "roster", so you can easily track student progress on your dashboard.

To create your roster, you'll need to share a way to identify your students. These "identifiers" can be:

- Student last names
- Student email addresses
- Any other unique piece of information

You can always come back and complete this step later.

What information would you like to use to identify your students?
(emails, student ID #, etc.)

Paste your list of identifiers below (one per line, please!):

Create an assignment for your course

The screenshot shows the GitHub Classroom interface for a course. At the top, there is a dark navigation bar with the GitHub Classroom logo on the left and several utility icons on the right, including 'GitHub Education', a chat icon, a video icon, a list icon, a link icon, a user profile icon, and a share icon. Below this is a green patterned header section containing the course title 'Computer Science 111 Fall 2018 at Allegheny College' and the identifier 'Allegheny-Computer-Science-111-F2018'. A 'Manage classroom' button is located on the right side of this header. The main content area is a white box with a title 'Assignments' at the top. The center of this box contains the text 'This organization doesn't have any assignments yet.' and a prominent green button labeled 'Create your first assignment'. At the bottom of the page, there is a footer with the text 'with ❤ by GitHub' and 'GitHub Classroom is open source.'

GitHub Classroom

GitHub Education



Computer Science 111 Fall 2018 at Allegheny College

Allegheny-Computer-Science-111-F2018

Manage classroom

Assignments

This organization doesn't have any assignments yet.

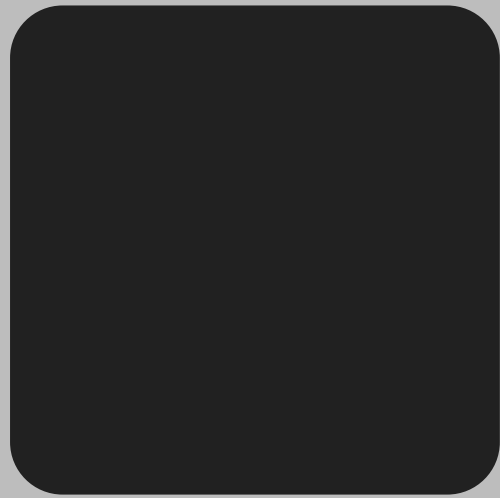
Create your first assignment

with ❤ by GitHub

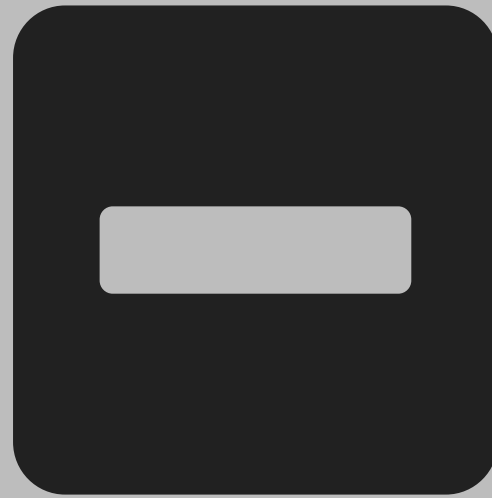
GitHub Classroom is open source.

**CREATE TWO
REPOSITORIES
FOR EACH
ASSIGNMENT**

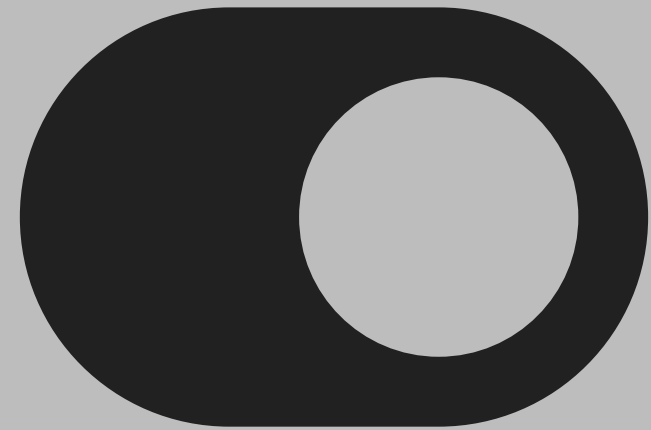
Using Travis CI



Solution









Starter



Check

THE STARTER
REPOSITORY
SHOULD *NOT*
PASS THE TESTS


Create an assignment using the starter

GitHub Classroom GitHub Education      

Computer Science 111 Fall 2018 at Allegheny College

Allegheny-Computer-Science-111-F2018 [Manage classroom](#)


New assignment



Individual assignment

Each participant works individually on their own repository.


