Continuous Integration

Design and Development, Software Engineering

Admin

- Assignment from last slide set and new one for now,
  - Read chapter 1 in pragmatic programmer
  - Listen to Soft skills Engineering podcast (linked on the class web site) episode 442
  - https://softskills.audio/2025/01/06/episode-442-improving-communication-skills-and-how-to-break-my-job-hopping-habit/
  - Get that Generative account
    - Several possiblities
    - Pick the free account for this class.

Continuous Integration

- What do we mean by continuous integration?

Continuous Integration

- What do we mean by continuous integration?
  - Every time we commit code to version control, the entire project is built and tested.
  - Compare to previous approaches
    - Group might work on its piece of the project, maybe a library, and build and test it in isolation except for occasional “gold master” style builds
  - Now, since automated tests run for every commit/push/pull request,
    - you are either fairly confident that the new changes don’t break the existing project
    - Of find out about the breaks right away.

Experiences

- Has anyone worked with Continuous Integration before?
  - What sorts?

Experiences

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  - What sorts?
    - Jenkins
    - TravisCI
    - CircleCI
    - Jetbrains TeamCity
    - CodeShip
    - Bamboo
    - etc

Continuous Integration

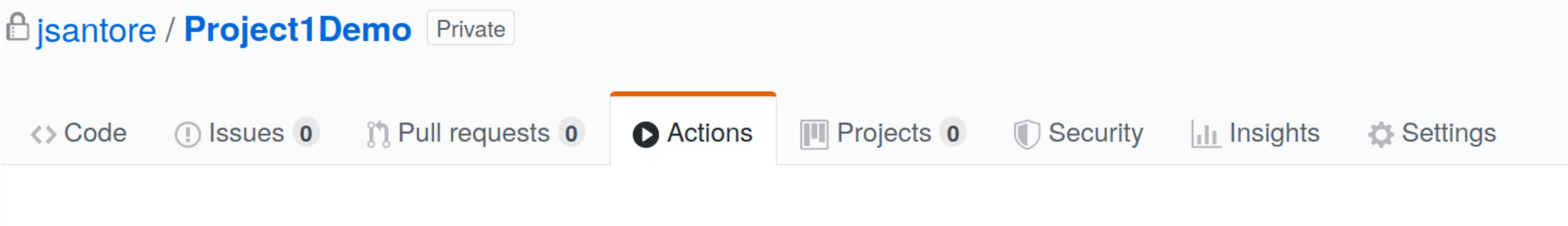
- Today the top two cloud based git servers provide CI services too
  - Gitlab has had CI for years
  - Github introduced github actions about a few years ago
    - And made them free for everyone after the Microsoft takeover.
    - We will use github for this class
      - Since the jetbrains integration with github is really good.
    -

Lets try it out

- I’ll use a python example here, but check out project1 sprint 1 assignment for tips on other languages
- Lets have a look at my example python “production code”
  - And add github actions to run flake8 on that code and automatically run the automated tests everytime you push to the branch.

