



소프트웨어공학개론 1조
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Overview

Overview

- What is carbon footprint?

Carbon footprint refers to the total amount of greenhouse gases generated directly or indirectly by individuals or organizations

This includes all fuels, electricity, goods, etc. that they use in their daily lives



Overview

- Why should we reduce it?

Environmental problems such as global warming, climate change, and abnormal climate are emerging around the world because of carbon emissions



Overview

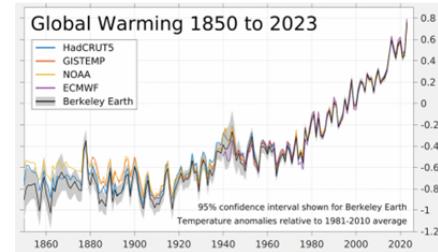
- Why should we reduce it?

Global warming, one of the most important issues nowadays, the critical point that we can rewind back to pre-global warming age is 1.5°C

But in 2023, we already reached 1.45°C

WMO has announced that the probability of crossing the threshold in 2027 is 66%

Global Warming



Global warming critical point

1.5°C

2023 temperature rise **1.45°C**

WMO: the probability of crossing the threshold in 2027 **66%**

Overview

- Why should we reduce it?

In this situation, Chat GPT appeared, and received a lot of attention

Big LLM models such as Chat GPT have parts that accelerate global warming

Efforts to reduce carbon footprint are needed to address this kind of problems

Chat GPT

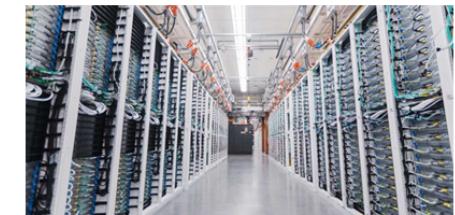


ChatGPT

Carbon emissions in training GPT-3: **502t**

Water consumed in one conversation: **500mL**

10x energy consumption of Google search



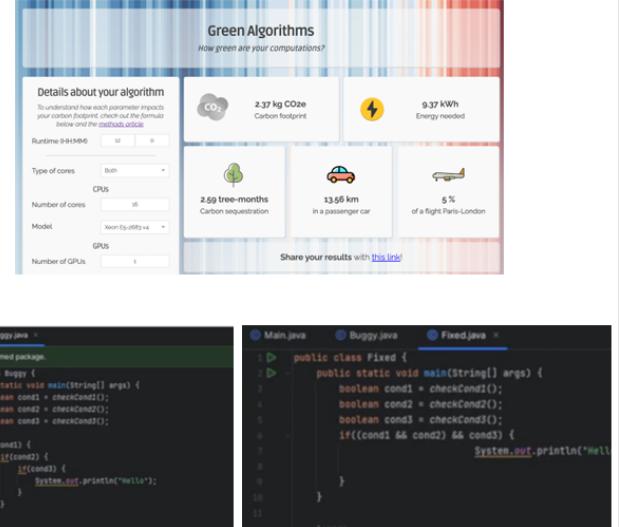
Overview

- How can we reduce it?

There are many ways to reduce carbon footprints, but the way we are going to use is to reduce greenhouse gases generated in the processing of the code by using environmentally friendly algorithms; which called **Green Algorithms**

Green Algorithms

Analyze source code to track **carbon footprint**, detect **carbon waste pattern**, convert it into **carbon-saving code** using improvement pattern



The figure shows a screenshot of the Green Algorithms tool. At the top, it asks 'How green are your computations?'. Below that, it displays 'Details about your algorithm' with fields for Runtime (9.8Mflops), Type of cores (Ibm), Number of cores (10), Model (Neon Es-6000 v4), and Number of GPUs (1). It also shows 'Carbon footprint' (2.37 kg CO₂e) and 'Energy needed' (9.37 kWh). Below these are icons for '2.59 tree-months Carbon sequestration', '13.56 km in a passenger car', and '5 % of a flight Paris-London'. At the bottom, there are two code snippets: 'Buggy.java' and 'Fixed.java', showing Java code for a checkCond function.

Buggy

```
1  public class Buggy {  
2      public static void main(String[] args) {  
3          boolean cond1 = checkCond1();  
4          boolean cond2 = checkCond2();  
5          boolean cond3 = checkCond3();  
6  
7          if(cond1) {  
8              if(cond2) {  
9                  if(cond3) {  
10                      System.out.println("Hello");  
11                  }  
12              }  
13          }  
14      }  
15  }
```

Fixed

```
1  public class Fixed {  
2      public static void main(String[] args) {  
3          boolean cond1 = checkCond1();  
4          boolean cond2 = checkCond2();  
5          boolean cond3 = checkCond3();  
6  
7          if((cond1 && cond2) && cond3) {  
8              System.out.println("Hello");  
9          }  
10     }  
11  }
```

Feature

Feature

- User can sign up and log in to the web site
- Refactor the input code automatically

