GIGABIT 1.0

NON-SPECIFIC TECHNOLOGY RISK CALCULATOR

NON SPECIFIC TECHNOLOGY RISK CALCULATOR

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2023-02-01

Our Team

Supervisor – Ms. Sanjeevi Chandrasiri

Co-Supervisor - Ms. Maduka Nadeeshani

RAHMAN S.H.
IT19189086

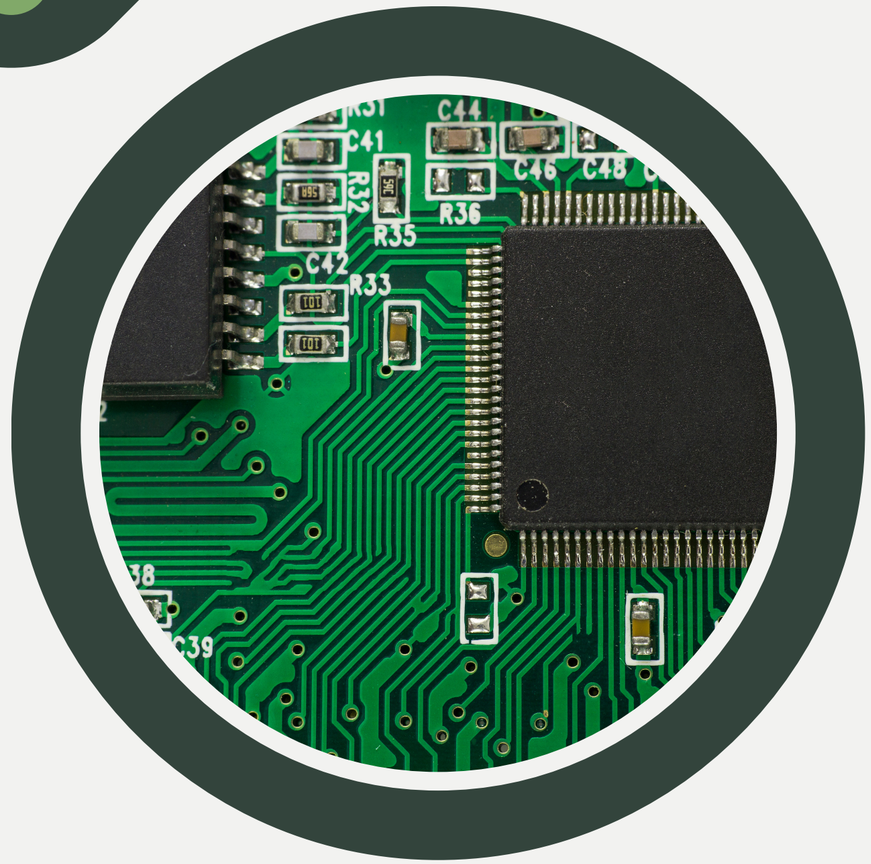
THIRANYA M.A.R.
IT19129440

JAYASINGHE H.M.C.P
IT19048338

RAJAPAKSHA R.M.
IT19156316

Our Research Topic

Detection of Energy Consumption and Performance of Third-party Applications using Machine Learning



Introduction to the Overall Project

Our team has created a Non-Specific Technology Risk Calculator which will detect performance issues and energy consumption of a third-party application/developing language before the installation/development stage.

Research Problem

- Any PC does not function well once an unknown third-party software is installed.
- Once the third-party program is installed, the PC becomes slow in performance and tasks.
- There can be risks to security and privacy issues coming from third-party applications.
- Lack of performance of device machines due to disk space or limited RAM capacity.

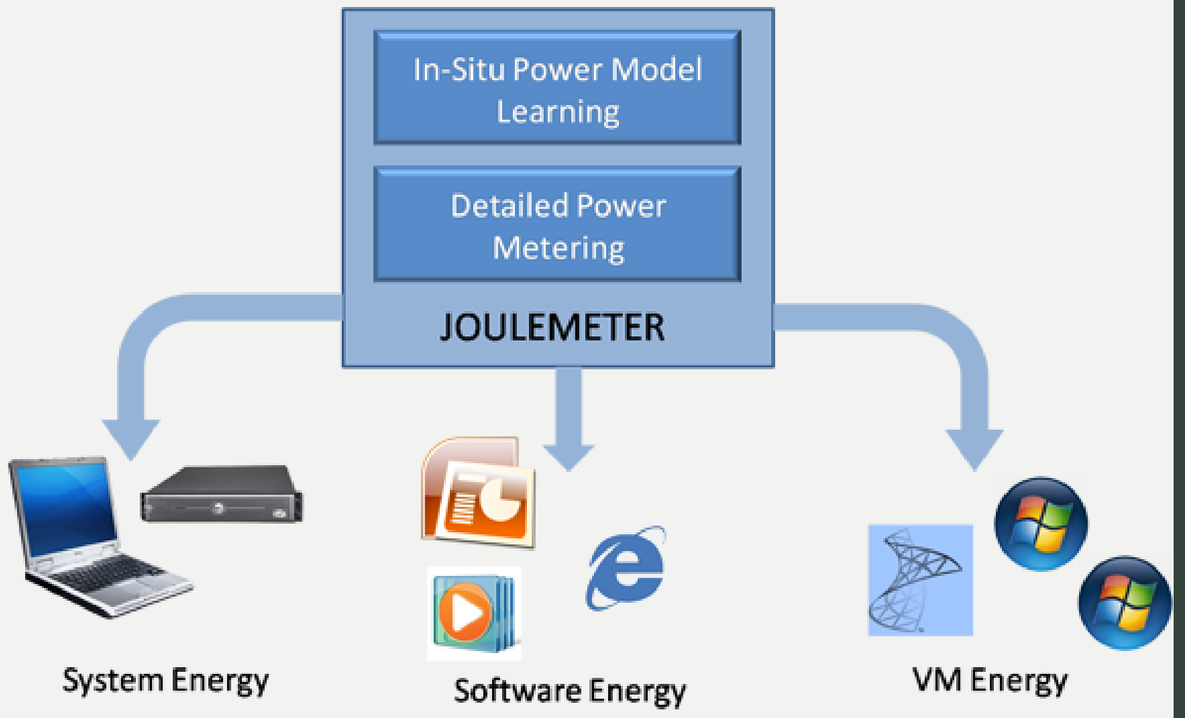
Literary Review

A number of performance or energy apps are available on the market, but are they really convenient to use?

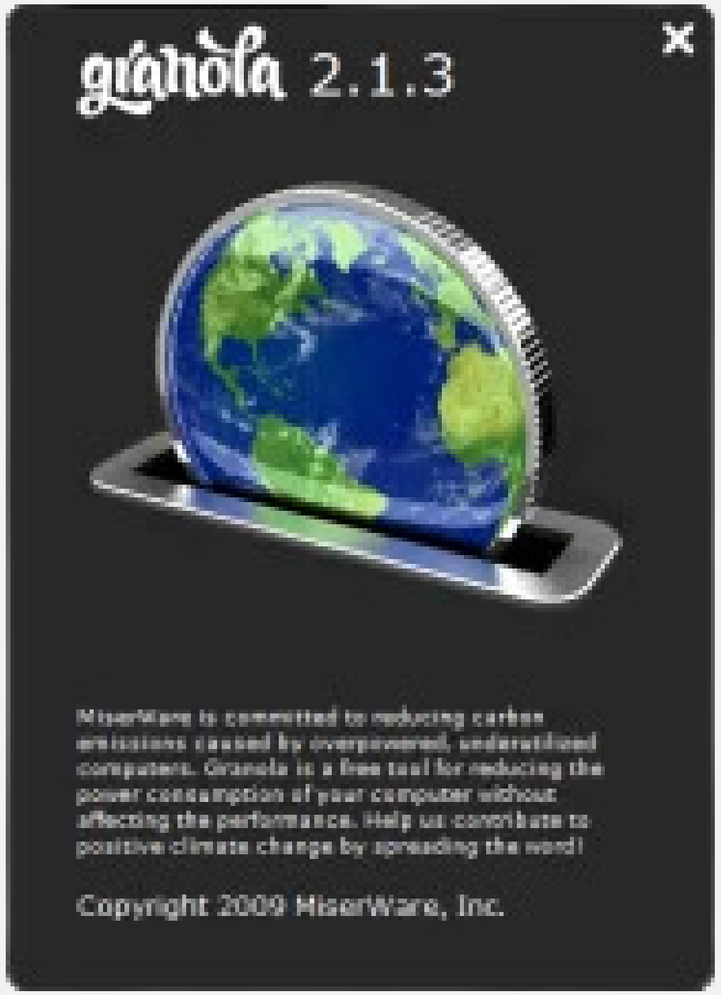
JouleMeter

JouleMeter is a Windows application that uses machine learning algorithms to estimate the energy consumption of desktop PCs. It provides real-time energy consumption data, as well as historical data and energy-saving tips.

Problem? Deprecated due to performance issues.



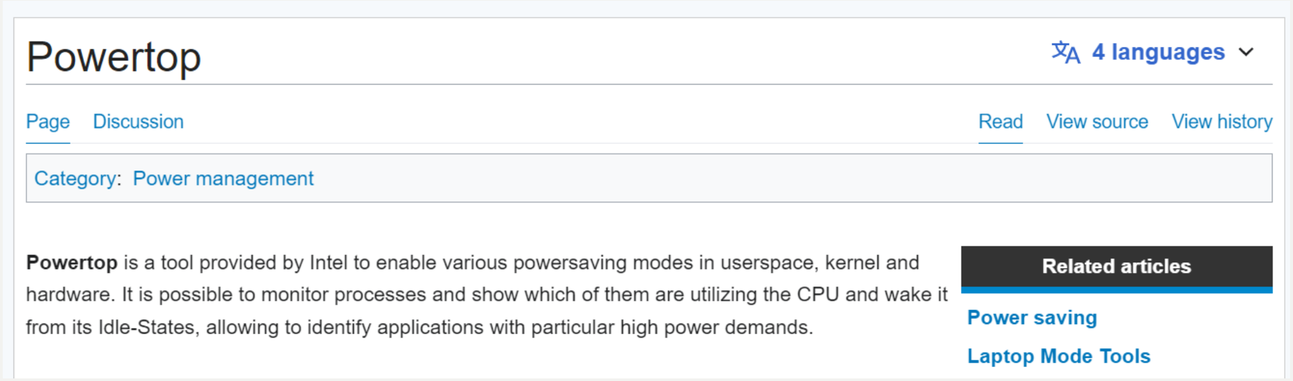
Granola



Granola is a lightweight Windows application whose purpose is to help users improve the energy efficiency of their computer and laptop.

