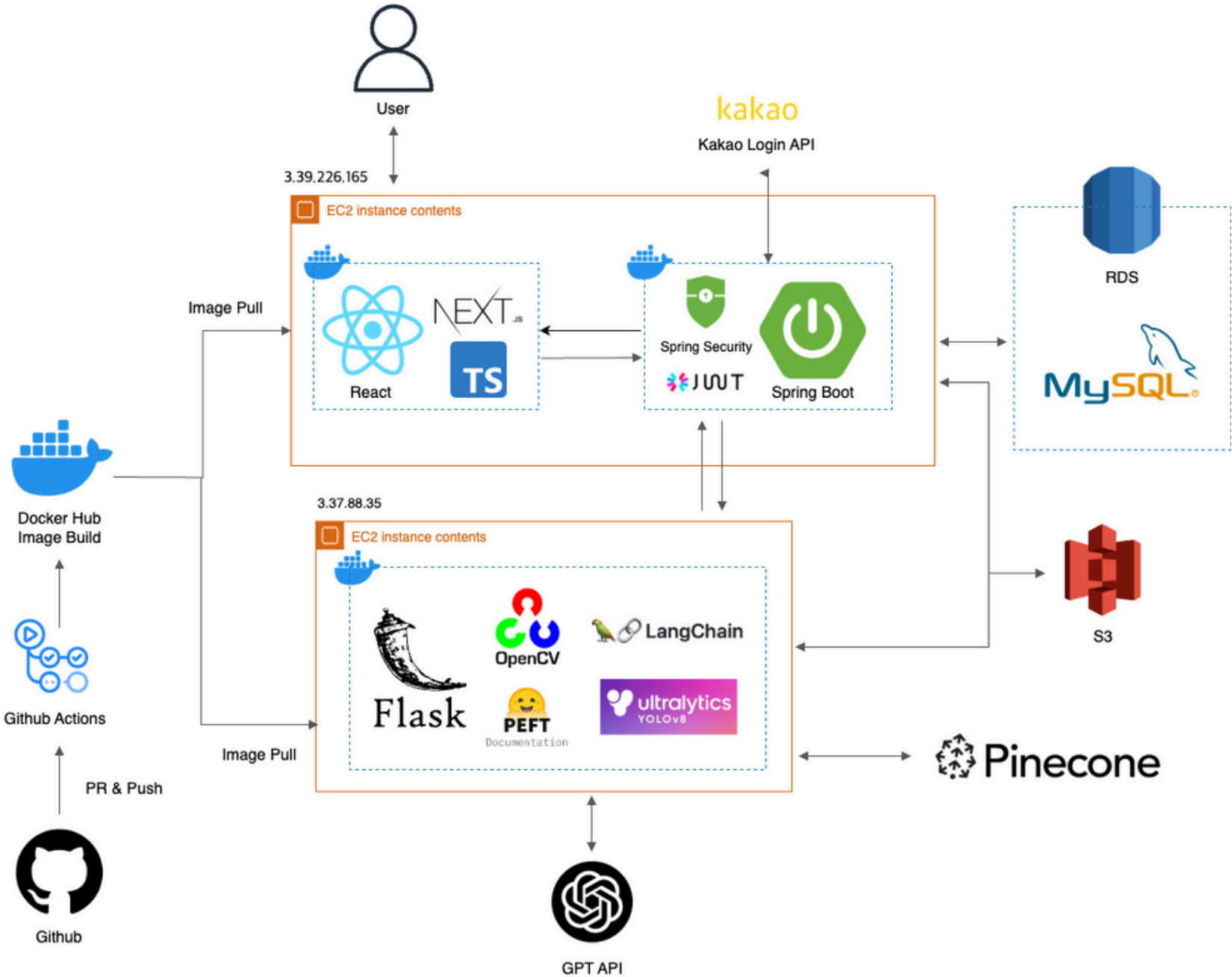


PORTFOLIO

M E & P R O J E C T S

Think flexibly, Design deeply, Solve precisely
AI/ML Engineer MINKYUNG KIM

StarBridge | LLM & Generative Vision AI-based Pet Loss Support Service



Overview

- Led the development of an AI-based service to support users experiencing pet loss, integrating LLMs, vision AI, and emotionally engaging UX.
 - 1. **Chatbot for Expert Guidance (GPT, RAG)**
 - Built a chatbot offering tailored advice (e.g., senior pet care, insurance, funerals)
 - Filtered irrelevant queries by dropping low-similarity results via Pinecone vector DB
 - Increased precision by chunking policy documents, extracting keywords (GPT-API), and applying similarity-based retrieval
 - 2. **Pet Constellation Generator (YOLO, SAM, PidiNet)**
 - Created constellations from pet images, helping users preserve memories in a symbolic form
 - Addressed segmentation issues (e.g., mis-splitting, imprecise areas) using YOLO + box-based SAM for cleaner UI/UX
 - 3. **Personalized Letters via Generative AI (Dreambooth - Stable Diffusion)**
