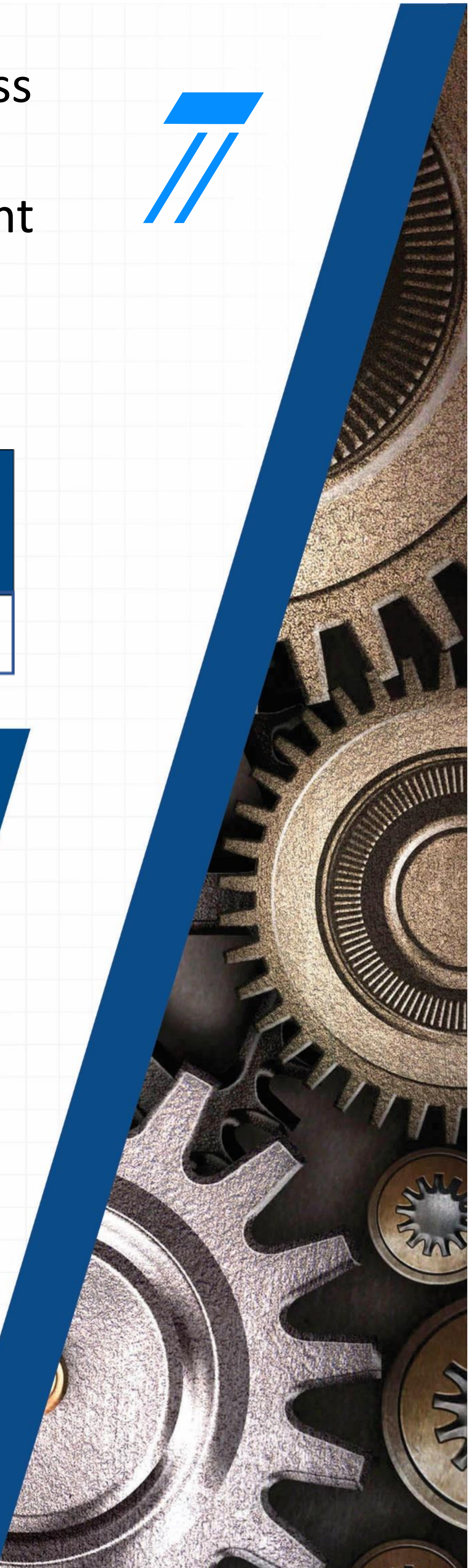
Learning Report – Keyless Car Entry using Face Recognition and Fingerprint Sensor

GLOBAL ENGINEERING ACADEMY

GENSIS



L&T Technology Services

Document History

Ver. Rel. No.	Release Date	Prepared. By	Reviewed By	Approved By	Remarks/Revision Details

Activity and Tasks

Activity 1– **System/Software Development**

- Sub Tasks
- Complete and Evolve

Activity 2 **– Agile Aspects**

- Themes
- Epics
- User Stories

Activity 3- **Software Development/CI**

- Requirements
- UML Diagram
- Test Plans
- GIT Aspects

Activity 1
System/Software Development

Contents

1.REQUIREMENTS

1.1 Research

Aging

Earlier

The first working steam-powered vehicle was designed — and quite possibly built by Ferdinand Verbiest, a Flemish member of a Jesuit mission in China around 1672

Cars became widely available in the early 20th century. One of the first cars accessible to the masses was the 1908 model T an American car manufactured by Ford.

In 1940, the first four-wheel drive, all-purpose vehicle is designed for the U.S. Military. It becomes known as the Jeep.

In 1974, the air bag system became a new car safety option.

In late 2000's, many vehicle manufacturers begin to abandon once popular gas-guzzling SUVs for more efficient vehicles due to environmental concerns and the recession.

Present Scenario

Over the years the cars have evolved very much with many added features starting from radio system to the GPS to the keyless car entry.

Cars are equipped with controls used for driving, passenger comfort and safety, normally operated by a combination of the use of feet and hands, and occasionally by voice on 21st century cars.

In the current scenario, there are provisions for keyless car entry using Fingerprint sensors or Face recognition system.

Gradation in cost

The cost of the car is very variant depending on the model, features and other parameters. The price can vary from 1 lakh to many crores.

1.2 My product

- In my product, I am going to make the car completely keyless by using both Face recognition and Fingerprint Sensing applications.
- The Fingerprint Sensors will be used to open the doors of the car whereas the Face recognition can be used to start the car.
- This would lead to more reliability, assurance and protection against theft.
- A highly secured mobile app would be built to collect the data (the ones who can access the car) for both the Fingerprints and Face Recognition system.
- This phone data will be linked to the car.

1.3 SWOT Analysis

Strength	Weakness	Opportunities	Threats
1.Theft security.	1. Sometimes, the proposed system is not much accurate which can lead to inconvenience.	1. Mobile enabled car finding feature can be added to find your car in the parking or some crowded place within some range.	
2. Cost efficient method.			
3. Automatic Locking is done in absence of the key.			

Table 1: SWOT ANANLYSIS

1.4 Requirements

ID	Description
HL_01	Engine: Heart and soul of the vehicle.
HL_02	Radiator: Keeps the engine cool by using coolant by removing heat.
HL_03	Fingerprint Sensors: Used to sense the fingerprint which will help to open the car.
HL_04	Smartphone containing the app: App is used to maintain the database and to enable the functions.
HL_05	Camera: Used for face recognition which helps to start the car.
HL_06	Brakes: Brakes are one of the most important safety systems on your vehicle
HL_07	Front Steering and Suspension: Helps in handling of the vehicle.
HL_08	Transmission (Gear Box): They are used to maintain the required torque which is provided to the wheels.
HL_09	Wheels: They are used to give the car the stability

	required and used for moving the car.
HL_10	Fuel tank: It is the storage tank where we store the fuel.
LL_11	Shock Absorber: They are used to dampen the oscillation to have a smooth drive.
LL_12	Alternator: Used to provide the power to the electrical components alongside with the batteries.
HL_13	Battery: The battery stores energy in chemical form so it can be released as electricity to run your vehicle's electrical components.
LL_14	Catalytic Converter: It is used to remove pollutants and make exhaust gasses less harmful to the environment.
HL_15	AC compressor: The AC Compressor is responsible for pumping coolant throughout your system and starting the process of cooling your car.

2. DESIGN

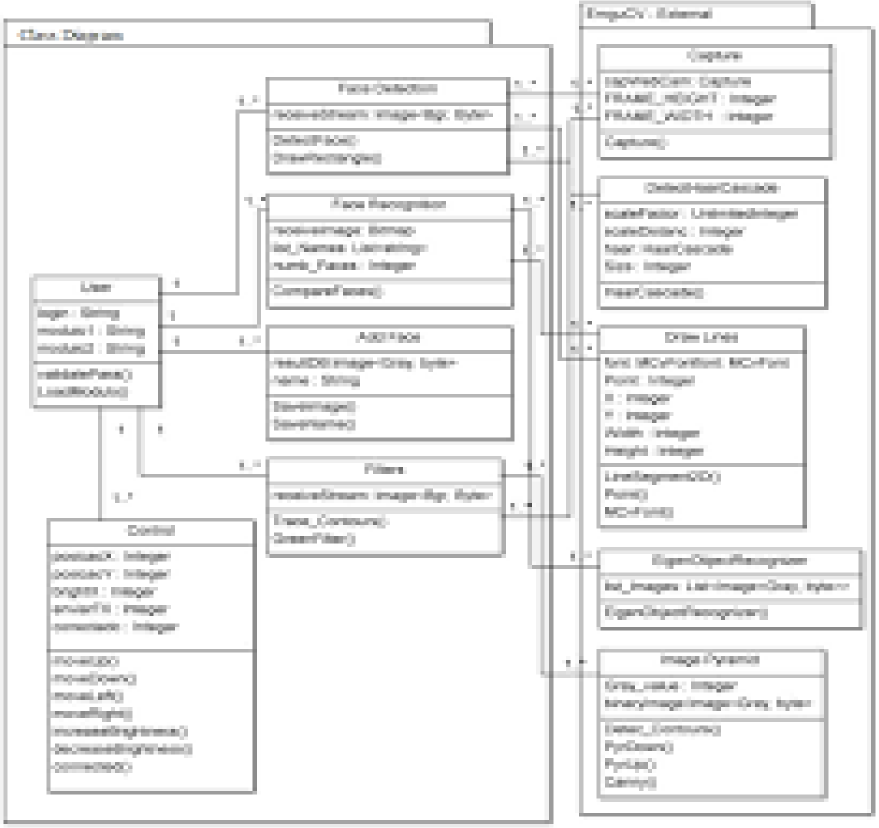


Figure1: Class Diagram(High Level)