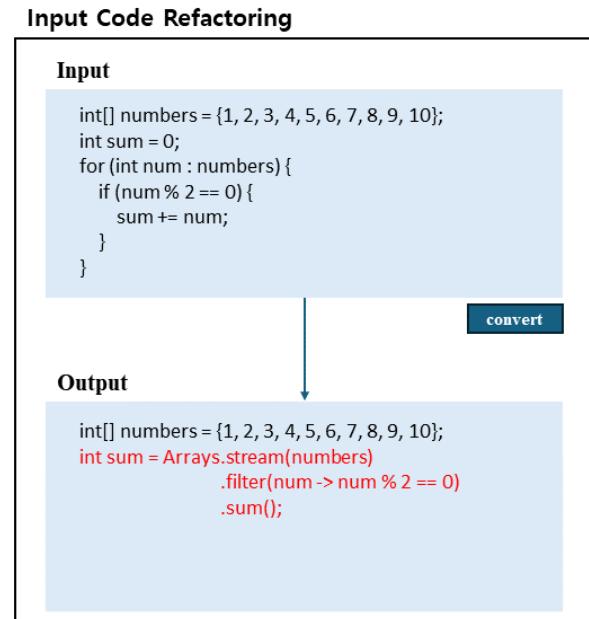
User Login

Login

ID

Password

[sign up](#)



Feature

- Display system information
- Evaluate carbon footprint by input code

System Information

CPU

Model:
Type:
Number of cores:

Memory

Capacity:
.
.

Calculate Carbon Footprint

Input

Example code

Output

Example code

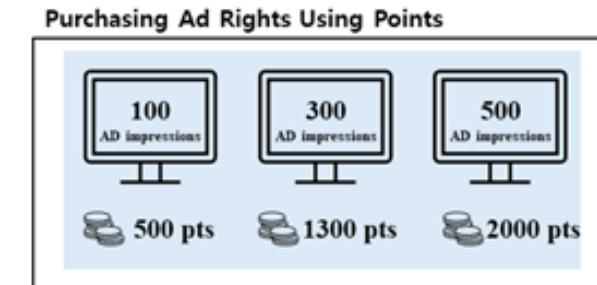
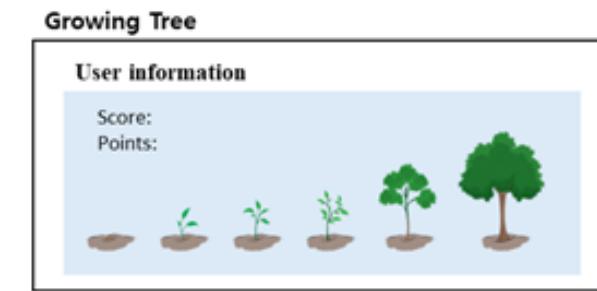
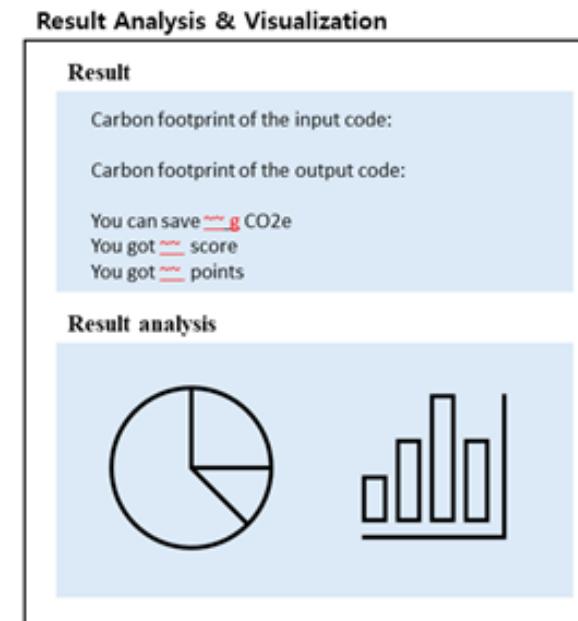
convert

Result

Carbon footprint of the input code:
Carbon footprint of the output code:
You can save ~~~~~~ g CO₂e
You got ~~~~~~ score
You got ~~~~~~ points

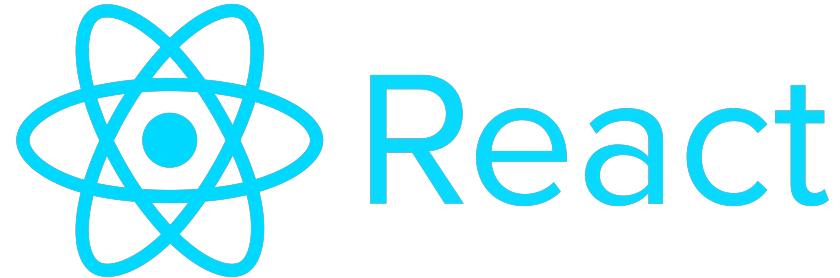
Feature

- Visualize code analysis
- Grow your virtual tree by carbon footprint reduction ranking
- Earn points by carbon footprint reduction – Buy advertising rights by points!



