Maxwell Lam Assignment 3

Github Username: Maxwell-Lam
Github Repo Link: **https://github.com/Maxwell-Lam/BMICalculator**

Objective:
Develop testing and deployment plans that enable continuous deployment of an existing software system that is extended for web access. Create automated acceptance tests (end-to-edn testing) and integration (regression) tests.

Discuss your deployment Pipeline:

Steps for pushing to production environment:

1. Source Control:
    a. The source control is where the source code will be stored and access through the project. The code for this project can be accessed throught Github: https://github.com/Maxwell-Lam/BMICalculator
    b. The source code uploaded is composed of Python/Flask and HTML programming languages.
    c. Github provides the benefits of version control to the developers, allowing developers to push previous or current versions of their code onto a digital safe space to store, execute or test their code. I personally use GitBash for the project's access, but they are multiple ways to accomplish this, depending on the developer(s).
    d. Some challenge one could encounter is understanding how the push/pull system works as a begineer in Git and how Git works as a whole with environment variables, SSH keys, etc.

2. Continuous Integration (CI)
    a. Continuous Integration is the automated building and testing of your application on every new commit, according to https://circleci.com
    b. The tool I used for this project will the online services of circleci, with the integrations of Github.
    c. Some benefits of integrating CI into your project is
        i. Improved team productivity and efficiency
        ii. Saves time on automated tasks.
        iii. Higher quality and more stable products.
    d. Some challenges one will face is:
        i. Understanding how to connect CI to your source control (Github)
            1. SSH public/private keys
            2. yaml configuration file. (orbs, workspaces, jobs, etc)

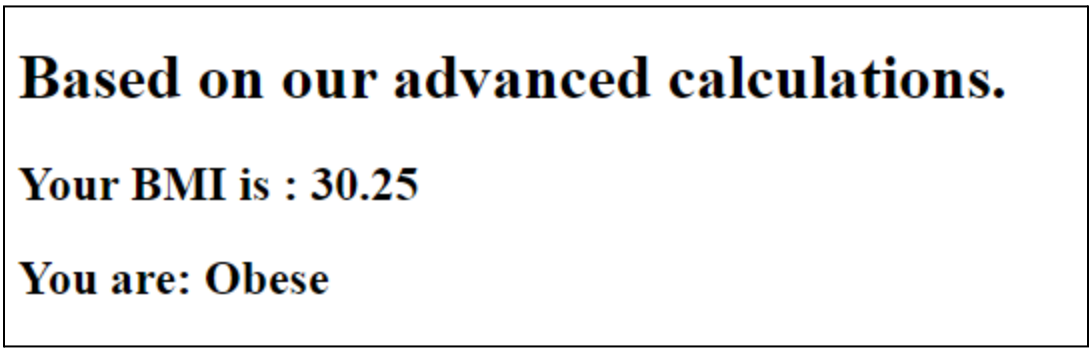
3. Static Analysis
    a. Static Analysis is “the method of a computer program debugging that is doen by examining the code without executing the program” according to Alexander S. Gillis.
    b. I didn’t apply any dedicated Static Analysis tools for this project (another than the natural debugging environment of Python) and only be discussing it as if I were to implement it.
    c. The defining benefits of static analysis is to detect programming errors, violations or basic vulnerabilities within your code without the need of the program’s execution. It can be used to increase the quality of your code and reduce human errors.
    d. Some drawbacks are that static analysis can not detect how a function will execute. False positives can be detected, and it does not tailor the rules of the developers but the rules of the programming language.
4. Automated Unit Tests
    a. The tool I used for automated testing is circleci.
    b. The defining benefits of automated unit testing is removes the need for manually test for your functions/units. Automated testing saves time and improves quality of your software.
    c. Some challenges one will face is:
        i. Understanding how to connect CI to your source control (Github)
            1. SSH public/private keys
            2. yaml configuration file. (orbs, workspaces, jobs, etc)
5. Automated end-to end tests (at least one per functionality):
    a. End to end testing is a way to make sure that applications behave as expected and that the flow of data is maintained for all kinds of user tasks and processes, according to circleci.com
    b. I didn’t apply any dedicated automated end to end testing tools for this project and only be discussing it as if I were to implement it.
    c. E2E testing allows developers to expand their test coverages by the addition of more tests cases if necessary.
    d. However, E2E can be time consuming and harder to the broadness of real-world scenarios.
6. Automated deploy to staging environment
    a. I didn’t apply any dedicated Automated deployment tools for this project and only be discussing it as if I were to implement it.
    b. Some benefits of automated deployment are improved reliability, increased efficiency, and faster release cycles.
    c. Reducing human involvement, allows the chance of introducing new security risks within an automated system.
7. Manual push to production.
    a. I manually push to production using Git Bash.
    b. There’s no large benefit nor challenges to manually pushing code. Its just a task that must be done if not automated.

