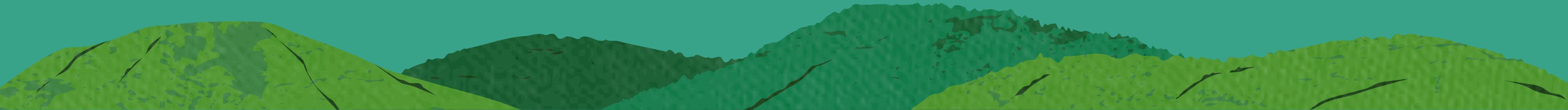




ECO2

Software Engineering Group 7



목차

01

Overview

- 사용한 FE tool
- 사용한 BE tool
- Web overview

02

Goal

- Goal
- 세부 Goal
- 서비스 제안

03

Work Flow

- Team
- Work flow

04

UI/UX 시나리오

- UI/UX 시나리오
- 홈페이지 기능 설명

05

그린화 패턴

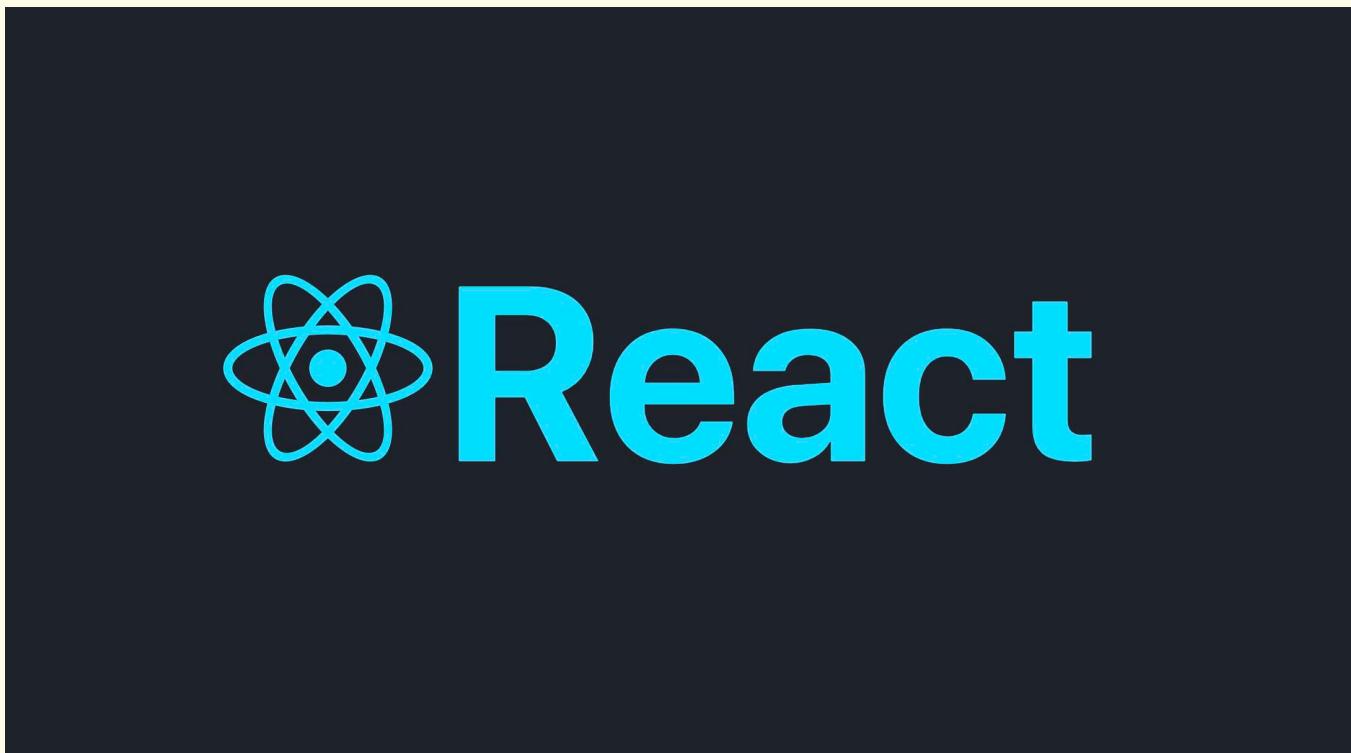
- Carbon calculator
- 그린화 패턴 발견 과정

01

Overview