Problem? Currently available but not updated for 6 to 10 years. There is also a problem with the installation folder.

PowerTOP



Powertop

4 languages

Page Discussion Read View source View history

Category: Power management

Powertop is a tool provided by Intel to enable various powersaving modes in userspace, kernel and hardware. It is possible to monitor processes and show which of them are utilizing the CPU and wake it from its Idle-States, allowing to identify applications with particular high power demands.

Related articles

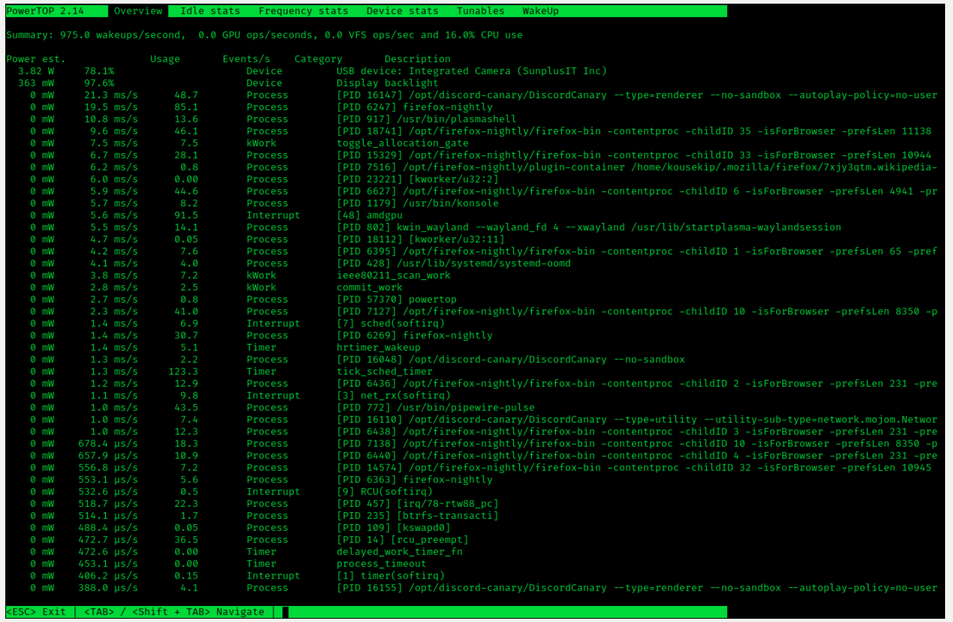
Power saving

Laptop Mode Tools

PowerTOP is a Linux tool to diagnose issues with power consumption and power management.

Problem? Bad UI and user experience.

Setup and Installation is a tedious task.

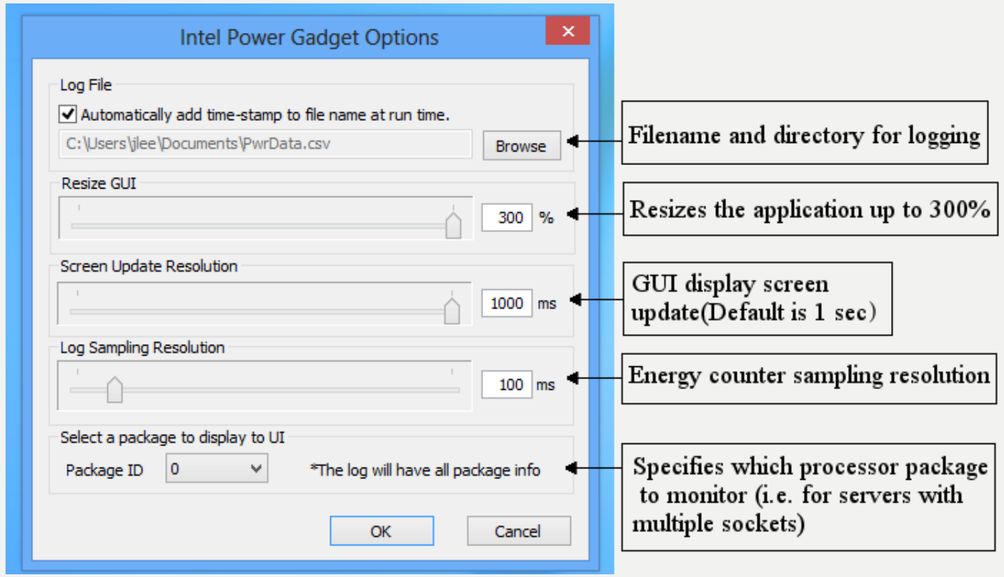


```
PowerTOP 2.14     Overview   Idle stats   Frequency stats   Device stats   Tunables   WakeUp

Summary: 975.0 wakeups/second,  0.0 GPU ops/seconds, 0.0 VFS ops/sec and 16.0% CPU use

Power est.             Usage       Events/s    Category       Description
  3.82 W     78.1%                             Device         USB device: Integrated Camera (SunplusIT Inc)
  363 mW     97.6%                             Device         Display backlight
    0 mW     21.3 ms/s      48.7               Process        [PID 16147] /opt/discord-canary/DiscordCanary --type=renderer --no-sandbox --autoplay-policy=no-user
    0 mW     19.5 ms/s      85.1               Process        [PID 6247] firefox-nightly
    0 mW     10.8 ms/s      13.6               Process        [PID 917] /usr/bin/plasmashell
    0 mW      9.6 ms/s      46.1               Process        [PID 18741] /opt/firefox-nightly/firefox-bin -contentproc -childID 35 -isForBrowser -prefsLen 11138
    0 mW      7.5 ms/s       7.5               kWork          toggle_allocation_gate
    0 mW      6.7 ms/s      28.1               Process        [PID 15329] /opt/firefox-nightly/firefox-bin -contentproc -childID 33 -isForBrowser -prefsLen 10944
    0 mW      6.2 ms/s       0.8               Process        [PID 7516] /opt/firefox-nightly/plugin-container /home/kousekip/.mozilla/firefox/7xjy3qtm.wikipedia-
    0 mW      6.0 ms/s       0.00              Process        [PID 23221] [kworker/u32:2]
    0 mW      5.9 ms/s      44.6               Process        [PID 6627] /opt/firefox-nightly/firefox-bin -contentproc -childID 6 -isForBrowser -prefsLen 4941 -pr
    0 mW      5.7 ms/s       8.2               Process        [PID 1179] /usr/bin/konsole
    0 mW      5.6 ms/s      91.5               Interrupt      [48] amdgpu
    0 mW      5.5 ms/s      14.1               Process        [PID 802] kwin_wayland --wayland_fd 4 --xwayland /usr/lib/startplasma-waylandsession
    0 mW      4.7 ms/s       0.05              Process        [PID 18112] [kworker/u32:11]
    0 mW      4.2 ms/s       7.6               Process        [PID 6395] /opt/firefox-nightly/firefox-bin -contentproc -childID 1 -isForBrowser -prefsLen 65 -pref
    0 mW      4.1 ms/s       4.0               Process        [PID 428] /usr/lib/systemd/systemd-oomd
    0 mW      3.8 ms/s       7.2               kWork          ieee80211_scan_work
    0 mW      2.8 ms/s       2.5               kWork          commit_work
    0 mW      2.7 ms/s       0.8               Process        [PID 57370] powertop
    0 mW      2.3 ms/s      41.0               Process        [PID 7127] /opt/firefox-nightly/firefox-bin -contentproc -childID 10 -isForBrowser -prefsLen 8350 -p
    0 mW      1.4 ms/s       6.9               Interrupt      [7] sched(softirq)
    0 mW      1.4 ms/s      30.7               Process        [PID 6269] firefox-nightly
    0 mW      1.4 ms/s       5.1               Timer          hrtimer_wakeup
    0 mW      1.3 ms/s       2.2               Process        [PID 16048] /opt/discord-canary/DiscordCanary --no-sandbox
    0 mW      1.3 ms/s     123.3               Timer          tick_sched_timer
    0 mW      1.2 ms/s      12.9               Process        [PID 6436] /opt/firefox-nightly/firefox-bin -contentproc -childID 2 -isForBrowser -prefsLen 231 -pre
    0 mW      1.1 ms/s       9.8               Interrupt      [3] net_rx(softirq)
    0 mW      1.0 ms/s      43.5               Process        [PID 772] /usr/bin/pipewire-pulse
    0 mW      1.0 ms/s       7.4               Process        [PID 16110] /opt/discord-canary/DiscordCanary --type=utility --utility-sub-type=network.mojom.Networ
    0 mW      1.0 ms/s      12.3               Process        [PID 6438] /opt/firefox-nightly/firefox-bin -contentproc -childID 3 -isForBrowser -prefsLen 231 -pre
    0 mW    678.4 µs/s      18.3               Process        [PID 7138] /opt/firefox-nightly/firefox-bin -contentproc -childID 10 -isForBrowser -prefsLen 8350 -p
    0 mW    657.9 µs/s      10.9               Process        [PID 6440] /opt/firefox-nightly/firefox-bin -contentproc -childID 4 -isForBrowser -prefsLen 231 -pre
    0 mW    556.8 µs/s       7.2               Process        [PID 14574] /opt/firefox-nightly/firefox-bin -contentproc -childID 32 -isForBrowser -prefsLen 10945
    0 mW    553.1 µs/s       5.6               Process        [PID 6363] firefox-nightly
    0 mW    532.6 µs/s       0.5               Interrupt      [9] RCU(softirq)
    0 mW    518.7 µs/s      22.3               Process        [PID 457] [irq/78-rtw88_pc]
    0 mW    514.1 µs/s       1.7               Process        [PID 235] [btrfs-transacti]
    0 mW    488.4 µs/s       0.05              Process        [PID 109] [kswapd0]
    0 mW    472.7 µs/s      36.5               Process        [PID 14] [rcu_preempt]
    0 mW    472.6 µs/s       0.00              Timer          delayed_work_timer_fn
    0 mW    453.1 µs/s       0.00              Timer          process_timeout
    0 mW    406.2 µs/s       0.15              Interrupt      [1] timer(softirq)
    0 mW    388.0 µs/s       4.1               Process        [PID 16155] /opt/discord-canary/DiscordCanary --type=renderer --no-sandbox --autoplay-policy=no-user

<ESC> Exit | <TAB> / <Shift + TAB> Navigate |
```

Intel Power Gadget

Intel® Power Gadget is a software-based power usage monitoring tool and includes an application, driver, and libraries to monitor and estimate real-time processor package power information

Problem? Bad UI and user experience. Setup and Installation is a tedious task.



