BIGCONTEST Innovation League

Designing Eco-friendly ESG JEJU Travel Route for Gen-Z

Eco-Friendly JEJU Travel Route Recommender System

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Assignment 1

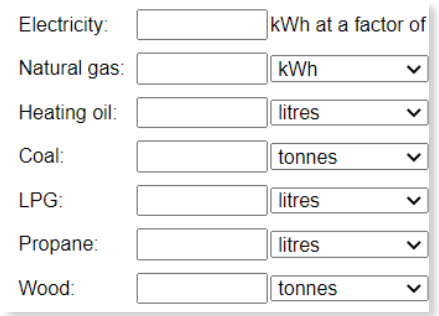
Carbon Footprint Calculator For Travel

Carbon Footprint Calculator Background

Limitation of Traditional Calculator

carbon footprint

Carbon Calculator
(carbonfootprint.com)



User has to enter **an accurate number**
for the amount of electricity, gas of energy used.

However it is hard to measure the exact usage,
which **creates a barrier to use.**

Redesigned Carbon Footprint Calculator

Travel Carbon Footprint

We implemented an
easy-to-use calculator
for travelers who want to know
their carbon emissions
during their trip

4 sections of travel

- Transportation
- Accommodation
- Food
- Tourism

Users can calculate their carbon footprint
through **approximate travel information**
instead of accurate energy usage.
(e.g., type of meal or accommodation)

1

Transportation

Carbon Footprint Calculator (1) Transportation

Data Used

t2) RENT.csv

[Shinhan Card] Rent car types booked for trips Sep.-Nov. 2021 & Mar.-May. 2022

YR	RANK	MODEL	TYPE
2021	1	3세대K5	중형
2021	2	올뉴아반떼	중소형

40 rows x 4 columns

YR	Year
RANK	Ranking
MODEL	Vehicle Model
TYPE	Vehicle Type

t3) BSP.csv

Airline passenger sales settlement data for Sep.-Nov. 2021 & Mar.-May. 2022

LSP_RID	MCT_NM	...	DPF_AOT_CD_VL	ARV_AOT_CD_VL	CNT
20211103	주)대한항공	...	GMP	CJU	6
20210920	주)대한항공	...	GMP	CJU	6

13856 rows × 8 columns

LSP_RID	Sales Slip Reception Date
MCT_NM	Franchise Name
...	
DPF_AOT_CD_VL	Departure Airport Code val
ARV_AOT_CD_VL	Arrival Airport Code val
CNT	Sales

c2) TRANS_CO2.csv

Carbon Emissions by types of transportation

LG_CAT	MD_CAT	SM_CAT	FUEL_TYPE	FUEL_COST	SCALE	FACTOR
대중교통	버스	시내버스	CNG	NaN	kgCO2/km	0.030306
대중교통	버스	시내버스	경유	NaN	kgCO2/km	0.034620

4730 rows × 7 columns

LG_CAT	Large Category
MD_CAT	Medium Category - Brand
SM_CAT	Small Category - Model
FUEL_TYPE	Fuel Type
FUEL_COST	Fuel Cost
SCALE	Scale
FACTOR	Carbon Emission Factor

Google Flight

Used to estimate carbon emissions
By departure airport and seats

Carbon Footprint Calculator (1) Transportation

Calculation Logic

Q1. How did you get to JEJU Island?

- Airplane → Q. Departure Airports (Gimpo/Gimhae) & Seat? (Business/Economy) → Carbon Emission depending on options
- Ship → Q. Departure Port? (Mokpo, Wando, etc.) → Carbon Emission depending on options
- Local residents → Zero Carbon

Carbon Emission depending on options → Carbon Footprint of transportation to Jeju is total [ ] kg/co2

Ex. Airplane & Gimpo Airport with economy seat (round trip) : 56kg/co2 x 2 = 112kg/co2

Q2. What types of transformation did you use during the trip?

- Own/Rental Car → Q. Passengers/ Distance traveled/ Vehicle type? → Carbon Emission depending on options
- Bus / Public Transportation → Q. Distance traveled? → Carbon Emission depending on options
- Bicycle → Zero Carbon

Carbon Emission depending on options → Carbon Footprint of transportation to Jeju is total [ ] kg/co2

Total Carbon Footprint is [ ] kg/co2 by using Transportation

2

Accommodation

Carbon Footprint Calculator (2) Accommodation

Data Used

t5) JT_MT_ACCTO_TRRSRT_SCCNT_LIST.csv

Tourism Demand Prediction Data
based on views of VISIT JEJU website

CL_CD	CL_NM	AREA_NM	ADDR	BASE_YEAR	...	DEC_VIEWS_CO
c3	숙박	메리어트관 제주신화월드 호텔앤리조트	제주특별자치도 서귀포시 안덕면 신화역사로 304번길 38	2021	...	NaN
c3	숙박	1915 지오하우스	제주특별자치도 서귀포시 성산읍 성산등용로 14	2021	...	NaN

22,220 rows x 8 columns

CL_CD	Classification Code
CL_NM	Classification Name
AREA_NM	Area Name
ADDR	Address
BASE_YEAR	Base Year
ALL_TOTAL_CO	Total Views of year
JAN_VIEWS_CO	Views of January
...	
DEC_VIEWS_CO	Views of December

c3) TB_ECO_BUILDING_GHG_GIS_JEJU_1920.csv

Geolocation Data by city and district :
GHG emissions for Buildings In Jeju

LTNO_ADDR	ROAD_NM_ADDR	...	ELCTY_USQNT	CITY_GAS_USQNT	SUM_NRG_USQNT	...	SUM_GRGS_DSAMT
제주특별자치도 제주시 이도이동 1987-1번지	제주특별자치도 제주시 구남동1길 2	...	18492	19731	38223	...	12.159453

329365 rows × 19 columns

LTNO_ADDR	Region Name Address
ROAD_NM_ADDR	Road Name Address
...	
ELCTY_USQNT	Electricity Usage Quantity
CITY_GAS_USQNT	City Gas Usage Quantity
SUM_NRG_USQNT	Sum of Energy Usage Quantity
...	
SUM_GRGS_DSAMT	Sum of Gas Emission

Carbon Footprint Calculator (2) Accommodation

Data Processing

if the user's accommodation information exists in DB

(1) Actual carbon emission of accommodations

분류명 CL_NM	지역명 AREA_NM	주소 ADDR
숙박	메리어트관 제주신화월드 호텔앤리조트	제주특별자치도 서귀포시 안덕면 신화역사로 304번길 38
숙박	1915 지오하우스	제주특별자치도 서귀포시 성산읍 성산등용로 14

['CL_NM' t5 Data == 숙박]

Merge by address

도로명주소 ROAD_NM_ADDR		합계온실가스배출량 SUM_GRGS_DSAMT
제주특별자치도 제주시 구남동1길 2	...	12.159453

[c3 Data]

숙박업종	co2
호텔제이엠	6.788652
호텔컬리넌제주	15.894569
화인호텔	16.206313
호텔더블유 탑동점	10.458882

Carbon Footprint
Per accommodation

if the user's accommodation information doesn't exist in DB

(2) Calculated carbon emission of accommodation type

호텔
리조트
모텔
펜션
빌라
게스트하우스

Classified accommodations to 6 types

레이크힐스 제주 리조트	5.727280
마린포트리조트	4.364010
벙커호텔앤리조트	2.113933
비스타리조트	3.740727
...	

Calculated carbon emission for types of accommodations based on the average of the actual value

	숙박업종	co2
0	호텔	32.859921
1	리조트	9.524720
2	모텔	4.325946
3	펜션	2.901318
4	캠핑&글램핑	1.507504
5	게스트하우스	2.077207

Carbon Footprint
Per type of accommodation

Carbon Footprint Calculator (2) Accommodation

Calculation Logic

Q1. How many nights did you stay?

Min 1, Max 20

Stay 1

Stay 2

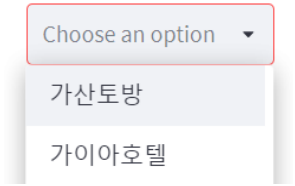
Stay 3

...

If the user's accommodation information

exists in DB

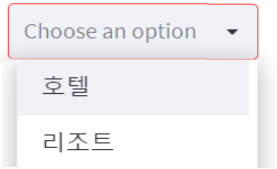
Q2. Where did you stay?



User selects the **accommodation** → Result based on **actual carbon emission**

doesn't exist in DB

Q2. Which type of accommodation did you stay?



User selects the **accommodation type** → Result based on **average carbon emission** per accommodation type

Carbon Footprint of your accommodation in Jeju Island is total [ ] kg/co2

3

Food

Carbon Footprint Calculator (3) Food

Data Used

t1) JEJU_MERCHANT.csv

Top franchise store data based on sales in Jeju
Sep.-Nov. 2021 & Mar.-May. 2022

	YR	MCT_NM	MCT_BRN	LG_CAT	LG_CAT_NM	MD_CAT	MD_CAT_NM	MCT_BSE_AR	MNTH_SALES_PCTL	DAW_CCD	APV_TMT_CD
0	2021	젠	2110164178	1	요식/유흥	2	일식/중식/양식	제주 서귀포시 안덕면 사계남로 186-8	3_25%~50%	1	4_09_12
1	2021	젠	2110164178	1	요식/유흥	2	일식/중식/양식	제주 서귀포시 안덕면 사계남로 186-8	3_25%~50%	2	6_15_18

316,174rows x 14 columns

YR	Base Year
MCT_NM	Franchise Name
-	
LG_CAT	Large Category
LG_CAT_NM	Large Category Name
MD_CAT	Medium Category
MD_CAT_NM	Medium Category Name
-	
UE_CT	Num. of Authorization

Carbon Calculator for food

Additional data for carbon emissions by food

c1) FOOD_ITEM.csv

Carbon footprint data by grocery category

	item	CO2
0	1.1.1.1 Rice	0.073
1	1.1.1.2 Bread	0.073

313 rows × 2 columns

Item	식료품명
CO2	탄소배출량

NAVER Map Grocery store Menu Crawling Data

	MCT_NM	naver_map_url	menu_list
328	제주김만복동문시장점	https://m.place.naver.com/restaurant/37609800/...	만복이네 김밥, 통전복주먹밥, 숯불갈비주먹밥, 전복컵밥, 왕전복죽, 전복성게해물면,...
329	제주약수터올레시장점	https://m.place.naver.com/restaurant/177724476...	4종 샘플러 (1040cc), 무료시음서비스, 제주 수제맥주 340cc 잔, 6종 ...

Crawling the menu of grocery store in t1 Data

Carbon Footprint Calculator (3) Food

Data Processing

if the user's restaurant information exists in DB

(1) Carbon Emission of Restaurant

가맹점명 MCT_NM	메뉴리스트 menu_list
제주김만복동문시장점	만복이네 김밥, 통전복주먹밥, 숯불갈비주먹밥, 전복컵밥, 왕전복죽, 전복성게해물면,...
제주약수터올레시장점	4종 샘플러 (1040cc), 무료시음서비스, 제주 수제맥주 340cc 잔, 6종 ...