[Create an individual assignment](#)



Group assignment

Participants form teams that work together on a shared repository.

[Create a group assignment](#)

 with ❤️ by **GitHub**
GitHub Classroom is [open source](#).

A classroom will contain many assignments

The screenshot displays the GitHub Classroom interface for a specific classroom. At the top, the header includes the 'GitHub Classroom' logo, 'GitHub Education' text, and several utility icons. The main title of the classroom is 'Computer Science 111 Fall 2017 at Allegheny College', with a 'Manage classroom' button to its right. Below this, the 'Assignments' section is visible, featuring a 'New assignment' button and a list of three assignments. Each assignment entry includes an icon (individual or group), the assignment title, a brief description, a URL, and a 'Copy invitation link' button.

Assignment Title	Description	URL	Action
Computer Science 111 Fall 2017 Lab 1	Individual assignment	https://classroom.github.com/a/Uzf3tjLV	Copy invitation link
Computer Science 111 Fall 2017 Lab 10	Group assignment for Computer Science 111 Lab 10 Teams Formed on November 9, 2018	https://classroom.github.com/g/G1VJvvkG	Copy invitation link
Computer Science 111 Fall 2017 Lab 11	Group assignment for Computer Science 111 Lab 11 Teams Formed on November 16, 2017	https://classroom.github.com/g/BNsbcvdC	Copy invitation link



How do you

AUTOMATICALLY

CHECK STUDENT

SUBMISSIONS?