Task Manager

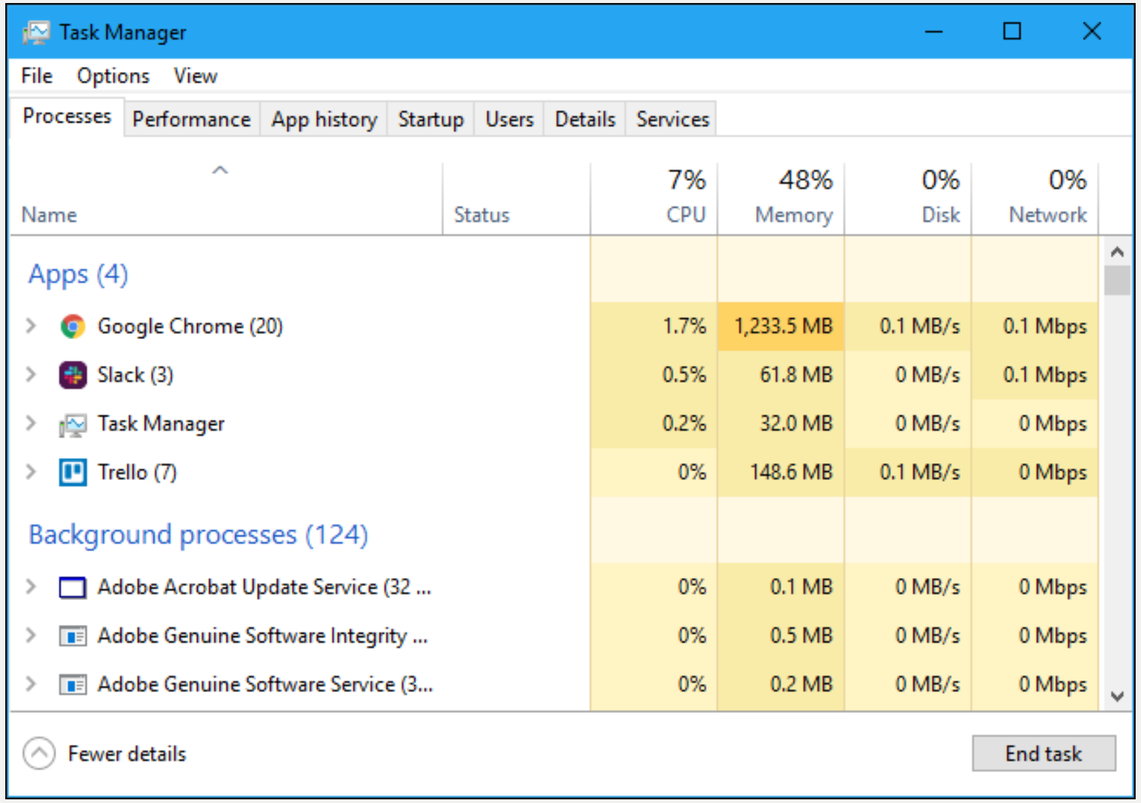
Task Manager provides real-time information about CPU, memory, disk, and network usage, which can be useful for monitoring performance and identifying potential performance bottlenecks.

Problem?

No personalized recommendations.

No comprehensive or accurate picture of energy usage.

Does not provide historical data or trends that can be used for analysis or planning.



The Solution

Overview

We have created a Non-Specific Technology Risk Calculator which will detect performance issues and energy consumption of a third-party application/developing language before the installation/development stage.

GIGABIT 1.0

NON-SPECIFIC TECHNOLOGY RISK CALCULATOR

NSTRC TOOL

Client Side

IT19189086 - RAHMAN S.H.

IT19129440 – THIRANYA M.A.R.

Developer Side

IT19048338 – JAYASINGHE H.M.C.P

IT19156316 – RAJAPAKSHA R.M.

Our Main Objective

To implement a Non-Specific Technology Risk Calculator which will detect performance issues and energy consumption of a third-party application/developing language before the installation/development stage.

Our Sub-Objectives

DETECTION OF USER DEVICE SPECIFICATIONS

COMPARISON OF SPECIFICATIONS WITH THIRD-PARTY APPLICATION

INITIATION OF THE PERFORMANCE FRAMEWORK FOR DEVELOPERS

GENERATION OF PERFORMANCE REPORT WITH SUGGESTIONS

Standards/Best Practices Used

- **Security**: Implement security measures such as encryption of sensitive data, authentication and authorization mechanisms.
- **Scalability**: Application can handle an increasing number of users and requests by using load balancing techniques and horizontal scaling.
- **Performance**: Optimized code and database queries to ensure that your application performs efficiently.
- **User Experience**: Focused on delivering a smooth and intuitive user experience by designing a clean and visually appealing interface.

Commercialization- Packages

GIGABIT 1.0
NON-SPECIFIC TECHNOLOGY RISK CALCULATOR

Free

Standard

- Mobile/Web Application functionalities.
- CPU and RAM Performance Check.
- App Suggestion Check.
- Security Analysis of Third-Party Application

LKR 490

Platinum

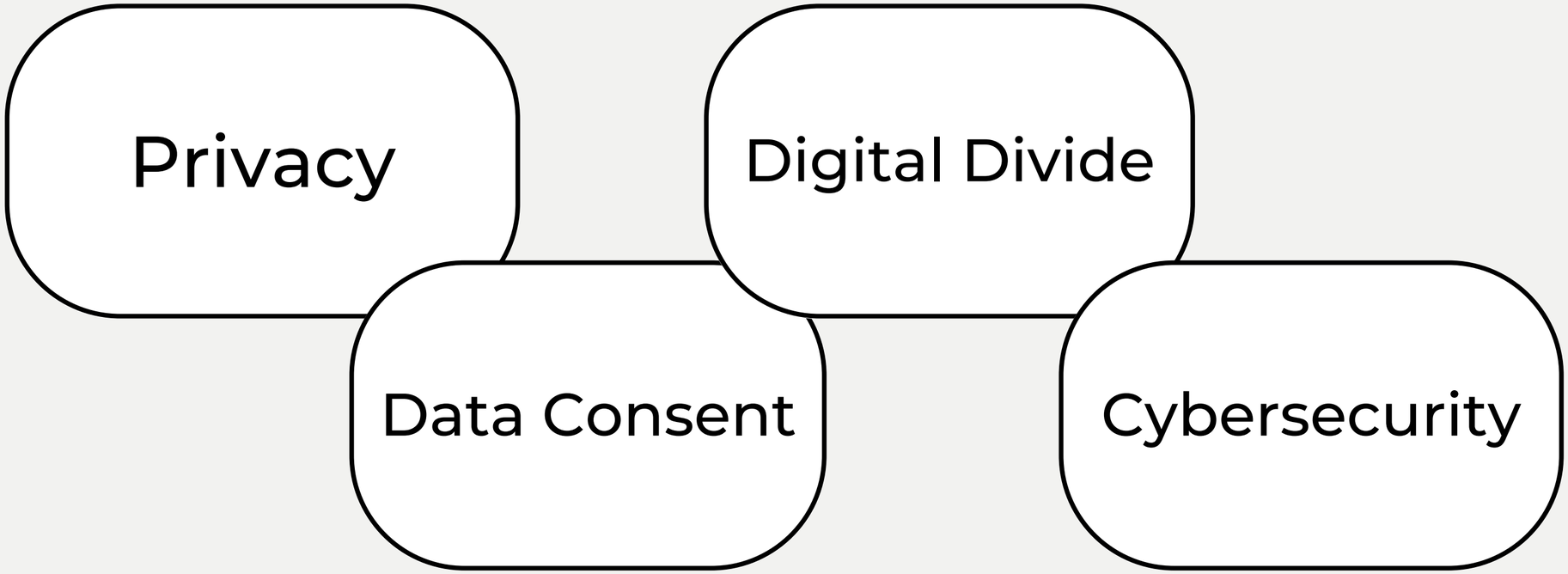
- All features in standard package.
- CPU and RAM Alert System.
- App suggestion and Performance Monitoring.
- In-Depth suggestions for PC/Browser Check

LKR 990

Developer

- Developer starter pack for code quality and syntax issues.
- VS Code Extension compatible with all OS.
- Simple bug tracking, maintenance index and language compatibility.

Professional, legal, social, security and ethical issues



IT19189086 – Rahman S.H

Software Engineering

Research Problem

- Installing third-party software can slow down a PC and pose security and privacy risks.
- It may also cause stress due to reduced performance caused by disk space or limited RAM.
- There can be risks to security and privacy issues to malware and virus attacks coming from the third-party application.

Research Objectives

Main Objectives

Detection of the User Device and Third-Party Application Performance and Compatibility

Sub-Objectives

Allow the proposed system to run in the background before installation.

Carry out the detection of RAM and CPU usage and check for performance

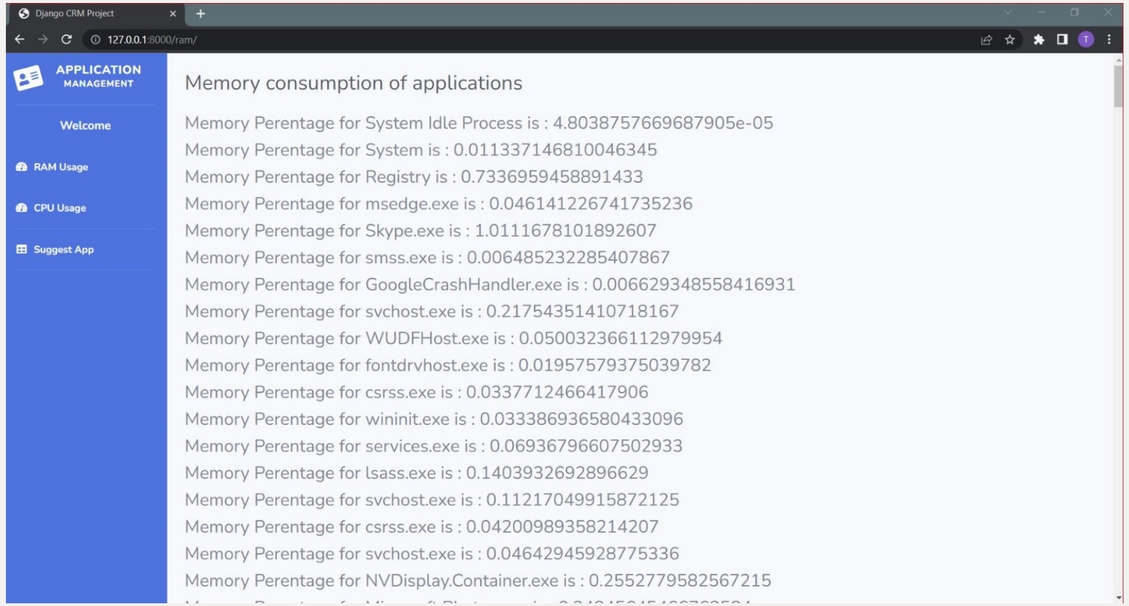
Display possible risks and performance errors on a security level basis with battery consumption