[c3 Data]

Calculated carbon footprint by the **average of the menu of the restaurant**

Ex. Western Restaurant

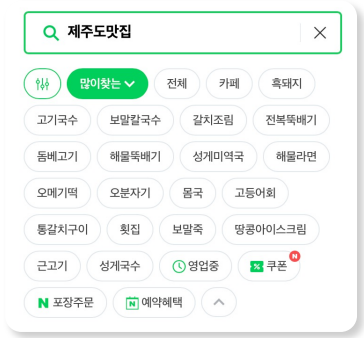
Chicken: 0.5 kgCO2 / Pizza : 0.3 kgCO2
→ Average : (0.5+0.3)/2=0.4

MCT_NM	carbon_avg
젠	3.80
가치	1.14

Carbon Footprint of the **restaurant** (per capita)

if the user's restaurant information doesn't exist in DB

(2) Carbon Emission of Restaurant Type



After querying [Jeju Restaurant] In Naver Map

Classified restaurant to 15 types

Calculated carbon footprint for types of restaurant based on the **average of the actual restaurant value**

Ex. Meat Noodles Restaurant
Average carbon emissions : ~~

음식점 유형	co2
횟집	2.05
고깃집	1.766667
초밥	1.4

Carbon Footprint of the **type of restaurant** (per capita)

Carbon Footprint Calculator (2) Accommodation

Calculation Logic

Q1. How many nights did you stay?

Min 1, Max 20

Food1

Food2

...

If the user's restaurant information

Q2. Which restaurant did you visit?

exists in DB

Choose an option

제주광해애월점

제주김만복본점

User selects the **restaurant** → Result based on **actual carbon emission**

Q2. What type of restaurant did you visit?

doesn't exist in DB

Choose an option

고기국수집

생선구이, 조림

User selects the **restaurant type** → Result based on **average carbon emission** per restaurant type

Carbon Footprint of that restaurant in Jeju Island is total [ ] kg/co2

4

Tourism

Carbon Footprint Calculator (4) Tourism

Data Used

t4) JT_TRRSRT_ENTRN_LIST.csv

	CL_NM	TRRSRT_NM	ADDR	TEL_NO	TOT_ENTRN_NMPR_CO	SETLE_PRICE	ENTRN_DE
0	기타	봄그리고가을리조트	제주 서귀포시 성산읍 해맞이해안로 2660 시흥근생 및주택	647842211.0	2	18000	20220301

CL_NM	Classification Name
TRRSRT_NM	Tourism Destination Name
ADDR	Address
TEL_NO	Telephone Number
TOT_ENTRN_NMPR_CO	Total number of people entering
SETLE_PRICE	Payment Amount
ENTRN_DE	Entering Date

c3) TB_ECO_BUILDING_GHG_GIS_JEJU_1920.csv

LTNO_ADDR	ROAD_NM_ADDR		ELCTY_USQNT	CITY_GAS_USQNT	SUM_NRG_USQNT		SUM_GRGS_DSAMT
제주특별자치도 제주시 이도이동 1987-1번지	제주특별자치도 제주시 구남동1길 2	...	18492	19731	38223	...	12.159453

LTNO_ADDR	Land Number Address
ROAD_NM_ADDR	Road Name Address
	-
ELCTY_USQNT	Usage Quantity of Electricity
CITY_GAS_USQNT	Usage Quantity of City Gas
SUM_NRG_USQNT	Sum of Energy Consumptions
	-
SUM_GRGS_DSAMT	Sum of GHG Emissions

VISIT JEJU Crawled Data for Tourism

	이름	주소	태그	주요목적	주요목적기타
0	성산일출봉(UNESCO 세계자연유산)	제주특별자치도 서귀포시 성산읍 일출로 284-12	#일출 #오름 #경관/포토\n#부모 #자연경관 #포토스팟 #유네스코	등산	산책로. 올레코스. 오름
2	카멜리아힐	제주특별자치도 서귀포시 안덕면 병악로 166	#경관/포토 #커플 #아이\n#맑음 #겨울 #힐링 #자연경관 #포토스팟 #어린이 #...	공연/전시,포토스팟	NaN
5	함덕해수욕장	제주특별자치도 제주시 조천읍 조함해안로 519-10	#해수욕장 #액티비티 #아이\n#맑음 #여름 #자연경관 #체험 #레저/체험 #해변 ...	NaN	NaN

Carbon Footprint Calculator (4) Tourism

Data Processing

Carbon emission of Tourist Destination

CL_NM	
자연	848912
테마관광지	92017
테마파크	50734
...	

Leisure, Theme Park, Performances, For Kids, Nature, Culture Tourism, Restaurant, Accomodation

t4) JT_TRRSRT_ENTRN_LIST.csv

	이름	주소
0	성산일출봉(UNESCO 세계자연유산)	제주특별자치도 서귀포시 성산읍 일출로 284-12
2	카멜리아힐	제주특별자치도 서귀포시 안덕면 병악로 166
5	함덕해수욕장	제주특별자치도 제주시 조천읍 조함해안로 519-10

VISIT JEJU Crawled Data for Tourism

Merge by address

도로명주소	합계온실가스배출량
ROAD_NM_ADDR	SUM_GRGS_DSAMT
제주특별자치도 제주시 구남동1길 2 ...	12.159453

[c3 Data]

	lg_cat	TOT_ENTRN_NMPR_CO
0	공연/전시	3203.421053
1	레저/체험	1155.758621
2	자연	177718.666667
3	테마파크/테마관광지	9140.738095

(1) Average number of visitors of each category

	lg_cat	co2
0	공연/전시	158.372926
1	레저/체험	122.924570
2	자연	168.860904
3	테마파크/테마관광지	227.015613

(2) Average carbon emission of each category

Divide (2) into (1)

lg_cat	final_carbon
공연/전시	0.049439
레저/체험	0.106358
자연	0.000950
테마파크/테마관광지	0.024836

Carbon footprint of each category
(per capita)

Classified Tourist Destination to 4 types

- Leisure / Experience
- Theme park / Attraction
- Nature
- Performance / Exhibition

Carbon Footprint Calculator (4) Tourism

Calculation Logic

Q1. Which tourist destination did you visit in Jeju Island?

1. Nature

a. Mountain
Ex. 성산일출봉

b. Ocean
Ex. 후포해변

2. Theme Park / Attraction

a. cultural heritage
Ex. 제주고산리유적

b. other
Ex. 윈트1947 카트 테마파크

3. Performance / Exhibition

a. Yes
Ex. 이중섭미술관

b. No

4. Leisure / Experience

Golf, workshop, drive, horseback riding, cruise ship/submarine, observatory, experience farm, camping, marine leisure, healthcare

› Carbon Footprint of that activity in Jeju Island is total [ ] kg/co2

Carbon Footprint of that activity in Jeju Island is total [ ] kg/co2

Carbon Footprint Calculator

Carbon Footprint Calculator (1) Implementation

Implementation

Implementation

Carbon calculator based on calculation Logic

Traffic / Food / Accomodation / Toursim

Deployment

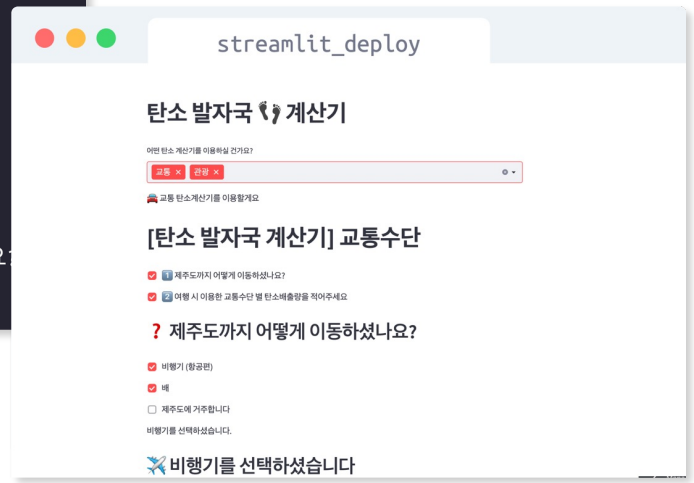
Carbon Footprint Calculator

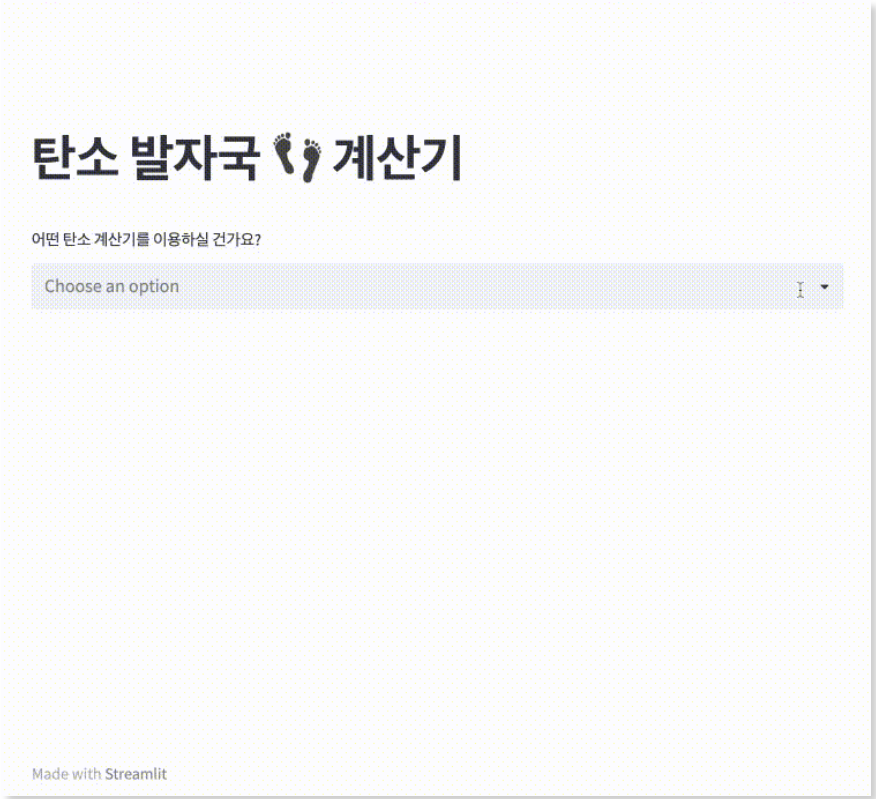
Interactive, easy-to-use calculator

carbon_calculator.py

```
from os import write
from tabnanny import check
from click import option
import streamlit as st
import pandas as pd


st.title("탄소 발자국 👣 계산기")
option_calc_type = st.multiselect(
        '어떤 탄소 계산기를 이용하실 건가요
        ("교통", "음식", "관광", "숙소"))
```





Carbon Footprint Calculator (2) Persona

Persona

I will take an economy class
from flight Gimpo Airport.

I with travel with my friend
who lives in Jeju Island by her car!

탄소 발자국 👣 계산기

어떤 탄소 계산기를 이용하실 건가요?

숙소 ×

Tips for reducing carbon emissions!

- EV can save carbon!
- You can also save carbon by riding bicycles!

✈️ 비행기를 선택하셨습니다

출발했던 공항을 선택해주세요

다른 공항을 탑승하셨다면, 김포공항(GMP)와 김해공항(PUS) 중 더 가까운 공항을 선택해주세요

김포공항(GMP)

어떤 좌석에 앉으셨나요?

비즈니스, 이코노미 중에 선택해주세요

이코노미 (Economy)

1️⃣ 총 탄소 배출량은 112kgCO2입니다

❓ 여행 시 이용한 교통수단 별 탄소배출량을 적어주세요

- [x] 자차
- [ ] 렌터카
- [ ] 대중교통

🚗 자차를 타고 이동하셨습니다

함께 탑승한 인원수를 입력해주세요

2

1 8

함께 2명 탑승했습니다

집에서 출발 항구까지의 이동 거리를 알려주세요

338

0 1000

Carbon Footprint Calculator (2) Persona

Persona

I will stay in OO Hotel for two days!

