

GitHub Classroom and Rice University's Comp215 (Introduction to Software Design)

Dan S. Wallach
Rice University

These slides are online: www.cs.rice.edu/~dwallach/sigcse2019.pdf



Rice CS pedagogy in one slide

Freshmen: Python coding in a browser-based IDE

Includes solo + group projects, flipped classrooms, 200+ students

Sophomores: Java coding in IntelliJ (180 students in Fall 2018)

Focus on test-driven development (unit tests first)

Mostly functional programming, leveraging Java8 features

Data structures, algorithms, lots of recursion, o-o basics, etc.

Solo coding: weekly projects, difficulty growing each week

After that? Many different tools, coding styles, groups vs. solo, etc.

We're using a lot of different tools!



JACOCO
Java Code Coverage

checkstyle



Java 8

GitHub



pitest.org



IntelliJ IDEA



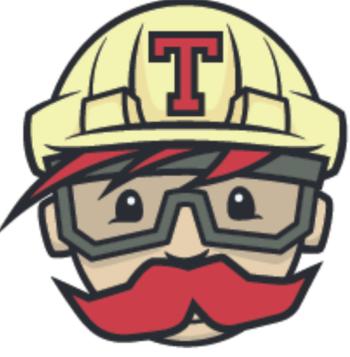
git



Gradle



Apache Commons
<http://commons.apache.org/>



Travis CI



Spark



mockito



JUnit



Maven



LOGBack
The Generic, Reliable
Fast & Flexible
Logging Framework

Tooling decisions

When in doubt, follow standard Google / Android coding practices

IntelliJ, Gradle, ErrorProne, etc.

Gradle makes it easy to set up and configure student machines

Pulls in necessary libraries, configures IntelliJ to run tests, etc.

Gradle brings lots of other benefits

Easy integration with Travis-CI, ErrorProne, CheckStyle, etc.

IntelliJ devs have been exceptionally responsive to bug reports

“Fixed in the next release” often within 48 hours!

Git non-issues

“Detached HEAD state” and other Git peculiarities

Students coding solo, using IntelliJ’s “VCS” frontend

- Helps prevent common mistakes
- No merging, no rebasing, no branches, no tags
- Those show up in subsequent courses

Server uptime

GitHub and Travis-CI have been very reliable

- One GitHub outage \Rightarrow 24-hour extension
- Way better than our old in-house SVN server



Git non-issues

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Fall 2019: We’re going to switch midway to group projects.



Week One: Setup is rough

Student setup instructions: 23 page PDF (with lots of screenshots)

Install IntelliJ and Java8 JDK (plus Git, for Windows machines)

Configure IntelliJ

GitHub Classroom: clone and check out a starter repo

Do a trivial Java assignment

Commit/push, verify by visiting GitHub.com

Most students get this done in a 50 minute lab

Maybe 2-3 of 180 had weird issues with their computer configuration

Example instructions from fall 2018:

www.cs.rice.edu/~dwallach/week01-lab-setup.pdf

Typical weekly timeline

Monday morning: PDFs & repo posted for project, side project, lab

Tuesday/Wednesday: Students do in-person labs

Thursday night: Unit tests and/or other preliminary code due

Friday morning: Additional unit tests added to student repos

- Students need to do a Git pull (some initial confusion, but works)

Sunday night: Everything is due.

The student experience

Step 1: Piazza post

Projects

Projects	Date	Actions
Week 14: Pretty Pictures, Part 3 	Nov 30, 2018	 Edit  Post a note  Delete
Week 13: Pretty Pictures, Part 2 	Nov 18, 2018	 Edit  Post a note  Delete
Week 12: Pretty Pictures, Part 1 	Nov 11, 2018	 Edit  Post a note  Delete
Week 10: RPN 	Oct 21, 2018	 Edit  Post a note  Delete
Week 9: Database Operations 	Oct 14, 2018	 Edit  Post a note  Delete
Week 7: Recursive Descent Parsing 	Oct 7, 2018	 Edit  Post a note  Delete
Week 6: Regular Expressions 	Sep 30, 2018	 Edit  Post a note  Delete
Week 5: Trees and Treaps 	Sep 23, 2018	 Edit  Post a note  Delete
Week 4: Queues 	Sep 16, 2018	 Edit  Post a note  Delete
Week 3: Lists 	Sep 9, 2018	 Edit  Post a note  Delete
Week 2: Dream Garage 	Sep 2, 2018	 Edit  Post a note  Delete

The student experience

Step 2: PDF Handout

One repo per week, also used for “labs” and “side projects”.