Flexible Checking



Local



Travis

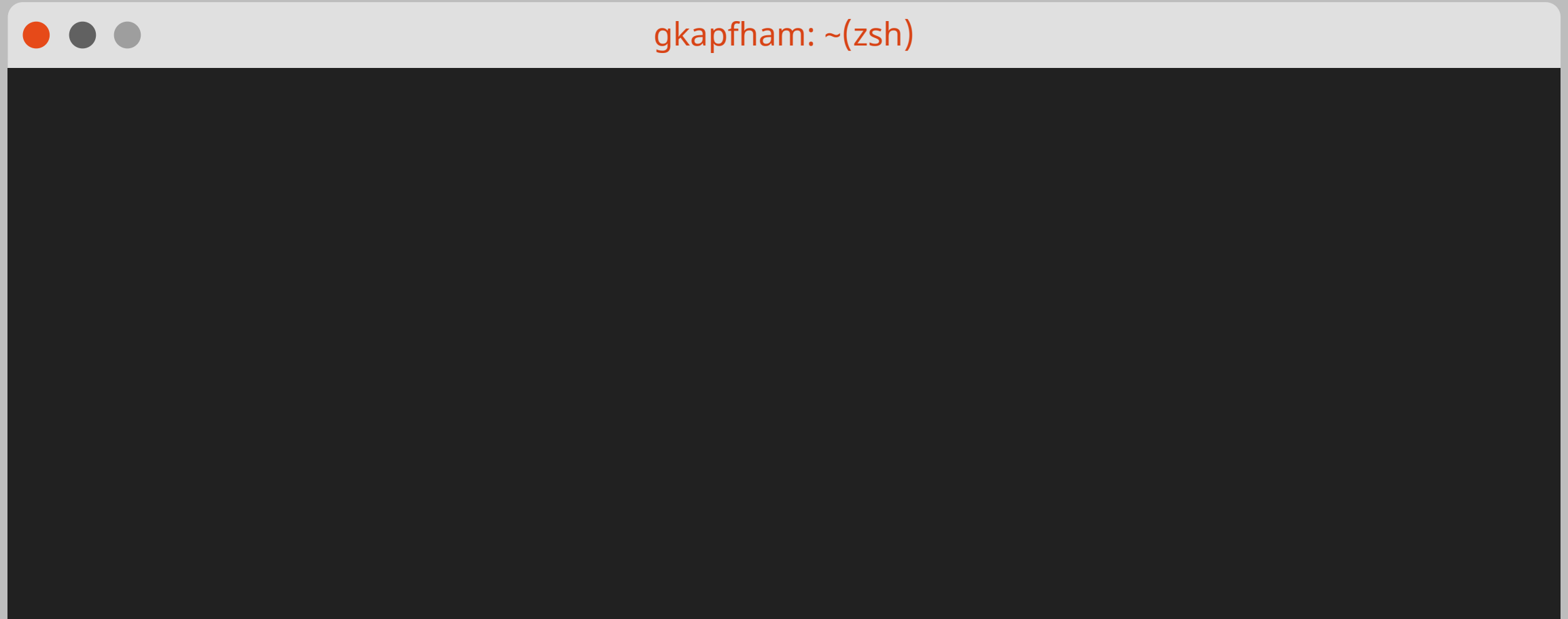
Use Java and Python

1. # use both Python and Java
2. sudo: required
3. dist: trusty
4. language: python
5. python:
6. - '3.6' is the main language for this course
7. before_install:
8. - jdk_switcher use oraclejdk8

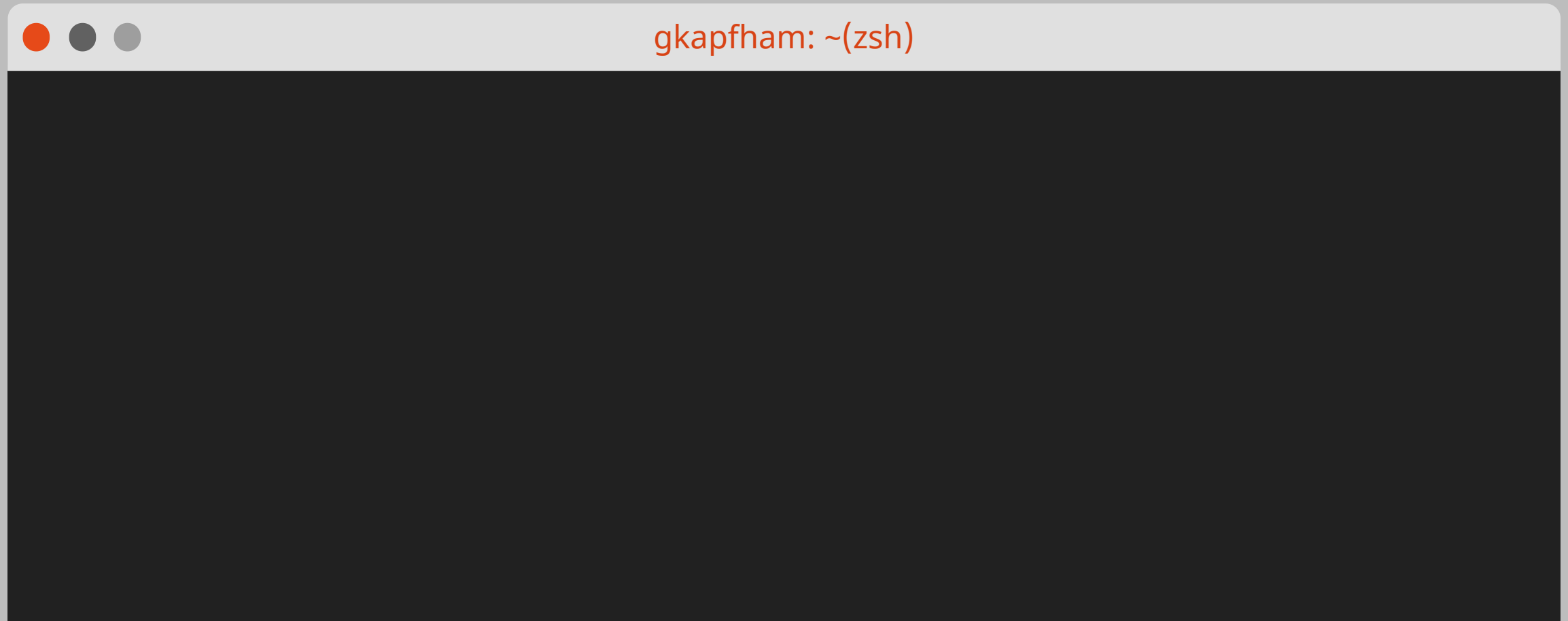
Decide if Check Passes

```
1. #!/bin/bash
2.
3. # assume that gatorgrader.py exits correctly
4. GATORGRADER_EXIT=0
5.
6. # assume that the human-readable answer is "No"
7. GATORGRADER_EXIT_HUMAN_PASS="No"
8.
9. # determine if the exit code is always failing
10. determine_exit_code() {
11.     if [ "$1" -eq 1 ]; then
12.         GATORGRADER_EXIT=1
13.     else
14.         The build passes if all of the checks pass
15.         if [ "$2" ]; then
16.             echo "$2 was successful"
17.         fi
18.     fi
19. }
```