탄소 발자국 👣 계산기

어떤 탄소 계산기를 이용하실 건가요?

숙소 ×

Tips for reducing carbon emissions!

Hotels release a lot more carbon than other accommodations.
If you want to help Earth, consider other types!

🏨머무시는 숙소의 이름과 숙박일수를 알려주세요

어디 숙소에 묵으셨나요?

그랜드 조선 제주 ×

얼마나 그랜드 조선 제주에 머무르셨나요?

1

그랜드 조선 제주에 머무르며 발생된 탄소 배출량은 28.2kgCO2입니다

숙소의 총 탄소 배출량 합계는 28.2kgCO2입니다

머무시는 숙소의 형태와 숙박일수를 알려주세요

숙소의 형태가 어떠셨나요

호텔 ×

얼마나 호텔에 머무르셨나요?

1

호텔에 머무르며 발생된 탄소 배출량은 30.49kgCO2입니다

총 탄소 배출량 합계는 30.49kgCO2입니다

Assignment 2

ECO JEJU TOUR

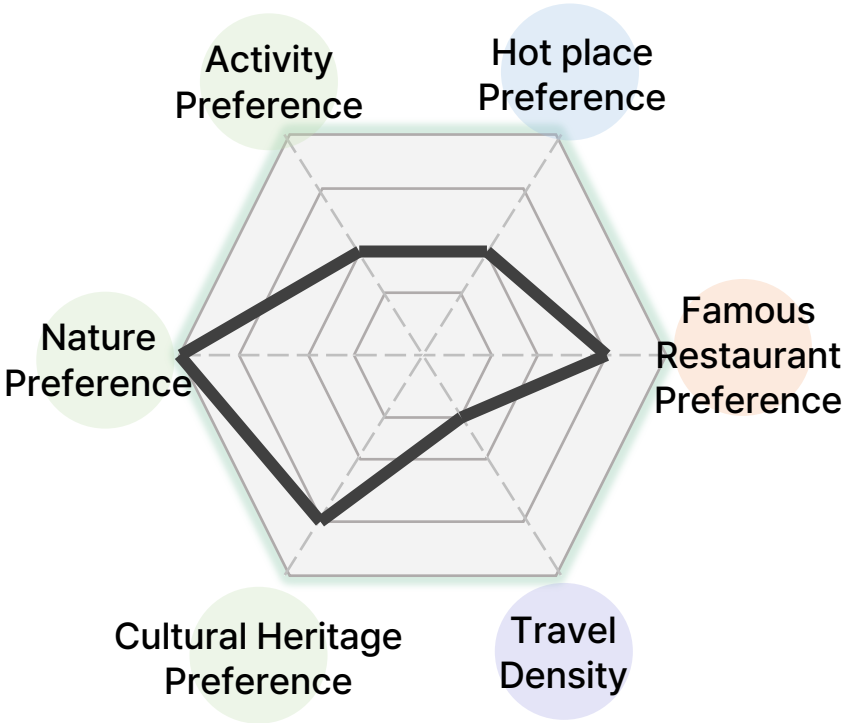
User Dataset

ECO JEJU TOUR User Dataset ❶ User Index

User Index

Attractiveness of travel route is also important as well as **minimizing carbon emissions**

➡ Created **user indexes** to reflect traveling preferences for **personalized travel route recommendations**



User can rate from **1 to 10** for each index

Preference for activity / nature / cultural heritage

Used to recommend **Tourist Destination**

→ Traveling spots that belongs to the category with higher score are included in the final route.

Hot Place Preference

Reflects **popularity of the Tourist Destination**

→ The higher the score, the more **famous place** is recommended.

Famous Restaurant Preference

Used to recommend **restaurant**

→ The higher the score, the more **famous restaurant** is recommended.

Travel Density

Used to choose the **number of Tourist Destination**

→ The higher the score, the more traveling spots are included in the final route.

ECO JEJU TOUR User Dataset ② User Input

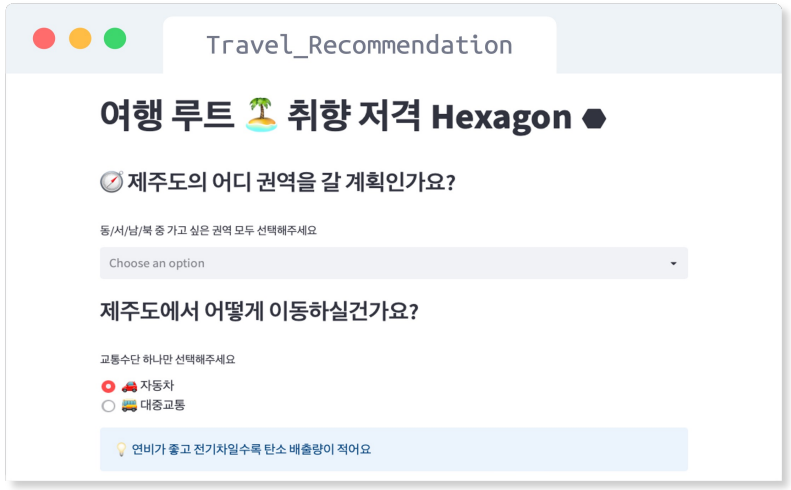
STEP 1

Q. Which part of Jeju do you want to travel?

User can choose N/S/E/W area in JEJU.

Q. What transportation will you use?

User can choose between private/public transportation.

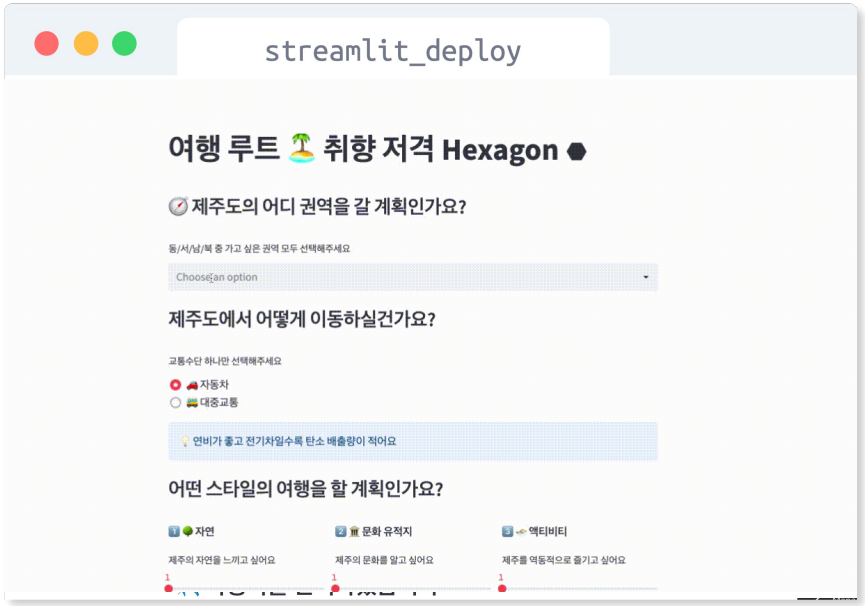


STEP 2

Q. Which travel do you prefer?

User will rate each index based on his/her preference.

Streamlit plotly



ECO JEJU TOUR User Dataset 3 Region Numbering

Region Labeling

- Divided Jeju in East, West, South, and North
- Subdivided regional divisions in counter-clockwise direction

[Reference] "2025 Jeju Island Development Blueprint", Province of Jeju, 2016

North(0)
Jocheon-eup (조천읍),
Jeju-si (제주시),
Aewol-eup (애월읍)

East(13)
Pyoseon-myeon (표선면),
Seongsan-eup (성산읍),
Gujwa-eup (구좌읍)

West(4)
Hanlim-eup (한림읍),
Hangyeong-myeon (한경면),
Daejeong-eup (대정읍),
Andeok-myeon (안덕면)

South(9)
Jungmun (중문),
Seogwipo (서귀포),
Namwon-eup (남원읍)

ECO JEJU TOUR User Dataset 4 Final Data

User Dataset

	Nature Preference	Activity Preference	Cultural Heritage Preference	Hot Place Preference	Travel Density	Famous Restaurant Preference	Transportation	Day1	Day2	Day3	Day4	Day
0	0.329639	0.778846	0.290843	0.205825	0.345948	0.26456	0	1	2	6	7	7

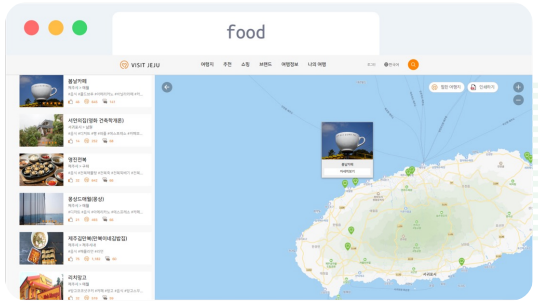
Tourist Destination Preference	Popularity of Traveling Spots	Number of Traveling Spots	Popularity of Restaurant	Transportation	Region user wants to travel each day	Date Property
$\mathbb{R} \in [0,1]$	$\mathbb{R} \in [0,1]$	$\mathbb{R} \in [0,1]$	$\mathbb{R} \in [0,1]$	0 or 1	$\mathbb{Z} \in [0,16]$	$\mathbb{Z} \in [0,8]$
	0 (Eco friendly) — 1 (Popularity)	0 (Little) — 1 (Many)	0 (Eco friendly) — 1 (Popularity)	0 (Public) — 1 (Private)		

Tourism Dataset

ECO JEJU TOUR Tourism Dataset 1 Food Data

Data Collection

List of restaurant in tourist destination



Basic info., interest level, usage guide, detailed info.

	이름	지역
0	봄날카페	제주시 > 애월
1	서연의집(영화 건축학개론)	서귀포시 > 남원
2	명진전복	제주시 > 구좌
3	몽상드애월(몽상)	제주시 > 애월
4	제주김만복(만복이네김밥집)	제주시 > 제주시내

...

	기타상세	상세텍스트
0	NaN	상세정보\n확장됨\n\n드라마의 주인공이 일하던 카페라서 유명해졌다.\n해변을 바라...
1	NaN	상세정보\n확장됨\n\n위미 포구 근처 가정을 영화 때문에 리모델링한 세트장이었지만...
2	NaN	상세정보\n확장됨\n\n수요미식회 TV프로그램을 통해 소개된 적이 있는 명진전복은 ...
3	NaN	상세정보\n확장됨\n\n애월에 위치한 봄날카페와 인접하여 많은 관광객들이 찾으며, ...
4	NaN	상세정보\n확장됨\n\n제주공항과 가까운 전복김밥이 유명한 분식집이다. 본점은 포장...

Preprocessing

Classified restaurant types based on tags and calculated carbon emission of each restaurant

Name	Tag
봄날카페	#카페 #커피 #음료 #Food #콜드브루 **#아메리카노** ···
가시아방	#고기국수 #비빔국수 #향토Food #Food
메종드쁘띠푸루	#빵집 #베이커리 #Food #빵 #감바스 #파스타 ···
...	...

Tag Dict. for Restaurant Type Classification

유형	태그
카페	밀크티, 주스, **아메리카노**, 케이크, ···
고기국수	**고기국수**, 고기 국수
이탈리안	파스타, 리조또, 피자, 스테이크, ···
...	...

(1) if the restaurant belongs to more than one type
Calculated the average carbon footprint for each type

(2) If it is difficult to classify as a specific type
Replaced it with the average value of all restaurant types

restaurant types classification

유형
카페
고기국수
카페, 이탈리안
...

Carbon footprint of restaurant type

유형	CO2
카페	0.35
고기국수	2.00
이탈리안	3.20
...	...