 - Delivered postcards with pet images and letters “written” by the pet
 - Used stylized LoRA to reduce the uncanny valley and improve emotional quality
 - 4. **Deployed all the ML Pipeline on AWS GPU server (Gitub CI/CD, Docker)**
 - enabled ML API on g4dnx.large instance with CUDA settings

StarBridge | LLM & Generative Vision AI-based Pet Loss Support Service



Chatbot for Expert Guidance (GPT, RAG)

Guide informative contexts of senior pet care, insurance, funerals



Personalized Letters via Generative AI (GPT, Dreambooth – Stable Diffusion)

Generate heartfelt letters using GPT based on users' memory posts about their pets. Create personalized images that reflect the pet's appearance.



Pet Constellation Generator (YOLO, SAM, PidiNet)

Automatically segment the pet from a photo, extract contour lines, sample key points, and connect them using a Minimum Spanning Tree (MST) to form a constellation.

PillForMe | Personalized Supplement Recommendation App (LLM + Genetic Algorithm)

RTX4090 GPU(24G)
32개 CPU의 로컬 환경에서 구현
total running time: 2~3 min



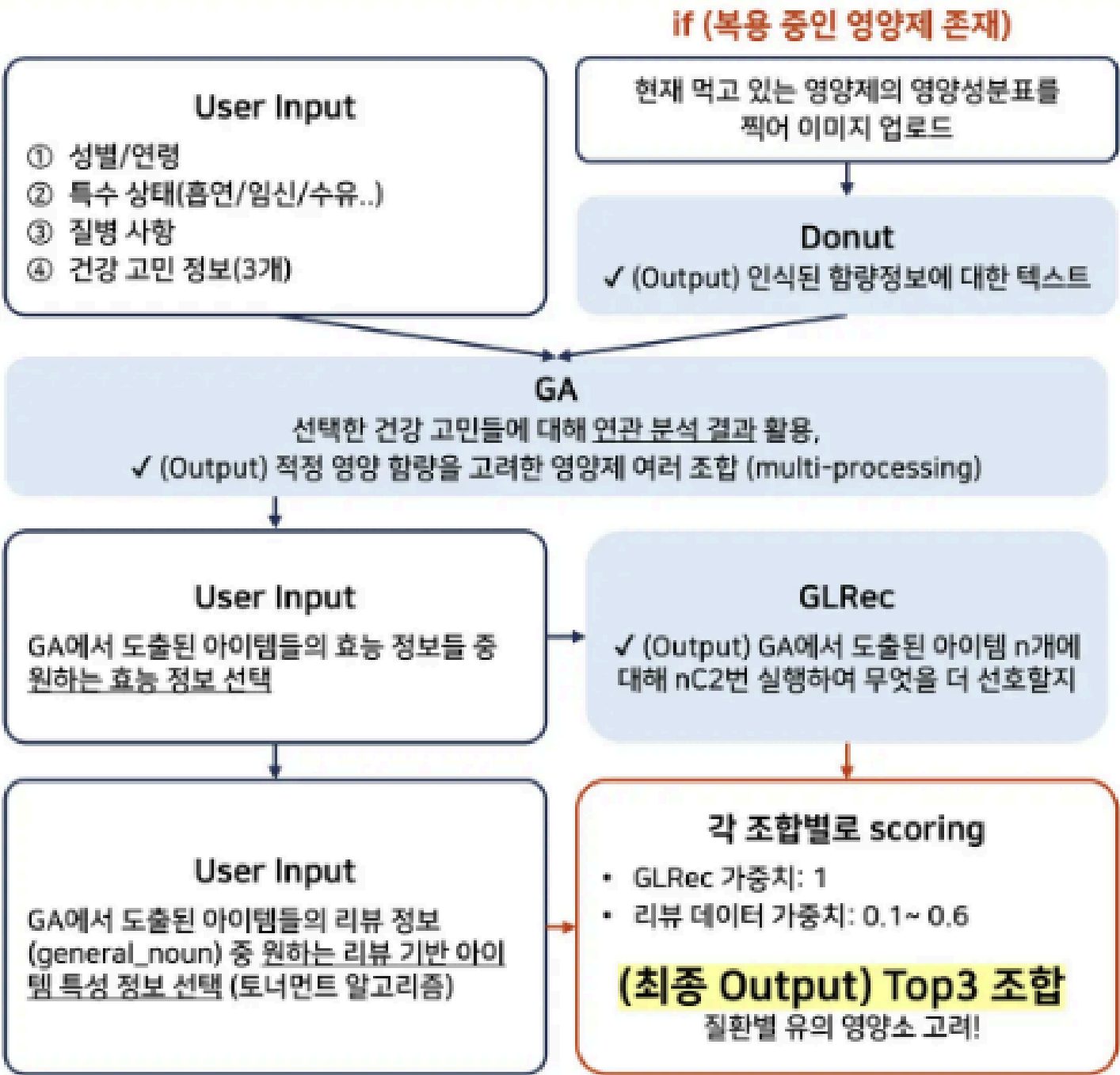
FE: react native expo(port:8081)