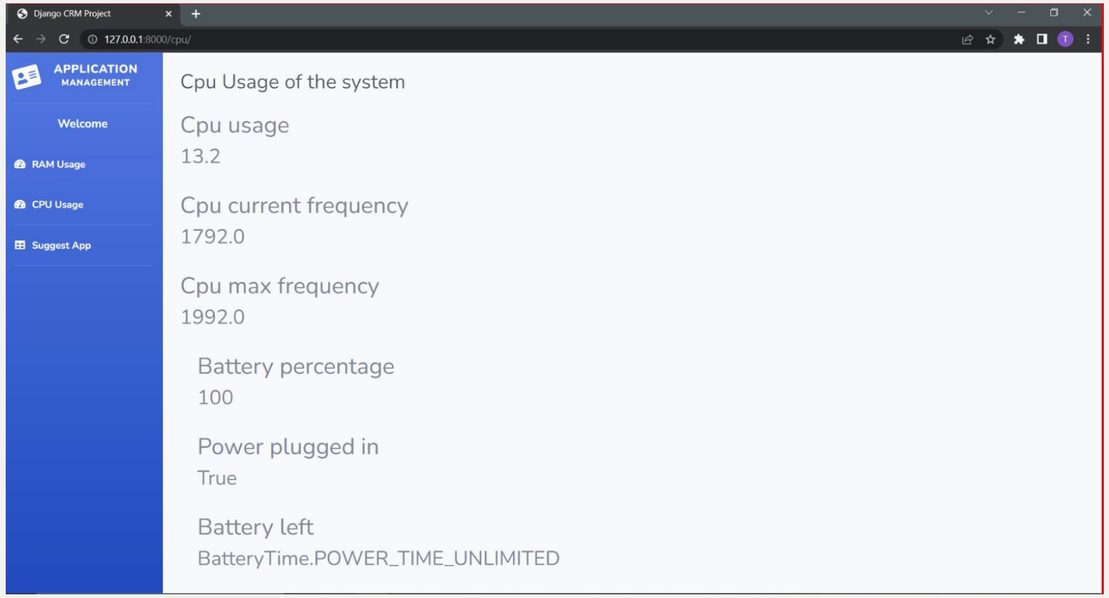
Current Progress

- Detect and initiate the performance and compatibility test for CPU and RAM usage in mobile and web application.
- Do a demonstration of the CPU and RAM usage with multiple background applications in mobile and web application.
- Perform a performance check on battery usage and display of the highest consumption of apps according to levels in the mobile application.

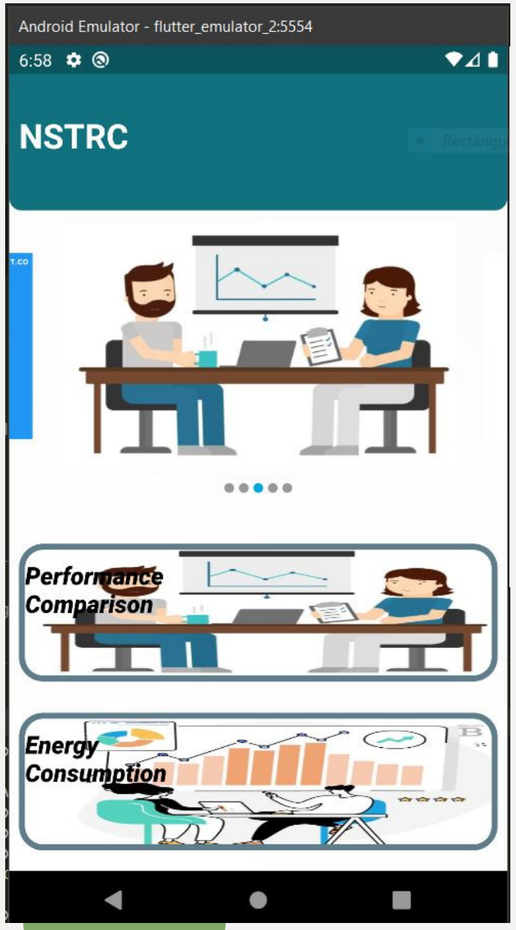
Project Evidence

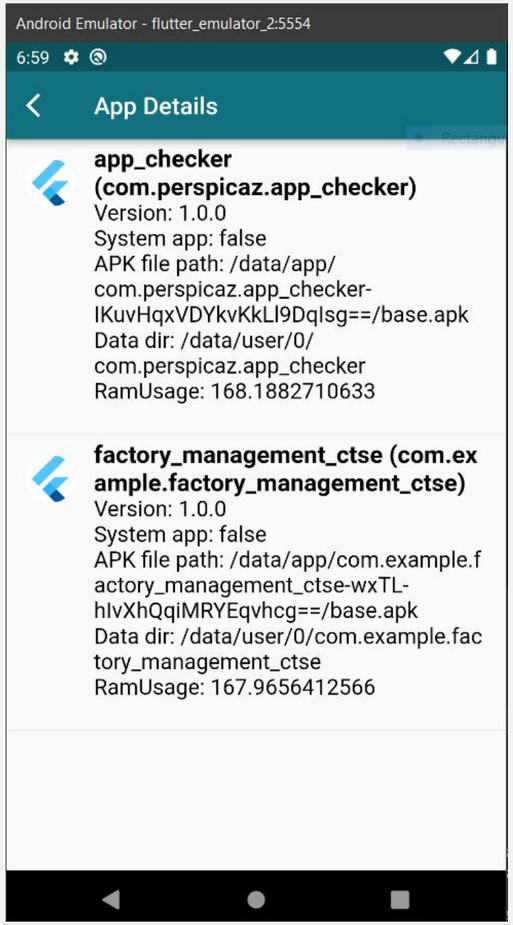
NSTRC

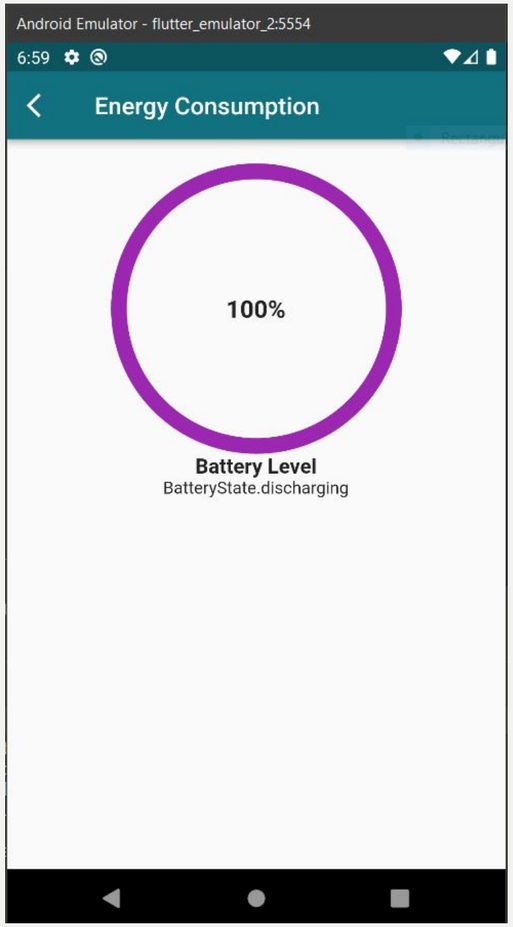




Project Evidence







Requirements

NSTRC

Functional requirements

1. SHOULD BE A FREE DOWNLOADABLE APPLICATION
2. DETECT THE DEVICE SPECIFICATIONS AND STORE THEM IN THE LOCAL DATABASE
3. GET INFORMATION ON THIRD-PARTY APP TO DETECT ANOMALIES.

Non-Functional Requirements

1. HIGH AVAILABILITY
2. EFFICIENCY OF PERFORMANCE
3. USER-FRIENDLINESS

References

[1] Couto, Marco & Carção, Tiago & Cunha, Jácome & Fernandes, João & Saraiva, João. (2014). Detecting Anomalous Energy Consumption in Android Applications. 77-91. 10.1007/978-3-319-11863-5_6.

[2] Himeur, Y., Alsalemi, A., Bensaali, F. et al. A Novel Approach for Detecting Anomalous Energy Consumption Based on Micro-Moments and Deep Neural Networks. Cogn Comput 12, 1381–1401 (2020). https://doi.org/10.1007/s12559-020-09764-y

IT19129440 – THIRANYA M.A.R.

Software Engineering

Research Problem

- How to identify the most suitable third-party application which matches user device performance and energy consumption ?
- How to identify what is the best suitable third-party application by providing the user requirement directly?

Research Objectives

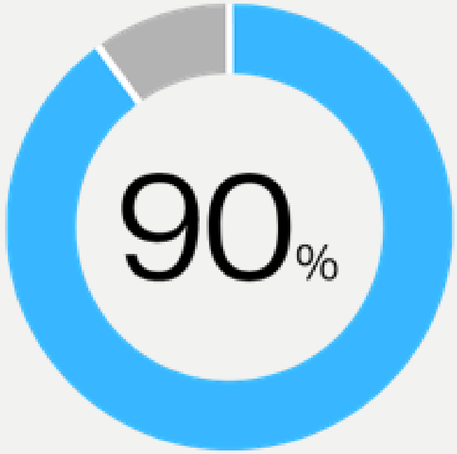
Main Objective

- Comparison of User device performance compatibility with the third-party application and suggest the most suitable third-party application.

Sub Objectives

- Identify the most suitable third-party application that matches the user's device.
- Identify different kinds of user requirements types.
- Suggest third-party applications according to priorities order.