Same clone link.

The student experience

Step 2: PDF Handout

One repo per week, also used for “labs” and “side projects”.

Same clone link.

Comp215:

Project 5: Trees and Treaps

Dan S. Wallach and Zoran Budimlić
dwallach@cs.rice.edu and zoran@rice.edu

Fall 2018

1 Deadline

Unit tests and subtree implementation: Thursday, September 20, 2018, 11:59pm. **No extensions.**
Project implementation: Sunday, September 23, 2018, 11:59pm. **No extensions.**
You’re writing a whole lot more code this week than in previous weeks. Start early.

2 Preliminaries

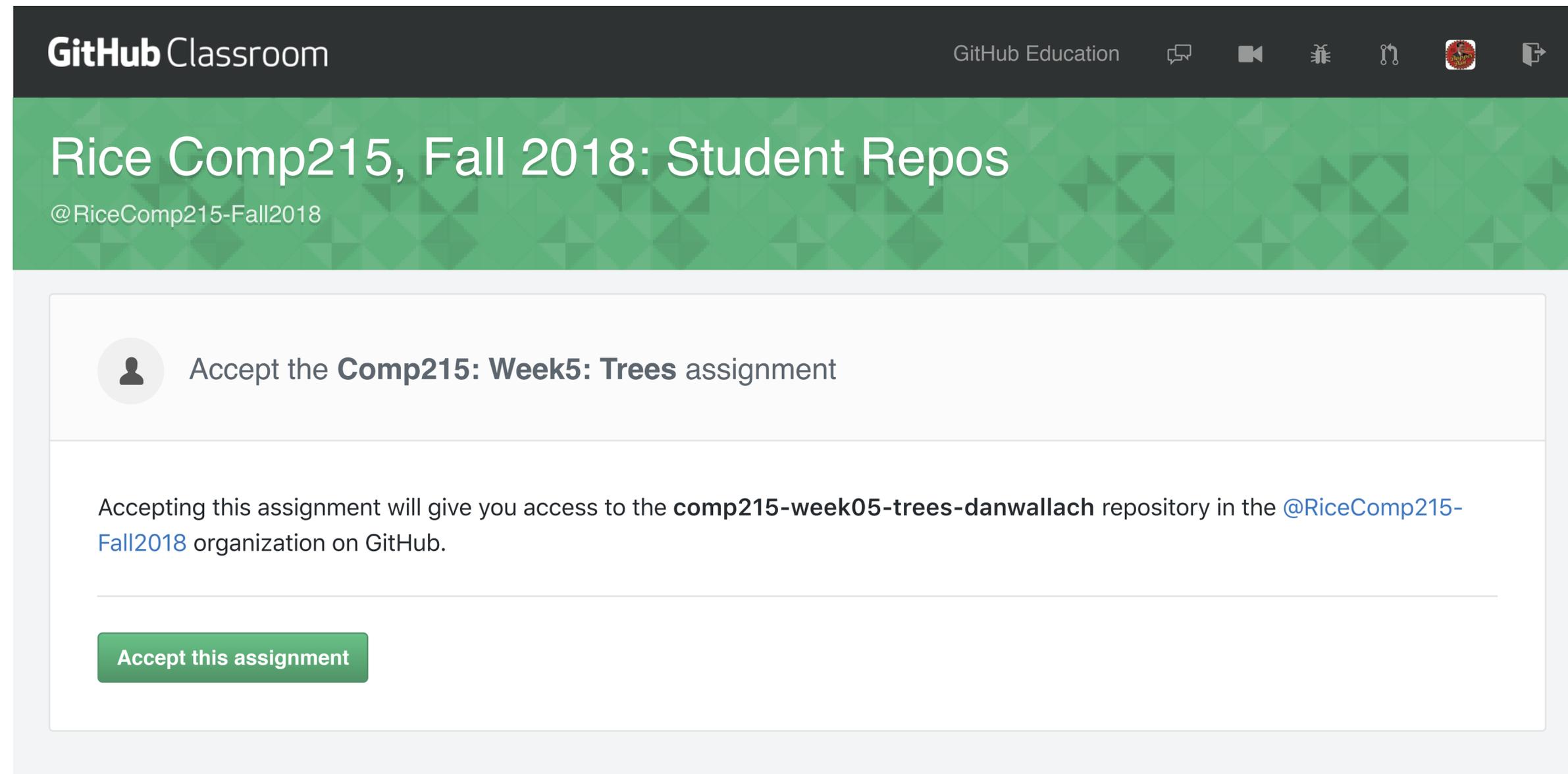
We’re giving you a whole new package of classes this week that implement trees, queues (your assignment from last week now completed), and more. You’ll find it in your GitHub repository for this week. You’ll also be using this same base code for your lab.