BE: flask(port:5000)
Donut_MLserver: flask(port:6000)
GA_MLserver: flask(port:7000)
GLRec_MLserver: flask(port:8000)



Pinecone
리뷰 데이터 활용 시 VectorDB 활용



Overview

- Led the development of a personalized supplement recommendation app leveraging LLMs, and graph-based prompt engineering.
 - **1. Custom Recommendation Model Design (LLM + GA)**
 - Identified limitations in existing systems that couldn't recommend multi-product combinations based on individual user health profiles
 - Co-designed a novel model integrating OCR, genetic optimization, and LLM reasoning to tailor complex supplement bundles
 - **2. Architecture Pivot & Data Strategy**
 - Initiated a structural shift from review-based similarity to LLM-based recommendation, based on academic research findings
 - Persuaded the team by presenting scenario-driven technical analysis and proposing a new data pipeline
 - Designed a graph-based prompt structure using clustered user-item interaction data for enhanced LLM context
 - Also complemented GA algorithm with multi-threading
 - **3. Model Fine-tuning & Performance Improvement**
 - Fine-tuned LLaMA model using LoRA, and resolved overfitting via data complexity control and reprocessing
 - Achieved 98% recommendation accuracy, enabling customization based on gender, age, concerns, and dosage
 - **4. Implemented a prototype app with React Native**
 - Connected the APIs for each ML Server (OCR/GA/LLM) and implemented FE with React Native

PillForMe | Personalized Supplement Recommendation App (LLM + Genetic Algorithm)