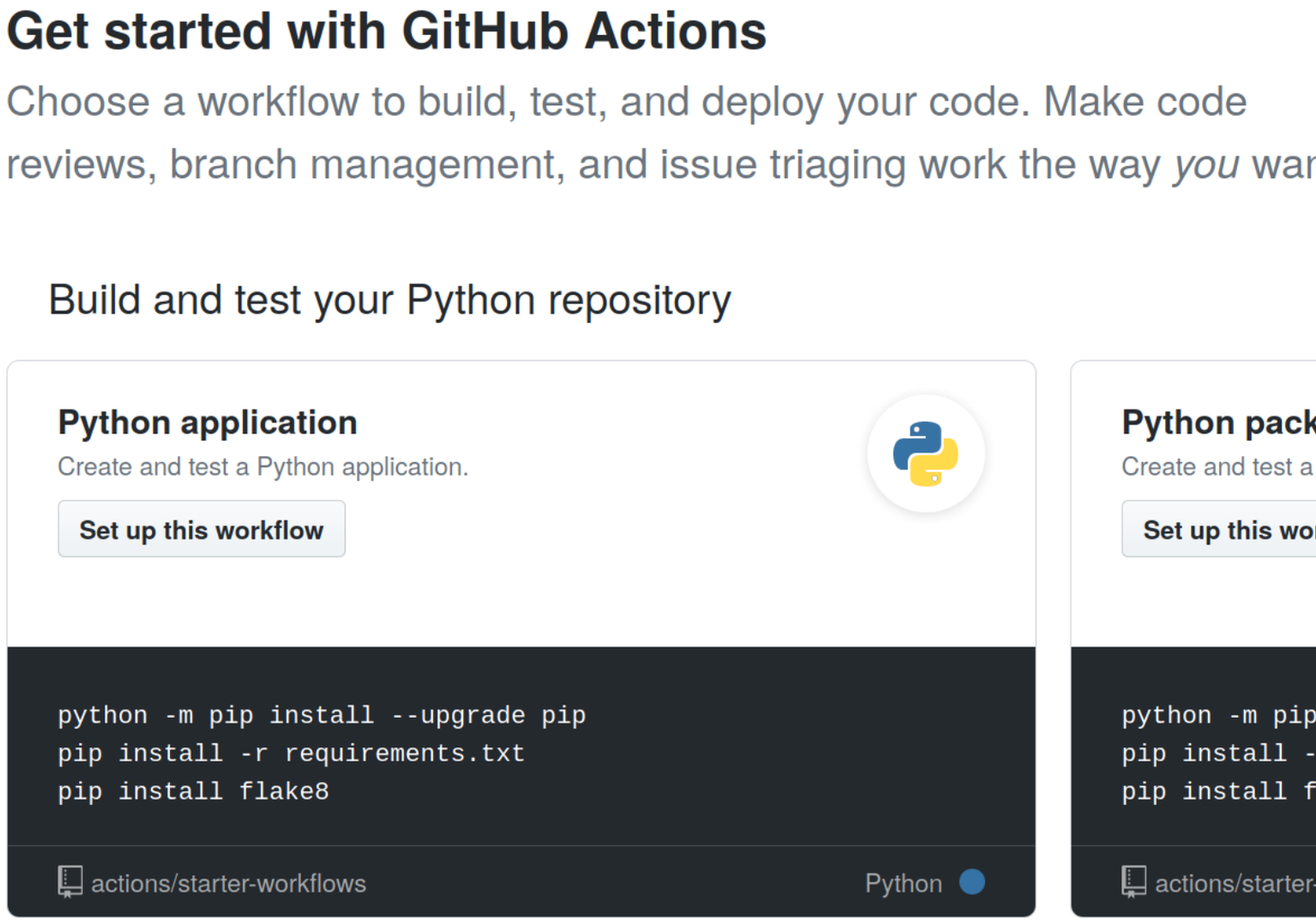
Adding Actions

- First Click the Actions Tab



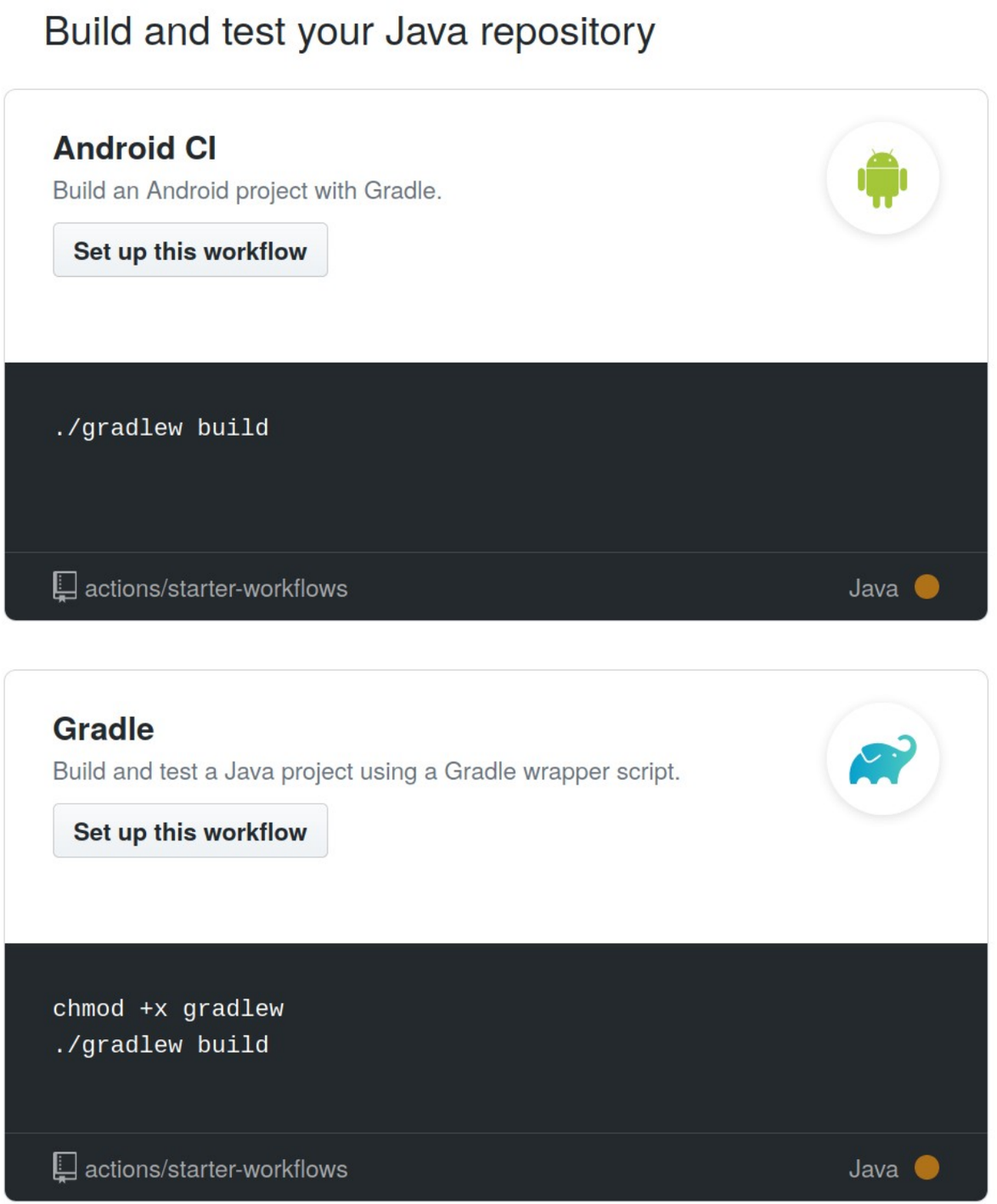
Python

- For python projects choose python application
-



Java

- If you are using java –
  I suggest starting with the gradle action
  - There are more options for java and I haven't explored them all



Python

- Once you have the default python action
  - Change flake8 to actually fail on format errors
  - And maybe change the way pytest is run to deal with tests in different folder than production code (python -m pytest)

```
    run: |
      pip install flake8
      # stop the build if there are Python syntax errors or undefined names
      flake8 . --count --select=E9,F63,F7,F82 --show-source --statistics
      # exit-zero treats all errors as warnings. The GitHub editor is 127 chars wide
      flake8 . --count --exit-zero --max-complexity=10 --max-line-length=127 --statistics
  - name: Test with pytest
    run: |
      pip install pytest
      pytest
```

JSON

- How Many of you have done work with APIs and JSON?