<https://classroom.github.com/a/XXXXXXXX>

Before you start writing any code, make sure that the unit tests for the old stuff (`ListTest`, `LazyListTest`, `ListQueueTest`) are all passing. There are many additional tests that will all fail if you run them. For this project, your goal will be to get all the Tree-relevant unit tests to pass without errors.

The student experience

Step 3: Accept assignment



The screenshot displays the GitHub Classroom interface. At the top, the 'GitHub Classroom' logo is on the left, and 'GitHub Education' with several utility icons (chat, video, calendar, etc.) is on the right. Below this is a green header bar with the text 'Rice Comp215, Fall 2018: Student Repos' and the organization handle '@RiceComp215-Fall2018'. The main content area is a white box with a light gray border. It features a user icon on the left and the text 'Accept the **Comp215: Week5: Trees** assignment'. Below this, a paragraph explains: 'Accepting this assignment will give you access to the `comp215-week05-trees-danwallach` repository in the [@RiceComp215-Fall2018](#) organization on GitHub.' At the bottom of this box is a green button with the text 'Accept this assignment'.

The student experience

Step 4: Start working!

🔒 [RiceComp215-Fall2018](#) / [comp215-week05-trees-danwallach](#) Private

comp215-week05-trees-danwallach created by GitHub Classroom

Edit

[Manage topics](#)

🕒 2 commits

🌿 1 branch

📦 0 releases

👤 1 contributor

Branch: master ▾

New pull request

Create new file

Upload files

Find file

Clone or download ▾



danwallach added IntelliJ settings

Latest commit 66d172a on Sep 17, 2018

📁 .idea	added IntelliJ settings	4 months ago
📁 buildSrc	initial commit	4 months ago
📁 config	initial commit	4 months ago
📁 gradle/wrapper	initial commit	4 months ago
📁 src	initial commit	4 months ago
📄 .gitignore	initial commit	4 months ago
📄 .travis.yml	initial commit	4 months ago
📄 README.md	initial commit	4 months ago
📄 build.gradle	initial commit	4 months ago
📄 comp215-code.iml	added IntelliJ settings	4 months ago
📄 gradlew	initial commit	4 months ago
📄 gradlew.bat	initial commit	4 months ago
📄 settings.gradle	initial commit	4 months ago

The student experience

Step 4: Start working!

Pre-configured IntelliJ settings

RiceComp215-Fall2018 / [comp215-week05-trees-danwallach](#) Private

comp215-week05-trees-danwallach created by GitHub Classroom

Edit

[Manage topics](#)

2 commits

1 branch

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buildSrc

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4 months ago

config

initial commit

4 months ago

gradle/wrapper

initial commit

4 months ago

src

initial commit

4 months ago

.gitignore

initial commit

4 months ago

.travis.yml

initial commit

4 months ago

README.md

initial commit

4 months ago

build.gradle

initial commit

4 months ago

comp215-code.iml

added IntelliJ settings

4 months ago

gradlew

initial commit

4 months ago

gradlew.bat

initial commit

4 months ago

settings.gradle

initial commit

4 months ago

The student experience

Step 4: Start working!



Autograder (Geoff Challen, UIUC)

Travis-CI configuration



Travis CI

RiceComp215-Fall2018 / comp215-week05-trees-danwallach Private

comp215-week05-trees-danwallach created by GitHub Classroom Edit

[Manage topics](#)

2 commits

1 branch

0 releases

1 contributor

Branch: master ▾

[New pull request](#)

[Create new file](#)

[Upload files](#)

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README.md	initial commit	4 months ago
build.gradle	initial commit	4 months ago
comp215-code.iml	added IntelliJ settings	4 months ago
gradlew	initial commit	4 months ago
gradlew.bat	initial commit	4 months ago
settings.gradle	initial commit	4 months ago

The student experience

Step 4: Start working!