Running GatorGrader on a Correct Submission



Running GatorGrader on an Incorrect Project

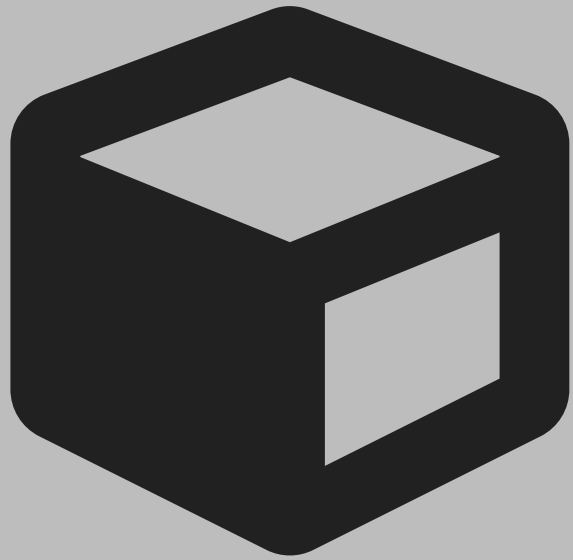


Previous Courses and Topics

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

Different topics, goals, languages, and levels

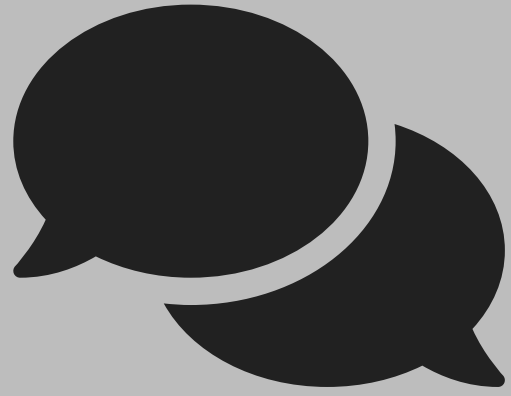
Exciting New Features



Script



Gradle



What do the

STUDENTS

THINK ABOUT

THIS IDEA?

This approach ensures that the source code and GitHub repositories are organized. It is easier for me to help the students who are struggling in an introductory course.

- SAEJIN MAHLAU-HEINERT

This tool suite made it easier for me to talk with students about technical requirements. It helped me to make complex assignments more accessible to students.