Current Progress



- ✓ Collected a similar kind third party application of software dataset.
- ✓ Collected different types of user requirements datasets.
- ✓ Trained the datasets with the content base recommendation ML algorithm and NLP.
- ✓ Completed the suggestion of the most suitable third-party application according to the performance of the user's device.
- ✓ Completed the suggestion of the most suitable third-party application according to the performance of the user's device based on user requirements.

Objectives completion

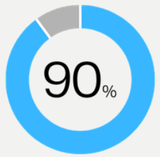
Dataset Preparing

Trained the datasets with the content base recommendation ML algorithm NLP.

Completed the suggestion of the most suitable third-party application according to the performance of the user's device and user requirements.

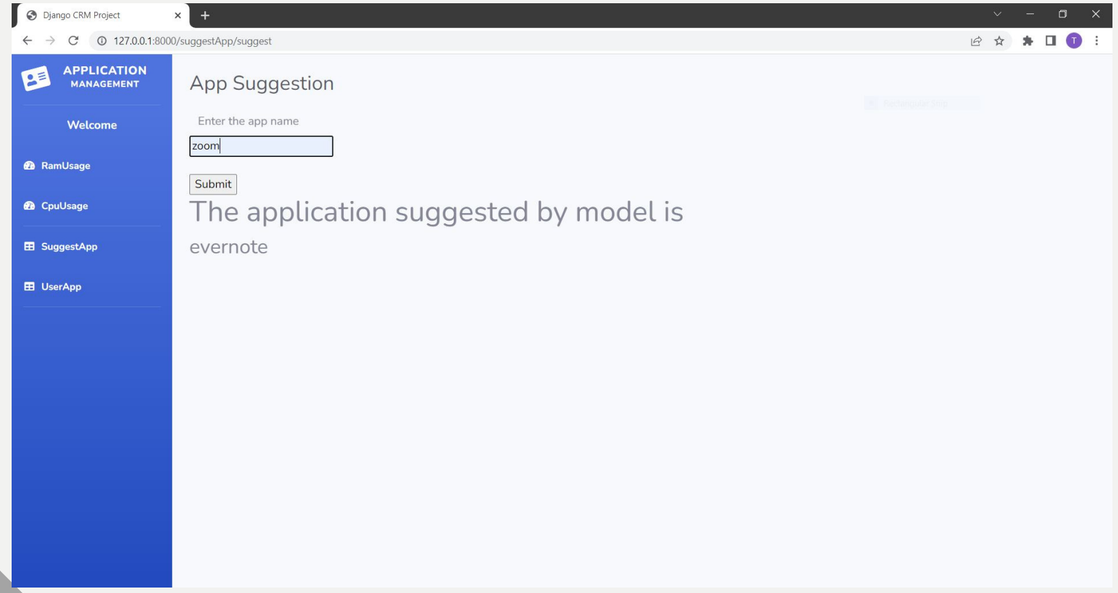
Completed the suggestion of the most suitable third-party application according to the performance of the user's device.

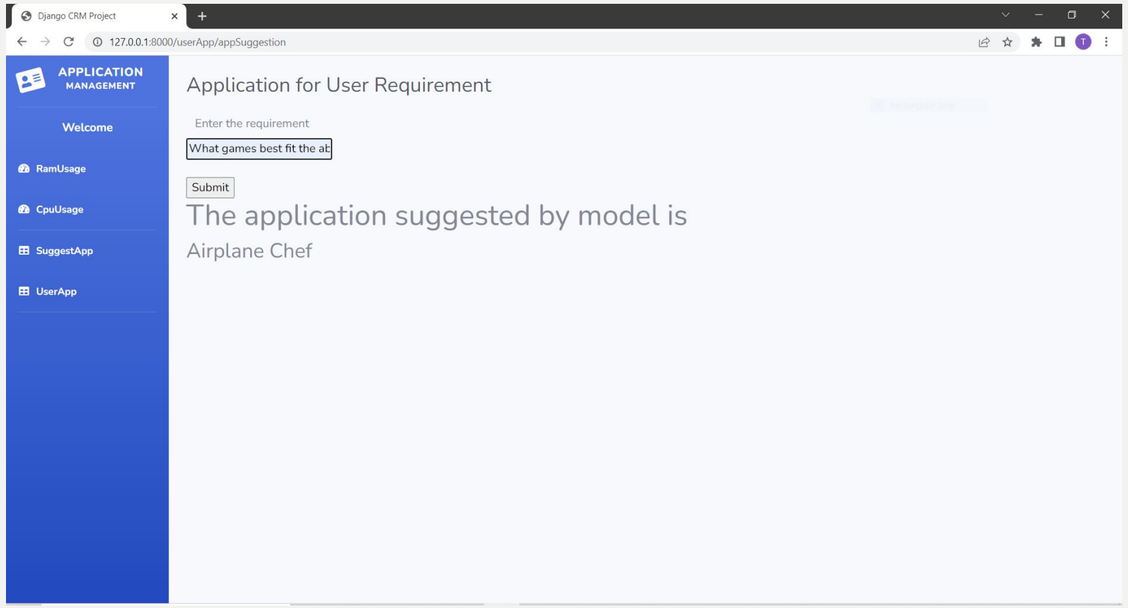
Completed the frontend for the web and mobile applications.