Pre-populated hyperlinks to this week's code files

Students edit the README.md

Week 5: Trees, Treaps, Binary Heaps

This week's project is in:

- [src/main/java/edu/rice/tree/Treap.java](#)
- [src/main/java/edu/rice/tree/Tree.java](#) (Thursday deadline)
- [src/test/java/edu/rice/tree/TreeSuite.java](#) (Thursday deadline)

This week's lab is in:

- [src/main/java/edu/rice/tree/IPriorityQueue.java](#)
- [src/main/java/edu/rice/list/IList.java](#)

This week's side project is in:

- [src/main/java/edu/rice/week5knapsack/Knapsack.java](#)

The project and lab specifications, as well as the course slide decks, can be found on the [Comp215 Piazza](#).

Student Information

Please edit *README.md* and replace your instructor's name and NetID with your own:

Student name: Dan WALLACH

Student NetID: dwallach

Your NetID is typically your initials and a numeric digit. That's what we need here.

If you contacted us in advance about the late policy and we approved a late submission, please cut-and-paste the text from that email here.

The student experience

Step 5: Work

The student

Step 5: Work

 committed on Oct 5, 2018			
fixed private tests so autograder knows about them  danwallach committed on Oct 5, 2018 			
Fixed makeArray by accounting for when a comma is at the beginning of... ...  committed on Oct 5, 2018 			
added private tests  danwallach committed on Oct 5, 2018 			
Commits on Oct 4, 2018			
Fixed some code so checkStyle passed  committed on Oct 4, 2018 			
Implemented makeKeyValue which will serve as a helper method for make... ...  committed on Oct 4, 2018 			
Implemented makeArray and all of my tests are currently working  committed on Oct 4, 2018 			
Started implementation of makeArray. My helper method makeValueList f... ...  committed on Oct 4, 2018 			
Wrote the method makeValue for the Parser. This method is currently t... ...  committed on Oct 4, 2018 			
Wrote the method makeBoolean for the Parser. The tests that I wrote f... ...  committed on Oct 4, 2018 			
Wrote the method makeNumber for the Parser. The tests that I wrote fo... ...  committed on Oct 4, 2018 			
Wrote the method makeString for the Parser. The tests that I wrote fo... ...  committed on Oct 4, 2018 			

The student

Step 5: Work

We encourage frequent commits
(and useful commit messages)

 committed on Oct 5, 2018		209186d	
fixed private tests so autograder knows about them  danwallach committed on Oct 5, 2018 ✖		7f87ab1	
Fixed makeArray by accounting for when a comma is at the beginning of... ...  committed on Oct 5, 2018 ✖		50c3e1d	
added private tests  danwallach committed on Oct 5, 2018 ✖		6c58c8d	
Commits on Oct 4, 2018			
Fixed some code so checkStyle passed  committed on Oct 4, 2018 ✖		183c356	
Implemented makeKeyValue which will serve as a helper method for make... ...  committed on Oct 4, 2018 ✖		6efe1f8	
Implemented makeArray and all of my tests are currently working  committed on Oct 4, 2018 ✖		5ef0f20	
Started implementation of makeArray. My helper method makeValueList f... ...  committed on Oct 4, 2018 ✖		05397e4	
Wrote the method makeValue for the Parser. This method is currently t... ...  committed on Oct 4, 2018 ✖		d7504b6	
Wrote the method makeBoolean for the Parser. The tests that I wrote f... ...  committed on Oct 4, 2018 ✖		e8733eb	
Wrote the method makeNumber for the Parser. The tests that I wrote fo... ...  committed on Oct 4, 2018 ✖		cde21bc	
Wrote the method makeString for the Parser. The tests that I wrote fo... ...  committed on Oct 4, 2018 ✖		f9ab532	

The student

Step 5: Work

Friday morning: added "private" unit tests for the students.

 committed on Oct 5, 2018 		
Completed implementation of jsonArray. Currently all tests pass ... 	 34a63a9	
 committed on Oct 5, 2018 		
Initial implementation for parseJsonValue. Some tests are still failing	 844aafa	
 committed on Oct 5, 2018 		
Merge remote-tracking branch 'origin/master'	 9033152	
 committed on Oct 5, 2018 		
Fixed makeObject. All tests are currently passing	 2a129fe	
 committed on Oct 5, 2018		
fixed dumb testing mistake	 3ded72f	
 danwallach committed on Oct 5, 2018 		
Merge remote-tracking branch 'origin/master'	 43cf5b5	
 committed on Oct 5, 2018 		
Initial implementation of makeObject. Some tests are currently still ... 	 2651bcd	
 committed on Oct 5, 2018		
fixed private tests so autograder knows about them	 7f87ab1	
 danwallach committed on Oct 5, 2018 		
Fixed makeArray by accounting for when a comma is at the beginning of... 	 50c3e1d	
 committed on Oct 5, 2018 		
added private tests	 6c58c8d	
 danwallach committed on Oct 5, 2018 		
Commits on Oct 4, 2018		
Fixed some code so checkStyle passed	 183c356	
 committed on Oct 4, 2018 		
Implemented makeKeyValue which will serve as a helper method for make		

The student

Step 5: Work

Oops.