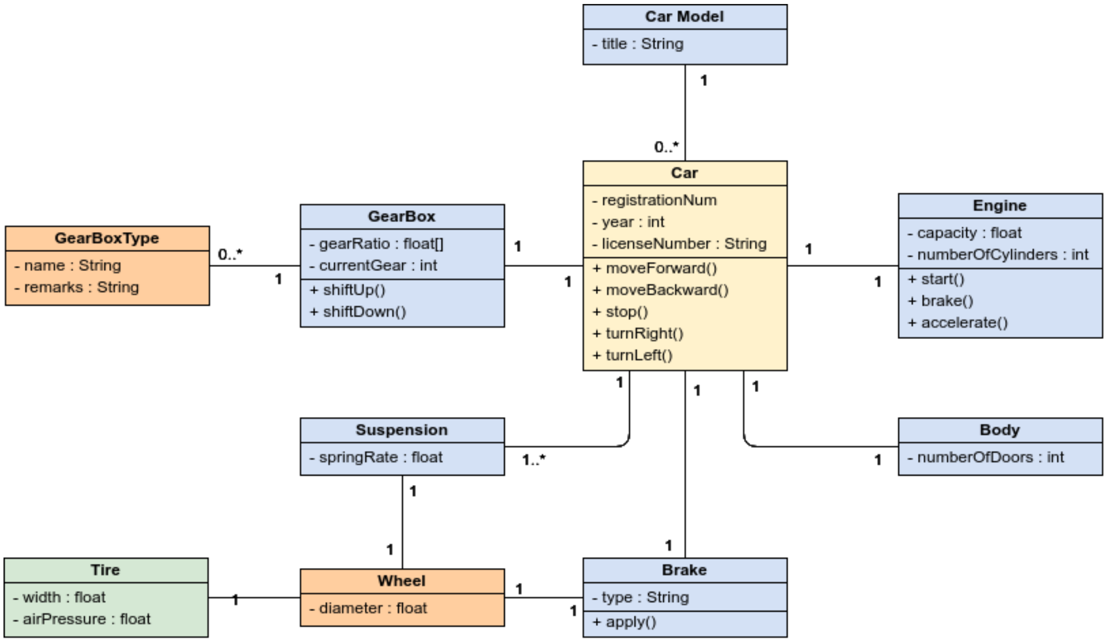


Figure 2: Class Diagram(Low level)

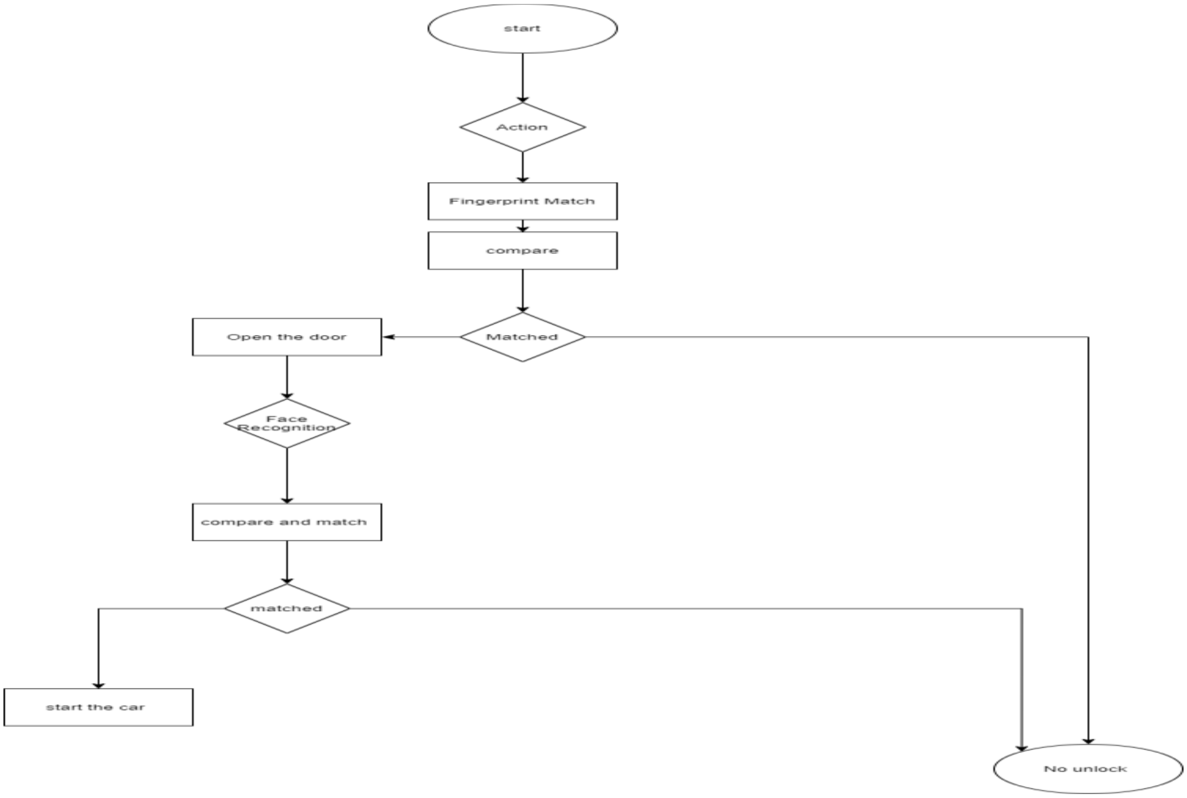


Figure 3: Activity Diagram (High level)

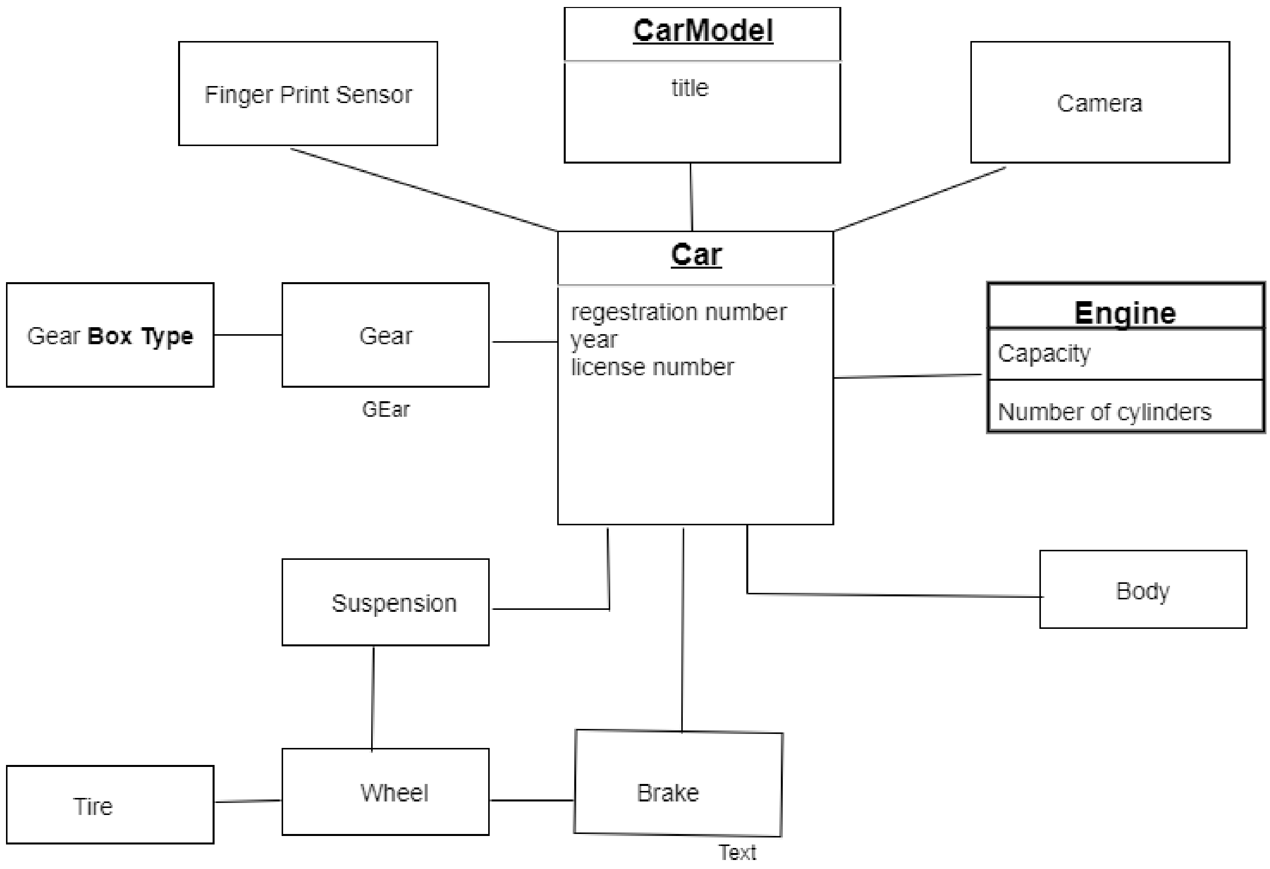


Figure 4 Activity diagram

3. TEST PLAN

3.1 Low Level Test Plan

ID	Description	Pre-condition	Expected I/P	Expected O/P	Actual O/P
HL_01	Engine	Engine is present in the car	The engine supplies proper power.	The engine starts.	
HL_06	Brakes	Brakes are present.	The brakes are applied at the right time.	The brakes are working properly.	
HL_02	Radiator	The radiator is present in the car	The coolant is working properly.	The radiator works properly and removes the heat	

LL_11	Shock Absorber	Shock Absorbers are attached to the wheels	The dampening action is happening at the correct time.	The shock absorber dampens the oscillation.	
HL_13	Battery	The batteries are connected in the car	The battery supplies proper power to the electrical component	The battery is working well and providing the current and required power.	
LL_12	Alternator	The alternator is connected properly.	The alternator is converting the DC to AC	We are getting the required AC power.	
HL_09	Wheels	There are 4 wheels attached to the car	The wheels are maintaining the stability.	The wheels are connected are working properly	
HL_10	Fuel tank	There is a fuel tank present in the car	The fuel can be injected properly into it.	The fuel level is properly maintained.	