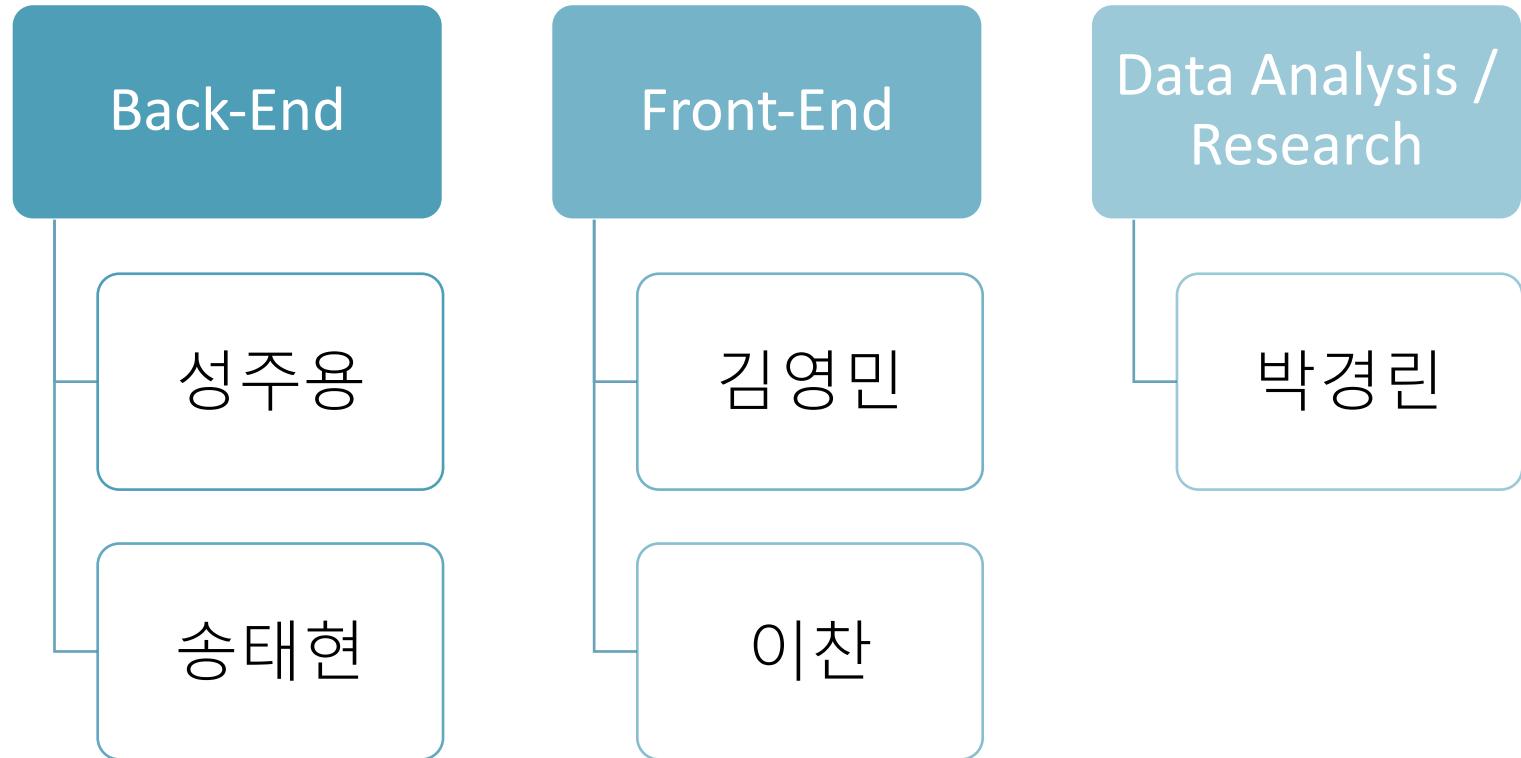
Architecture & Development Stack

Architecture & Development Stack



Team

Team



Schedule

Schedule



Schedule

	~04/19 (W7)	~04/26 (W8)	~05/03 (W9)	~05/10 (W10)	~05/17 (W11)	~05/24 (W12)	~05/31 (W13)	~06/07 (W14)
Requirement Specification								
Design Specification								
Development								
Test planning + Integration								
Test + Test Automation								
Deployment + Code review								

Expectation

Expectation



- As an individual, through refactoring, developers can cultivate environmentally friendly and simplified, better development habits



- You can check and reduce the carbon footprint of your code and can contribute to solving environmental concerns like global warming, climate change, etc.



- It could lead to a virtuous cycle of reducing carbon footprints by earning points / listing to the ranking

Thank You!