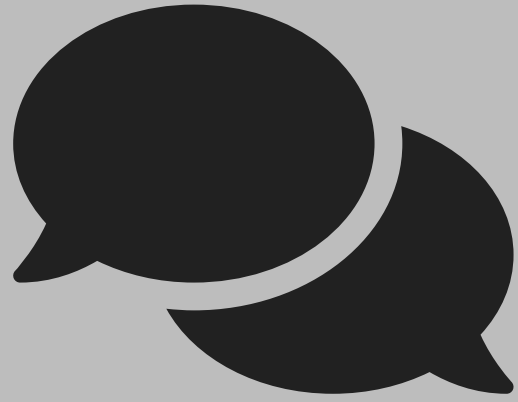
- MARIA KIM

GatorGrader encouraged me to add better code comments and try out language constructs that I would not have otherwise investigated. The tool was a big help this semester!

- SAMATHA DARRIS

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



How can we

IMPROVE AND

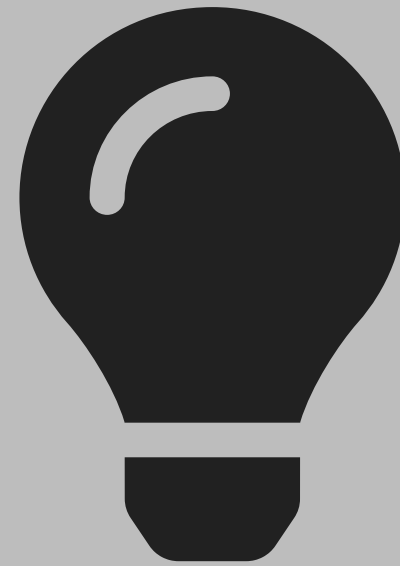
STUDY THIS

APPROACH?

Ideas for Experiments



Deliverables



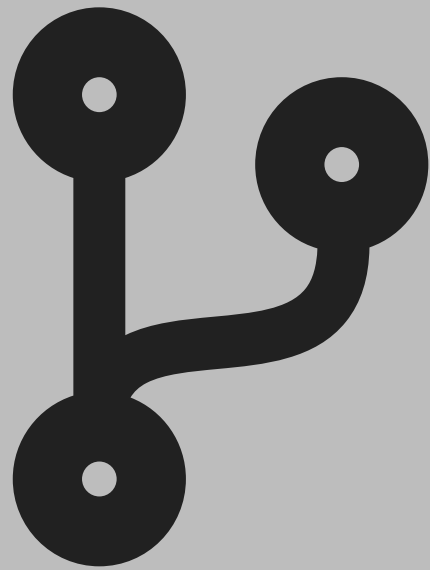
Insights

**WHAT CODE AND
CONCEPTS
CAUSE STUDENT
FRUSTRATION?**

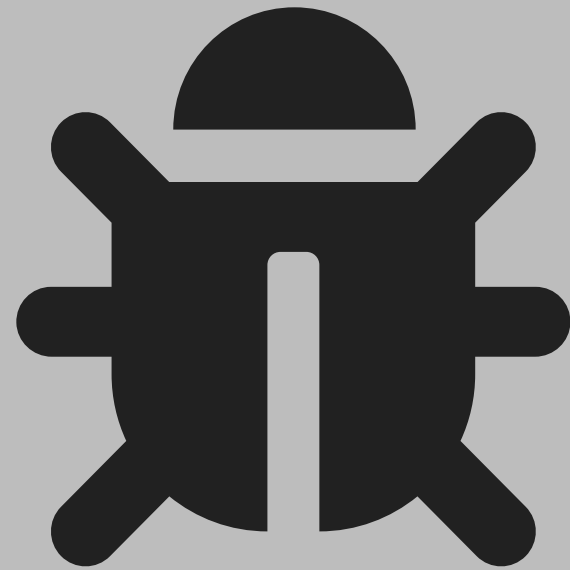
**WHAT FEATURES
BEST SUPPORT
EMERGING
PROGRAMMERS?**

**HOW DO TEAM
MEMBERS
INFLUENCE
LEARNING?**

Let's Collaborate



Pull Requests



Bug Reports

GitHub Classroom developers are great!