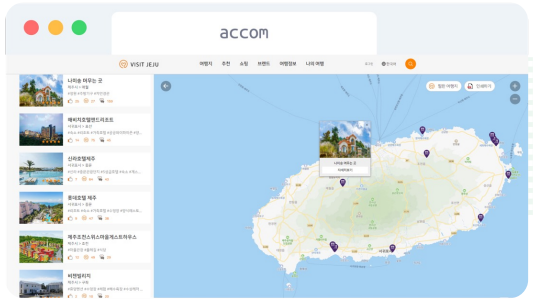
Calculate Carbon Emissions

CO2
0.35
2.00
1.775
...

ECO JEJU TOUR Tourism Dataset ② Accommodation Data

Data Collection

List of accommodations in tourist destination from VISIT JEJU



Basic info., interest level, usage guide, detailed info.

	이름	지역
0	나미송 머무는 곳	제주시 > 애월
1	해비치호텔앤드리조트	서귀포시 > 표선
2	신라호텔제주	서귀포시 > 중문
3	롯데호텔 제주	서귀포시 > 중문
4	제주조천스위스마을게스트하우스	제주시 > 조천

...

	기타상세	상세텍스트
0	NaN	상세정보\n확장됨\n\n애월읍 시인의 마을에 위치한 나미송 머무는 곳 민박은 요즘 ...
1	NaN	상세정보\n확장됨\n\n해가 처음 비추는 곳이라는 뜻의 해비치 호텔&리조트는 에메랄...
2	NaN	상세정보\n확장됨\n\n중문관광단지에 위치한 제주 신라호텔은 90년 개관 이후 이국...
3	NaN	상세정보\n확장됨\n\n푸른 제주바다와 하늘이 맞닿은 곳에 위치한 롯데호텔 제주는 ...
4	NaN	상세정보\n확장됨\n\n조천읍 와산리에 위치한 제주조천스위스마을은 총 4개 단지, ...

Preprocessing

Classified accommodation types

Accommodation	Type
해비치호텔앤드리조트	호텔
제주조천스위스마을게스트하우스	NaN
호텔더블유합동점	NaN
제주푸른산푸른바다	펜션
...	...

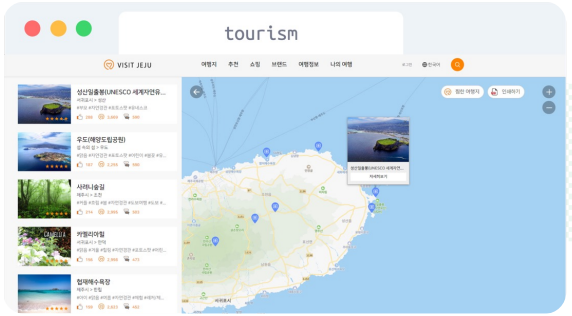
Classified types based on **name**
Else classified through **direct search**

Accommodation	Type
해비치호텔앤드리조트	호텔
제주조천스위스마을게스트하우스	게스트하우스
호텔더블유합동점	호텔
제주푸른산푸른바다	펜션
...	...

ECO JEJU TOUR Tourism Dataset ③ Tourism Data

Data Collection

List of tourist destinations from VISIT JEJU



Basic info., interest level, usage guide, detailed info., nearby accommodation

	이름	지역	...
0	성산일출봉(UNESCO 세계자연유산)	서귀포시 > 성산	
1	우도(해양도립공원)	섬 속의 섬 > 우도	
2	사려니숲길	제주시 > 조천	
3	카멜리아힐	서귀포시 > 안덕	
4	협재해수욕장	제주시 > 한림	

주변숙박개수	주변숙박
28.0	['아름다운리조트', '플레이스 캠프 제주', '골든튤립 제주 성산호텔', '봄그리...
20.0	['우도피아', '소섬바당', '우도사랑', '우도쉼팡게스트하우스', '뽀요요펜션'...
0.0	[]
7.0	['디아넥스 호텔', '중문휘미리리조트', '서귀포호텔 카라반', '레이크힐스 제주...
35.0	['inn jeju 인제주 게스트하우스', '객의하우스', '블루하와이리조트', '...

Preprocessing

(1) Data Used

c3) TB_ECO_BUILDING_GHG_GIS_JEJU_1920.csv

Greenhouse Gas Emissions from Jeju Buildings: Location Information Combination Data by City, County and District

LTNO_ADDR	ROAD_NM_ADDR	...	ELCTY_USQNT	CITY_GAS_USQNT	SUM_NRG_USQNT	...	SUM_GRGS_DSAMT
제주특별자치도 제주시 이도이동 1987-1번지	제주특별자치도 제주시 구남동1길 2	...	18492	19731	38223	...	12.159453

LTNO_ADDR	Region Name Address
ROAD_NM_ADDR	Road Name Address
...	
ELCTY_USQNT	Electricity Usage Quantity
CITY_GAS_USQNT	City Gas Usage Quantity
SUM_NRG_USQNT	Sum of Energy Usage Quantity
...	
SUM_GRGS_DSAMT	Sum of Gas Emission

ECO JEJU TOUR Tourism Dataset ③ Tourism Data

Preprocessing

(2) Outlier Detection

① Too low carbon emission for Cruise ships and Submarines

	AREA_NM	주소	태그	주요목적	주요목적기타	co2	lg_cat	md_cat
107	서귀포잠수함(대국해저관광)	제주특별자치도 서귀포시 남성중로 40	#액티비티 #커플 #아이\n#우수관광사업체 #체험 #레저/체험 #어린이 #수상레저 ...	NaN	NaN	1.525711	레저/체험	유람선&잠수함
389	그린크루즈(산방산유람선)	제주특별자치도 서귀포시 안덕면 화순해안로106번길 16	#경관/포토 #부모 #맑음\n#봄 #포토스팟	NaN	NaN	3.913918	레저/체험	유람선&잠수함

Carbon mission from **ticket offices**,
not from cruise ships and submarines

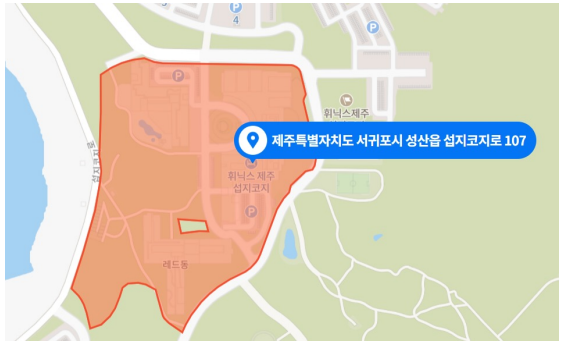
	AREA_NM	주소	태그	주요목적	주요목적기타	co2	lg_cat	md_cat
107	서귀포잠수함(대국해저관광)	제주특별자치도 서귀포시 남성중로 40	#액티비티 #커플 #아이\n#우수관광사업체 #체험 #레저/체험 #어린이 #수상레저 ...	NaN	NaN	179.495797	레저/체험	유람선&잠수함
195	우도잠수함(제주씨월드)	제주특별자치도 서귀포시 성산읍 성산등용로 130-21	#액티비티 #부모 #아이\n#체험 #레저/체험 #어린이 #수상레저 #어트랙션	NaN	NaN	179.495797	레저/체험	유람선&잠수함

Adjusted value to
(carbon emission of ships per km) + (ticket offices)

② Too high carbon emission for landscape

	AREA_NM	주소	태그	주요목적	주요목적기타	co2	g_cat	md_cat
128	신양섭지해수욕장	제주특별자치도 서귀포시 성산읍 섭지코지로 107	#해수욕장 #액티비티 #커플\n#맑음 #여름 #자연경관 #체험 #레저/체험 #해변 ...	NaN	NaN	224.019160	자연	바다
8	섭지코지	제주특별자치도 서귀포시 성산읍 섭지코지로 107	#일출 #해변 #경관/포토\n#커플 #맑음 #가을 #자연경관 #포토스팟 #봄꽃 #유채꽃	등산,기타	산책로	224.019160	자연	바다

Total **sum of the carbon emission**
of all buildings that belong to the area



Removed outliers
through IQR
and **replaced with**
average values of
traveling spot categories

ECO JEJU TOUR Tourism Dataset ③ Tourism Data

Preprocessing

(3) Carbon emission calculation of each category

Average carbon emission
of each tourist destination category

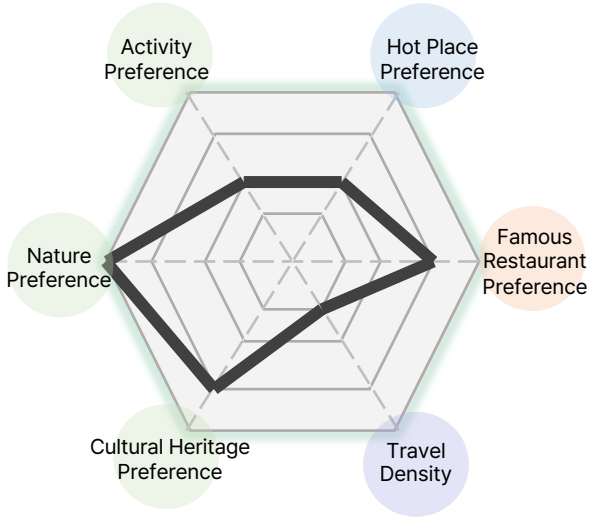
	lg_cat	md_cat	co2
0	레저/체험	골프	62.642068
1	레저/체험	공방	1.962184
2	레저/체험	드라이브	0.572844
3	레저/체험	승마	6.519183
4	레저/체험	유람선&잠수함	179.495797
5	레저/체험	전망대	22.357629
6	레저/체험	체험농장	5.018057
7	레저/체험	캠핑	0.652027
8	레저/체험	해양레저	3.474841
9	레저/체험	헬스케어	28.627041
10	자연	바다	1.639161
11	자연	산	4.831689

Calculated carbon emission of each tourist destination

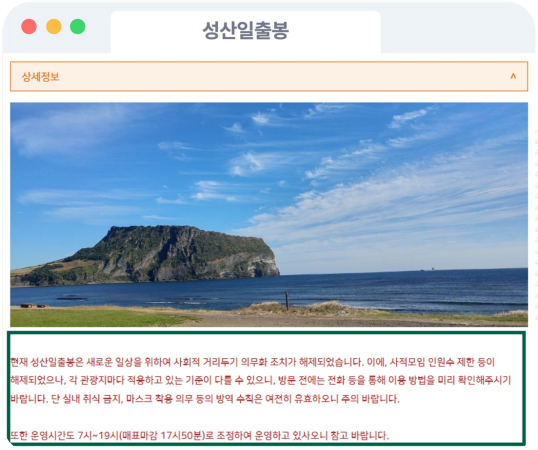
	AREA_NM	주소	태그	주요목적	주요목적기타	co2	lg_cat	md_cat
1	사려니숲길	제주특별자치도 제주시 조천읍 교래리 산 137-1	#숲길 #걷기/등산 #친구\n#커플 #흐림 #봄 #자연경관 #도보여행 #도보 #숲 #단풍	NaN	NaN	4.831689	자연	산

ECO JEJU TOUR Tourism Dataset ③ Tourism Data

Tourist Destination Index



To reflect preference of the user,
we calculated **Activity, Nature, and Cultural Heritage Score** of each traveling spot.