3.2 High Level Test Plan

ID	Description	Pre-condition	Expected I/P	Expected O/P	Actual O/P
HL_03_HL_04	Fingerprint Sensors: Correct fingerprint	App should be installed in your smartphone.	The fingerprint sensor senses the fingerprint and it matches with the specified fingerprints	Fingerprints are sensed properly and opens the door	
HL_03_HL_04	Fingerprint Sensors: Incorrect fingerprint.	App should be installed in your smartphone.	The fingerprint sensor senses the fingerprint and it matches with the	It matches with the database and doesn’t open the door.	

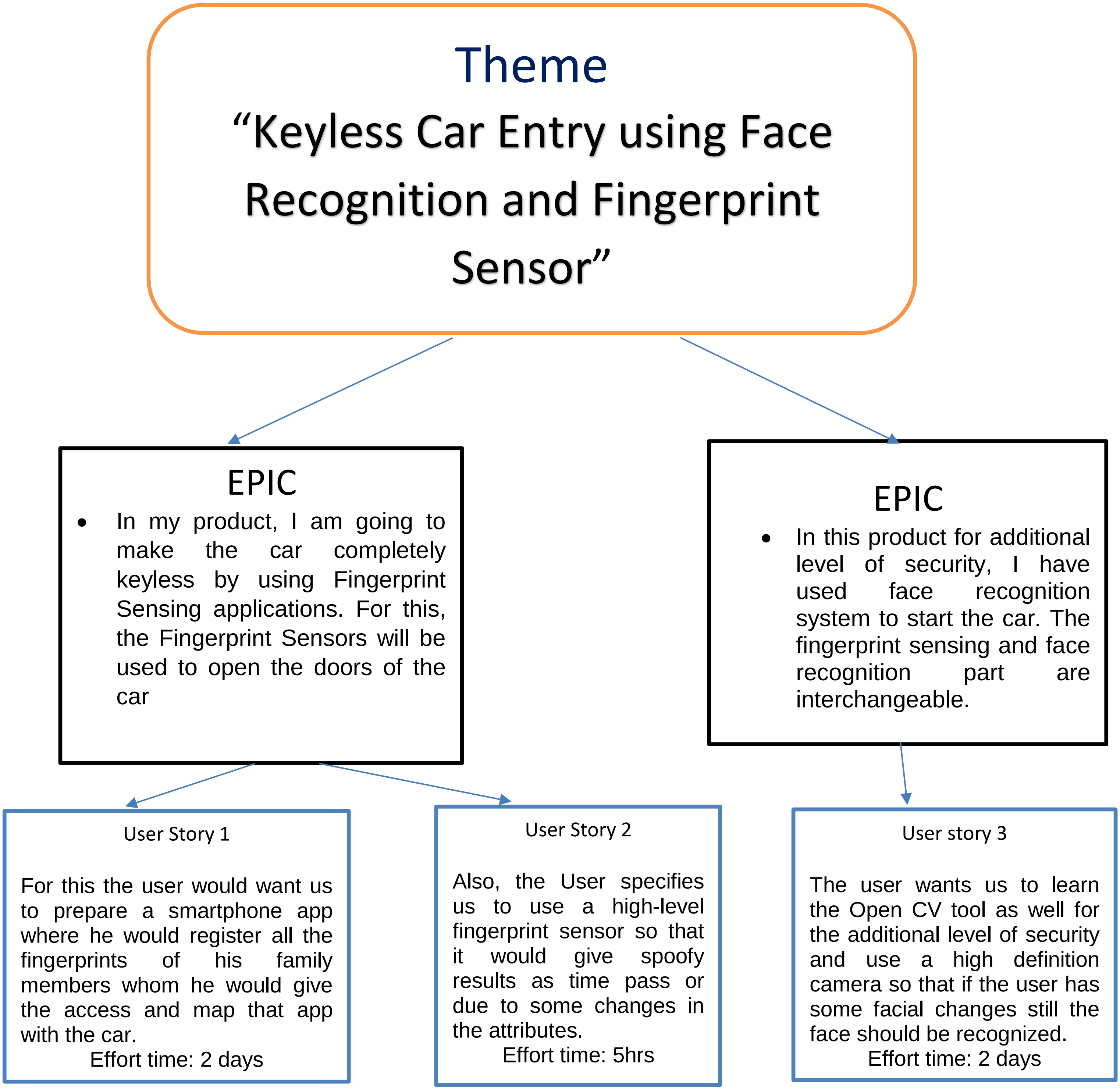
			specified fingerprints		
HL_13_LL_14	The battery and Catalytic converter is working well properly.	The battery and the catalytic converter are working properly individually.	The battery and Catalytic converter are supplying properly.	They are coordinating properly with each other.	
HL_03_HL_04_HL_05	Face recognition: Correct person	App should be installed in your smartphone and the camera is working	It matches the face with the database if it matches then car starts.	The car will start as it is the correct person.	
HL_08_HL_09	The wheels are well coordinated with the gear box.	The wheels and the gear box are working properly.		They are well coordinated and working properly together	

5.REFERENCES

1. https://www.titlemax.com/articles/a-timeline-of-car-history/
2. https://www.autozone.com/diy/trustworthy-advice/basic-parts-of-a-car-and-their-functions
3. https://www.drivparts.com/parts-matter/learning-center/by-the-numbers/car-parts-diagram.html
4. https://www.planinsurance.co.uk/blog/pros-cons-keyless-cars/
5. https://en.wikipedia.org/wiki/Car
6. https://www.electronicdesign.com/markets/automotive/article/21119162/fingerprint-recognition-for-the-car-use-cases-and-design-considerations
7. https://app.diagrams.net/

Activity 2
Agile Model

Contents:



Theme

"Keyless Car Entry using Face Recognition and Fingerprint Sensor"

EPIC

- In my product, I am going to make the car completely keyless by using Fingerprint Sensing applications. For this, the Fingerprint Sensors will be used to open the doors of the car

EPIC

- In this product for additional level of security, I have used face recognition system to start the car. The fingerprint sensing and face recognition part are interchangeable.

User Story 1

For this the user would want us to prepare a smartphone app where he would register all the fingerprints of his family members whom he would give the access and map that app with the car.

Effort time: 2 days

User Story 2

Also, the User specifies us to use a high-level fingerprint sensor so that it would give spoofy results as time pass or due to some changes in the attributes.

Effort time: 5hrs

User story 3

The user wants us to learn the Open CV tool as well for the additional level of security and use a high definition camera so that if the user has some facial changes still the face should be recognized.

Effort time: 2 days

References

1. https://www.atlassian.com/agile/project-management/epics-stories-themes
2. https://dzone.com/articles/themes-agile-software
3. https://www.agilemarketing.net/epic-vs-theme-2/#:~:text=A%20Theme%20is%20a%20group,that%20are%20all%20PR%20activities.
4. https://www.atlassian.com/agile/project-management/epics

Activity 3
Continuous Integration
Employee Database System

Content:

3.1 Description:

- Employee Database Management System is a database system developed to maintain all the details of the employees working in any organization.
- An EDS is a platform where all work-related as well as necessary personal details of all the working employee is stored and managed in a secure way.
- The EDS is maintained to overcome the problems present in the manual system management.