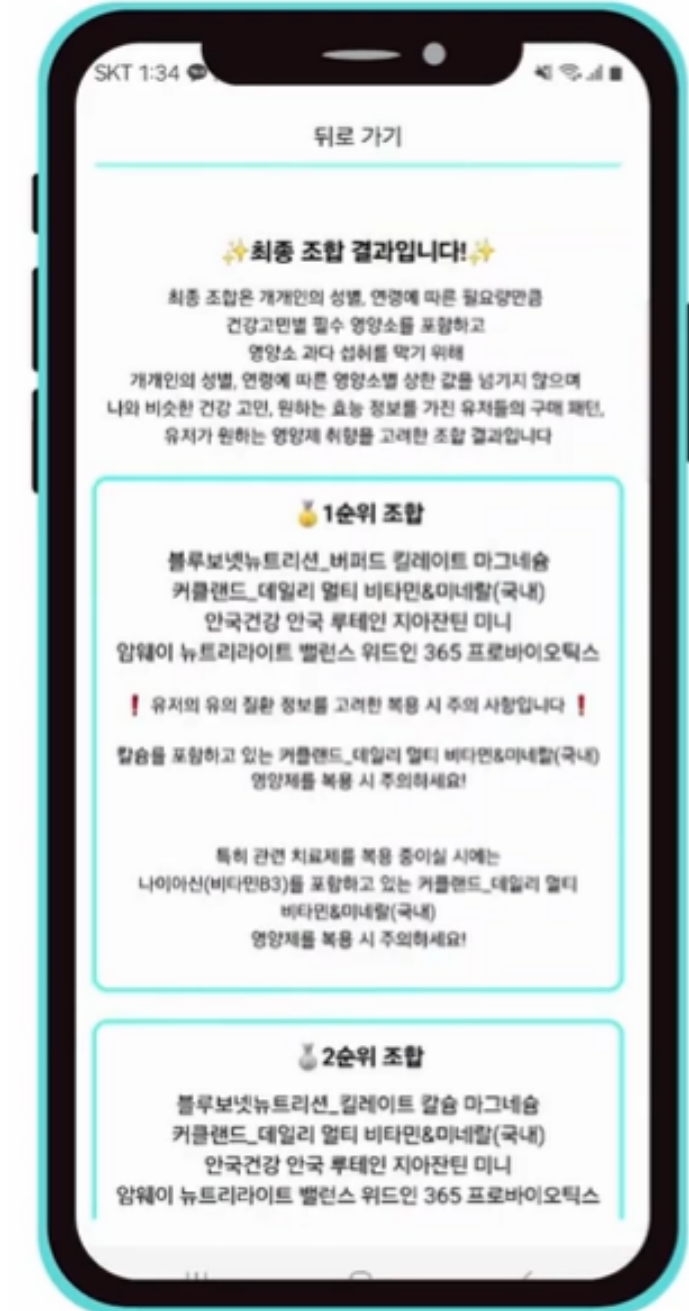


1. Generate candidate supplement combinations using a Genetic Algorithm (GA) based on user inputs (e.g., health concerns, lifestyle, demographics).



2. Select desirable combinations using tournament-based filtering with:

- User-specified functional goals
- Review-based product characteristics
- Pairwise LLM-based recommendations across all possible combinations (nC2)



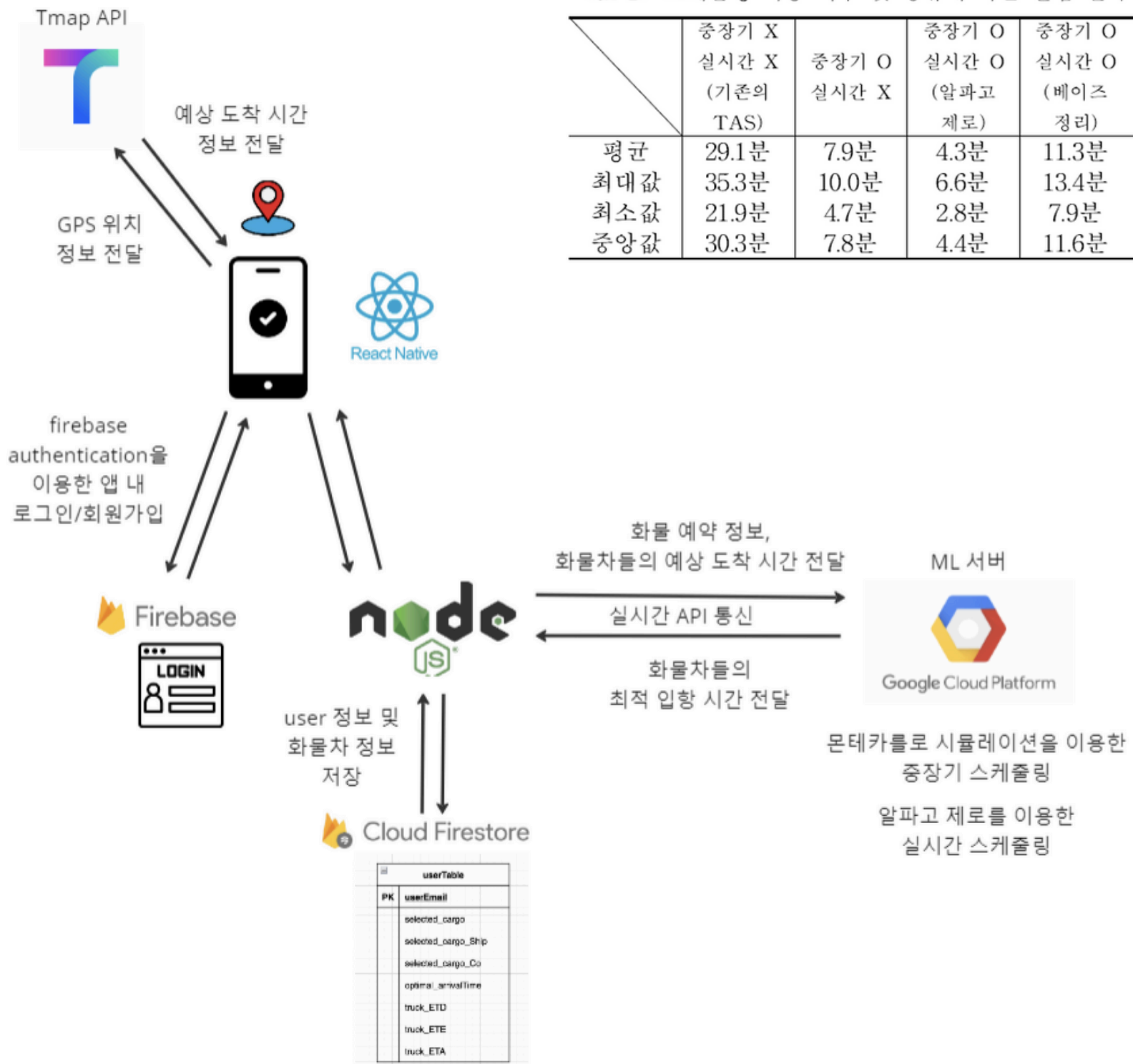
3. Score all combinations using weighted factors (e.g., GLRec score, label data relevance), and return the Top 3 optimized supplement bundles.