8. Connect 3rd Party Code Coverage Tool.
    a. The tool I used for code coverage is coveralls.
    b. Coverage testing shows the developers a percentage of what isn't covered by tests or usage. Coveralls allows the users to see relevant coverage, covered and missedlines and the hits per line for each file.
    c. A drawback is the having full coverage testing does not mean you have quality code or quality tests.
    d. For Coveralls, I did have to connect my account to Github and created a private and public SSH key like circleci.

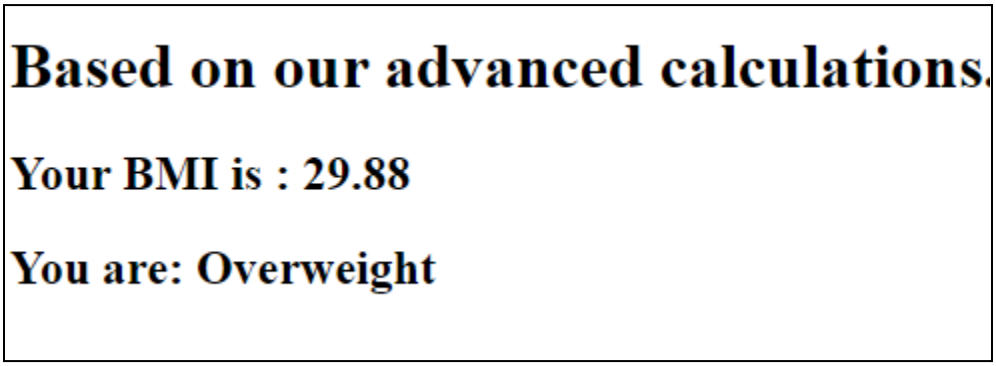
Test Cases for Manual Testing:

Here are 2 manual test cases to represent the average weight and height of men and women in the US.

1. Average BMI for men. (69 inches, 200 lbs)



2. Average BMI for women. (64, 170lbs)



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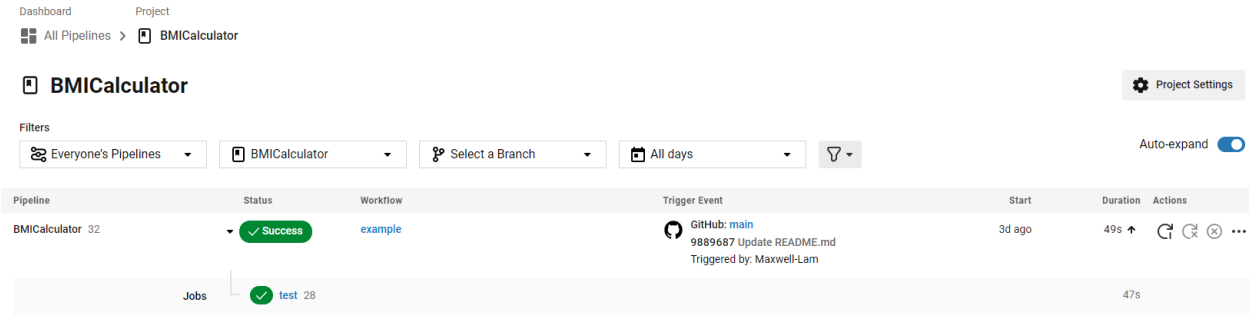
Discuss automated unit testing:

The automated unit testing tool used for this project was circleCi. circleCi will run the designated test cases after each commit to the source code. For circleCi to run, you will need to integrate a yaml configuration file within your github repository and give 3rd party access to the github. After automated testing is completed, you may view your test results on github or the pipelines applications on circleci.



Tool Descriptions:

1. Automated Unit Testing **AND** Continous Integration tool: circleCi.com
    a. See “Discuss automated unit testing” section above for description on this tool.
    b. I recommend this tool because:
        i. Pipelines allows you to see exactly where and what part of the testing or project configuration circleci software failed at.
        ii. You are allowed to have multiple pipelines with different users within an organizations, allowing different projects to have different test perspectives. \
    c. This tool is integrated with the overall pipeline process with a yaml configuration file. This file tells circle the testing production environment to be set up and how to run the tests. The tool can produce a digital test result file if needed as well.