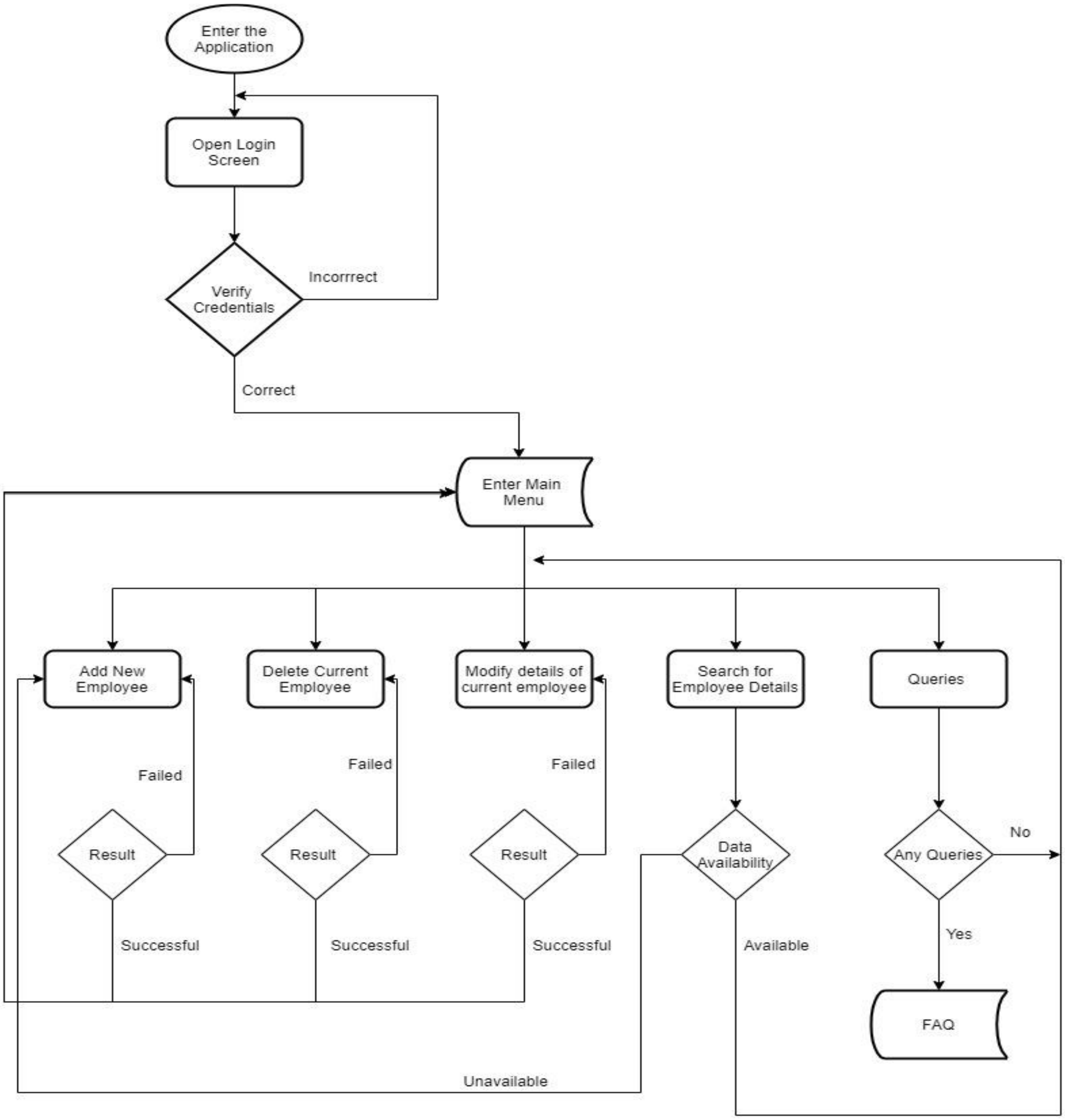
3.2 OBJECTIVES OF THE PROJECT:

- The project aims to simplify the task of maintaining records of the employees of company and reduce man-work.
- To develop a user-friendly database system to store the employee information.
- The objective of this project is to provide a comprehensive approach towards the management of employee information.

3.3 Requirement:

ID	Description
01	Employees should be present in the company
02	Unique Employee ID should be given to all employee.
03	Contact Details should be taken from the employees.
04	Biometrics should be taken for each employee
05	All the personal details should be collected and kept in the database

3.4 UML Diagram



3.5 Test Plan

3.5.1 High Level Test Plan:

Id	Description	Pre-Condition	Expected I/P	Expected O/P	Actual O/P
HL_01	Two employees should have different ID	Unique Id Must Be Provided	Entering the Same Employee Id	Error must be shown	

HL_02	Same Name Issue	Unique Id Is Present	Name mapped and Employee Id	Correct Person Is Matched-Correct output	
HL_03	Invalid ID entrance	Biometrics should be present with the company	Thumb Impression is checked	No match-wrong input	
HL_04	Name Mismatch (Database error)	Correct Database Is Present	Wrong Input	Error Will Arise	

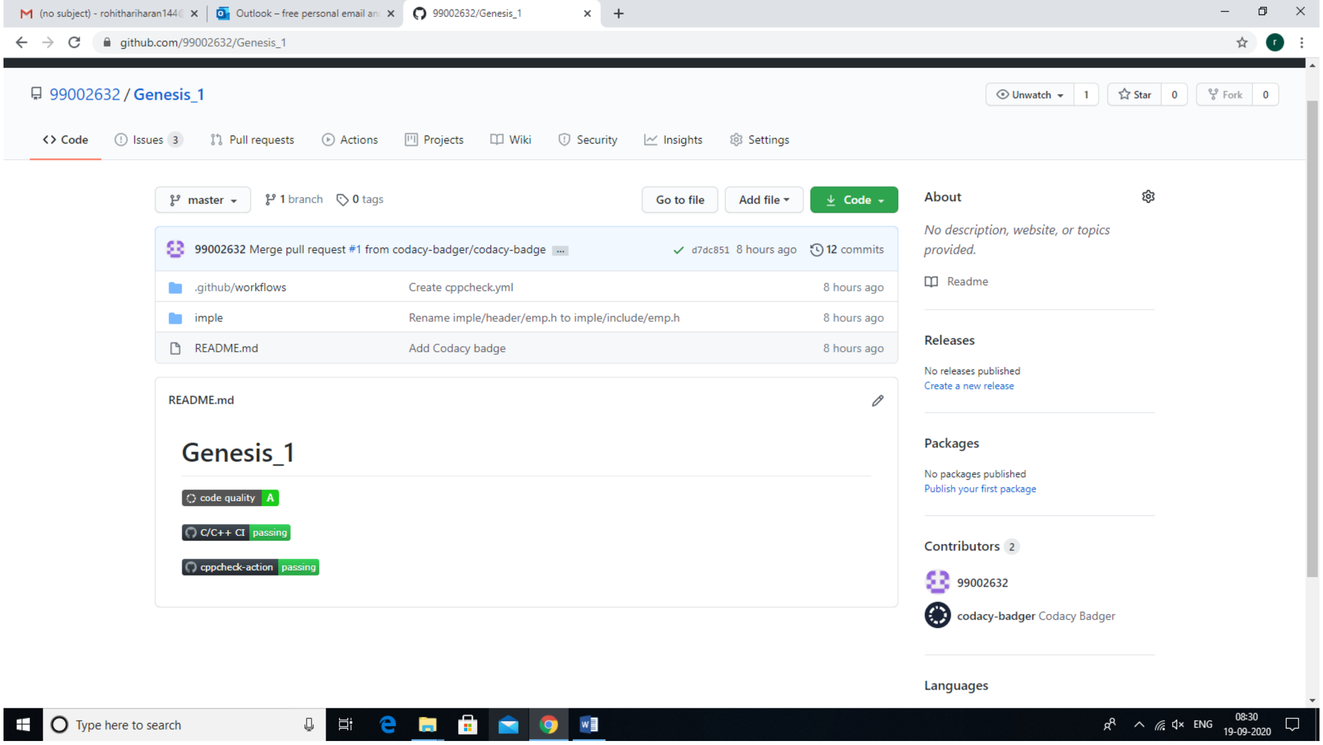
3.5.2 Low Level Test Plan:

Id	Description	Pre-Condition	Expected I/P	Expected O/P	Actual O/P
LL_01	Employee Name should contain only alphabet.	Employee Details	Alphabet checking	Consist of alphabets only	
LL_02	Employee Id consist of numeric only	Unique Employee Id	Employee Id Check	Contains Numeric only	
LL_03	Employees Salary is a whole number	Employee Salary details	Numeric checking	Correct Output	

3.6 GIT Aspects

3.6.1 GIT

https://github.com/99002632/Genesis_1



99002632 / Genesis_1

99002632 Merge pull request #1 from codacy-badger/codacy-badge … ✓ d7dc851 8 hours ago 12 commits

.github/workflows	Create cppcheck.yml	8 hours ago
imple	Rename imple/header/emp.h to imple/include/emp.h	8 hours ago
README.md	Add Codacy badge	8 hours ago

README.md

Genesis_1

About

No description, website, or topics provided.

Readme

Releases

No releases published
Create a new release

Packages

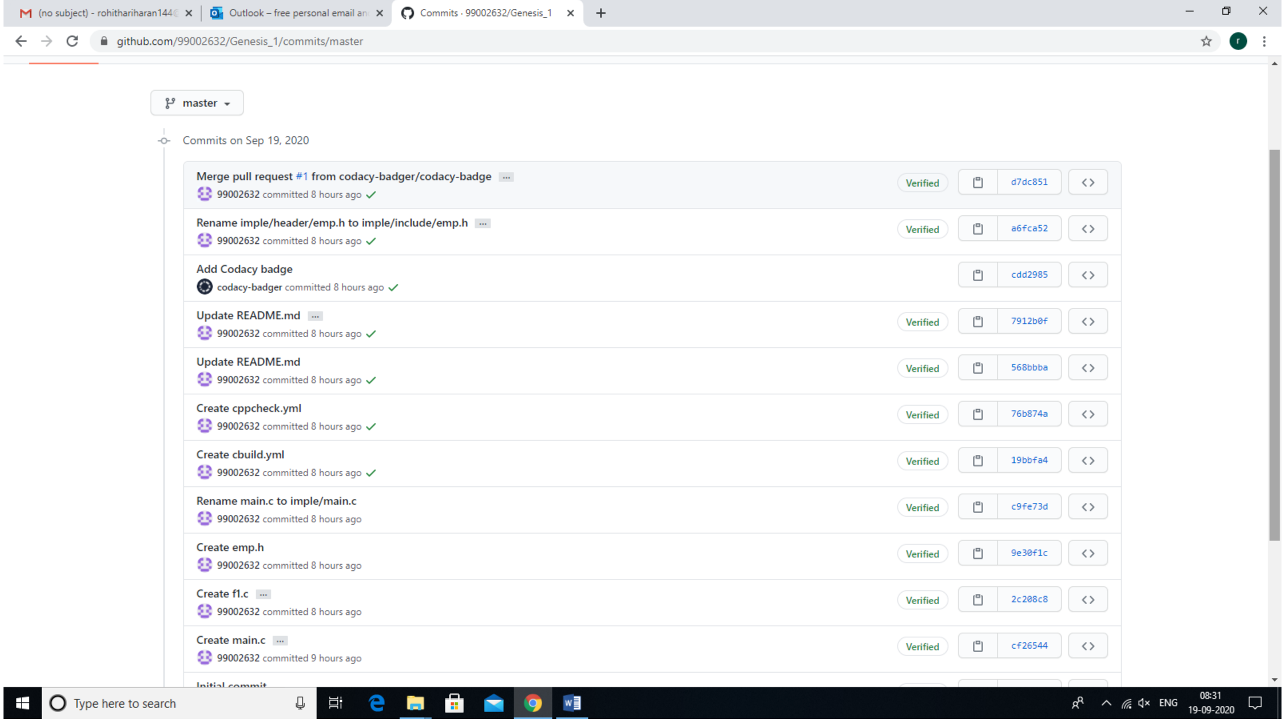
No packages published
Publish your first package