Port Scheduler | Reinforcement Learning-Based Truck Scheduling System

3. 실시간 스케줄링 모델의 성능 평가

<표 1> 스케줄링 적용 여부 및 종류에 따른 실험 결과

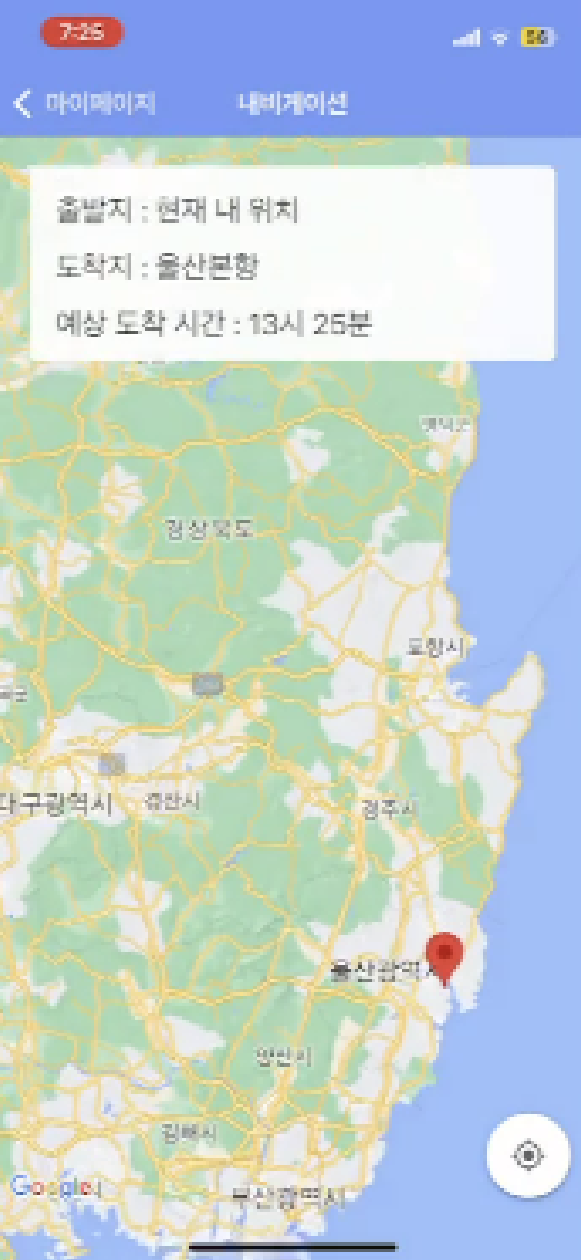
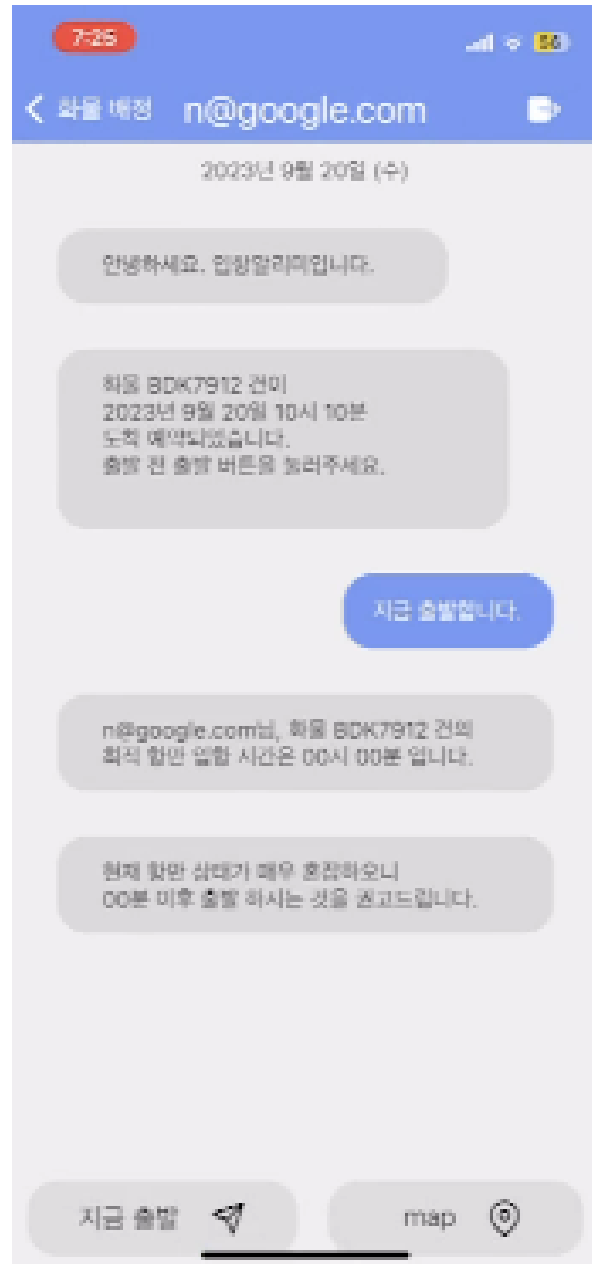