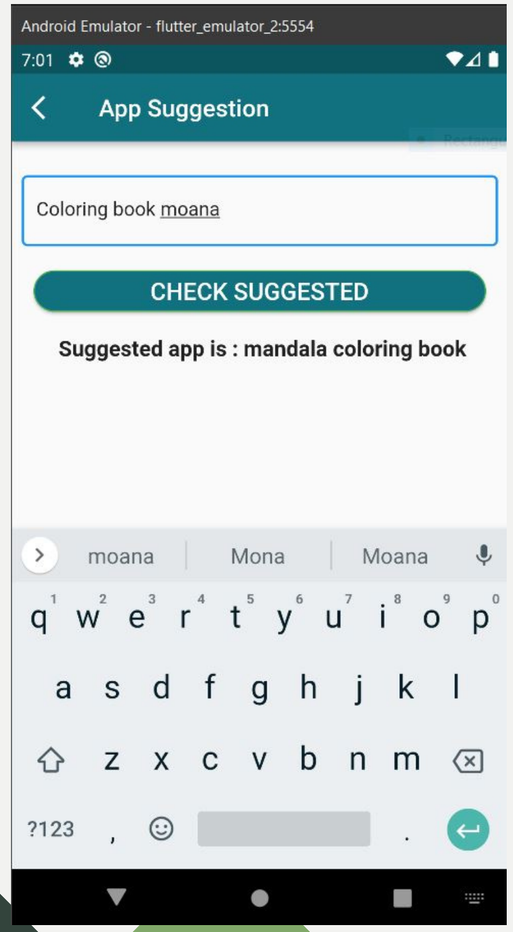
Project Evidence and Best Practices

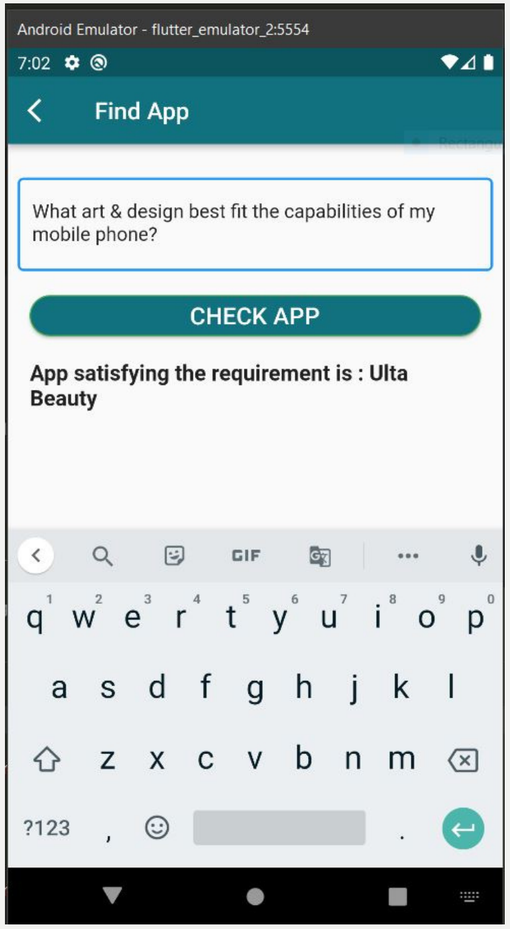
NSTRC

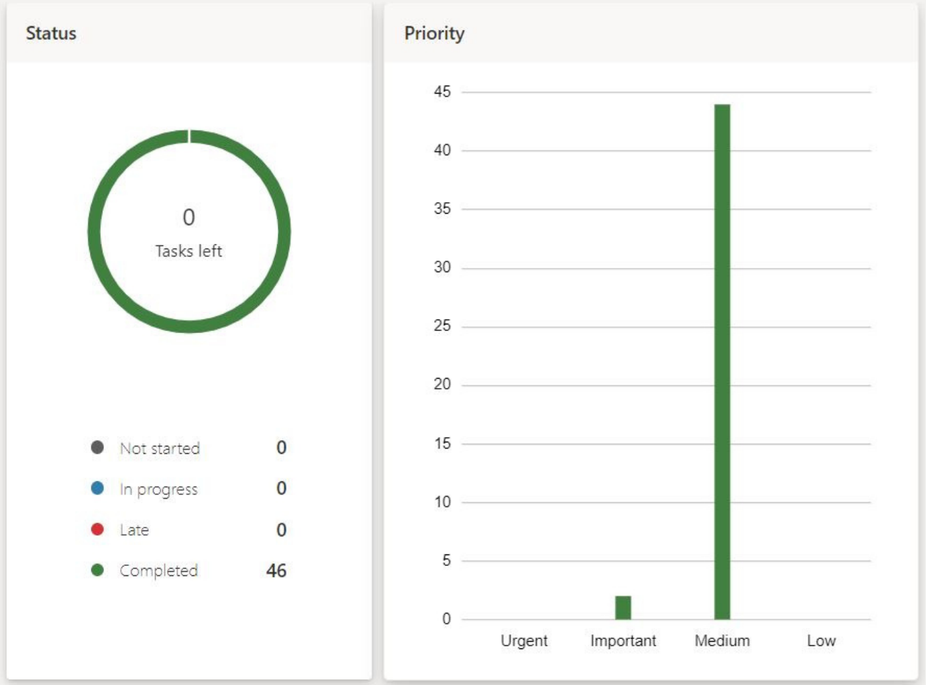




Project Evidence and Best Practices



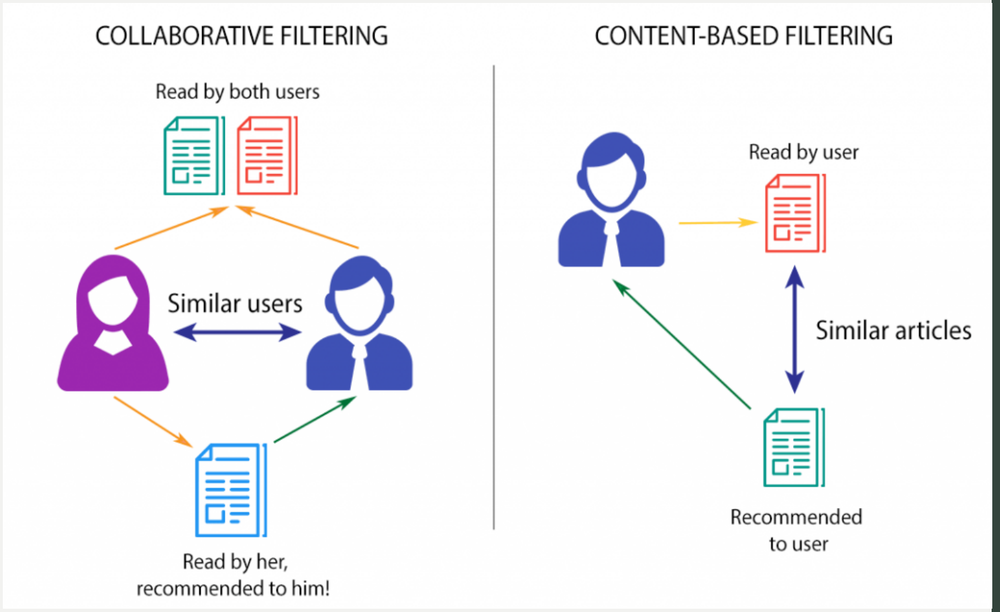




Technical Terms

In dataset training part

- Scikit-learn(sklearn) and keras used to create the model
- Used machine learning algorithm - Content-based recommendation - Django framework with django REST API
- Cosine similarity
- Natural Language Processing for identifying different kinds of user requirements - Keras framework with sequential API



In web and mobile application development part

- Django python-based framework is used jinger template for the web application front end development.
- Flutter framework used for mobile application frontend development.
- Django REST framework to create the web API for the web and mobile applications.

Requirements

Functional requirements

- Identified the user device performance level.
- Identify the third-party application performance level.
- Identify different kinds of user requirements.
- Suggest the most suitable third-party application according to the performance level and different kinds of user requirements.

User requirements

- Compatible with any smart device
- The processing speed should be high
- Data should be Reliable
- User Friendliness

References

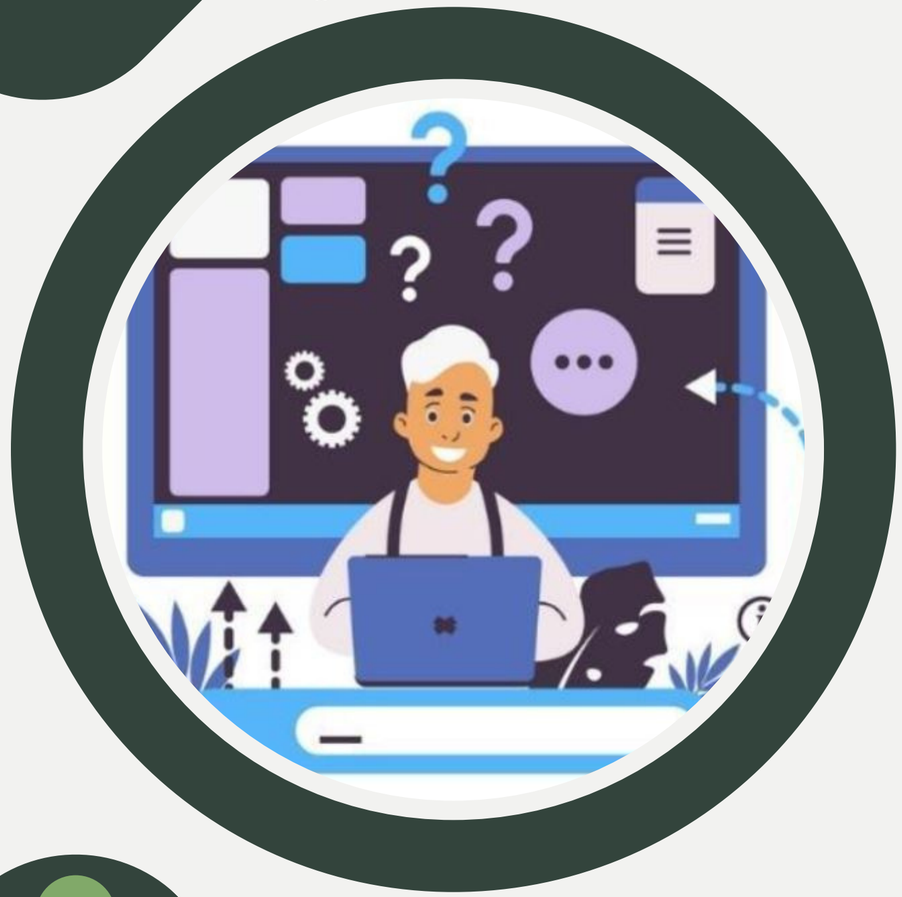
[1] Systemrequirementslab.com. 2022. Requirements Test. [online] Available at: <https://www.systemrequirementslab.com/cyri> [Accessed 14 October 2022].

[2] Zhenyu Liu, Yun Hu and Lizhi Cai, 2014. Research on software security and compatibility test for mobile application. Fourth edition of the International Conference on the Innovative Computing Technology (INTECH 2014),.

[3] Ki, T., Park, C., Dantu, K., Ko, S. and Ziarek, L., 2019. Mimic: UI Compatibility Testing System for Android Apps. 2019 IEEE/ACM 41st International Conference on Software Engineering (ICSE).

IT19048338 – JAYASINGHE H.M.C.P

Software Engineering



Research Problem

- Can every developer write quality code ?
- Is every working codes written with quality standards and better quality to manage the traffic?
- Does code quality and code maintainability affects the site performance?
- Does every developer know about the how to improve the site speed and how it be done?

Research Objectives

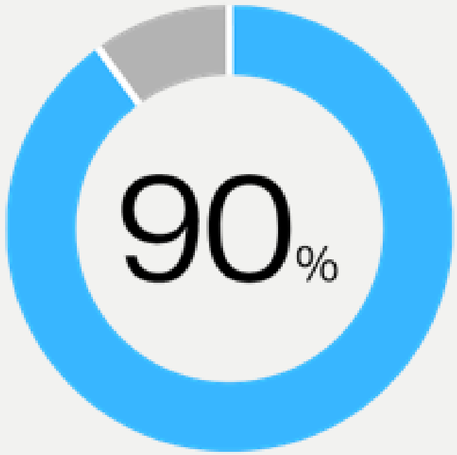
Main Objective

- Detection of the Developer’s code performance level, code quality level and speed level. Provide suggestions to improve the speed level and performance.

Sub Objectives

- Collect data set and find a better solution architecture.
- Develop a package to identify maintenance index, code smells and performance score.
- develop a algorithm to identify java project code metrics.
- Develop a application with wrap all the developed components and generate reports and visualization. (backend and frontend apps)
- intigrate search engine for search performance improvements and code quality related things.

Current Progress



- Collect data set and find a better solution architecture.
- Develop a package to identify maintenance index, code smells and code analysis metrics performance score
- Develop an algorithm to get java code metrics
- Develop an application and wrap all the developed components and generate reports and visualization.
- Integrate Search Engine