Oops.

 committed on Oct 5, 2018 			
Completed implementation of jsonArray. Currently all tests pass ... 		34a63a9	
 committed on Oct 5, 2018 			
Initial implementation for parseJsonValue. Some tests are still failing		844aafa	
 committed on Oct 5, 2018 			
Merge remote-tracking branch 'origin/master'		9033152	
 committed on Oct 5, 2018 			
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 committed on Oct 5, 2018			
fixed dumb testing mistake		3ded72f	
 danwallach committed on Oct 5, 2018 			
Merge remote-tracking branch 'origin/master'		43cfcb5	
 committed on Oct 5, 2018 			
Initial implementation of makeObject. Some tests are currently still ... 		2651bcd	
 committed on Oct 5, 2018			
fixed private tests so autograder knows about them		7f87ab1	
 danwallach committed on Oct 5, 2018 			
Fixed makeArray by accounting for when a comma is at the beginning of... 		50c3e1d	
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Commits on Oct 4, 2018			
Fixed some code so checkStyle passed		183c356	
 committed on Oct 4, 2018 			
Implemented makeKeyValue which will serve as a helper method for make 			

The student

Step 5: Work

Student merged on their own.

 committed on Oct 5, 2018 			
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 committed on Oct 5, 2018 			
Initial implementation for parseJsonValue. Some tests are still failing		844aafa	
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The student

Step 5: Work

All tests passing!

Code Issues Pull requests Projects Wiki Insights Settings

Branch: master ▾

Commits on Oct 7, 2018

- Cleaned up code by adding some comments and making the code more read...
[Avatar] committed on Oct 7, 2018 ✓ [1abf4dc](#) [↔](#)

Commits on Oct 5, 2018

- Fixed implementation of makeArray because tests were failing using qu...
[Avatar] committed on Oct 5, 2018 ✓ [8e94e3c](#) [↔](#)
- Fixed implementation of parseJsonValue. All tests are now passing for...
[Avatar] committed on Oct 5, 2018 ✗ [a86128f](#) [↔](#)
- Completed implementation of parseJsonArray. Currently all tests pass ...
[Avatar] committed on Oct 5, 2018 ✗ [34a63a9](#) [↔](#)
- Initial implementation for parseJsonValue. Some tests are still failing
[Avatar] committed on Oct 5, 2018 ✗ [844aafa](#) [↔](#)
- Merge remote-tracking branch 'origin/master'
[Avatar] committed on Oct 5, 2018 ✗ [9033152](#) [↔](#)
- Fixed makeObject. All tests are currently passing
[Avatar] committed on Oct 5, 2018 [2a129fe](#) [↔](#)
- fixed dumb testing mistake
danwallach committed on Oct 5, 2018 ✗ [3ded72f](#) [↔](#)
- Merge remote-tracking branch 'origin/master'
[Avatar] committed on Oct 5, 2018 ✗ [43cfeb5](#) [↔](#)
- Initial implementation of makeObject. Some tests are currently still ...
[Avatar] committed on Oct 5, 2018 [2651bcd](#) [↔](#)

The student

Step 5: Work

All tests passing!

Code Issues Pull requests Projects Wiki Insights Settings

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[Avatar] committed on Oct 7, 2018 ✓
1abf4dc

Commits on Oct 5, 2018

- Fixed implementation of makeArray be...
[Avatar] committed on Oct 5, 2018 ✓
Travis CI - Branch — Build Passed
8e94e3c
- Fixed implementation of parseJsonValue. All tests are now passing for...
[Avatar] committed on Oct 5, 2018 ✗
a86128f
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[Avatar] committed on Oct 5, 2018
2651bcd