Contributors 2

99002632
codacy-badger Codacy Badger

Languages

Figure 1



github.com/99002632/Genesis_1/commits/master

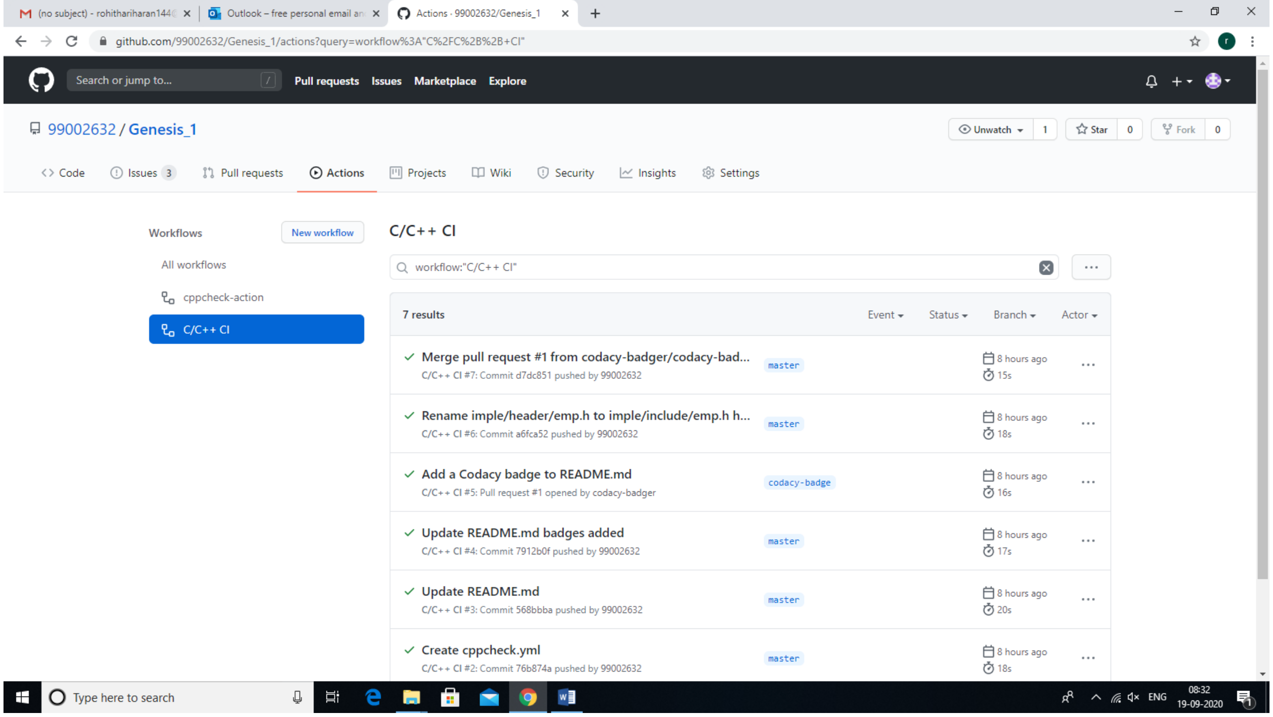
Commits on Sep 19, 2020

Merge pull request #1 from codacy-badger/codacy-badge … 99002632 committed 8 hours ago ✓	Verified	d7dc851
Rename imple/header/emp.h to imple/include/emp.h … 99002632 committed 8 hours ago ✓	Verified	a6fca52
Add Codacy badge codacy-badger committed 8 hours ago ✓		cdd2985
Update README.md … 99002632 committed 8 hours ago ✓	Verified	7912b0f
Update README.md 99002632 committed 8 hours ago ✓	Verified	568bbba
Create cppcheck.yml 99002632 committed 8 hours ago ✓	Verified	76b874a
Create cbuild.yml 99002632 committed 8 hours ago ✓	Verified	19bbfa4
Rename main.c to imple/main.c 99002632 committed 8 hours ago	Verified	c9fe73d
Create emp.h 99002632 committed 8 hours ago	Verified	9e30f1c
Create f1.c … 99002632 committed 8 hours ago	Verified	2c208c8
Create main.c … 99002632 committed 9 hours ago	Verified	cf26544
Initial commit		

Figure 2

3.6.2 Make

3.6.3 Build



C/C++ CI

workflow:"C/C++ CI"

7 results

✓ Merge pull request #1 from codacy-badger/codacy-bad... `master` 8 hours ago 15s
C/C++ CI #7: Commit d7dc851 pushed by 99002632

✓ Rename imple/header/emp.h to imple/include/emp.h h... `master` 8 hours ago 18s
C/C++ CI #6: Commit a6fca52 pushed by 99002632

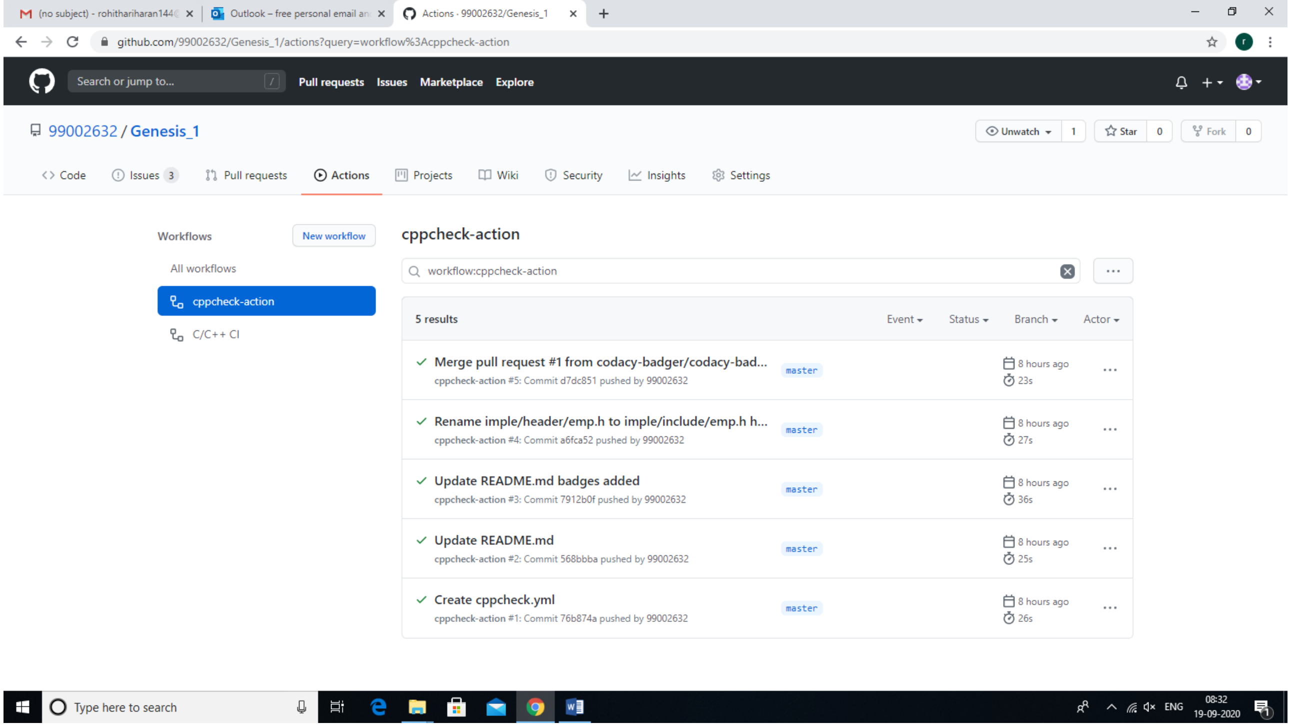
✓ Add a Codacy badge to README.md `codacy-badge` 8 hours ago 16s
C/C++ CI #5: Pull request #1 opened by codacy-badger

✓ Update README.md badges added `master` 8 hours ago 17s
C/C++ CI #4: Commit 7912b0f pushed by 99002632

✓ Update README.md `master` 8 hours ago 20s
C/C++ CI #3: Commit 568bbba pushed by 99002632

✓ Create cppcheck.yml `master` 8 hours ago 18s
C/C++ CI #2: Commit 76b874a pushed by 99002632

Figure 4



cppcheck-action

workflow:cppcheck-action

5 results

✓ Merge pull request #1 from codacy-badger/codacy-bad... `master` 8 hours ago 23s
cppcheck-action #5: Commit d7dc851 pushed by 99002632