Text Preprocessing
Used explanations of each tourist destination to rate scores

Word Embedding
Transformed words and sentences into numerical vectors

Clustering
Calculated scores based on clustering result

이름	자연	액티비티	문화유적
성산일출봉(UNESCO 세계자연유산)	0.771565	0.682662	0.948563

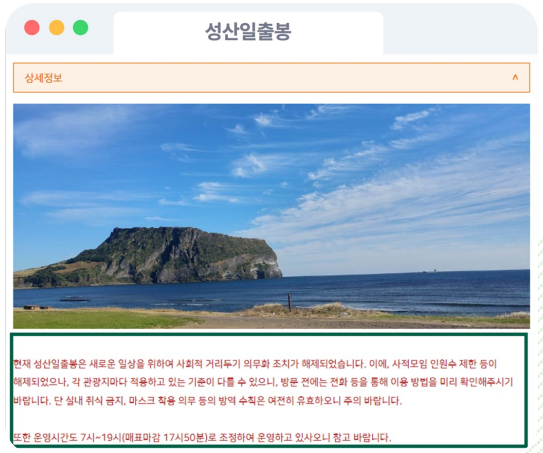
Nature Activity Cultural Heritage

ECO JEJU TOUR Tourism Dataset ③ Tourism Data

Tourist Destination Index

(1) Text Preprocessing

Used **explanations of each tourist destination** to rate scores



상세정보\n확장됨\n\n현재 성산일출봉은 새로운 일상을 위하여
사회적 거리두기 의무화 조치가 해제되었습니다.
이에, 사적모임 인원수 제한 등이 해제되었으나,
각 Tourism지마다 적용하고 있는 기준이 다를 수 있으니,
방문 전에는 전화 등을 통해 이용 방법을 미리 확인해주시기 바랍니다. ···

Text Cleansing

- Removed Spaces
- Removed Repetitive Expressions Ex. 상세정보 확장됨

Removing Stopwords

- Used Business Stopwords Dictionary
- Removed terms such as suffixes, conjunctions, etc.

Tokenization

- Extract nouns and adjectives after POS tagging

KoNLPy

Result

Noun

['현재', '성산일출봉', '일상', '위', '사회',
'거리', '두기', '의무', '조치', '해제', '이', ...]

Adjective

['새로운', '다를', '있으니', '유효하오니',
'있', '뜨거운', '차가운', '완벽하게', '오목한', ...]

ECO JEJU TOUR Tourism Dataset ③ Tourism Data

Tourist Destination Index

(2) Word Embedding

Transformed words and sentences into **numerical vectors** for text data analysis

Word2Vec — GENSIM (topic modelling for humans)

Popular algorithm for generating word embedding

Ex. 성산일출봉

Words

현재
성산일출봉
일상
⋮

Word2Vec →

Word Vector

150 dimensional vector

[0.42 1.55 -1.26 0.08 -0.18 -0.15 ⋯]
[-0.56 0.20 0.09 -0.80 0.64 -0.30 -0.49 ⋯]
[0.73 -0.08 0.29 0.46 0.09 -0.37 0.33 ⋯]
⋮

Average →

Sentence Vector

Average of word vectors
that constructs the sentence

[1.59 1.27 0.078 0.096 -0.13 0.16 ⋯]

Result

이름	문장벡터
성산일출봉(UNESCO 세계자연유산)	[1.59384653e-01 1.27016619e-01 7.80506432e-...
사려니숲길	1.74861196e-02 -3.92737612e-02 -4.39658324e-...
카멜리아힐	[0.15226805 0.17677808 0.22964895 0.205246...
협재해수욕장	[0.00995103 0.00769248 0.07662856 0.134402...
월정리해변	[0.10971704 0.2394778 0.10183809 0.164624...

ECO JEJU TOUR Tourism Dataset ③ Tourism Data

Tourist Destination Index

(3) Clustering Unsupervised learning to group data points based on their inherent similarities or patterns

Sentence vector

K-Means

- Distance-based clustering
- Group data into clusters that **minimize distance from the cluster centroid**
- Simple and efficient method

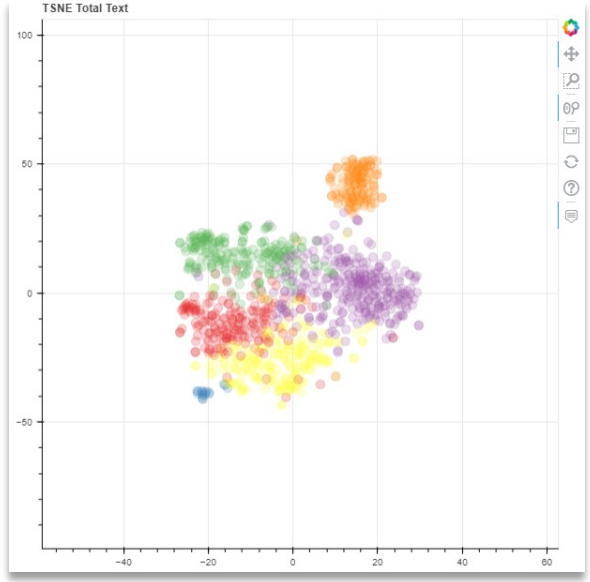
➡ **Selected the best cluster result through observation**

t-SNE

- Dimensionality reduction technique widely used in machine learning and data visualization
- Effective for visualizing high-dimensional data in lower-dimensional space

➡ **Visualized Clustering Results**
by reducing 150 dimensional sentence vectors to 2 dimension

Clustering Result



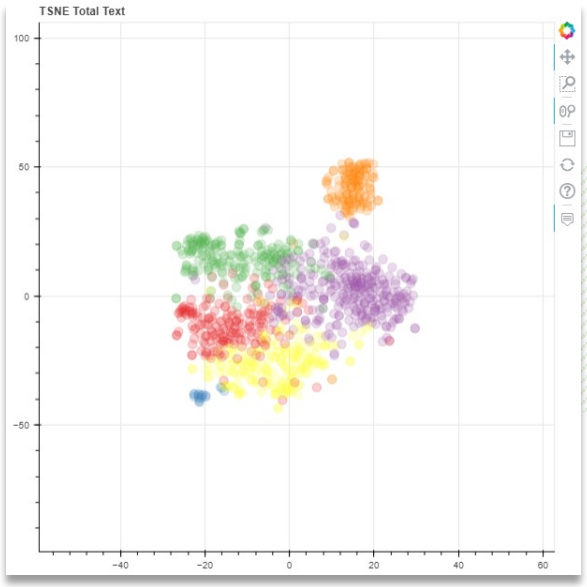
ECO JEJU TOUR Tourism Dataset ③ Tourism Data

Tourist Destination Index

(3) Clustering

Unsupervised learning to group data points based on their inherent similarities or patterns

Clustering Result



List of destinations of each cluster

cluster	tour
0	['오설록티뮤지엄', '에코랜드 테마파크', '아쿠아플라넷 제주', '한림공원', ...
1	['썬플라워의원제주대학교병원제주우리병원제주한라병원', '본초족욕']
2	['성산일출봉(UNESCO 세계자연유산)', '한라산국립공원', '용눈이오름', '...
3	['사려니숲길', '협재해수욕장', '월정리해변', '함덕해수욕장', '산굼부리']
4	['새별오름', '제주절물자연휴양림', '다랑쉬오름(월랑봉)', '백약이오름', '...
5	['카멜리아힐', '비자림', '휴애리 자연생활공원', '제주국제공항', '아침미소...

TOP 10 Nouns of each cluster

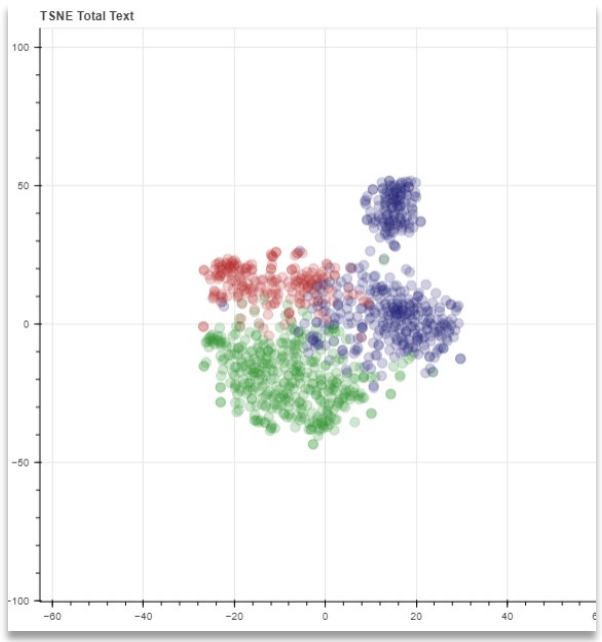
cluster0	cluster1	cluster2	cluster3	cluster4	cluster5
어트랙션	의료관광	역사유적	자연경관	오름	어트랙션
실내관광지	어트랙션	문화관광	맑음	자연경관	체험
문화관광	스파	문화유적지	커플	도보	레저/체험
아이	호텔	어트랙션	해변	도보여행	액티비티
실내	체험	자연경관	친구	친구	어린이
미술/박물관	웰니스	4.3	포토스팟	커플	아이
커플	뷰티	제주4.3	경관/포토	걷기/등산	커플
어린이	테라피	커플	걷기/등산	맑음	친구
사계절	헬스케어	맑음	어트랙션	혼자	맑음
비.눈	관광지	친구	여름	부모	체험관광

Removed unnecessary cluster irrelevant to travel

Restructure

- Cluster 0, Cluster 5 → Activity
- Cluster 3, Cluster 4 → Nature
- Cluster 2 → Cultural Heritage

Final Result

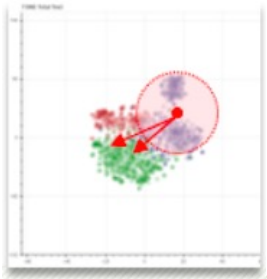


ECO JEJU TOUR Tourism Dataset ③ Tourism Data

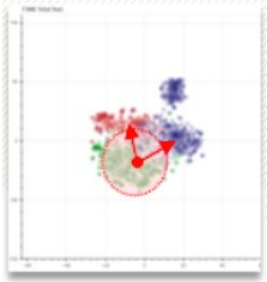
Tourist Destination Index

(4) Scoring

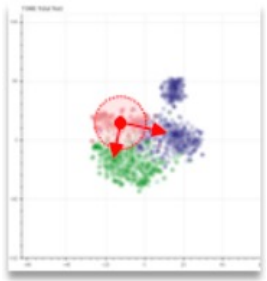
Cluster 0 Cluster 5
➡ Activity



Cluster 3 Cluster 4
➡ Nature



Cluster 2
➡ Cultural Heritage



Rated scores based on distance from cluster centroid to each data point

Scaling

이름	nature	activity	history	nature_scaled	activity_scaled	history_scaled	nature_score	activity_score	history_score
성산일출봉(UNESCO 세계자연유산)	0.250492	0.295974	0.849157	0.100429	0.132540	0.466720	0.809227	0.752487	0.284387
사려니숲길	0.297651	0.292119	0.875527	0.133274	0.130072	0.482981	0.751213	0.756774	0.267308
카멜리아힐	0.167756	0.222251	1.080659	0.042807	0.085355	0.609478	0.916218	0.836576	0.152507
새별오름	0.607294	0.692936	0.336697	0.348929	0.386609	0.150706	0.423893	0.376249	0.721300
섭지코지	0.287539	0.168912	0.997374	0.126232	0.051216	0.558120	0.763471	0.900192	0.195258

Final Score Calculation

$$(1 - distance(scaled))^2$$

Final score of each cluster

category_new	nature_score	activity_score	history_score
문화유적지	0.376759	0.355032	0.670845
액티비티	0.284036	0.533730	0.351672
자연	0.625013	0.351415	0.437761