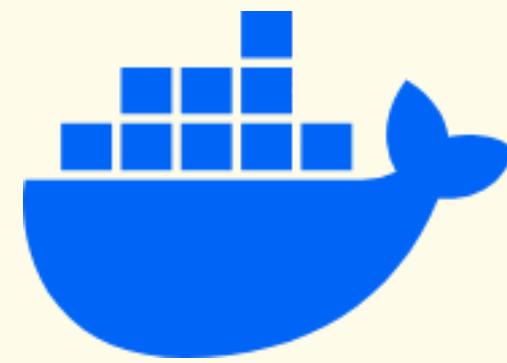
✓ 사용한 tool - Frontend



✓ 사용한 tool - Backend

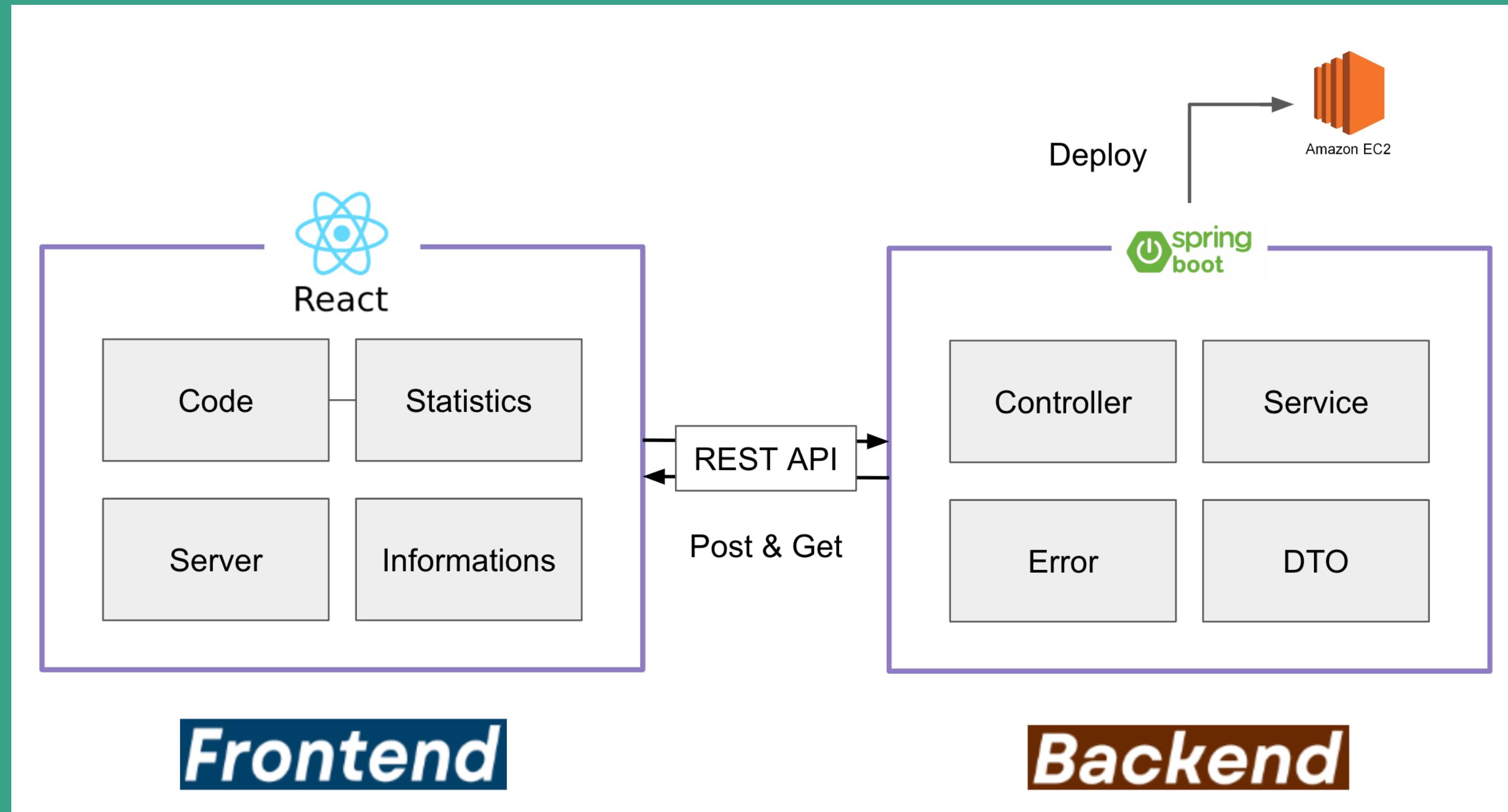


spring boot



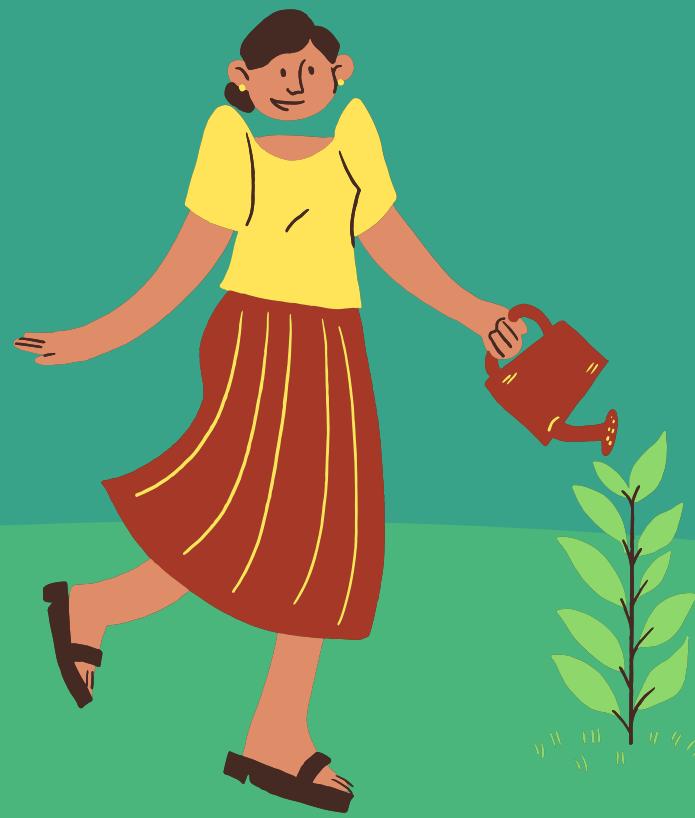
docker

✓ Web Overview



02

Goal

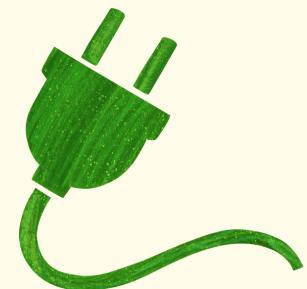


✓ Goal

- 입력된 자바 코드의 탄소배출량을 수치적, 시각적으로 제공하는 웹 서비스를 제공
- 코드 작성자로 하여금 경각심 및 환경보전을 위한 코드 작성 유발