The student

Step 5: Work

Code Issues 0 Pull requests 0 Projects 0 Wiki Insights Settings

Branch: master ▾

```
539 > Task :grade
540
541 -----
542 JSON Parser Grade Summary
543 -----
544 checkstyleTest          -0.0      No checkstyle errors were reported
545 ParserTestPrivate       -0.0      No test failures in ParserTestPrivate
546 ParserTest              -0.0      No test failures in ParserTest
547 ValueTheories          -0.0      No test failures in ValueTheories
548 Test Coverage           -0.0      Coverage is 0.9761904762, reached expected(0.85)
549 -----
550 Total Points            7.0
551 -----
552 This week's autograder understands 7 project points. The rest are your
553 Thursday unit tests and Sunday code-style.
554 -----
555
556 BUILD SUCCESSFUL in 38s
557 12 actionable tasks: 12 executed
558
559
560 The command "./gradlew grade" exited with 0.
```

Merge remote-tracking branch 'origin/master'

 committed on Oct 5, 2018 ✖ [43cfeb5](#) <>

Initial implementation of makeObject. Some tests are currently still ... [...](#)

 committed on Oct 5, 2018 [2651bcd](#) <>

The student

Step 5: Work

Code Issues Pull requests Projects Wiki Insights Settings

Branch: master

```
539 > Task :grade
540
541 -----
542 JSON Parser Grade Summary
543 -----
544 checkstyleTest          -0.0      No checkstyle errors were reported
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546 ParserTest              -0.0      No test failures in ParserTest
547 ValueTheories          -0.0      No test failures in ValueTheories
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550 Total Points             7.0
551 -----
552 This week's autograder understands 7 project points. The rest are your
553 Thursday unit tests and Sunday code-style.
554 -----
555
556 BUILD SUCCESSFUL in 38s
557 12 actionable tasks: 12 executed
558
559
560 The command "./gradlew grade"
```

Merge remote-tracking branch 'origin/master' from origin
committed on Oct 5, 2018

Initial implementation of makeObject. Some tests are currently still ...
committed on Oct 5, 2018

43cfeb5

2651bcd

Graders start with this, then dig in (e.g., one student disabled a test!) Project grade + grader feedback to student go into our university Canvas LMS.

Instructor workflow

Master repo

One branch per assignment

Each week

```
% git clone (to a fresh directory)
```

```
% git checkout weekNN-2018
```

```
% rm -rf .git
```

```
% git init .
```

```
% git add . ; git commit
```

Create new repo on GitHub

Push code, make Classroom clone link

Overview	Yours	Active	Stale	All branches
Search results				
pp2-2018	Updated 2 months ago by danwallach			✓
pp3-2018	Updated 2 months ago by danwallach			✓
pp1-2018	Updated 2 months ago by danwallach			✗
week11-2018	Updated 3 months ago by danwallach			✗
week10-2018	Updated 3 months ago by danwallach			✗
week14-2018	Updated 3 months ago by danwallach			✗
week09-2018	Updated 3 months ago by danwallach			✗
week07-2018	Updated 4 months ago by danwallach			✗
week06-2018	Updated 4 months ago by danwallach			✗
week05-2018	Updated 4 months ago by danwallach			✗
week04-2018	Updated 4 months ago by danwallach			✗
NoWildcards-2018	Updated 4 months ago by danwallach			✗
week08-2018	Updated 4 months ago by danwallach			✗
week03-2018	Updated 4 months ago by danwallach			✗

Instructor workflow

Master repo

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```
% git checkout weekNN-2018
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Search results				
pp2-2018	Updated 2 months ago by danwallach			✓
pp3-2018	Updated 2 months ago by danwallach			✓
				✗
				✗
week10-2018	Updated 3 months ago by danwallach			✗
week14-2018	Updated 3 months ago by danwallach			✗
week09-2018	Updated 3 months ago by danwallach			✗
week07-2018	Updated 4 months ago by danwallach			✗
week06-2018	Updated 4 months ago by danwallach			✗
week05-2018	Updated 4 months ago by danwallach			✗
week04-2018	Updated 4 months ago by danwallach			✗
NoWildcards-2018	Updated 4 months ago by danwallach			✗
week08-2018	Updated 4 months ago by danwallach			✗
week03-2018	Updated 4 months ago by danwallach			✗

Student branches start in a "failing" state

Instructor workflow

Master repo

One branch per assignment

Each week

```
% git clone (to a fresh directory)
```

```
% git checkout weekNN-2018
```

```
% rm -rf .git
```

```
% git init .
```

```
% git add . ; git commit
```