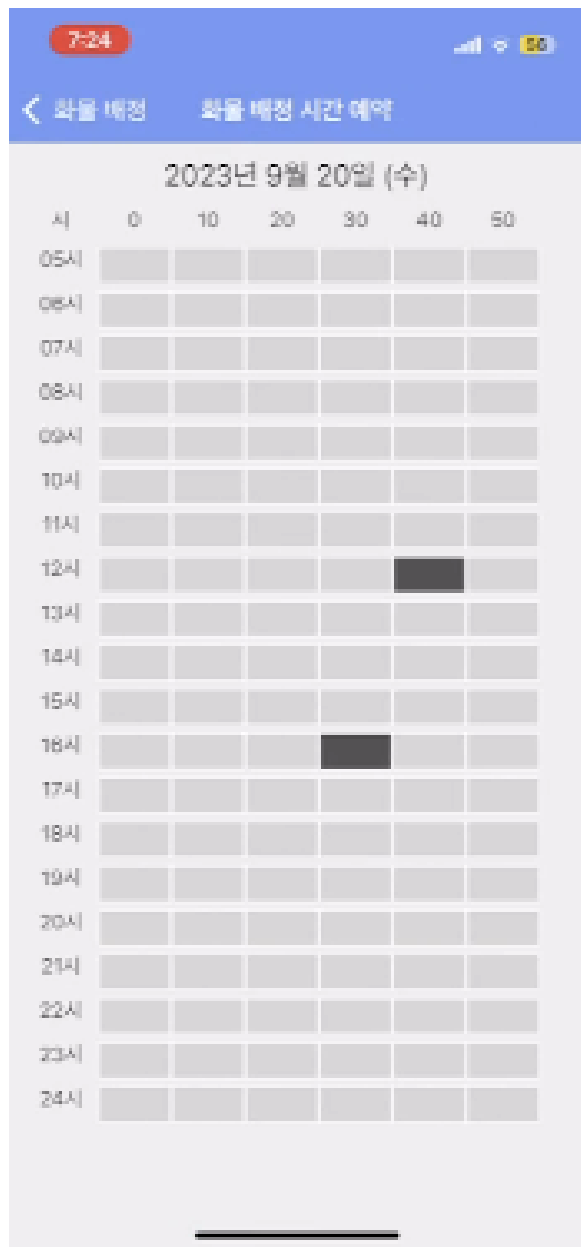
	중장기 X 실시간 X (기존의 TAS)	중장기 O 실시간 X	중장기 O 실시간 O (알파고 제로)	중장기 O 실시간 O (베이지스 정리)
평균	29.1분	7.9분	4.3분	11.3분
최대값	35.3분	10.0분	6.6분	13.4분
최소값	21.9분	4.7분	2.8분	7.9분
중앙값	30.3분	7.8분	4.4분	11.6분