✓ 세부 Goal



작성된 코드의 탄소 배출
량을 수치적으로 제공



다른 대상의 탄소배출량
과 비교, 시각자료 제공



코드 작성자에게 환경에
미치는 영향에 대한 경각
심 유발



궁극적으로 환경보전을
위한 친환경 코드작성을
유도

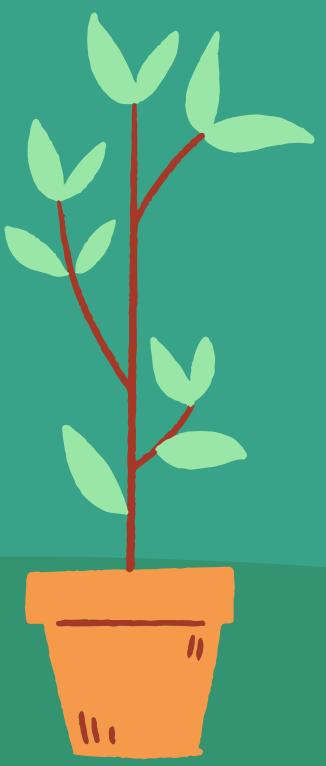
✓ ECO2:탄소 배출량 측정 프로그램



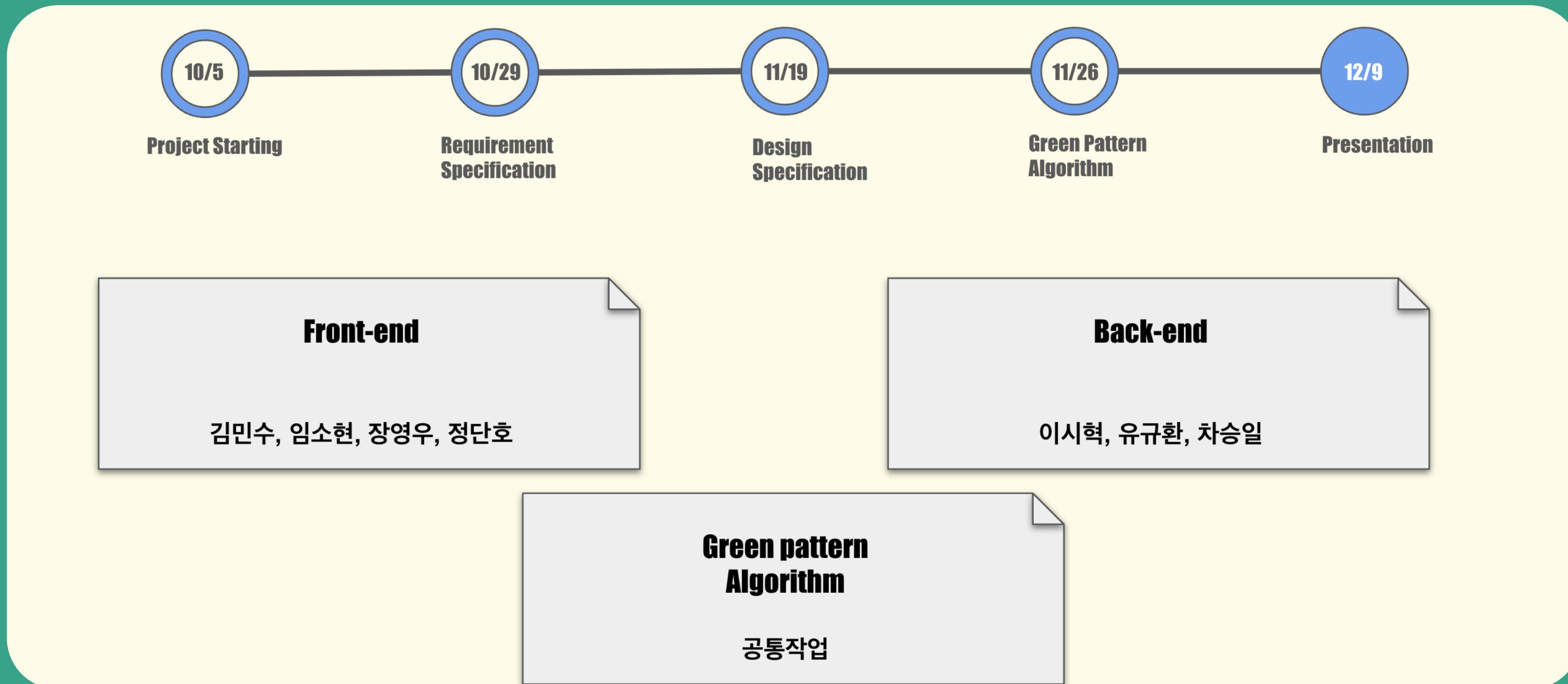
- ✓ 입력된 자바 코드에 악성코드 포함여부 확인
- ✓ 코드의 정상적인 컴파일 여부 확인
- ✓ 제한시간 10초 이내 실행여부 확인
- ✓ 탄소배출량 계산 및 관련 시각 자료 제공