The screenshot shows the GitHub interface for the 'education / classroom' repository. At the top, there is a search bar and navigation links for 'Pull requests', 'Issues', 'Marketplace', and 'Explore'. The repository name 'education / classroom' is displayed, along with statistics for 'Watch' (71), 'Star' (831), and 'Fork' (239). Below this, there are tabs for 'Code', 'Issues 61', 'Pull requests 17', 'Projects 8', and 'Insights'. The main heading of the issue is 'Internal Server Error 500 When Accessing an Assignment in GitHub Classroom #1117', with 'Edit' and 'New issue' buttons. A red 'Closed' label is present, along with the text 'gkapfham opened this issue on Aug 31, 2017 · 10 comments'. A comment from 'gkapfham' is shown, dated 'Aug 31, 2017', with an 'edited' status. The comment text reads: 'Hello! Thank you so much for developing GitHub Classroom. So far, my students and I have really enjoyed using the system. In advance of running the laboratory session today, I have tested it repeatedly with small class sizes for our first laboratory assignment and everything always worked correctly. That is, it was possible to:'. A bulleted list follows: '• Instructor: Create an organization for the class'. On the right side, there are sections for 'Assignees' (No one assigned), 'Labels' (a red 'bug' label), and 'Projects' (None yet).

education / classroom

Watch 71 Star 831 Fork 239

Code Issues 61 Pull requests 17 Projects 8 Insights

Internal Server Error 500 When Accessing an Assignment in GitHub Classroom #1117

Edit New issue

Closed gkapfham opened this issue on Aug 31, 2017 · 10 comments

gkapfham commented on Aug 31, 2017 • edited

Hello! Thank you so much for developing GitHub Classroom. So far, my students and I have really enjoyed using the system. In advance of running the laboratory session today, I have tested it repeatedly with small class sizes for our first laboratory assignment and everything always worked correctly.

That is, it was possible to:

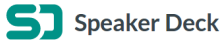

- Instructor: Create an organization for the class

Assignees
No one assigned


Labels
bug

Projects
None yet

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Gregory Kapfhammer

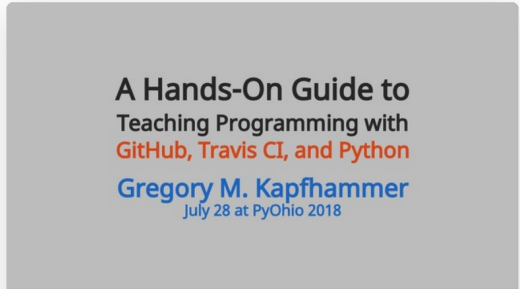
gkapfham

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Focusing on software engineering, software testing, and data science, I program, teach, research, and write.


www.gregorykapfhammer.com

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A Hands-On Guide to Teaching Programming with GitHub, Travis CI, and Python
Gregory M. Kapfhammer
July 28 at PyOhio 2018

 Jul 22, 2018 ☆ 0 👁 0





Using Controlled Numbers of Real Faults and Mutants to Empirically Evaluate Coverage-Based Test Case Prioritization

David Paterson University of Sheffield Gregory Kapfhammer Allegheny College Gordon Fraser University of Passau Phil McMinn University of Sheffield

Workshop on Automation of Software Test
29th May 2018


dpaterson1@sheffield.ac.uk

 May 29, 2018 ☆ 0 👁 24



Using GitHub, Travis CI, and Python to Introduce Collaborative Software Development

Rowan Castellanos, Gregory M. Kapfhammer, Nicholas Tocci
PyCon 2018 Education Summit
May 10, 2018

 May 10, 2018 ☆ 0 👁 110

See slide source code on GitHub

gkapfham / pyohio2018-presentation Unwatch 1 ★ Star 0 Fork 0


[Code](#) [Issues 0](#) [Pull requests 0](#) [Projects 0](#) [Wiki](#) [Insights](#) [Settings](#)