✓ Rename imple/header/emp.h to imple/include/emp.h h... `master` 8 hours ago 27s
cppcheck-action #4: Commit a6fca52 pushed by 99002632

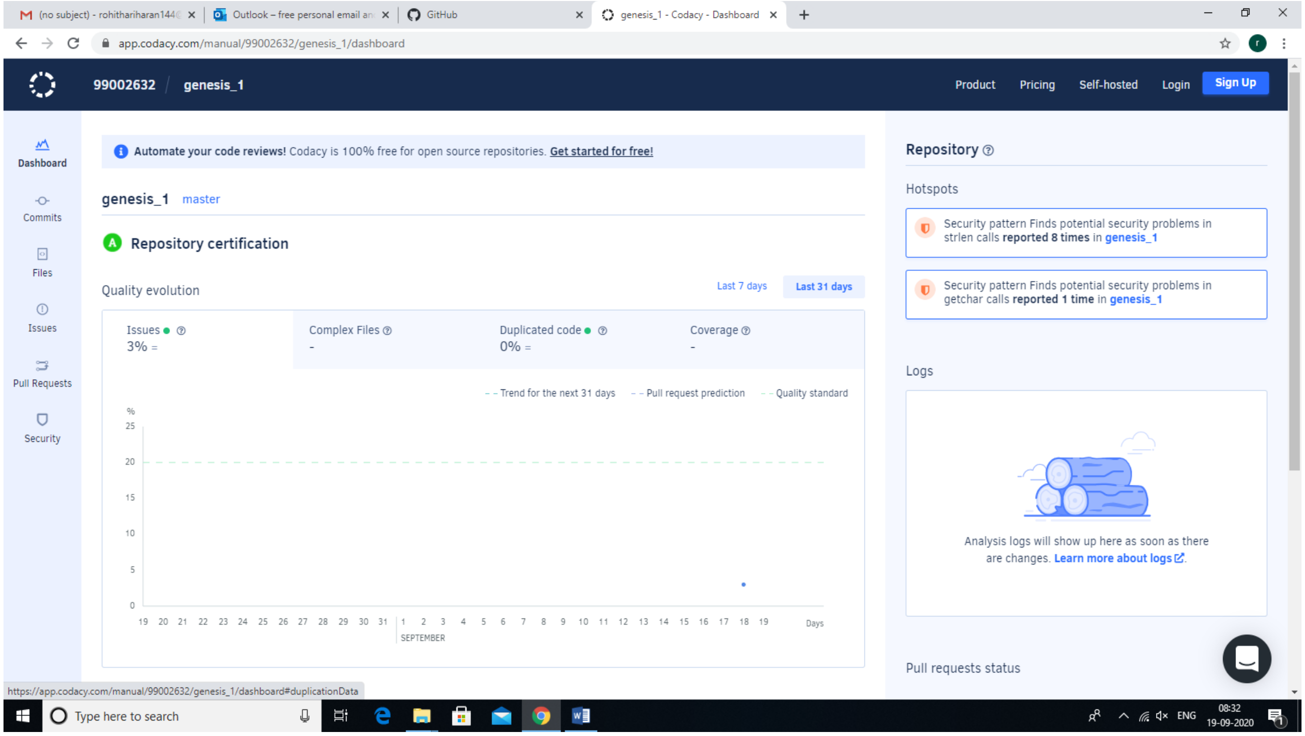
✓ Update README.md badges added `master` 8 hours ago 36s
cppcheck-action #3: Commit 7912b0f pushed by 99002632

✓ Update README.md `master` 8 hours ago 25s
cppcheck-action #2: Commit 568bbba pushed by 99002632

✓ Create cppcheck.yml `master` 8 hours ago 26s
cppcheck-action #1: Commit 76b874a pushed by 99002632

Figure 5

3.6.4 Codacy



Automate your code reviews! Codacy is 100% free for open source repositories. Get started for free!

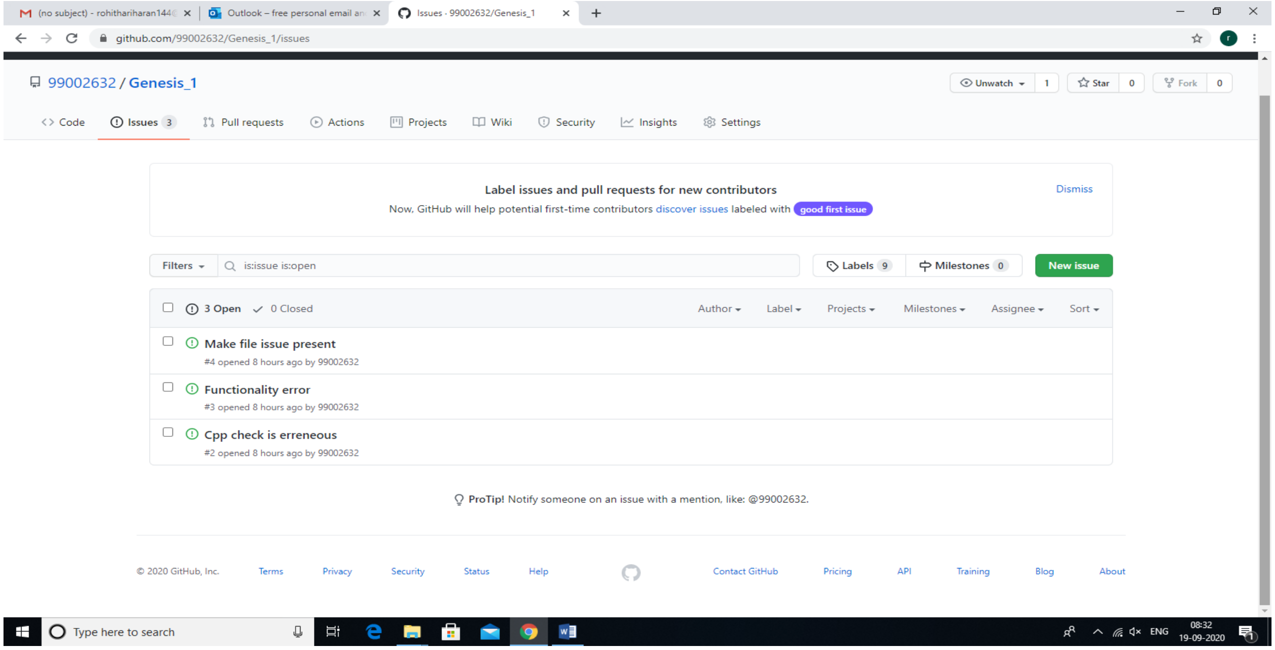
Security pattern Finds potential security problems in strlen calls reported 8 times in genesis_1

Security pattern Finds potential security problems in getchar calls reported 1 time in genesis_1

Analysis logs will show up here as soon as there are changes. Learn more about logs

Figure 6

3.6.5 Issues



Label issues and pull requests for new contributors

Now, GitHub will help potential first-time contributors discover issues labeled with good first issue

Make file issue present	#4 opened 8 hours ago by 99002632
Functionality error	#3 opened 8 hours ago by 99002632
Cpp check is erreneous	#2 opened 8 hours ago by 99002632

ProTip! Notify someone on an issue with a mention, like: @99002632.