Project Evidence and Best Practices

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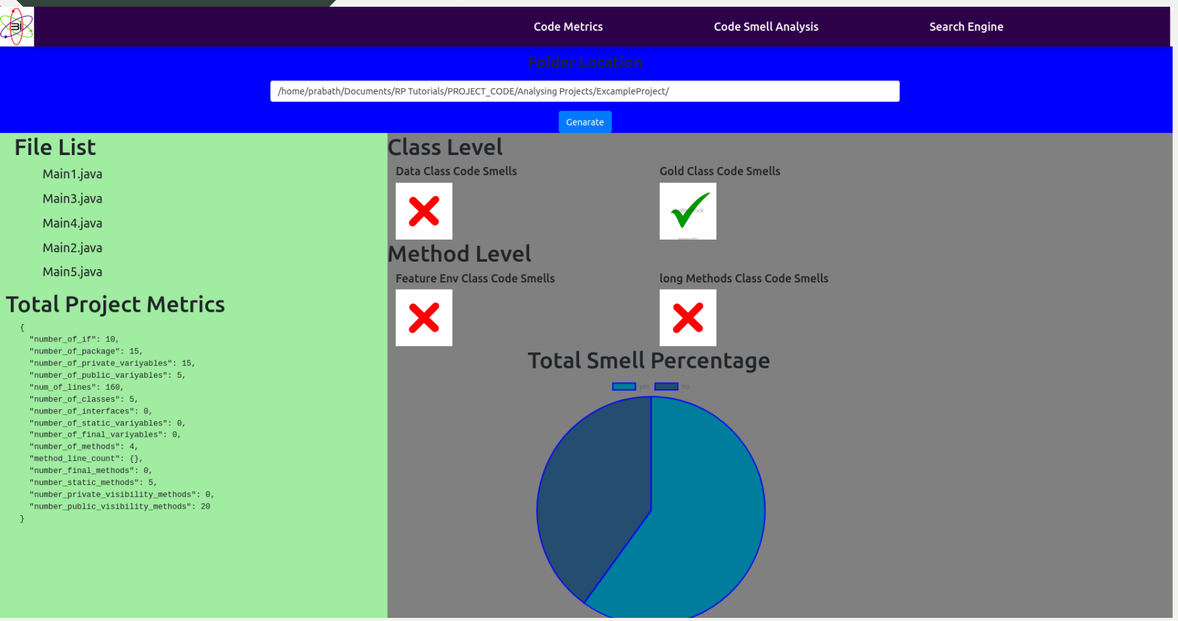
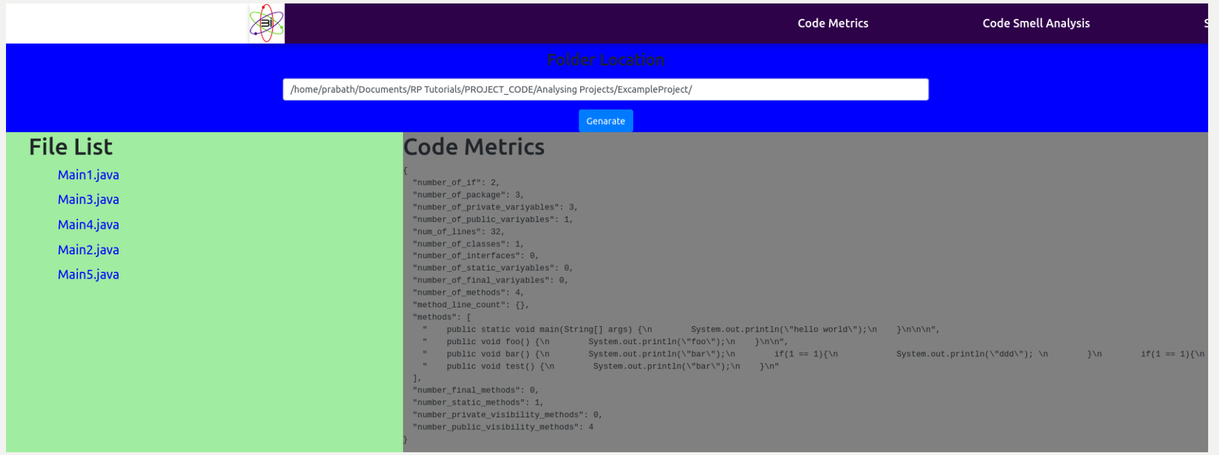
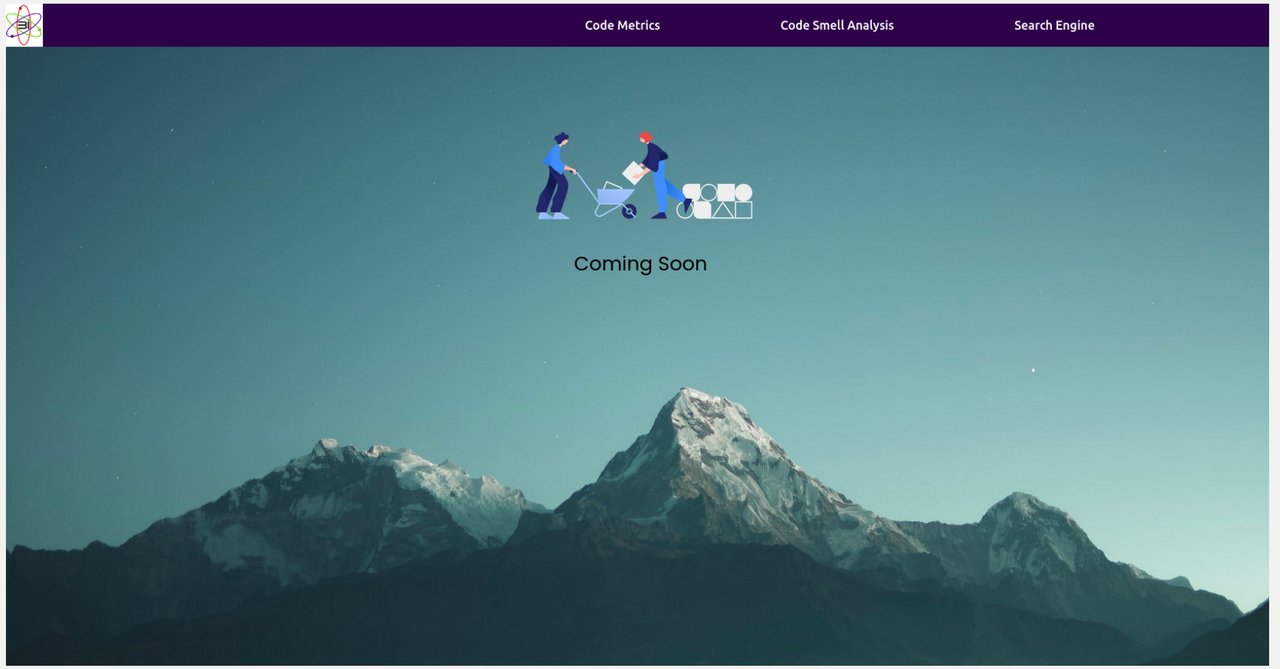
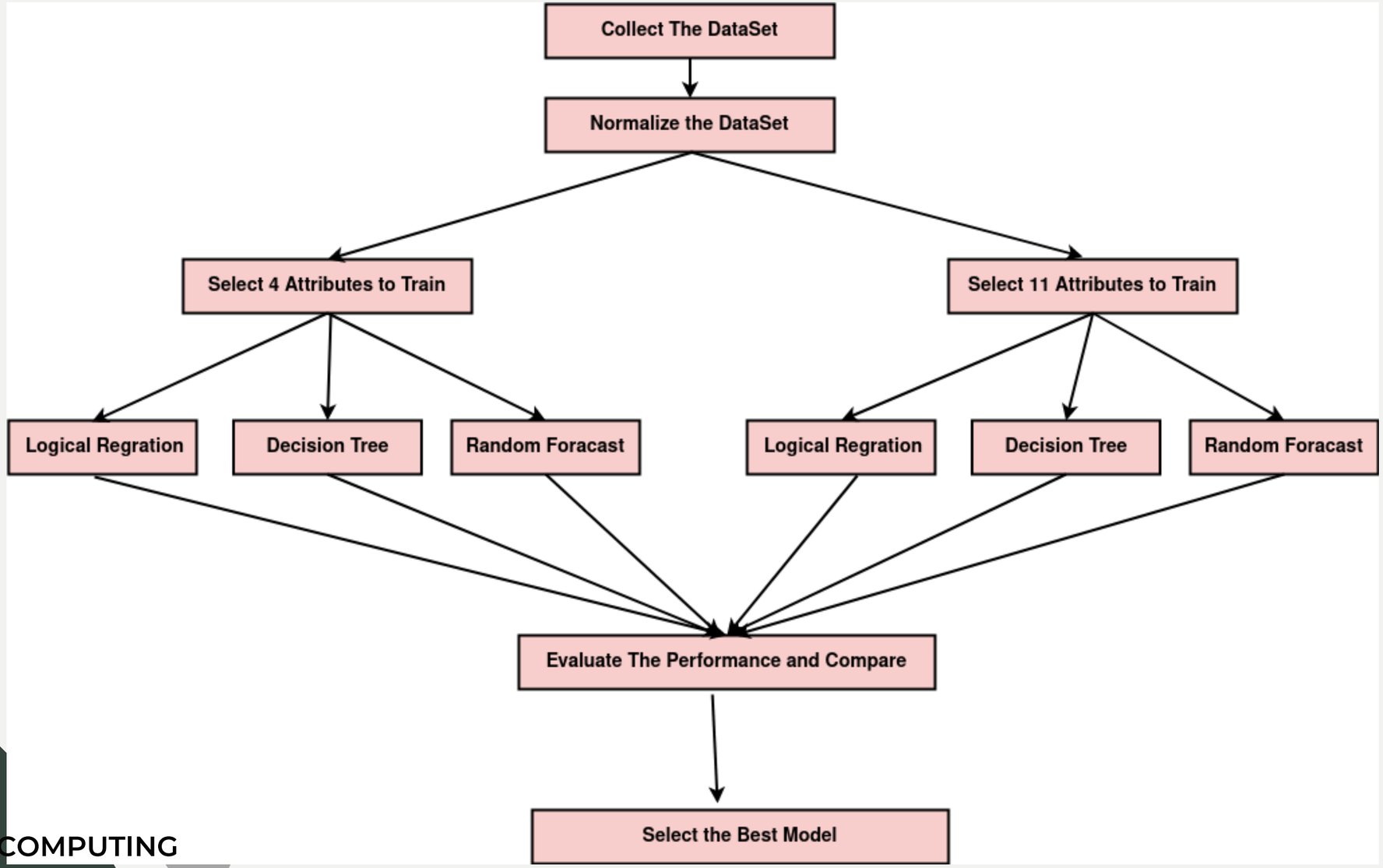






Research Methology and Evidence for Research



Research Methology and Evidence for Research

	Logistic Regression						Decision Tree						Random Forest					
	With 4 parameters			With 11 parameters			With 4 parameters			With 11 parameters			With 4 parameters			With 11 parameters		
	Recall	F1	Accuracy	Recall	F1	Accuracy	Recall	F1	Accuracy	Recall	F1	Accuracy	Recall	F1	Accuracy	Recall	F1	Accuracy
Data Class	0.14	0.22	0.66	0.64	0.65	0.77	0.92	0.86	0.904	1	0.54	0.44	0.35	0.43	0.69	0.75	0.77	0.85
God Class	0.17	0.29	0.71	0.89	0.94	0.96	0.82	0.9	0.94	1	1	1	0.53	0.58	0.9	0.92	0.92	0.95
Feature-Envy	0.14	0.23	0.69	0.28	0.41	0.72	0.57	0.69	0.83	0.71	0.8	0.88	0.39	0.44	0.66	0.46	0.56	0.76
Long-Param	0.14	0.22	0.66	0	0	0.66	0.89	0.75	0.8	0.5	0.56	0.73	0.57	0.55	0.69	0	0	0.66

Requirements

Functional requirements

1. INSTALLABLE APPLICATION FROM THE WEB.
2. INSTALLABLE PACKAGE MANAGER FROM THE WEB.
3. GIVE SUGGESTIONS TO IMPROVE SITE SPEED BY USING SEARCH ENGINE

Non-Functional Requirements

1. SHOULD BE COMPATIBLE WITH ANY OF THE OS.
2. ANALYZING SPEED SHOULD BE HIGH.
3. USER FRIENDLY GUI FOR TESTING TOOL.

References

- Himeur, Y., Ghanem, K., Alsalemi, A., Bensaali, F. and Amira, A. (2021). Artificial intelligence based anomaly detection of energy consumption in buildings: A review, current trends and new perspectives. Applied Energy, [online] 287, p.116601. doi:10.1016/j.apenergy.2021.116601.
- Eid, S., Makady, S. and Ismail, M. (2020). Detecting software performance problems using source code analysis techniques. Egyptian Informatics Journal, 21(4), pp.219–229. doi:10.1016/j.eij.2020.02.002.