Slides for a Technical Presentation Given at the PyOhio 2018 Conference Edit

[presentation-slides](#) [javascript](#) [react](#) [spectacle](#) [Manage topics](#)

136 commits 1 branch 0 releases 1 contributor

Branch: **master** New pull request Create new file Upload files Find file Clone or download

 **gkapfham** Adding the use of the questionFont variable back to the section slides. Latest commit 24d5bfe 25 minutes ago

assets	Adding the travis file to the assets/code directory.	an hour ago
default	Adding the JavaScript files to the default directory.	an hour ago
presentation	Adding the use of the questionFont variable back to the section slides.	25 minutes ago
.babelrc	Updating the babelrc to reflect the content from the boilerplate.	an hour ago
.eslintignore	Adding in all of the JavaScript files and many of the dotfiles.	6 days ago
.eslintrc	Adding in all of the JavaScript files and many of the dotfiles.	6 days ago

Check out GatorGrader on GitHub!

The screenshot shows the GitHub repository page for `GatorEducator / gatorgrader`. At the top, there are navigation options: `<> Code`, `Issues 6`, `Pull requests 0`, `Projects 0`, `Wiki`, `Insights`, and `Settings`. On the right, there are interaction buttons: `Unwatch 3`, `Star 4`, and `Fork 1`.

The repository description is `Automated Grading Tool that Checks the Work of Writers and Programmers`, with an `Edit` button. Below the description are topic tags: `python`, `python3`, `pytest`, and `auto-test`, along with a `Manage topics` link.

Repository statistics are shown: `382 commits`, `1 branch`, `0 releases`, and `3 contributors`.

Navigation options include: `Branch: master`, `New pull request`, `Create new file`, `Upload files`, `Find file`, and `Clone or download`.

A recent commit by `Michionlion` is highlighted: `Merge pull request #24 from gkapfham/i-20-sentence-count-bug`, with the latest commit `b3e81a7` on `Apr 19`.

File	Description	Time
<code>internal/java</code>	Renaming the DisplayOutput file to Sample instead.	11 months ago
<code>tests</code>	added test and check for empty paragraph list in counting words	4 months ago
<code>.coveragerc</code>	Adding the first version of the coveragerc file for pytest-cov testing.	6 months ago
<code>.gitignore</code>	adding .pytest_cache to gitignore	4 months ago
<code>.style.yapf</code>	The yapf style is now using pep8.	a year ago
<code>.travis.yml</code>	fixing flake8 and mdl problems	4 months ago
<code>README.md</code>	fixing flake8 and mdl problems	4 months ago
<code>gatorgrader.py</code>	Added non-existent check error exit code	4 months ago
<code>gatorgrader_comments.py</code>	Fixing a docstring in the gatorgrader_comments.	6 months ago
<code>gatorgrader_entities.py</code>	One more docstring fix in the gatorgrader_entities.	7 months ago

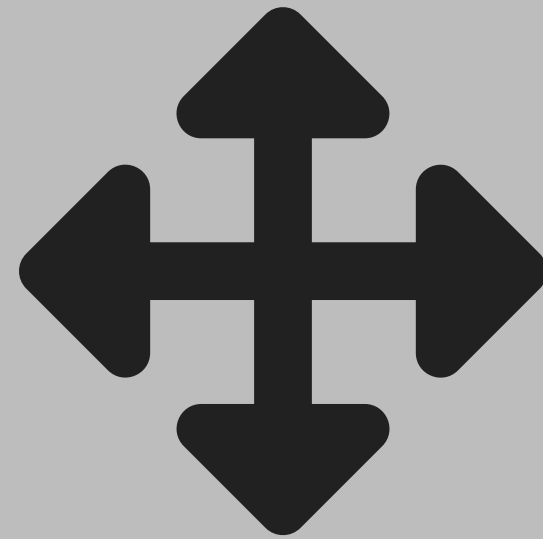
Main Contributions



**Clear
Status**



**Key
Ideas**



**Fast
Grading**

GatorEducator/GatorGrader