Overview

- Built a port truck scheduling system using Monte Carlo simulation, AlphaGo Zero-style reinforcement learning, and Bayesian inference to reduce congestion at Ulsan Port.
 - 🏗️ 1. Hybrid Scheduling Model (Monte Carlo + RL + Bayes)
 - Designed long-term and real-time models to optimize truck arrivals
 - Used 2 years of data to estimate reservation capacity via Monte Carlo simulation
 - Applied reinforcement learning with MCTS and Bayesian updates for dynamic real-time rescheduling
 - 🔄 2. Strategic Pivot & Implementation
 - Switched from an underperforming graph-based model to an RL-based approach, inspired by Go AI
 - Led team transition by proposing new structure, guiding daily discussions, and formulating RL strategy
 - Implemented final model as a Flask ML server with API integration
 - 📊 3. Results & Deployment
 - Reduced average wait time by 85% (29.1 → 4.3 mins), with ~30M KRW annual savings
 - Built full-stack app: Flask (ML), Node.js (backend), React Native (frontend)
 - Conducted on-site visits and managed team workflow to ensure project delivery

Port Scheduler | Reinforcement Learning-Based Truck Scheduling System



1. Time Slot Reservation (Long-Term Scheduling)

Fully booked time slots are closed to new reservations.
Truck capacity per slot is limited by an algorithm.