JSON

- How Many of you have done work with APIs and JSON?
- Depending on the answer we might be skipping some slides

Code Examples

- The code examples in the following slides are in java because python is too easy
  - import requests
  - requests.get(<your location here>)

Data on the Internet

- Once upon a time
  - Data on the web (http/https) was all web pages intended to be viewed by people.
    - If we wanted to have a program read the data – need to ‘scrape’ the page.
- Back in 2000, Roy Fielding proposes REST framework (Ph.D thesis)
  - REpresentational State Transfer
  - Provide a way for web server to give data directly to program clients.
  - In last 5-10 years really used a lot

json

- json: JavaScript Object Notation
  - pronunciation note
  - json notation used by many RESTful interfaces to provide data
  - Says javascript but not really
  - Java vs javascript?
  - Java is to javascript as?

json

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  - pronunciation note
  - json notation used by many RESTful interfaces to provide data
  - Says javascript but not really
  - Java vs javascript?
  - Java is to javascript as?
    - Car is to Carpet
- Official json spec
  - http://www.json.org/

Sample json

From https://openlibrary.org/dev/docs/api/lists


```
{
  "links": {
    "self": "/people/george08/lists.json",
    "next": "/people/george08/lists.json?limit=5&offset=5"
  },
  "size": 12,
  "entries": [
    {
      "url": "/people/george08/lists/OL13L",
      "full_url": "/people/george08/lists/OL13L/Various_Seeds_for_Testing",
      "name": "Various Seeds for Testing",
      "last_update": "2010-12-21T00:46:17.712513",
      "seed_count": 13,
      "edition_count": 13181
    },
    {
      "url": "/people/george08/lists/OL97L",
      "full_url": "/people/george08/lists/OL97L/Time_Travel",
      "name": "Time Travel",
      "last_update": "2010-12-17T18:27:14.781336",
      "seed_count": 5,
      "edition_count": 838
    },
    ...
  ]}
```

From the web

- To get data from the web we use what protocol?

From the web

- To get data from the web we use what protocol?
  - http
  - Or https
- Java 11-17 (and of course java21) improved java's support for getting data from http sources quite a bit
- Added

```
java.net.http.HttpClient;
java.net.http.HttpRequest;
java.net.http.HttpResponse;
```

HttpClient

- The HttpClient class manages the connection from your program to the website
- Like so much of the java standard library
  - Uses factory functions.
  - Constructor is protected to keep you from directly using it.

```
var dataGrabber = HttpClient.newHttpClient();
```

  - Use send(<params here>) function on dataGrabber to actually get data
  - But we need more before we have the right params

HttpRequest

- The HttpRequest object packages up everything we need to do to make a request of a website
  - Allows for significant customization for advanced applications
  - But perfectly usable for early learners like us as well.
  - Lots of tutorials do this in one step – lets learn it in two.

```
var requestBuilder = HttpRequest.newBuilder();
var dataRequest = requestBuilder.uri(

URI.create("http://universities.hipolabs.com/search?name=Young")).build();
```

  - Once again use a factory to build the object.
  - Then we add the web location and call build.

Making the request.

- Now we have everything ready to ask the server for data
  - But as soon as we touch the network what do we have to think about?

Making the request.

- Now we have everything ready to ask the server for data
  - But as soon as we touch the network what do we have to think about?
  - EXCEPTIONS!?!?!
    - It could be as simple as the wifi being off on your laptop
      - Or the server is down
      - Or the server was up, but network cable gets cut
      - Or more…….

Making the request.

- Now we have everything ready to ask the server for data

```
HttpResponse<String> response = null;
try {
    response = dataGrabber.send(dataRequest, HttpResponse.BodyHandlers.ofString());
}catch(IOException e){
    System.out.println("Error connecting to network or site");
}
catch (InterruptedException e){
    System.out.println("Connection to site broken");
}
```

  - Two types of exceptions possible
  - Hi-lighted text says treat the main bit of data returned as a string.

What if it went wrong

- If the connection failed
  - In a bigger program we might try to recover
  - For this simple example just fail and exit

```
if (response == null ){
    System.out.println("Something went terribly wrong, ending program");
    System.exit(-1);
}
```

And in python

- Lets take a super quick look at how we would get that university data in python.