03

Work Flow



✓ Team



Work flow

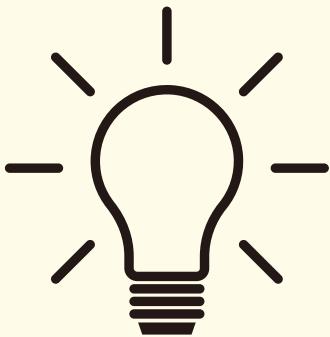
04

UI/UX 시나리오



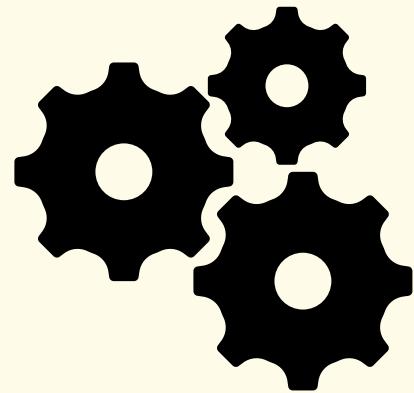
✓ UI/UX 시나리오

Convenience



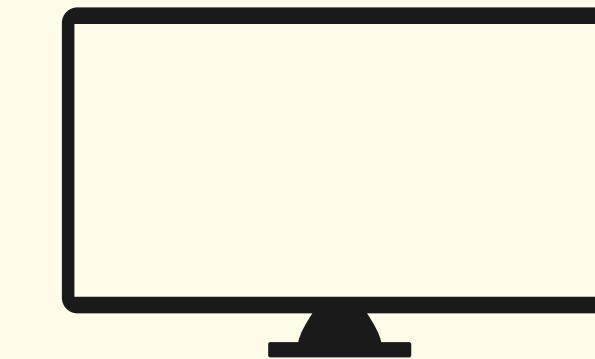
- 회원가입, 로그인 없이 곧바로 사용 가능

Customizable



- Server HW 정보의 custom 기능
- 사용자가 직접 서버 정보를 변경함에 따라 달라지는 탄소배출량 확인 가능

Intuitive



- 홈 (코드 & 통계 지표) 와 서버 (하드웨어 정보) 페이지 분리
- 부기능인 서버 정보 입력력 없이도 코드 입력력 후 각종 통계 및 그래프 곧바로 확인 가능

✓ Homepage

The screenshot shows the homepage of the ECO2 platform. On the left, a sidebar is visible with the following navigation options:

- ECO2
- Home
- Server
- Info

The main content area is divided into two sections. The top section is titled "Input Java Code" and contains a code editor with the following Java code:

```
1. public class Main {  
2.     public static void main(String[] args) {  
3.         System.out.println("Hello, world!");  
4.     }  
5. }
```

Below the code editor are two buttons: "Clear" (red) and "Submit" (green).

The bottom section is titled "Statistics Overview" and features a small purple cartoon character icon. To the right of the icon, the text "0.0000 g CO2e" and "carbon footprint" is displayed.

Two red callout boxes with arrows point to specific elements:

- A box labeled "Sidebar Server, Info 페이지로 이동 가능" points to the "Server" and "Info" items in the sidebar.
- A box labeled "Code, Statistics, Graph 확인" points to the "Submit" button and the "Statistics Overview" section.

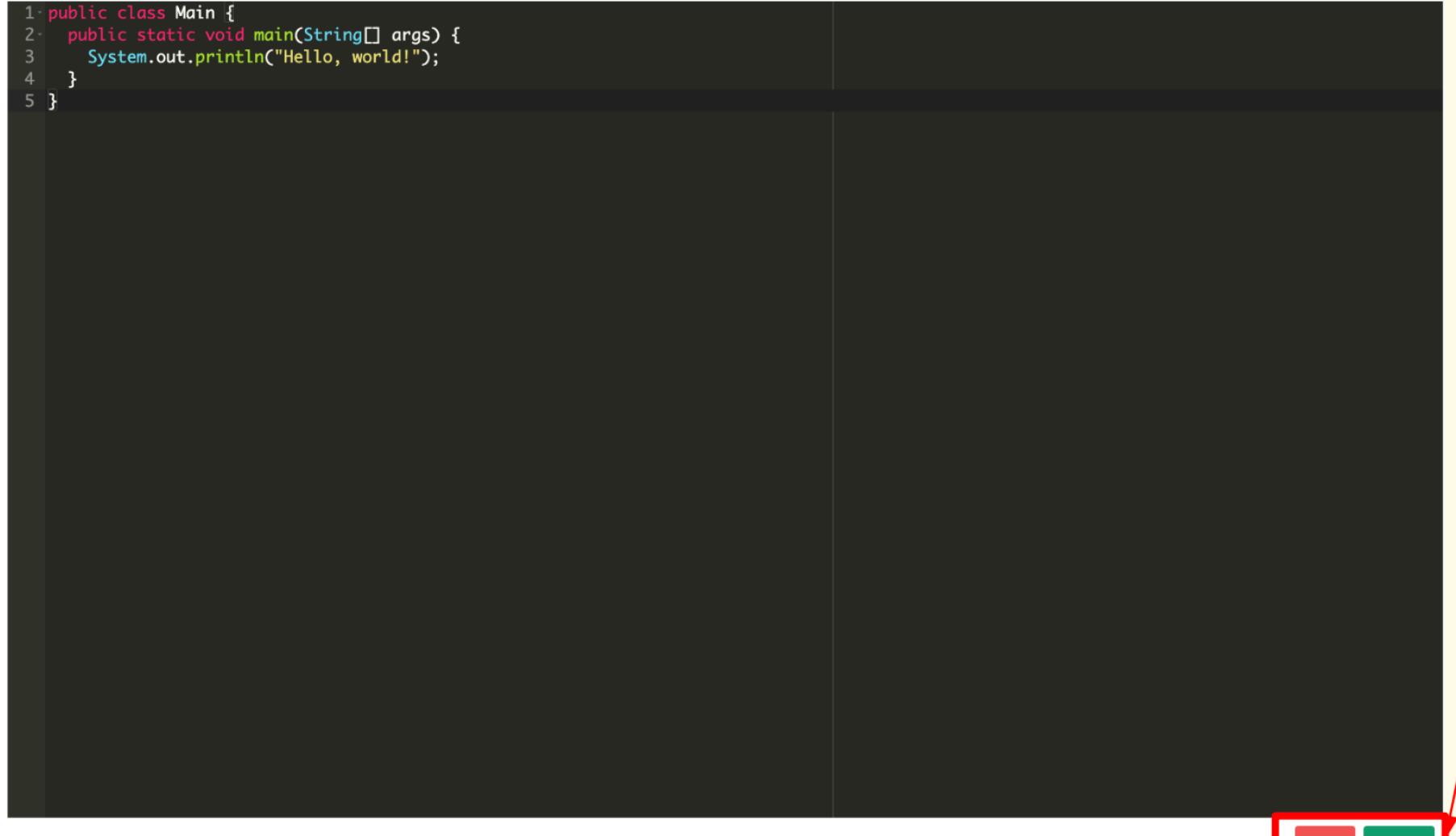
✓ Homepage - code

Input Java Code

```
1 public class Main {  
2     public static void main(String[] args) {  
3         System.out.println("Hello, world!");  
4     }  
5 }
```