Create new repo on GitHub

Push code, make Classroom clone link

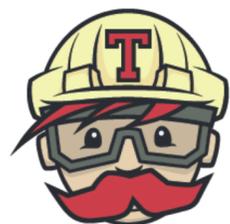
Overview	Yours	Active	Stale	All branches
Search results				
pp2-2018	Updated 2 months ago by danwallach			✓
pp3-2018	Updated 2 months ago by danwallach			✓
pp1-2018	Updated 2 months ago by danwallach			✗
week11-2018	Updated 3 months ago by danwallach			✗
week10-2018	Updated 3 months ago by danwallach			✗
week14-2018	Updated 3 months ago by danwallach			✗
week09-2018	Updated 3 months ago by danwallach			✗
				✗
				✗
				✗
week05-2018	Updated 4 months ago by danwallach			✗
week04-2018	Updated 4 months ago by danwallach			✗
NoWildcards-2018	Updated 4 months ago by danwallach			✗
week08-2018	Updated 4 months ago by danwallach			✗
week03-2018	Updated 4 months ago by danwallach			✗

Students see a master branch, no history

Instructor workflow: leveraging Travis CI

Sunday afternoon view of the Travis dashboard

Travis provides a real-time view of how students are doing.



Travis CI



Rice Comp215: Fall 2018 (Student Repositories)

RiceComp215-Fall2018

✗	comp215-week01-intro-	# 8	🔗 master	🔗 3f3ce9f	📅 Failed 3 minutes ago
✗	comp215-week01-intro-	# 4	🔗 master	🔗 a6ba40c	📅 Failed 17 minutes ago
✗	comp215-week01-intro-	# 5	🔗 master	🔗 c08e80c	📅 Failed 19 minutes ago
✓	comp215-week01-intro-	# 5	🔗 master	🔗 d1cde37	📅 Passed 21 minutes ago
✗	comp215-week01-intro-	# 4	🔗 master	🔗 b2cf224	📅 Failed 32 minutes ago
✓	comp215-week01-intro-	# 7	🔗 master	🔗 f3bca93	📅 Passed 40 minutes ago
✗	comp215-week01-intro-	# 5	🔗 master	🔗 f734e45	📅 Failed about an hour ago
✓	comp215-week01-intro-	# 6	🔗 master	🔗 b21d632	📅 Passed about an hour ago
✓	comp215-week01-intro-	# 7	🔗 master	🔗 ec3e8ce	📅 Passed about an hour ago
✓	comp215-week01-intro-	# 6	🔗 master	🔗 39668f3	📅 Passed about 2 hours ago
✓	comp215-week01-intro-	# 4	🔗 master	🔗 00bebe3	📅 Passed about 2 hours ago

Instructor-facing tooling

Instructor-fac



Dan Wallach

danwallach

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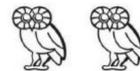
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Organizations



Overview **Repositories 20** Stars 4 Followers 16 Following 0

Find a repository...

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CalWatch

Android WearOS watch face app, displays your day's events on your wrist

Kotlin 12 6 GNU General Public License v3.0 Updated 5 days ago

github-graders

Randomly assign graders to your projects

Python 1 1 Updated on Aug 10, 2018

github-event-times

print all the the "push" times for commits to GitHub

Python 11 1 Updated on Nov 21, 2017

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simple tool to clone all repos in a project that share a common prefix

Python 16 5 Updated on Nov 20, 2017

travis-activate

Activates Travis-CI builds for all repos in a given GitHub project

[#travis-ci](#) [#travis-api](#) [#github-api](#)

Python 15 3 GNU General Public License v3.0 Updated on Sep 7, 2017

github.com/danwallach

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Fun, personal projects...



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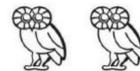
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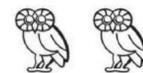
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Assign graders to students

Print "push" times for a repo

Clone every repo with a prefix

"Activate" Travis-CI on new repos

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github-graders

Scan all repos with a desired prefix

Takes a few minutes

(GitHub search API, which would speed this up, seems to have bugs...)