Cultural Heritage
Activity
Nature

ECO JEJU TOUR Tourism Dataset ③ Final Data

Tourism Dataset

		Nature Score	Activity Score	Cultural Score	Hot Place Score	CO2	Region number		Nearby traveling spots	Nearby restaurant	Nearby accommodations
0	성산일출봉 (UNESCO 세계자연유산)	0.771565	0.682662	0.948563	0.692564	7.606409	15	13	['성산일출봉(UNESCO 세계자연유산)', '광치기해변', '우도잠수함(제주씨월드...	['맛나식당', '성산회관', '경미네집(경미휴게소)', '바다의 집', '그리운바다...	['아름다운리조트', '플레이스 캠프 제주', '골든튤립 제주 성산호텔', '봄그리...
1	사려니숲길	0.376859	0.325865	0.345421	0.693147	4.831689	1	0	['사려니숲길', '제주돌문화공원', '노루생태관찰원', '샤이니 숲길', '물찻오름...	[]	[]

Tourist Destination Scores

$\mathbb{R} \in [0,1]$

Popularity of the Destination

$\mathbb{R} \in [0,1]$

Website views
(Log scaled)

Carbon Emission

$\mathbb{R}$

Region Number of each Destination

$\mathbb{Z} \in [1,3], [5,8], [10,12], [14,16]$

N(0)/W(4)
S(9)/E(13)

Nearby Information

Travel Route Recommender System

ECO JEJU TOUR Travel Route Recommender System

Personalized Recommendation

(1) **Tourist Destinations**

Based on user's **Nature, Activity, Cultural Heritage Preference**

(2) **Popularity**

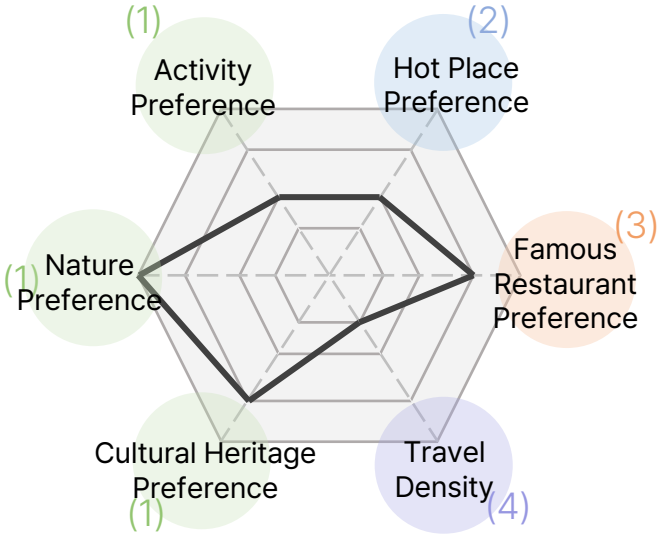
Based on user's **Hot Place Preference**

User	Nature Preference	Activity Preference	Cultural Preference	Hot Place
A	0.6	0.3	0.5	0.4

vs.

Destination	Nature Score	Activity Score	Cultural Score	Popularity
A	0.7	0.3	0.4	0.3
B	0.2	0.6	0.9	0.6

→ Select tourist destination based on **similarity** between **user preference** and **tourist destination score**



(3) **Restaurant**

Based on user's **Famous Restaurant Preference**

→ **The higher** the score, **the more famous** restaurant recommended

(4) **Number of Tourist Destination**

Based on **Travel Density**

Travel Density	Private Car	Public Transportation
0~0.3	3	2
0.3~0.7	4	3
0.7~1	5	4

→ **The higher** the score, **the more** tourist destinations are recommended

ECO JEJU TOUR Travel Route Recommender System

STEP 1. Tourist Destination Filtering

	이름	purpose1	purpose2	purpose3	popularity	co2	loc1	loc2
1	사려니숲길	0.376859	3.258648e-01	0.345421	0.693147	4.831689	1	0
0	성산일출봉(UNESCO 세계자연유산)	0.771565	6.826621e-01	0.948563	0.692564	7.606409	15	13
12	비자림	0.588894	7.084264e-01	0.496272	0.691981	4.532505	16	13
...	...	...	...	...	...	...	...	...
579	무비랜드왁스뮤지엄	0.183546	5.206298e-01	0.401657	0.005811	1.564037	10	9
747	제주베스트힐	0.406613	5.728497e-01	0.385180	0.004651	4.831689	1	0
843	해빛	0.175198	4.998554e-01	0.236963	0.003490	16.114343	1	0

List of 858 Tourist Destinations

Some not well-known destinations enough to be recommended are included

Filtering with Popularity

Major Category(Ex.North) : remove 'popularity<0.5'

Minor Category(Ex.Aeworl) : remove 'popularity<0.25'

To recommend more hidden tourist attractions

Region	Numbers
북부(0)	113
서부(4)	84
남부(9)	67
동부(13)	56
조천(1)	48
제주(2)	113
애월(3)	61
한림(5)	39
한경(6)	30
대정(7)	36
안덕(8)	54
중문(10)	21
서귀포(11)	83
남원(12)	35
표선(14)	27
성산(15)	35
구좌(16)	56

Filtered Regional Tourist Attractions

ECO JEJU TOUR Travel Route Recommender System

STEP 2. Combination of Attraction

combination

(Total Number of Attraction) C (Number of attraction to visit)

Attraction's INDEX

	0	1	2
0	13	19	25
1	13	19	26
2	13	19	31
3	13	19	43
4	13	19	48
...	...	...	...
302616	791	814	839
302617	805	806	814
302618	805	806	839
302619	805	814	839
302620	806	814	839

⬇

Combination of 3
tourist attractions to visit

STEP 3. Calculate carbon emissions by combination of destination

Carbon Emission

	0	1	2	co2
0	13	19	25	22.278586
1	13	19	26	12.962554
2	13	19	31	27.177649
3	13	19	43	27.177649
4	13	19	48	27.177649
...	...	...	...	...
302616	791	814	839	30.490135
302617	805	806	814	21.840575
302618	805	806	839	28.484213
302619	805	814	839	30.508753
302620	806	814	839	16.922895

Set Threshold of Carbon Emission

Mean	32.468987
std	19.241773
Min	0.142393
Max	181.671537
25%	20.675181
50%	29.373847
75%	39.189104

Select only low-carbon tourist destination combinations with the bottom 25% carbon emissions

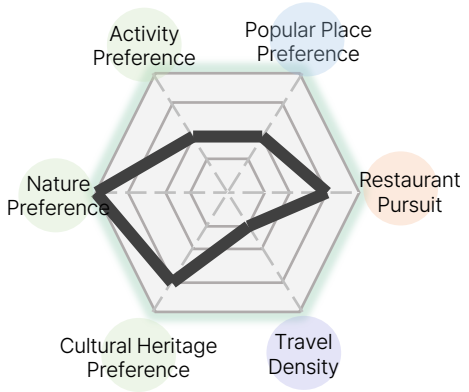
→ Eliminate rich-carbon tourist destination combinations for eco-friendly travel

ECO JEJU TOUR Travel Route Recommender System

STEP 4. Calculate Similarity with users by Attraction Combination

	0	1	2	co2	Similarity similarity
0	13	19	25	22.278586	0.950265
1	13	19	26	12.962554	0.931049
2	13	19	31	27.177649	0.900032
3	13	19	43	27.177649	0.942952
4	13	19	48	27.177649	0.902906
...	...	...	...	...	...
302616	791	814	839	30.490135	0.960133
302617	805	806	814	21.840575	0.921974
302618	805	806	839	28.484213	0.915455
302619	805	814	839	30.508753	0.932211
302620	806	814	839	16.922895	0.962704

Calculate **cosine similarity to the user's Taste Hexagon Preference** score



Choose the most similar tourist destination combination

→ **Selected as a personalized** tourist destination combination

STEP 5. Closest Distance

Reduce carbon emissions from transportation by reducing travel distance

	0	1	2	...	877	878	879
0	0.000000	27.982931	56.188593	...	44.580294	26.436862	3.991053
1	27.982931	0.000000	28.656421	...	19.821806	10.440169	27.020414
2	56.188593	28.656421	0.000000	...	24.555824	31.314689	54.603683
3	65.252372	37.526944	16.616512	...	23.441149	43.634991	64.535818
4	16.427955	21.859265	49.650862	...	32.213764	26.780620	18.916690
...	...	...	...	...	...	...	...
882	65.275245	37.520627	16.329368	...	23.615866	43.546742	64.534944
883	62.505821	34.974590	16.712549	...	20.135483	41.608493	61.918430
884	35.363124	10.388595	21.346259	...	23.134036	10.019503	33.463548

latitude and longitude
via Naver Map API for each location

Calculate the **straight distance from GeoPy Library** for the calculated latitude/longitude

Compute for all paths with full navigation

ECO JEJU TOUR Travel Route Recommender System

STEP 6. Recommend the closest restaurant and lodging

Restaurant

[Tourist Site Data Crawling from VISIT JEJU]

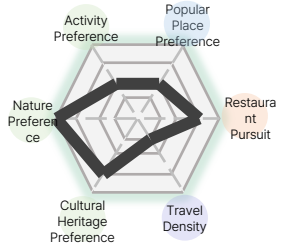
이름	주변음식점개수	주변음식점
카멜리아힐	7.0	['아뜰리에 제주명월', '숨비나리카페', '창천삼거리식당', '숨비나리', '헬로...
협재해수욕장	40.0	['명랑스낵', '피어22', '협재해녀의집', '앤트러사이트', '수우동', '명...

Restaurant Surrounding Tourist Site

[Restaurant Data Crawling from VISIT JEJU]

이름	pop	co2_rank
봄날카페	0.692525	0.614967
서연의집(영화 건축학개론)	0.691281	0.614967
명진전복	0.692214	0.165715

인기도 탄소배출량



Recommended Restaurant by
Restaurant Pursuit Score

High: Consider Popularity than Carbon Emission
Low: Consider Carbon Emission than Popularity

Accomodation

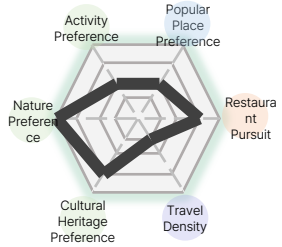
[Accomodation Data Crawling from VISIT JEJU]

이름	주변숙박개수	주변숙박
SCO 세계자연유산)	28.0	['아름다운리조트', '플레이스 캠프 제주', '골든튤립 제주 성산호텔', '봄그리...
우도(해양도립공원)	20.0	['우도피아', '소섬바당', '우도사랑', '우도쉼팡게스트하우스', '뽀요요펜션'...