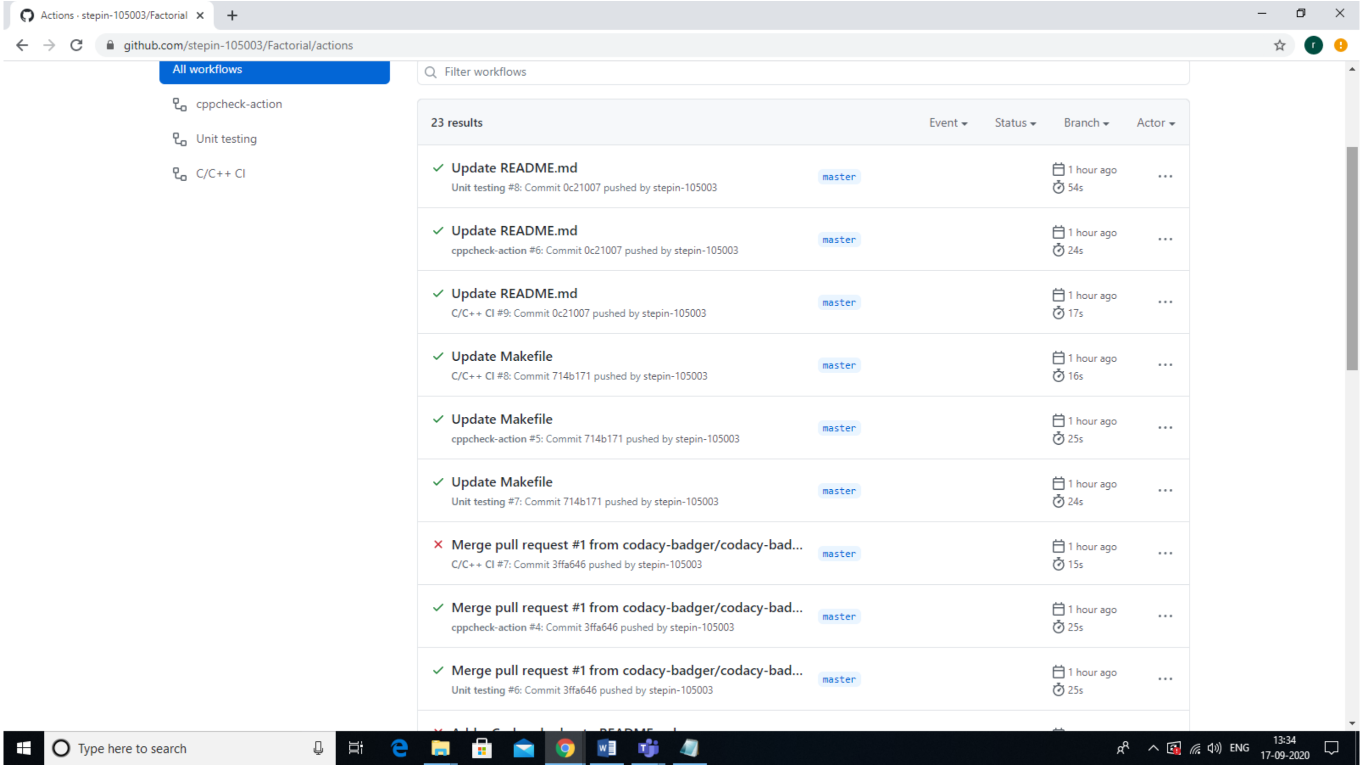
Figure 7

References

1. https://github.com/Bibeknam/programming techniques/blob/master/Employee%20Record%20System/employee_record.c
2. https://www.pockethrms.com/employee-management-system/#:~:text=An%20employee%20management%20system%20is,an%20easier%20and%20quicker%20way.
3. https://www.freshworks.com/hrms/features/employee-database-software/#:~:text=What%20is%20an%20Employee%20Database,an%20HR%20to%20refer%20from.
4. https://connecteam.com/top-10-employee-management-tools/
5. http://www.intoweb.com/hr/module_employees.php

APPENDIX A1. CONTINIOUS INTEGRATION

1.1.GIT

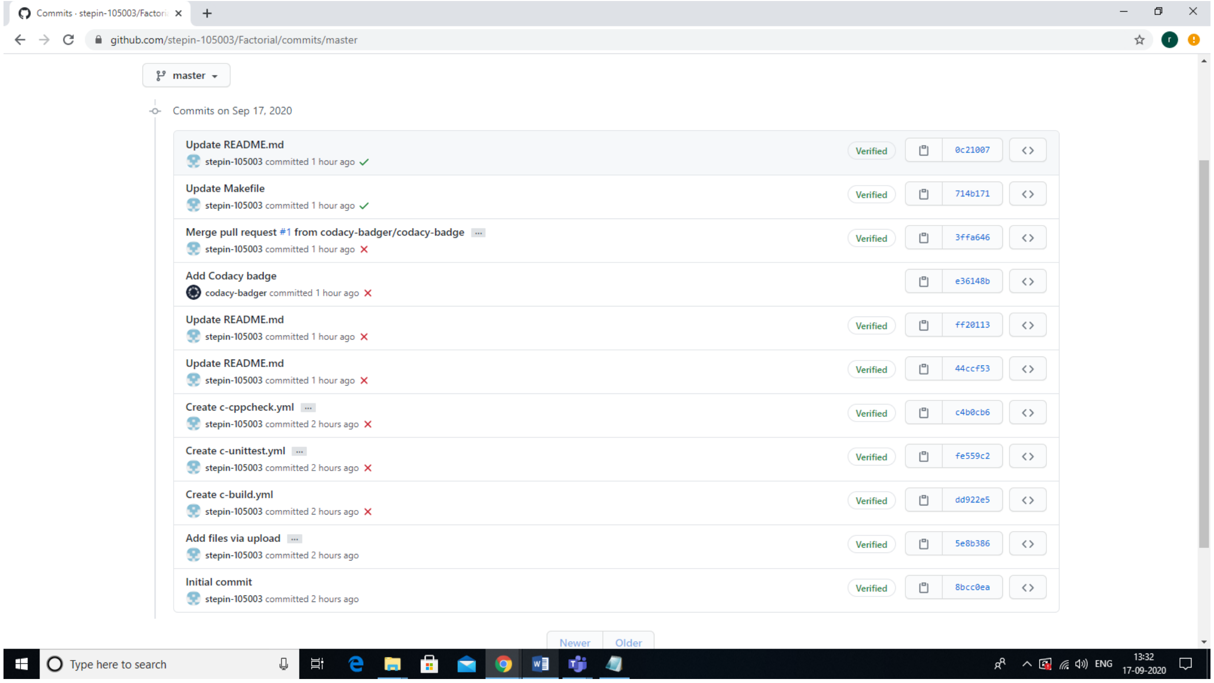


23 results

Event ▾ Status ▾ Branch ▾ Actor ▾

✓	Update README.md Unit testing #8: Commit 0c21007 pushed by stepin-105003	master	1 hour ago 54s	···
✓	Update README.md cppcheck-action #6: Commit 0c21007 pushed by stepin-105003	master	1 hour ago 24s	···
✓	Update README.md C/C++ CI #9: Commit 0c21007 pushed by stepin-105003	master	1 hour ago 17s	···
✓	Update Makefile C/C++ CI #8: Commit 714b171 pushed by stepin-105003	master	1 hour ago 16s	···
✓	Update Makefile cppcheck-action #5: Commit 714b171 pushed by stepin-105003	master	1 hour ago 25s	···
✓	Update Makefile Unit testing #7: Commit 714b171 pushed by stepin-105003	master	1 hour ago 24s	···
✗	Merge pull request #1 from codacy-badger/codacy-bad... C/C++ CI #7: Commit 3ffa646 pushed by stepin-105003	master	1 hour ago 15s	···
✓	Merge pull request #1 from codacy-badger/codacy-bad... cppcheck-action #4: Commit 3ffa646 pushed by stepin-105003	master	1 hour ago 25s	···
✓	Merge pull request #1 from codacy-badger/codacy-bad... Unit testing #6: Commit 3ffa646 pushed by stepin-105003	master	1 hour ago 25s	···

Figure 4



Commits · stepin-105003/Factori
github.com/stepin-105003/Factorial/commits/master
master

Commits on Sep 17, 2020

Update README.md
stepin-105003 committed 1 hour ago ✓ — Verified — 0c21007

Update Makefile
stepin-105003 committed 1 hour ago ✓ — Verified — 714b171

Merge pull request #1 from codacy-badger/codacy-badge …
stepin-105003 committed 1 hour ago ✗ — Verified — 3ffa646

Add Codacy badge
codacy-badger committed 1 hour ago ✗ — e36148b

Update README.md
stepin-105003 committed 1 hour ago ✗ — Verified — ff20113

Update README.md
stepin-105003 committed 1 hour ago ✗ — Verified — 44ccf53

Create c-cppcheck.yml …
stepin-105003 committed 2 hours ago ✗ — Verified — c4b0cb6

Create c-unittest.yml …
stepin-105003 committed 2 hours ago ✗ — Verified — fe559c2

Create c-build.yml
stepin-105003 committed 2 hours ago ✗ — Verified — dd922e5

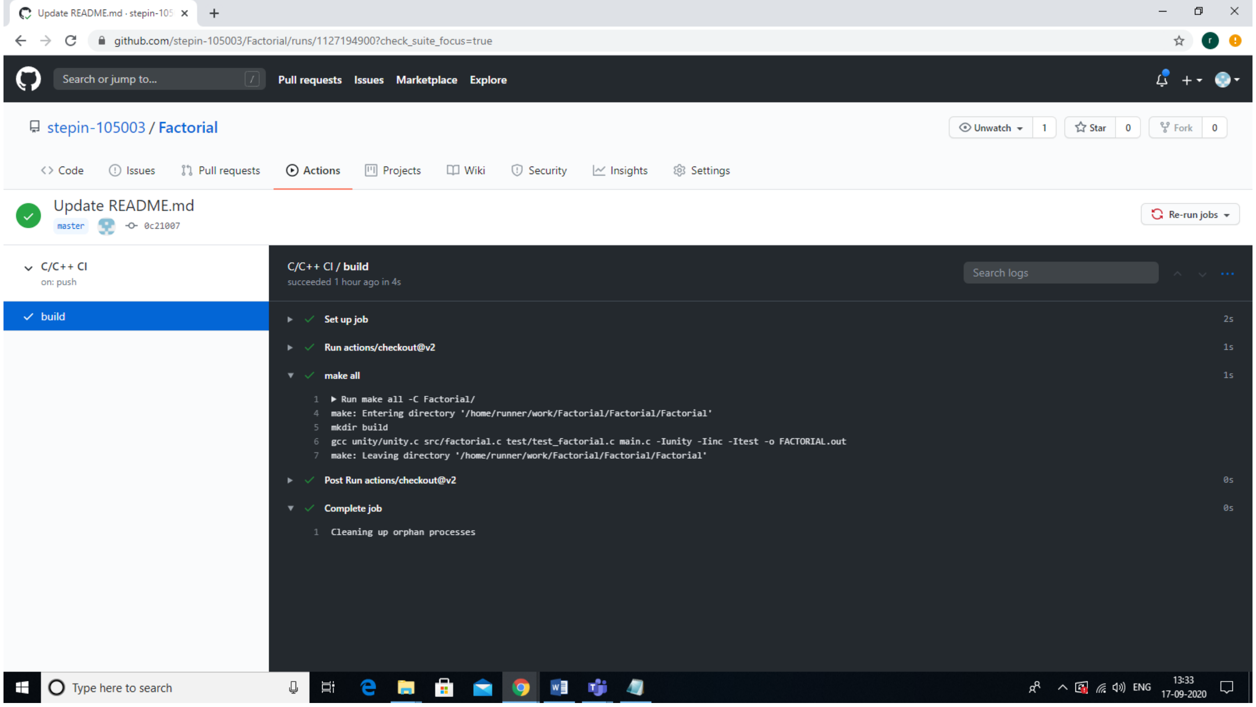
Add files via upload …
stepin-105003 committed 2 hours ago — Verified — 5e8b386