Assign students at random to graders

Prints Markdown with hyperlinks to student repos

Cut-and-paste into an “instructors only” post on Piazza

github-event-times

Reads “push” times from GitHub

Students can modify their computers' clocks, forge commit times

GitHub push times cannot be forged

Our Gradle build script, running on Travis-CI, also prints the day/time

- Graders are instructed to pay attention to this

Output is a $L^A T_E X$ table

Suitable for pasting into a report to the university's Honor Council

github-clone-all

Clones all repos sharing a given prefix

You get one directory per student repository

Friday “private” tests?

foreach repo: copy files, git add, git commit, git push

MOSS plagiarism detection?

foreach repo: copy relevant files to root of project

manually scan to see if any students made relevant sub-packages

run MOSS on all-repos/*.java

travis-activate

Uses Travis-CI REST APIs to “activate” repos

Runs hourly in a cron job on my Mac desktop

No longer necessary (Travis auto-activates if it sees *.travis.yml* file)

- But for one week last fall, *something* went wrong
- Handy to have this tool as a backup

Hacking notes

Python *requests* library: easy interaction with GitHub or Travis APIs

Example: I once forgot to make repos be private on an assignment

Students had already cloned and started their work for the week!

1: Start with *github-clone-all*

2: Get list of all repos with the assignment prefix

3: Figure out the API call to set the “private” flag

Total effort: 30 minutes in a panic, then problem fixed

Work in progress: a new autograder



Geoff Challen's autograder: github.com/cs125-illinois/gradlegrader

Write config scripts (auxiliary YAML file, read by a custom Gradle task)

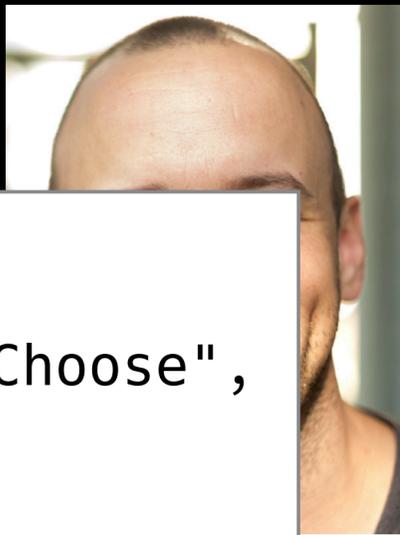
- Assign points to different unit tests
- Test, test, test
- Realize you forgot something
- Test, test, test
- Realize you forgot something ...

My goal: Java “grade annotations” directly on unit test methods

Specify which week(s) they belong to, leave them in the codebase

Extract autograder configuration from the annotations

Work in progress: a new autograder



Geoff Challen's autograder: github.com/cs12

Write config scripts (auxiliary YAML file, read in)

- Assign points to different unit tests
- Test, test, test
- Doing something
- JUnit5 tests that we already have
- Realize you forgot something ...

My goal: Java "grade annotations" directly

Specifications to, leave

Extract autograder configuration from the a

```
@GradeProject(  
    name = "TP3",  
    description = "Factorial and Choose",  
    warningPoints = 1.0,  
    coveragePoints = 1.0,  
    coverageRatio = 0.9,  
    coverageMethod = "INSTRUCTIONS")
```

```
public class TestProject3 {  
    @Test  
    @Grade(project = "TP3", points = 4.0)  
    public void testFactorial() {  
        assertEquals(1, factorial(0));  
        assertEquals(1, factorial(1));  
        assertEquals(6, factorial(3));  
    }
```

```
    @Test  
    @Grade(project = "TP3", points = 4.0)  
    public void testChoose() {  
        assertEquals(15, choose(6, 2));  
    }  
}
```

Contact me if you're interested in helping!

Miscellaneous best practices

Travis-CI only gives us one concurrent build for free

Warn your students that Travis bogs down near deadlines!

- They're "experimenting" with giving us higher concurrency on their cloud service
- Travis-CI Enterprise (run on your own hardware) is available to education for free

Create a separate GitHub "organization" every semester

Tools & searches run faster with fewer repos in an organization

Make every course staffer be an "owner" of the organization

- Full read/write access to every private student repo

Create a separate "staff" organization where your master code lives

Easier to control who has access: no students, etc.

Stuff happens

One student changed GitHub IDs half-way through the semester

Be flexible with your scripts

Not every student did every assignment

Cleanup phase after the graders are done

Not every student edited their name into the README.md

Survey at start of semester: name, Rice NetID, GitHub ID, etc.

Acknowledgements

Zoran Budimlić: my co-instructor for Comp215

Omar Shaikh (SF State): early user of GitHub Classroom / Travis CI

Everything I did started from his tutorials

Vanessa Gennarelli: GitHub Classroom evangelist / consigliere

If I needed anything, she helped make it happen!

Anna Nagy (Travis CI): profiled our student load on Travis servers

Travis CI is working to improve our experience

Geoff Challen (UIUC): Gradle-based Java autograder

These slides are online: www.cs.rice.edu/~dwallach/sigcse2019.pdf