Accomodation Surrounding Tourist Site

[Accomodation Data Crawling from VISIT JEJU]

이름	지역
나미송 머무는 곳	제주시 > 애월
해비치호텔앤드리조트	서귀포시 > 표선
신라호텔제주	서귀포시 > 중문



Recommended Accomodations by
Travel Density

High: Recommend Cheaper Accomodations
Low: Recommend More Expensive Accomodations

Travel Route Recommendation Example

ECO JEJU TOUR Recommended Route Example 1 Persona 1

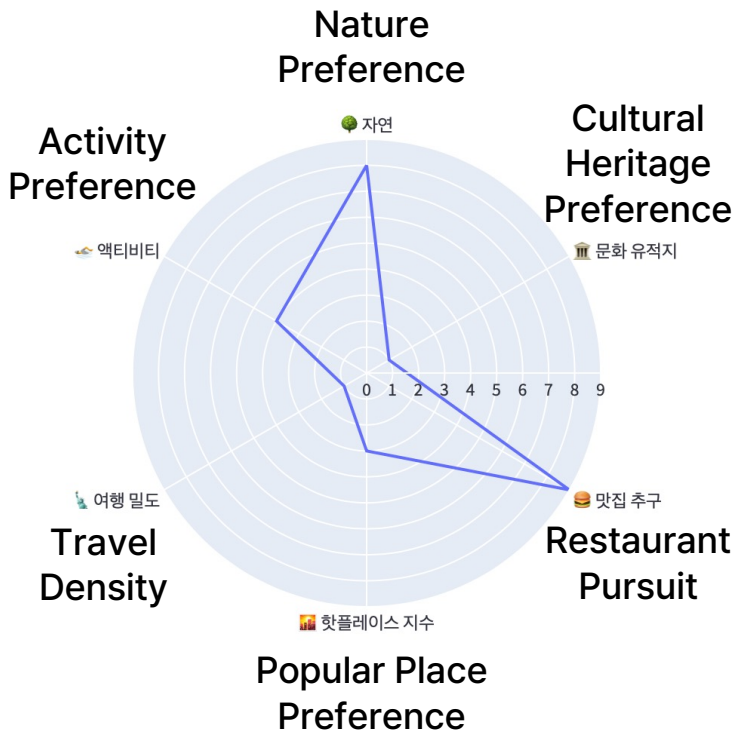
Persona 1

Likes to **Heal in Nature** and **Hates Activity**

It's good to just **go around** a couple of places

I only want to go to **a famous restaurant**

It doesn't have to be a famous tourist destination



Q. Which part of Jeju Island are you going to travel to?

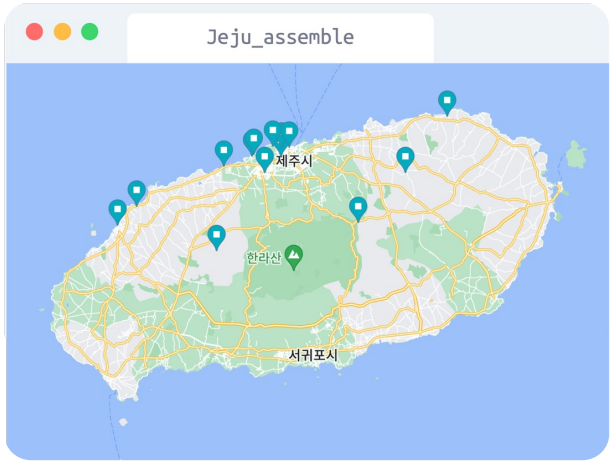
→ I want to travel to the northern part of Jeju Island

Q. What transportation will you use?

→ Going to use Public Transportation

ECO JEJU TOUR Recommended Route Example 1 Persona 1

Recommended Route



Total Carbon Footprints

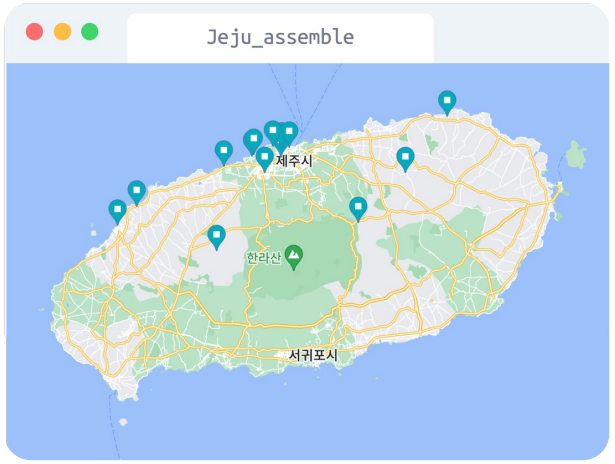
Traffic	5.96kgCO_2
Food	16.11kgCO_2
Tourism	0.113 kgCO_2
Accomodation	8.73kgCO_2
Airplane	112kgCO_2

= 142.913kgCO_2

DAY 1	제주 국제공항	사려니 숲길	Lunch 숙성도 노형본관	도두항	Dinner 도두 해녀의집	섬타임즈 제주
DAY 2	섬타임즈 제주	용담/용두암 해안도로	Lunch 미친부엌	도두봉	Dinner 김희선몸국	섬타임즈 제주
DAY 3	섬타임즈 제주	김녕 지질트레일	Lunch 구좌상회	보물섬 하이킹	Dinner 우진해장국	섬타임즈 제주
DAY 4	섬타임즈 제주	큰노꼬메 오름	Lunch 제주프리또	제주올레 15-A코스	제주 국제공항	

ECO JEJU TOUR Recommended Route Example 1 Persona 1

Recommended Route



Total Carbon Footprints

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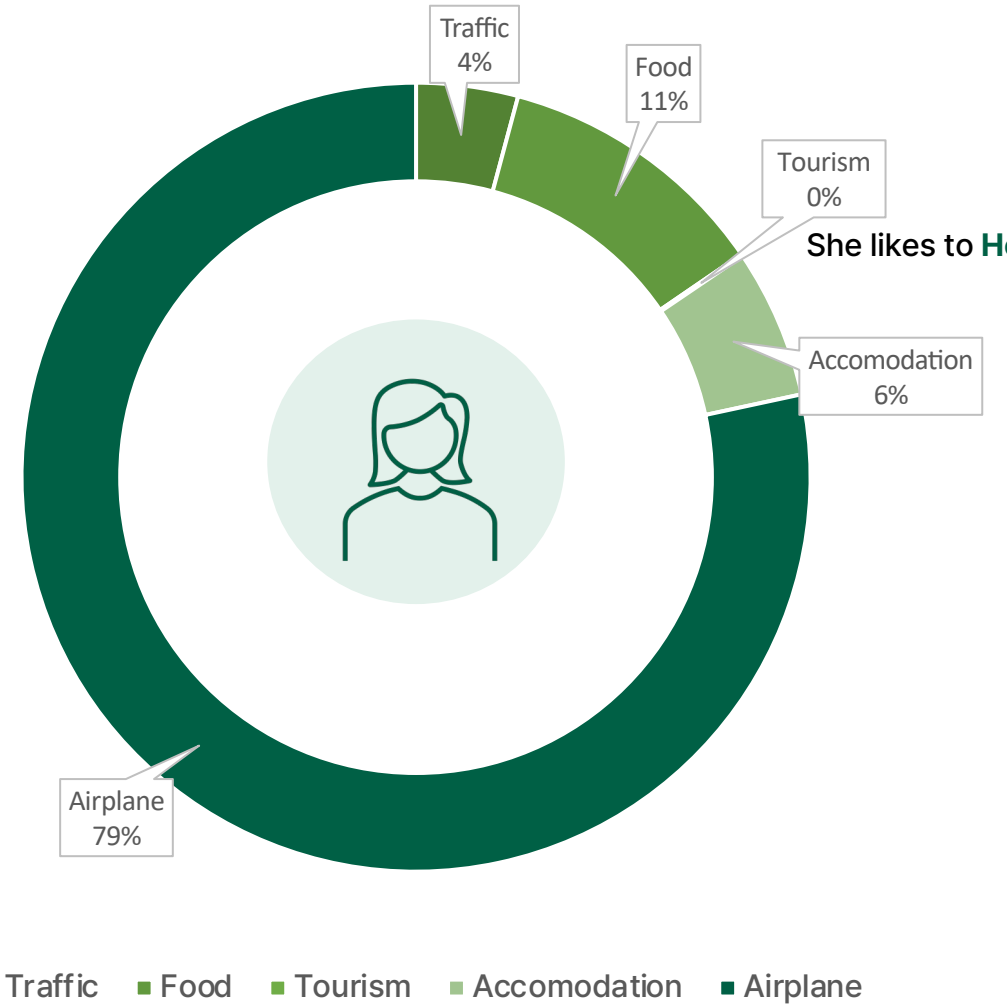
Accomodation	8.73kgCO_2
Airplane	112kgCO_2

= 142.913kgCO_2

Persona 1

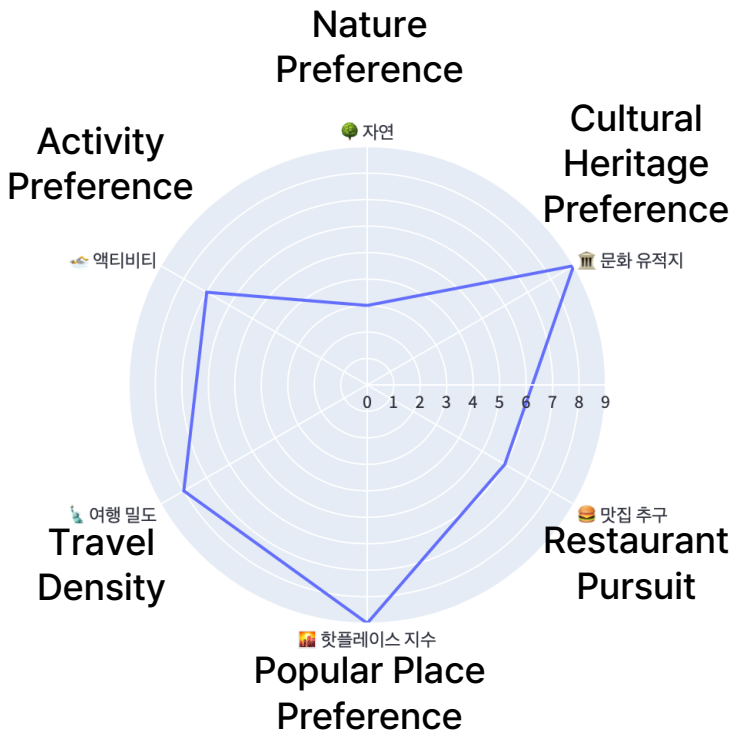


ECO JEJU TOUR Recommended Route Example 1 Persona 2

Persona 2

I'm okay with nature,
but I prefer History and Activities.