2. Code Coverage Reporting Tool: Coveralls
    a. Coveralls is a service that tracks the code coverage of the project, allowing optimization of unit testing. For Coveralls to run, you will need to integrate a yaml configuration file within your github repository and give 3rd party access to the github (Very similar to circleCi.com). The yaml configuration file can be the same as the yaml configuration file as the circleCi file. Everytime the github receives a commit, Coveralls will run the coverage testing report and post the coverage percentage to the Coveralls application.
    b. I recommend this tool because:
        i. The dashboard of Coveralls is very comprehensive and detailed. The dashboard tells you everything you need for the coverage report.
    c. This tool is integrated with the overall pipeline process with a yaml configuration file just like the circleCi yaml configuration file. The tool can produce a digital test result file if needed as well.

3. Cloud Platform Usage / Backend Hosting: PythonAnywhere
    a. PythonAnywhere is easy to set up and use. The free version of PythonAnywhere is great for very simplistic python projects such as this project.
    b. While I didn't use this tool for my project: I recommend this tool because:
        i. PythonAnywhere is highly praised with a 4.6 Star rating on Capterra.com
        ii. Its quick and accessible anywhere.
    c. The tool would be integrated as the final production environment. Once all the testing reports are completed and satisfied, the source code will be operated on this cloud platform.

4. End to End Testing: Selenium
    a. Selenium is for automated wb applications for testing purposes. It can automate suites and tests, create scripts to aid in automation testing, and make it easier to run tests against a vast combination of cloud platform.
    b. While I didn't use this tool for my project: I recommend this tool because:
        i. Has a variety of testing types while providing a continuous integration environment for whatever project you have.
        ii. Supports most types of cloud platform testing.
        iii. Have different main tools for powerful focused testing groups.
    c. The tool would integrated before the source code is uploaded or updated onto the cloud platform. Selenium library will be accessed before the final push and report back the E2E results. Selenium is not responsible for the proper execution of a web application, but plays a cruicial role in validating web applications.

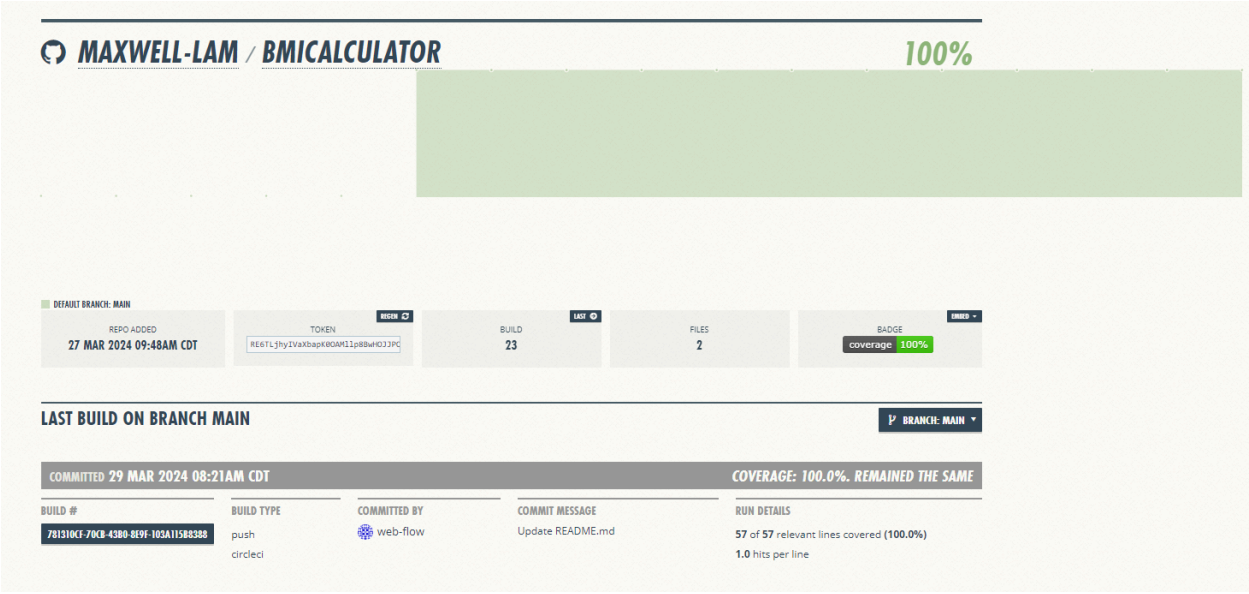
5. Static Analysis Testing: mypy
    a. Mypy is a Python static type checker and enforce good coding practices without the need for the execution of the python code. Mypy is a python library that would be imported like any other python library.
    b. While I didn't use this tool for my project: I recommend this tool because:
        i. Has easy command lines to get proper feedback to developers.
        ii. Supports gradual typing, allowing developers to adopt it incrementally.
    c. The tool would be integrated during code development. While the developer(s) are producing code, they can take the time to static analysize the code with mypy to produce higher quality code.