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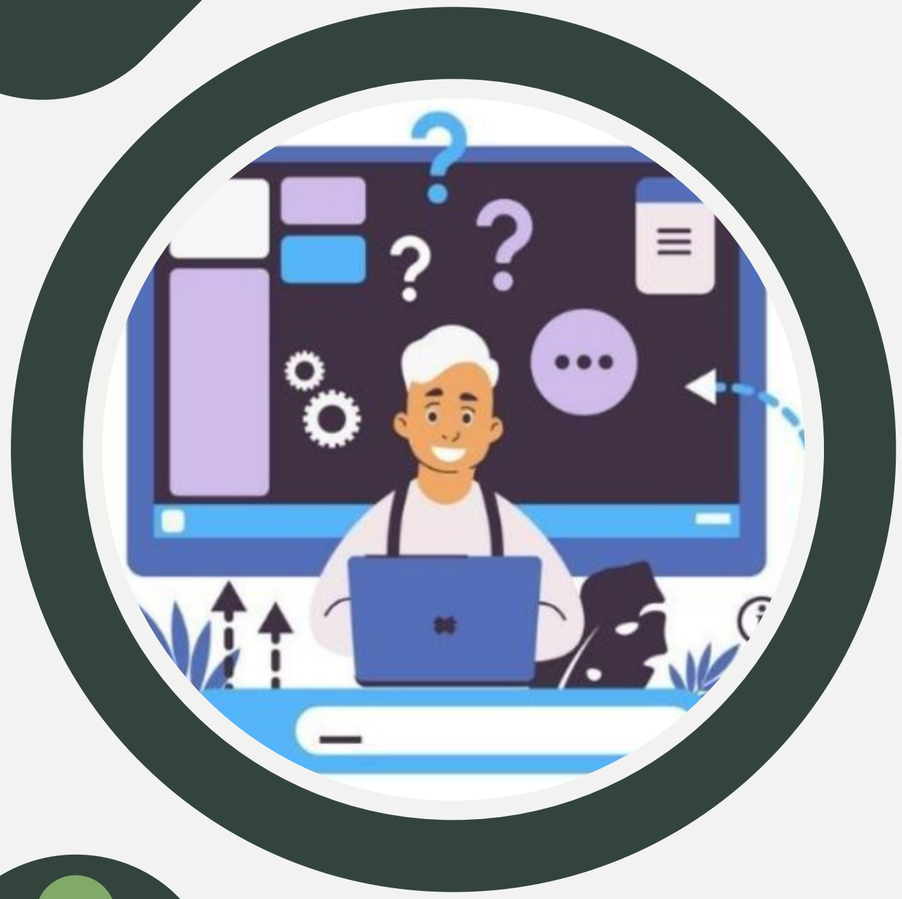


Research Problem

- Developers always must ensure the efficiency of their software Programs
- Currently they do not have a proper way of providing a quality code to QA testers

Research Objectives

Main Objective

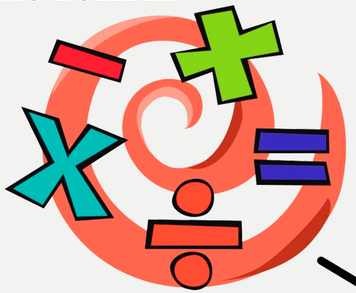
- Development of Code scanner algorithem
- Create two Machine learning Model to predict defective value and Overall complexity
- Development of Equations Builder
- Development of Recursive CSS function to Draw abstract view

Sub Objectives

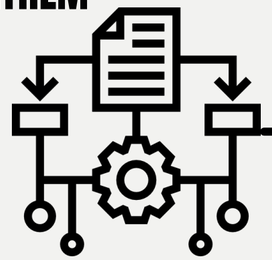
- Create the Front end that uses the code scanner, Equations builder, CSS function
- Create the backend that connect with the two ML models
- Identify Syntax Code Mistakes when Code scanner running

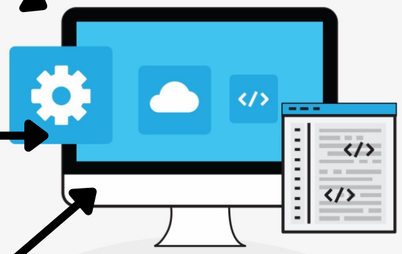
System Diagram

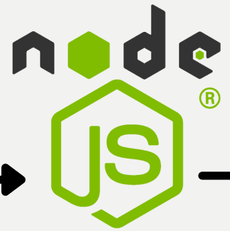
EQUATIONS BUILDER



CODE SCANNING ALGORITHEM

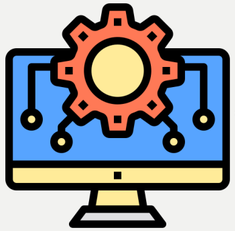




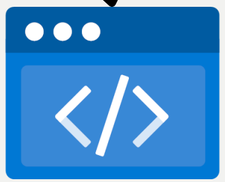


NODE BACKEND

ML MODEL

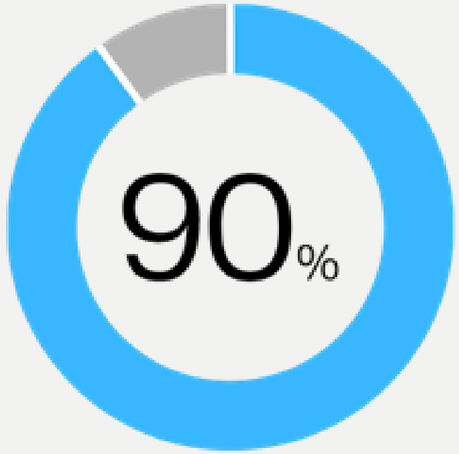


CSS RECURSIVE LOGICAL FUNCTION



ML MODEL

Current Progress



- Development of Code scanner algorithem ✓
- Create two Machine learning Model to predict defective value and Overall complexity ✓
- Development of Equations Builder ✓
- Development of Recursive CSS function to draw abstract view ✓

Project Evidence and Best Practices

NSTRC

it Javascript developer code Scanner

defects:0.021032548035212185 | **Code overall Complexity:**

mcCabe's lines of code: 13	mcCabe's cyclomatic complexity:
halstead's volume: 62.26976913547135	halstead's program difficulty: 2.25
mcCabe's essential Complexity:	halstead's effort: 140.10698055481055
mcCabe's design complexity:	halstead's program length: 28.75488750216347
halstead's total operands and opertaors: 18	halstead's intelligance: 27.67545294909838

Put your code here..

```
let a = 2;
if(x>1){
let b = 8;
}
class Point {
    def constructor(x, y) {
        this.x = x;
```

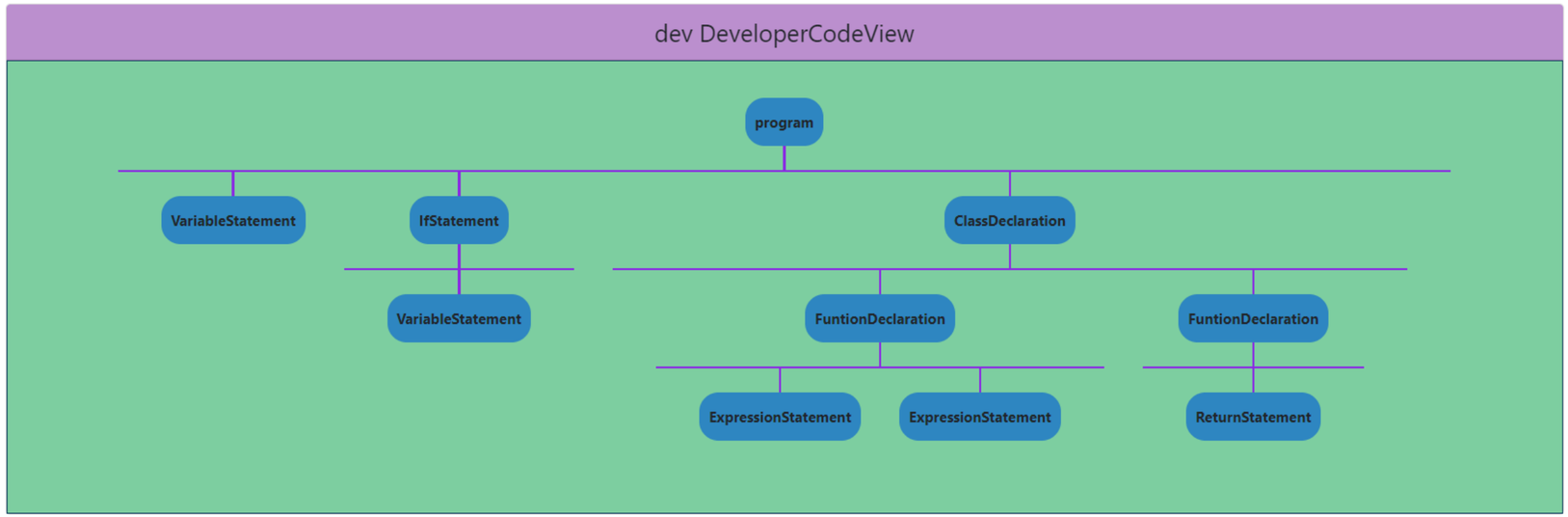
Gigabit Javascript developer code Scanner

Developer Json View


```
{
  "type": "Program",
  "body": [
    {
      "type": "VariableStatement",
      "declarations": [
        {
          "type": "VariableDeclaration",
          "id": {
            "type": "Identifier",
            "name": "a"
          },
          "init": {
            "type": "NumericLiteral",
            "value": 2
          }
        }
      ]
    },
    {
      "type": "IfStatement",
      "test": {
        "type": "BinaryExpression",
```


Javascript developer code Scanner

dev DeveloperCodeView



Requirements

Functional requirements

- Equations builder working accurately
- Machine learning Model will Predict the accurate outcomes
- Code scanner algorithem run effectively
- Recursive logical CSS function run smoothly

User requirements

- Developer can input his JavaScript code and see abstract view
- Developer can see the defective Number and overall complexity
- Developer can see the Deep view of his JS code
- Developer can see his JS code status

References

- Himeur, Y., Ghanem, K., Alsalemi, A., Bensaali, F. and Amira, A. (2021). Artificial intelligence based anomaly detection of energy consumption in buildings: A review, current trends and new perspectives. Applied Energy, [online] 287, p.116601. doi:10.1016/j.apenergy.2021.116601.
- Eid, S., Makady, S. and Ismail, M. (2020). Detecting software performance problems using source code analysis techniques. Egyptian Informatics Journal, 21(4), pp.219–229. doi:10.1016/j.eij.2020.02.002.

DEMO