코드 입력시 코드 창의 높이를 늘리도록 하여 사용자의 편의성 증가

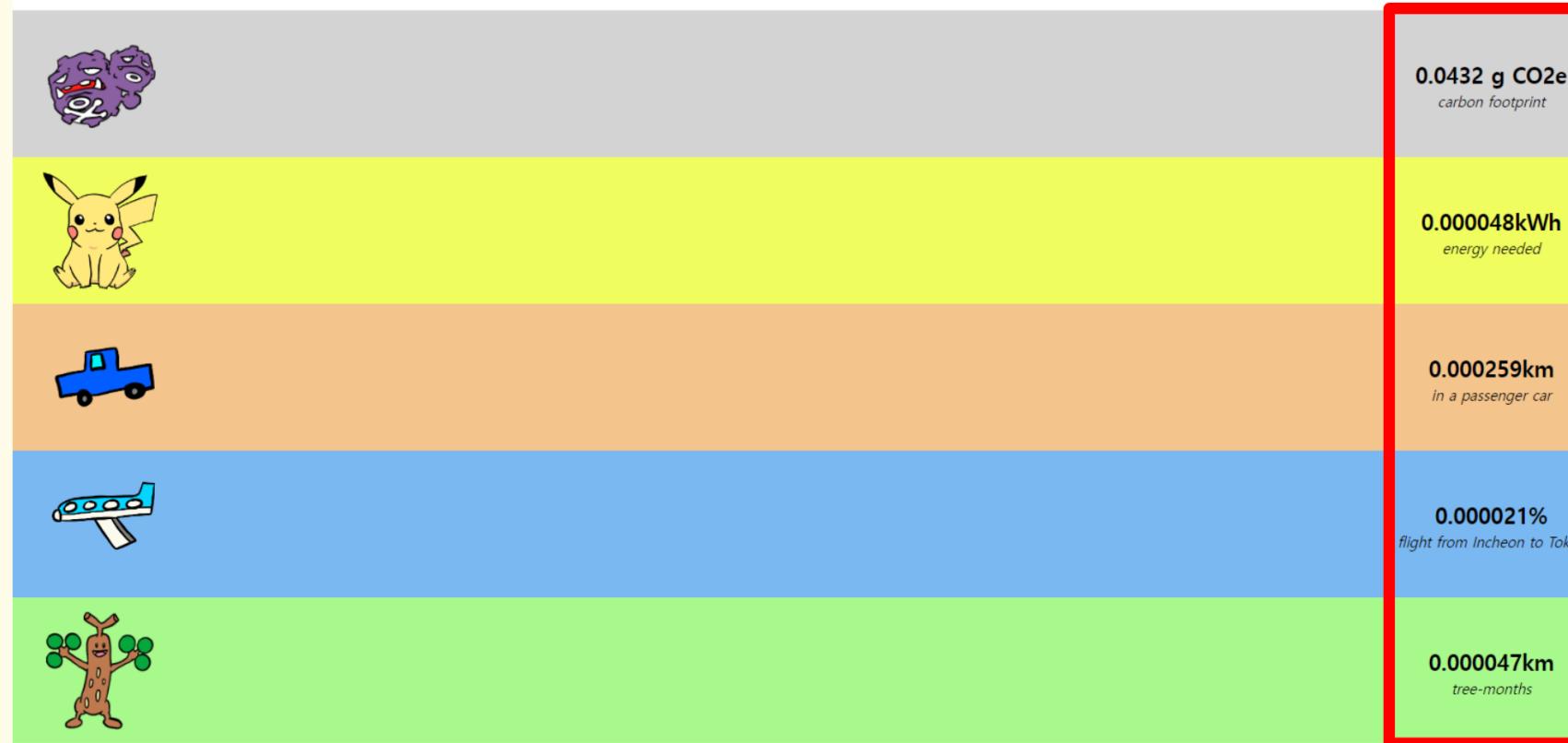
코드 입력 후 submit 버튼 클릭, clear 버튼 클릭시 코드 초기화



The screenshot shows a dark-themed code editor with the Java code above. Below the editor is a white toolbar containing two buttons: 'Clear' (red background) and 'Submit' (green background). A red arrow points from the explanatory text on the left to the top of the code editor. Another red arrow points from the explanatory text on the right to the 'Submit' button.