Cloud Patform Usage: PythonAnywhere

PythonAnywhere is easy to set up and use. The free version of PythonAnywhere is great for very simplistic python projects such as this project. While I didn't use PythonAnywhere for this project, some challenges that could show up are the limited resources PythonAnywhere provides. If you want more website processing power - for example - you will have to subscribe to a monthly subscription instead of using the free version of PythonAnywhere. Some benefits to PythonAnywhere is that is easy to use, great customer service and easy to access anywhere.

Code Coverage Report:

The code coverage report was created from Coveralls.io



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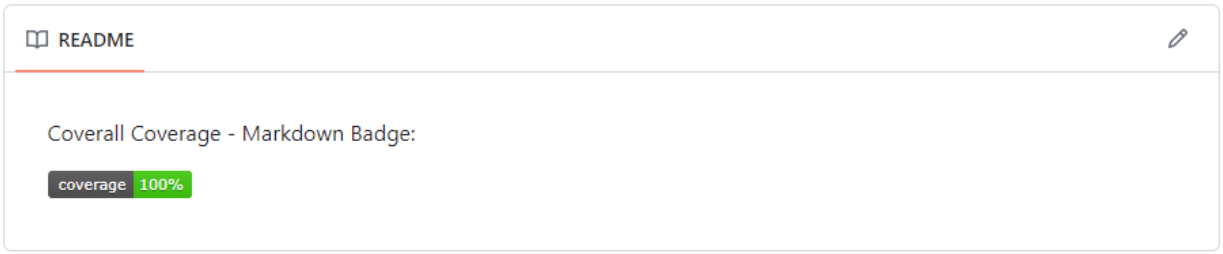
Github Badge Coveralls Coveage: (Located in README file)



Additional Resources: (Research Based)

"Using source control in your codespace" - https://docs.github.com/en/codespaces/developing-in-a-codespace/using-source-control-in-your-codespace

"What is continuous integration (CI)?" - https://circleci.com/continuous-integration/

"Static analysis (static code analysis)" - https://www.techtarget.com/whatis/definition/static-analysis-static-code-analysis

"The Mypy Blog" - https://mypy-lang.blogspot.com/2024/03/mypy-19-released.html

"A Guide to Popular Python Static Analysis Tools" - https://blog.codacy.com/python-static-analysis-tools

"Automated testing in CircleCi" - https://circleci.com/docs/test/

"What is end-to-end testing?" - https://circleci.com/blog/what-is-end-to-end-testing/

"Depolyment automation: What is it and how to start" - https://www.atlassian.com/devops/frameworks/deployment-automation#:~:text=Automated%20deployment%20standardizes%20and%20streamlines,releases%20may%20require%20manual%20approval

"The Pros and Cons of Autodeploy from a deveps perspective" - https://www.split.io/blog/pros-cons-of-auto-deploy-from-devops-perspective/#:~:text=Automation%2C%20despite%20reducing%20human%20error,access%20or%20disrupt%20your%20operations

"Coveralls - Continuous Integration" - https://coveralls.io/continuous-integration#:~:text=Coveralls%20takes%20the%20build%20data,isn%27t%20covered%20by%20tests

“Coveralls coverage report- How to forward coverage reports to Coveralls” - https://codefresh.io/docs/docs/example-catalog/ci-examples/coveralls-testing/#:~:text=Coveralls%20is%20a%20web%20service,effectiveness%20of%20their%20unit%20tests

“Python Web Frameworks: What are the pros and cons: PythonAnywhere vs. Heruoku?” - https://www.quora.com/Python-Web-Frameworks-What-are-the-pros-and-cons-PythonAnywhere-vs-Heroku

“What is Selenium?” - https://www.browserstack.com/selenium#:~:text=It%20enables%20automated%20testing%20of,as%20new%20code%20is%20introduced

“Reviews of PythonAnywhere” - https://www.capterra.com/p/234268/PythonAnywhere/reviews/

“Average Weight For Men: Healthy Ranges” - https://www.forbes.com/health/mens-health/average-weight-for-men/#:~:text=The%20average%20American%20man%20stands,waist%20circumference%20of%2040.5%20inches.

“What is the average weight for women?” - https://www.medicalnewstoday.com/articles/321003#:~:text=What%20is%20the%20average%20weight%20for%20women%3F&text=American%20women%20aged%2020%20years,for%20Disease%20Control%20and%20Prevention.

“Average Height for Women: What’s Tall?” - https://www.verywellhealth.com/average-height-for-women-8420952

Additional Resources: (Software Based)

circleCi.com - https://circleci.com/

Coveralls - https://coveralls.io/

PythonAnywhere - https://www.pythonanywhere.com/

Selenium - https://www.selenium.dev/

Python - https://www.python.org/