Plan on going around a lot
Any restaurant is fine
Love Popular Place



Q. Which part of Jeju Island are you going to travel to?

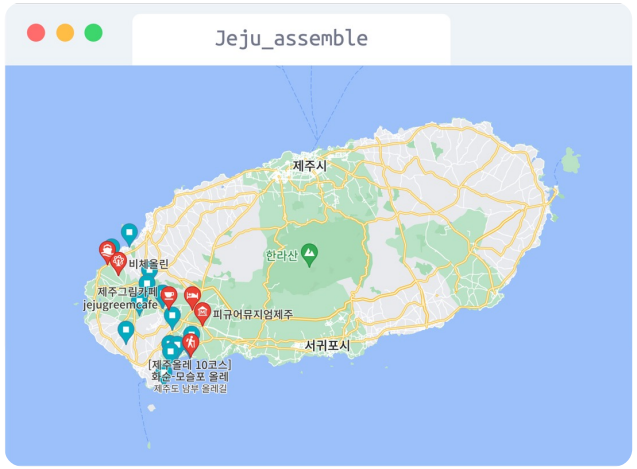
→ I want to travel to the Southern part of Jeju Island

Q. What transportation will you use?

→ Going to use Public Transportation

ECO JEJU TOUR Recommended Route Example 1 Persona 2

Recommended Route



Total Carbon Footprints

Traffic	8.78kgCO_2
Food	7kgCO_2
Tourism	1.0473kgCO_2
Accomodation	6.28kgCO_2
Airplane	112kgCO_2

= 135.107kgCO_2

DAY 1

제주 국제공항	금능 해수욕장	Lunch	리치망고	신창 해안도로	제주 현대미술관	Dinner	뉴저지	코즈게스트 하우스

DAY 2

코즈게스트 하우스	판포 포구	비체 올린	Lunch	울트라 마린	산양 곶자왈	송악산 진지동굴	Dinner	헤이 브라더	코즈게스트 하우스

DAY 3

코즈게스트 하우스	초콜릿 박물관	이니스프리 제주하우스	Lunch	아뜰리에 제주명월	점보 빌리지	화순금 모래해 수욕장	Dinner	치치퐁	섬타임즈 제주

DAY 4

섬타임즈 제주	제주올레 10코스	하늘여행 행글라이더 체험장	Lunch	헤이 브라더	그린 크루즈	용머리 해안	제주 국제공항

ECO JEJU TOUR Recommended Route Example 1 Persona 2

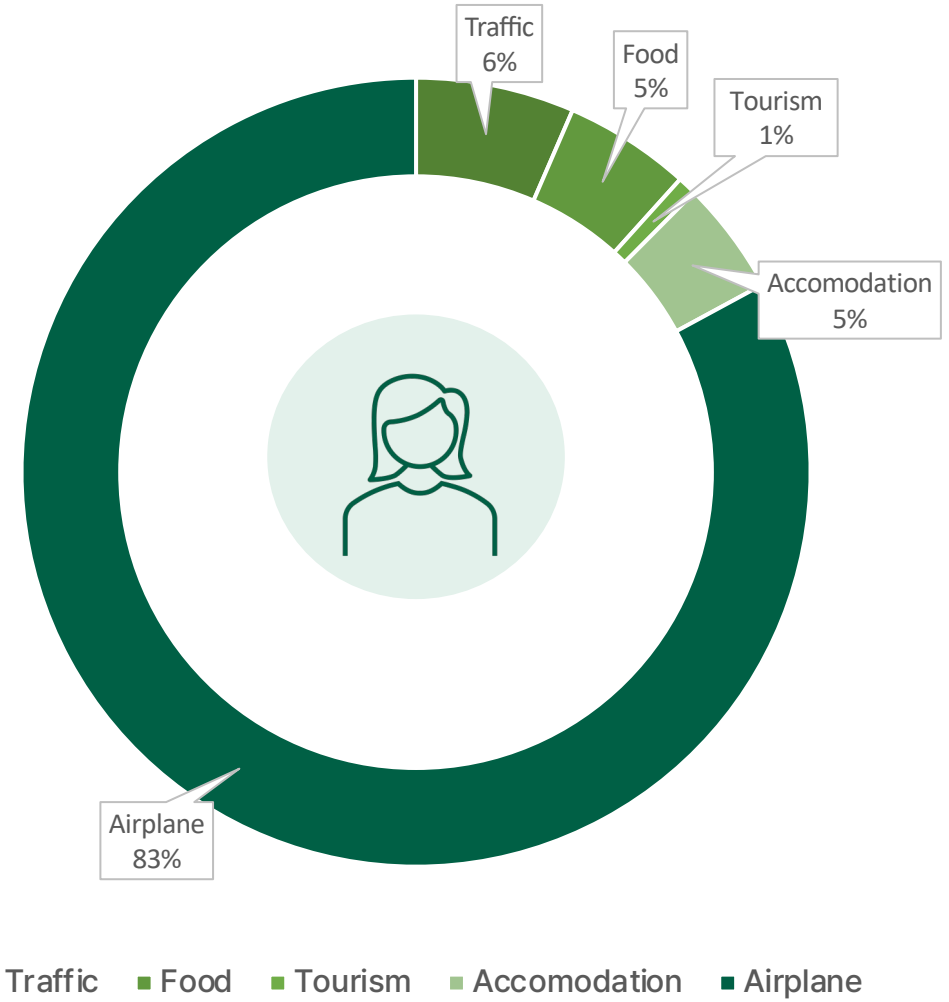
Recommended Route

Total Carbon Footprints

- 🚗 Traffic 8.78
- 🍳 Food 7
- 🚃 Tourism 1.0473
- 🏨 Accomodation 6.28
- ✈️ Airplane 112

= 135.107kgCO2

Persona 2



Assignment 3

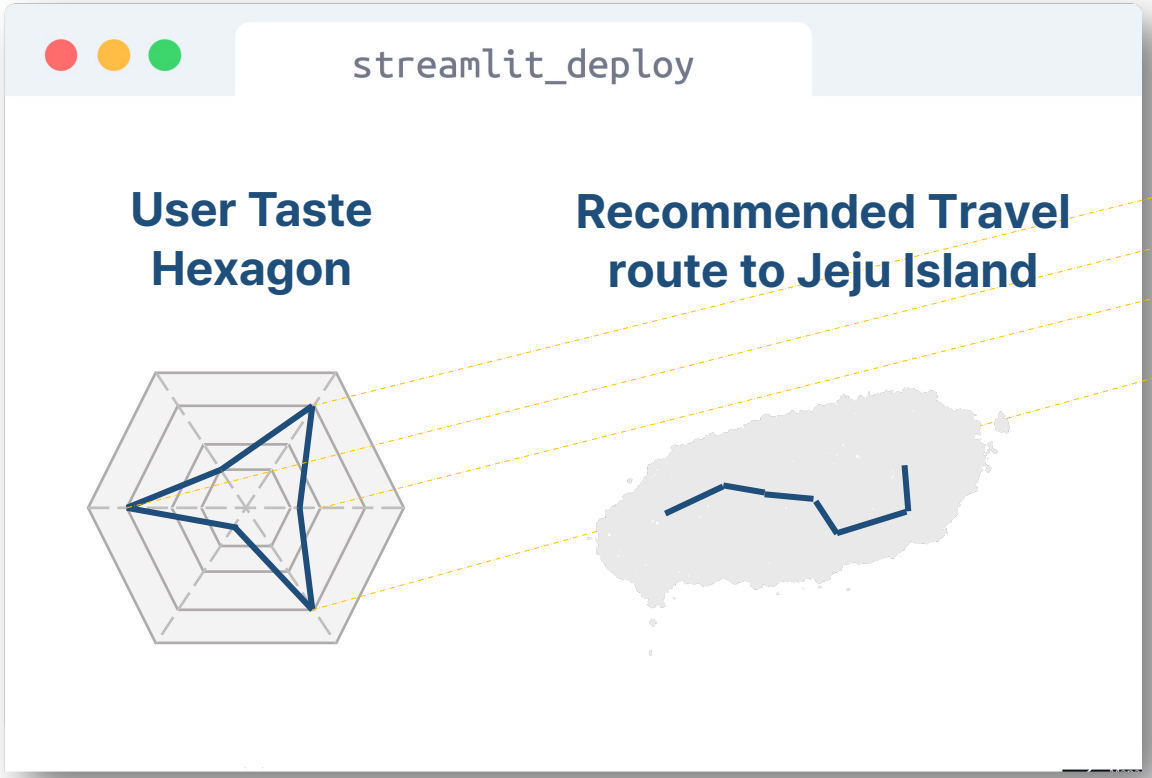
Customer Communication Plan

Customer Communcation ① Instagram Marketing

Stars in the Blue Night Sky of Jeju Island

Implemented to look like a constellation according to Trace drawn based on the input received from User Taste Hexagon - Draw via Instagram Story/Post Event

 # Blue Night Sky **# Jeju Horse** **# Constellation** **# the Big Dipper**



Customer Communcation ② Eco-friendly performances tailored to JEJU

Jeju Island's Big Dipper Acoustic Busking Live

신한카드 제주관광공사 JEJU TOURISM ORGANIZATION

Busking

Citizen Welfare Town Plaza (Donam-dong, Jeju-si)

Park near Chilseongdae Fountain that shines brightly at night
Historic Site of the Ancient Tamna Kingdom

VISIT JEJU Selected <Night Trip in the City of Jeju City>

Motivation

Jeju : a descendant of the Big Dipper

新增東國輿地勝覽 (Chosun, 1530)

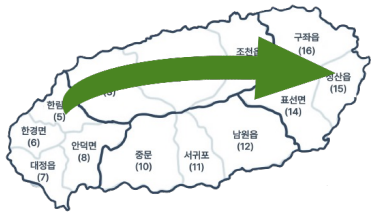
"Chilseongdo Island is located in the main castle, and there is an old site built with stones."
"I lived in a village by stacking stones that resemble the shape of the Big Dipper."

Customers

Selection of excellent reviewers from customers who have visited the recommended travel route (calculated about 100 people)

(1) Whether you have been to Jeju Island as the recommended route
(2) Calculation of scores through review sensitivity analysis
(3) Limited to customers whose carbon footprint does not exceed the threshold value

Customer Communcation ③ Shinhan Card Contest



ESG Jeju Travel Contest

Route Recommendation Algorithm
Carbon Footprint Calculator

Let's go on a trip to Jeju Island as the recommended route!
Calculation Carbon Emissions from Tourism in Jeju Island!

Carbon Footprint on Travel

신한카드

Carbon Emission index in the consumption sector
'Shinhan Green Index'

Shinhan Card Payment
Events such as accumulating labeling points for purchased items and purposes are held

Shinhan Green Index
Calculate the user's carbon emissions
Awarded prizes to outstanding users

VLOG Contest

Travel Influencer
Proposed shooting of carbon footprint travel vlog

Goal
New Trend of Carbon Footprint Travel vlog

Expectation

To alert everyone by informing them of their travel total carbon emissions

Carbon footprint travel trend not only in Jeju but also across the country

Conclusion

Conclusion Design the Carbon Footprint Calculator & Develop the Travel Route Recommender System

1 Selection of indicators

The Definitely Popular Place !
vs. A hidden place that
only I want to know

Characteristic of Gen-Z

Reflects the tendency to prefer places that **only you want to know** in addition to famous places

#Popular Place Preference
#Restaurant Pursuit

2 User Taste Hexagon

Defines me & my preference

The reason why MBTI and psychological tests are so popular

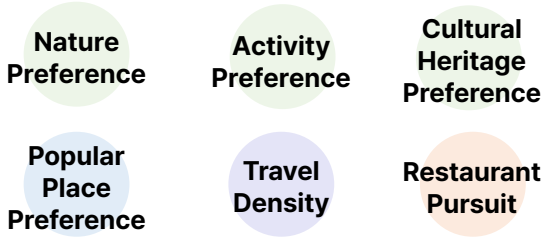
User-Taste Hexagon

Attracting great interest to the Gen-Z

Enjoy sharing and comparing the results of each Hexagon and Root with friends

3 Various Routes

Benefits of receiving
6 metrics differently each time



It's fun to modify indicators together when planning a trip with friends and find routes that everyone is satisfied with

Conclusion Future Works

Business Item Proposal

Application of deep learning and natural language processing technology

Travel propensity analysis

Analysis of propensity by classifying the characteristics of travelers like MBTI

⬇

Can recommend travel routes that are better for travelers

Utilizing genetic algorithms

Development of Travel Route Recommender Algorithm Using Collaborative Filtering and Genetic Algorithm

Reference

유전알고리즘을 이용한 사용자 평가기반 여행계획 모델링, 권순호 et al., 2020

Applying RNN

Development of personalized next travel recommendation model using RNN/GRU

Reference

딥러닝을 이용한 시퀀스 기반 여행경로 추천시스템 개발, 이희준 et al., 2020

Chatbot

Travel destinations and words received from users

⬇

Calculate travel routes and carbon emissions from LM

Team DAVENGERS

Construct a Carbon Footprint Calculator & Develop the JEJU Tour Recommender System

Project Official Webpage

Official GitHub Repository

Carbon Footprint Calculator

Travel Route User Taste Hexagon

Conclusion DAVENGERS Team

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