Secrets

- In these slides we were using an API that doesn’t require an API key
- But today most require a key
  - Or oAuth
- And of course we put all that code up on github
  - So what could possibly go wrong?
-

Secrets

- In these slides we were using an API that doesn’t require an API key
- But today most require a key
  - Or oAuth
- And of course we put all that code up on github
  - So what could possibly go wrong?
- So yeah – we don’t want that API key out on the web where people can use it


REMEMBER WHEN YOU
HARD CODED CREDENTIALS
GIT REMEMBERS
imgflip.com

Secrets

- One common solution is to use a ‘Secrets’ file,
  - maybe api_secrets.py
  - That file is used locally, but not put up on github
  - Make sure to add it (api_secrets.py) to “gitignore” so that it doesn’t get added and pushed accidentally
    - Lets try something simple
    - https://serpapi.com/playground

Lets look at serpapi site – they give you code in many languages for getting their data. **BUT**, they embed the secrets into the code. You would never want to put those API keys into github that way.

- Lets use python to make it easy to start with.

Secrets.py

- Introduce api_secrets.py.
  - Or apiSecrets.go
  - Or apiSecrets.java
- Put it in gitignore
- submit it via slack for the first project!!

Let’s look at the project

- Let’s look at project 1 sprint 1
  - If we haven’t done so already

If we are one week from first day

- The rest of this is the review of pragmatic programmer

Pragmatic Programmer

- Lets talk about the first chapter of the pragmatic programmer
  - Agency: lots of you will be highly paid professionals in less than a year
    - You'll be in a position to do great things and responsible when things go terribly wrong (just ask Knight Capital)
    - Many of you have not had the chance to take this kind of responsibility
    - But now….

Impostor Syndrome

- There is a lot of discussion these days in the industry about “Impostor Syndrome”
  - What is it?

Impostor Syndrome

- There is a lot of discussion these days in the industry about “Impostor Syndrome”
  - What is it?
  - The notion that many developers have that they don’t know as much as people think they do
  - That they will soon be “found out”
- Opposite and just as bad as “know it alls”
- discuss

Good?

- What is the single best indicator of how good a student is likely to be in this course?

Good?

- What is the single best indicator of how good a student is likely to be in this course?
  - Practice.
    - How much time has the student devoted to the projects in previous classes?
    - Did the student do an internship?
    - Has the student worked on personal projects outside of class
      - Unless the student lets their personal projects get in the way of class projects in which case this becomes and counter indicator
    - Does the student need to work in a way that limits their practice time
  - All boils down to practice.

Practice

- Much of this practice time will be evened out by this time next year.
  - You will spend 100% of your work time on actually doing development.
  - So you will practice your craft more in the first year of work than in 4 years here
  - Prediction: Many ‘aha moments’

Keeping up to date

- Keep Learning
  - My mechanic example
  - ‘Lifetime Learning’ – so important today required by both ABET and New England Commission of Higher Education
  - What did you think of Andy and Dave’s take on lifetime learning?

Keeping up to date

- Keep Learning
  - My mechanic example
  - ‘Lifetime Learning’ – so important today required by both ABET and New England Commission of Higher Education
  - What did you think of Andy and Dave’s take on lifetime learning?
    - A deep technical book a month?
      - Might be a bit ambitious
    - Deep technical books at all?
      - I think so, I’ve done video courses and they are more like web tutorials – great but not as in depth.
    - “Long form” vs “short form”

Pragmatic Programmer

- Language Learning
  - Lets talk about language learning
  - One common criticism of academic programs
    - They teach one language
    - And use it for all classes
      - students come out with blinders on
  - But it is important to learn a couple of languages well
    - (jsantore's opinion) Start with two
      - One compiled language (eg Java, C++, Rust, Go, Kotlin, Swift)
      - One interpreted language (eg Python, Javascript, ruby, php)
  - Then when you know a couple well, then try 'cool kid' languages (eg Erlang, Haskell Clojure etc)

Pragmatic Programmer

- Anything else on chapter 1?

Assignment: If not assigned already, do Assignment 1 sprint 1