✓ Homepage - statistics

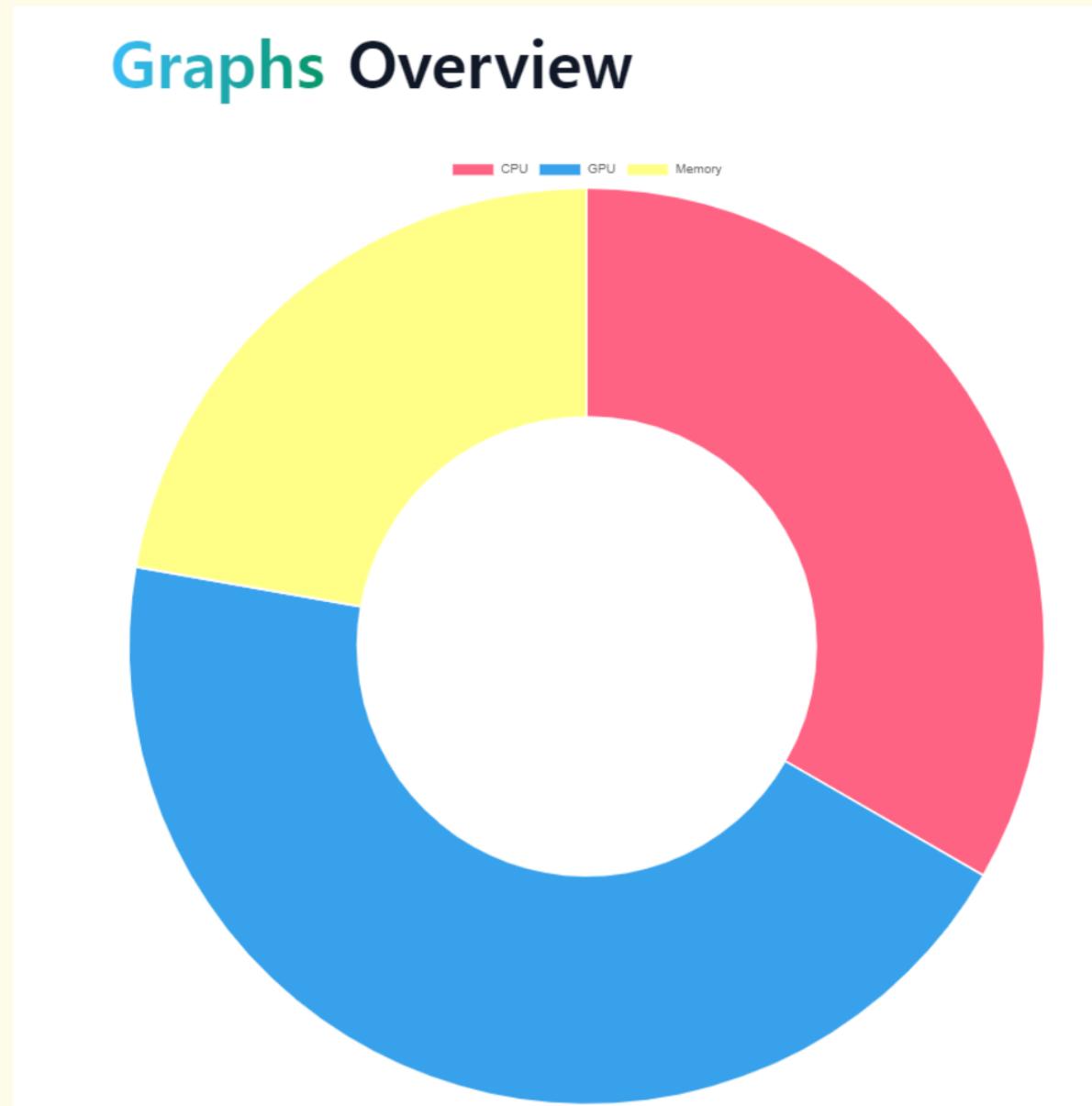
Statistics Overview



코드 입력 후
5가지 통계자료 확인 가능

- carbon footprint
- energy needed
- in a passenger car
- flight from Incheon to Tokyo
- tree-months

✓ Homepage - graphs



탄소 배출량 계산시 사용된
cpu, gpu, memory 비율 시각화
→ 그래프에 마우스 올리면 수치 출력

✓ Server page

The screenshot shows a web-based server configuration interface. On the left, a sidebar menu includes 'ECO2' (selected), 'Home', 'Server' (selected), and 'Info'. The main content area is titled 'Server Setting' and contains the following information:

Check the server information. And check the changing information by changing it to the desired figure.

Memory	PSF	PUE
8 Core : 8 Model : Intel Core i9-14900K Usage : 0.8 CPU	2.7 Core : 7 Model : WRadeon 520 Usage : 0.7 GPU	1.0 NORTH_AMERICA Canada New Brunswick Location

A red box highlights the hardware configuration section (CPU, GPU, Location) with an annotation: "현재 하드웨어 정보 파악 및 코어 유형 (cpu, gpu), memory, location, psf 값 직접 변경 가능". A red arrow points from this annotation to the highlighted area.

A red box highlights the top-level server information (Memory, PSF, PUE) with an annotation: "memory, psf, pue, cpu, gpu, location 정보 확인". A red arrow points from this annotation to the highlighted area.

✓ Server page - customize HW

The screenshot shows a server configuration interface with a sidebar on the left and a main configuration panel on the right.

Left Sidebar:

- Types of Core** (highlighted with a red box)
- Memory
- PUE
- PSF
- Location

A red arrow points from the "Types of Core" section in the sidebar to the "Type of Core" section in the main panel.

Main Configuration Panel:

Type of Core (dropdown menu: Both)