Initial commit
stepin-105003 committed 2 hours ago — Verified — 8bcc0ea

Figure 5

https://github.com/stepin-105003/Factorial

1.2. MAKE



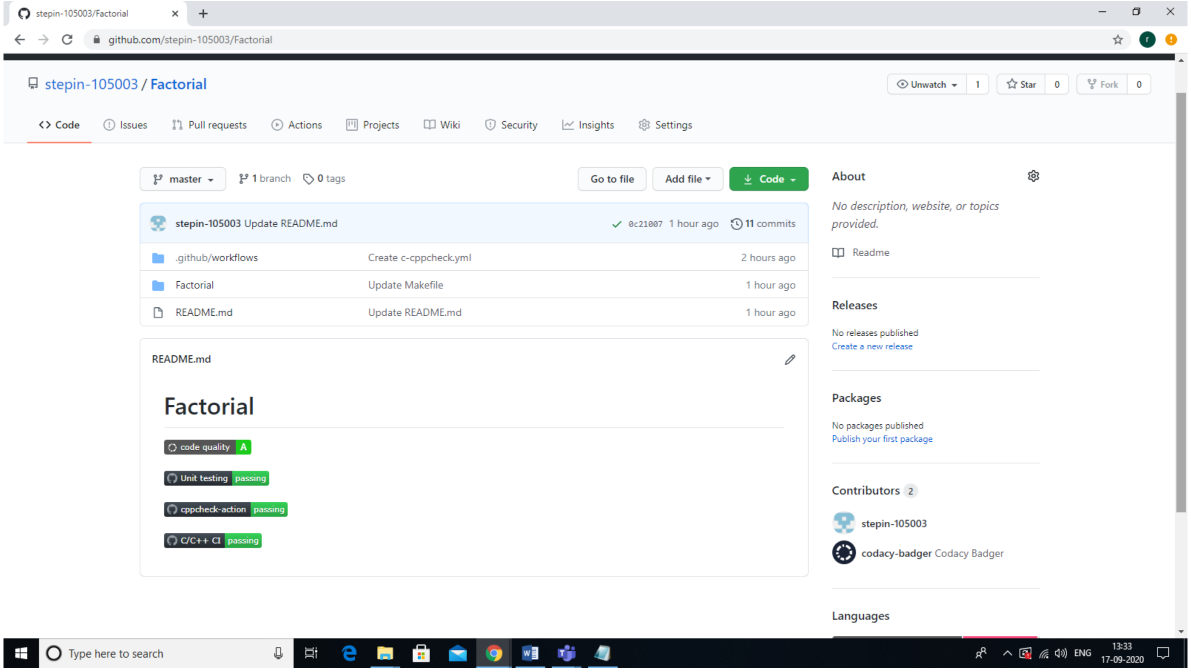
Update README.md
master 0c21007

C/C++ CI / build
succeeded 1 hour ago in 4s

```
▶ ✓ Set up job                                         2s
▶ ✓ Run actions/checkout@v2                            1s
▼ ✓ make all                                           1s
      ▶ Run make all -C Factorial/
      make: Entering directory '/home/runner/work/Factorial/Factorial/Factorial'
      mkdir build
      gcc unity/unity.c src/factorial.c test/test_factorial.c main.c -Iunity -Iinc -Itest -o FACTORIAL.out
      make: Leaving directory '/home/runner/work/Factorial/Factorial/Factorial'
▶ ✓ Post Run actions/checkout@v2                       0s
▼ ✓ Complete job                                       0s
      Cleaning up orphan processes
```

Figure 6

1.3. BUILD



stepin-105003/Factorial

github.com/stepin-105003/Factorial

stepin-105003 / Factorial

Unwatch 1 Star 0 Fork 0

Code Issues Pull requests Actions Projects Wiki Security Insights Settings

master 1 branch 0 tags Go to file Add file Code

stepin-105003 Update README.md ✓ 0c21007 1 hour ago 11 commits

.github/workflows	Create c-cppcheck.yml	2 hours ago
Factorial	Update Makefile	1 hour ago
README.md	Update README.md	1 hour ago

README.md

Factorial

code quality A

Unit testing passing

cppcheck-action passing

C/C++ CI passing

About

No description, website, or topics provided.

Readme

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No packages published

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Contributors 2

stepin-105003

codacy-badger Codacy Badger

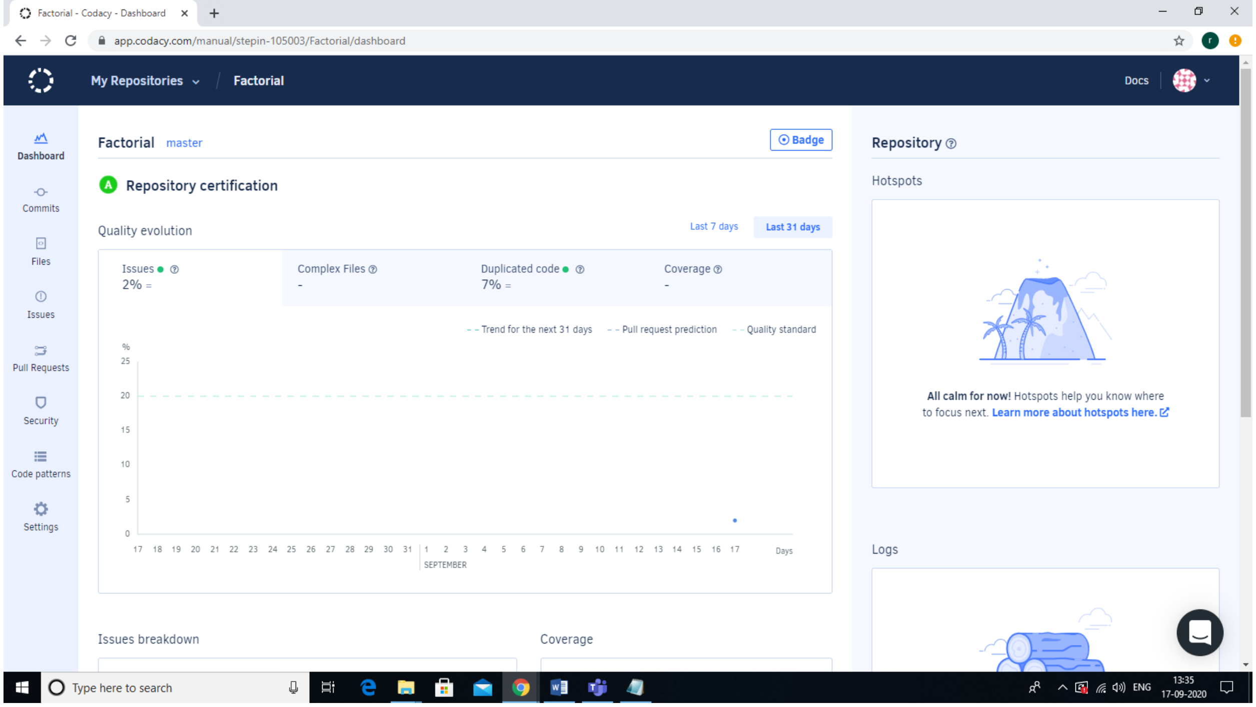
Languages

Type here to search

ENG 13:33 17-09-2020

Figure 7

1.4. CODE QUALITY



Factorial - Codacy - Dashboard

app.codacy.com/manual/stepin-105003/Factorial/dashboard

My Repositories / Factorial Docs

Factorial master Badge

A Repository certification

Quality evolution Last 7 days Last 31 days

Issues	Complex Files	Duplicated code	Coverage
2% =	-	7% =	-

Issues breakdown

Coverage

Repository

Hotspots

All calm for now! Hotspots help you know where to focus next. **Learn more about hotspots here.**

Logs

Type here to search

ENG 13:35 17-09-2020

Figure 8

MAIN FILE CODE

```
#include
"test_factorial.h"


int main(void)
{
    test_main();
    return 0;
}
```

FUNCTION FILE CODE

```
#include
"factorial.h"


int factorial(int number)
{
  /* Return -1 for negative numbers */
  if(number < 0)
    return -1;


  /* Return 1 for 0 */
  if(number == 0)
    return 1;


  /* Recursively calculate Factorial of the
number */
  return number * factorial(number-1);
}
```

HEADER FILE CODE

```
/
**
   * @file factorial.h
```

```
    *
    */
    #ifndef __FACTORIAL_H__
    #define __FACTORIAL_H__


    /**
    * Calculates the factorial of integer number
    * @param[in] number for which factorial has to be
found
    * @return Factorial of the number
    * @note Returns -1 for negative values
    */
    int factorial(int number);


    #endif /* #ifndef __FACTORIAL_H__ */
```