CPU

- Number of core: 8
- Usage: 0.8
- Model: Intel Core i9-14900K

GPU

- Number of core: 7
- Usage: 0.7
- Model: WRadeon 520

Types of core - both / cpu / gpu 선택 및
각 코어 개수 및 사용량, 모델 이름 변경 가능

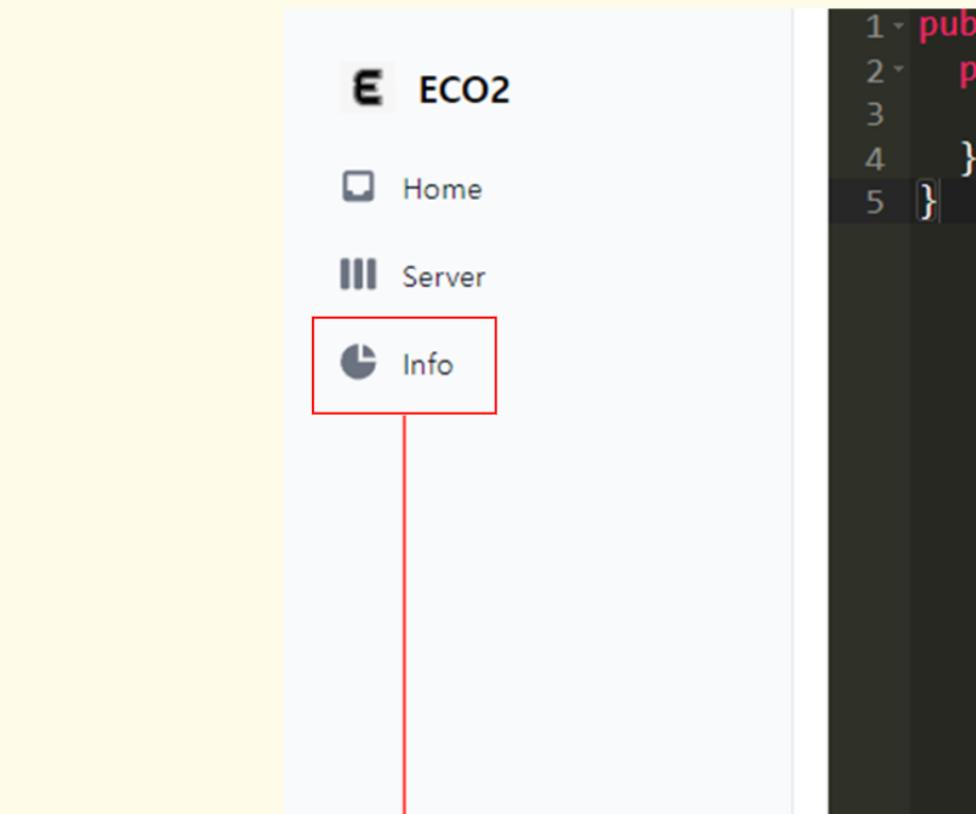
✓ Server page - customize HW

The screenshot displays a server configuration interface with various customization options:

- Types of Core:**
 - Memory** (highlighted with a red box)
 - PUE
 - PSF
 - Location** (highlighted with a red box)
- Memory:** A section showing the current configuration:
 - Memory** (highlighted with a red box)
 - A value input field set to **8**, with decrease (-) and increase (+) buttons.
- Location:** A section showing location details:
 - Location** (highlighted with a red box)
 - Continent: NORTH_AMERICA (dropdown menu)
 - Country: Canada (dropdown menu)
 - Region: New Brunswick (dropdown menu)

Location - Continent, Country, Region 보기에서 선택 및 변경

✓ UI/UX - info



“Info” 버튼을 클릭하면 본 서비스에 대한 정보를 제공하는 페이지로 이동

Problem : CO2
As carbon emissions continue to increase due to various human activities, carbon dioxide concentrations increase, accelerating global warming. This causes extreme climate events such as droughts more frequently around the world, raising average temperatures, and severely affecting the global ecosystem.
We need to be aware of the seriousness of carbon emissions to the global ecosystem.

What is Green Software?
It refers to software that is developed and operated in an environmentally friendly way. Energy efficiency, reusability, recyclability, and sustainability are considered important factors. It aims to minimize power consumption and reduce its long-term impact on the environment. It can be achieved through methods such as code optimization and energy-efficient algorithm use. Reduce unnecessary SW power consumption for the planet!

Services Provided
Calculate the carbon emissions of the user's Java source code and provide the results. The result value allows the user to work on code optimization, and continuously check carbon emissions in the process. The calculation results are replaced not only by figures, but also by carbon emissions from various means of transportation, making them more visually visible.

Carbon Emissions Formula
 $\text{carbon footprint} = \text{energy needed} * \text{carbon intensity}$
Where the energy needed is:
 $\text{runtime} * (\text{power draw for cores} * \text{usage} + \text{power draw for memory}) * \text{PUE} * \text{PSF}$
The power draw for the computing cores depends on the model and number of cores. The memory power draw only depends on the size of memory available and the usage factor corrects for the real core usage. The PUE (Power Usage Effectiveness) measures how much extra energy is needed to operate the data center. The PSF (Pragmatic Scaling Factor) is used to take into account multiple identical runs.

Input Method
Users can configure their hardware environment in the 'server' sector.
Type of cores: CPU, GPU, both options are available.
number of cores: Users can choose the number of cores.
usage: The ratio at which the processor operates at maximum performance. The default value is 1, and users can set a decimal value between 0 and 1 if necessary.
model: The type of model used for calculations, used to calculate Thermal Design Power (TDP) per core.
memory: The available memory, measured in GB.
pue(Power Usage Effectiveness): Reflects the data center's power usage efficiency, the ratio of total energy consumption to the energy supplied to IT equipment. The default value is 1.
psf(Power Scaling Factor): A power scaling coefficient used to adjust the system's power usage. The default value is 1, and users can adjust it if necessary.
location(Location): The value necessary for calculating carbon intensity, indicating how much carbon the electricity in the corresponding country emits.
In the 'Home' sector, users can input Java code.
Clear button: Users can reset the written Java code.
Submit button: Users can save their code and hardware specifications in JSON format to interact with the backend and check the calculated carbon emissions.

Code / More Information [GitHub](#)

탄소배출량 공식, 자바 코드 입력 방식 등을 비롯한 정보를 제공

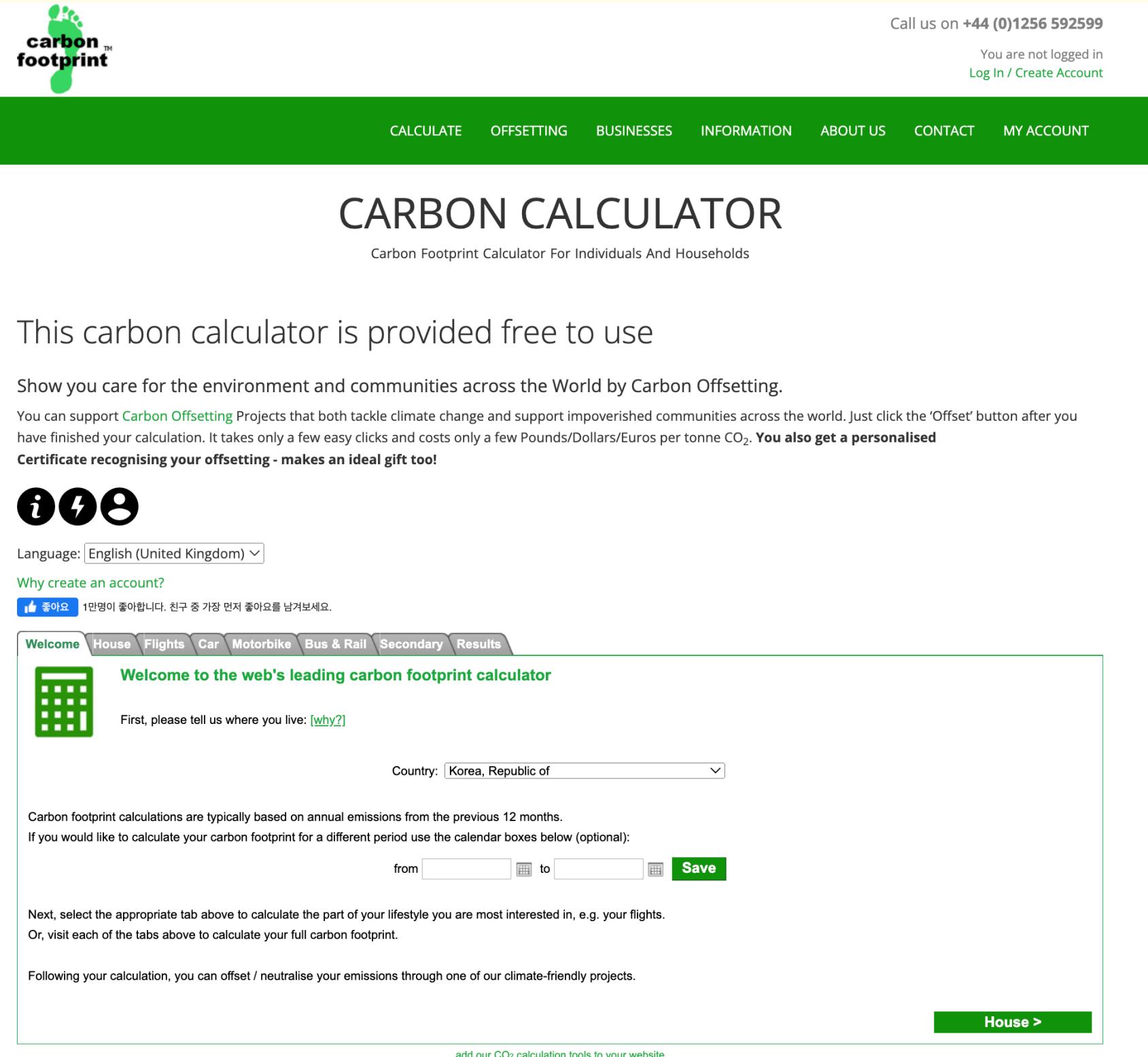
링크를 클릭하면 본 서비스를 구현한 코드가 있는 Github repository로 이동

05

그린화 패턴

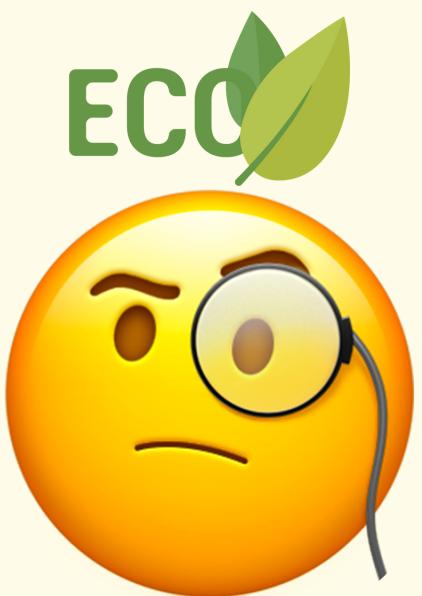


✓ Carbon calculator



The screenshot shows the homepage of the Carbon Footprint website. At the top, there's a green header bar with the 'carbon footprint' logo featuring a green footprint icon. To the right of the logo are links to 'Call us on +44 (0)1256 592599', 'You are not logged in', 'Log In / Create Account', and a navigation menu with links to 'CALCULATE', 'OFFSETTING', 'BUSINESSES', 'INFORMATION', 'ABOUT US', 'CONTACT', and 'MY ACCOUNT'. Below the header, a large green banner displays the text 'CARBON CALCULATOR' and 'Carbon Footprint Calculator For Individuals And Households'. The main content area starts with a statement: 'This carbon calculator is provided free to use'. It encourages users to 'Show you care for the environment and communities across the World by Carbon Offsetting.' It explains that users can support 'Carbon Offsetting Projects' that both tackle climate change and support impoverished communities. It highlights that users can get a 'personalised Certificate recognising your offsetting - makes an ideal gift too!'. Below this text, there are social sharing icons for Facebook, Twitter, and LinkedIn, and a language selection dropdown set to 'English (United Kingdom)'. A 'Why create an account?' link is also present. The main form area has tabs at the top: 'Welcome', 'House', 'Flights', 'Car', 'Motorbike', 'Bus & Rail', 'Secondary', and 'Results'. The 'House' tab is currently selected. The main content area contains a 'Welcome to the web's leading carbon footprint calculator' message, a 'First, please tell us where you live: [why?]' input field, a 'Country' dropdown set to 'Korea, Republic of', and a note about annual emissions. It also includes a date range input field ('from _____ to _____') and a 'Save' button. Further down, it says 'Next, select the appropriate tab above to calculate the part of your lifestyle you are most interested in, e.g. your flights.' and 'Or, visit each of the tabs above to calculate your full carbon footprint.' Finally, it mentions 'Following your calculation, you can offset / neutralise your emissions through one of our climate-friendly projects.' and a 'House >' button.

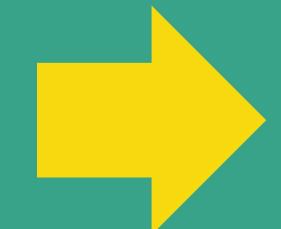
✓ 그린화 패턴 발견 과정



매주 인당 1개씩
그린화 패턴 후보군 조사



매주 교차 검증 및
Carbon calculator 검증



그린화 패턴 수집



감사합니다