2. AI Delay Guidance (Real-Time Scheduling)

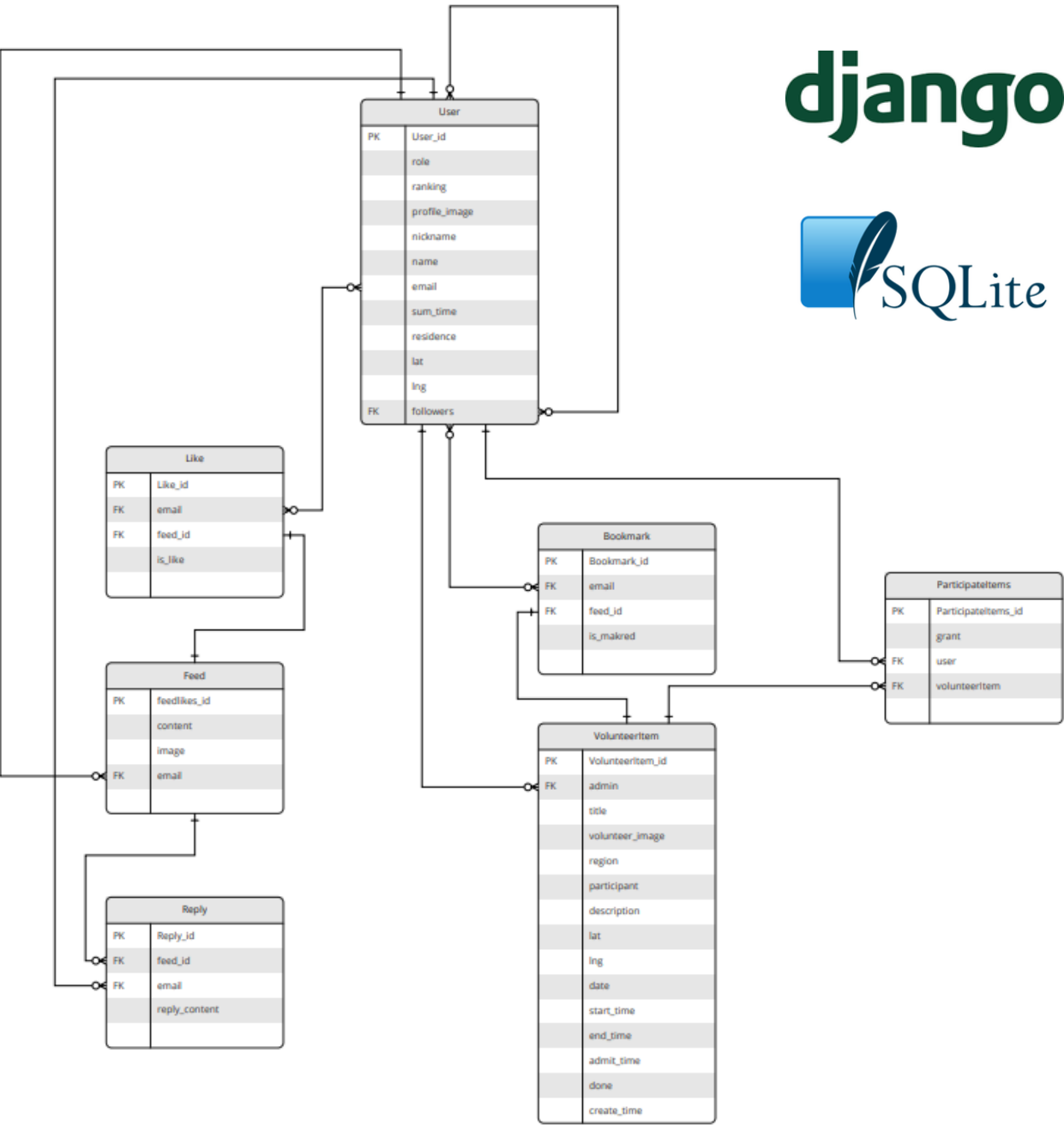
When the driver taps "Depart", AI recommends a delay (0–30 mins) based on current traffic and scheduling conditions.

3. Live GPS & Queue-Aware Scheduling

Google Maps displays real-time location via GPS.
AI uses this to track queue status and reschedule arrivals dynamically.

++ Frontend / Backend / DB Experiences

<https://lean-advantage-d78.notion.site/45ad43382ff4467db8f1091c10f0c499>



Developed core volunteer platform features including user auth, CRUD, social functions, and distance-based recommendations using Kakao Map API. Also structured ERD for SNS-like features and managed data with SQLite DB

<https://lean-advantage-d78.notion.site/s-339970fb06d442dab4be92c3c6ccd8c2>

02. 오밀조밀 주요 기능 1 : 컬리의 식탁

기획 배경 서비스 소개 개발 과정 서비스 적용

| 컬리의 재료로 만든 한상을 공유할 수 있는 곳

#너와나의연결고리 #구매후기의전환

[컬리의식탁 메인 페이지]

- 맞춤 추천 게시물 중 인기가 많은 TOP4 좋아요를 많이 받은 인기있는 피드 4개가 연립으로 best 오늘의 meal에 보여짐
- 실시간으로 업데이트 되는 컬리 피드 다른 사용자가 업로드 하는 게시글이 실시간으로 반영되어 업데이트 됨. 미리보기에는 알상이 함께 보임

[컬리의식탁 세부 페이지]

- 다른 사용자의 게시글 세부 페이지 조리시간, 난이도, 레시피, 알상글을 확인할 수 있고 마음에 드는 게시글에 좋아요 버튼도 있음!
- 요리에 함께 쓰인 컬리 상품 목록 필요한 재료 및 주방용품 목록이 보여지게 되며 상품을 누르면 세부 상품 페이지로 전환되어 장바구니 기능 및 구매를 유도
- 게시글 포스트링 가능 사용자가 직접 게시글을 업로드 할 수 있음

02. 오밀조밀 주요 기능2 : 컬리 플레이팅

기획 배경 서비스 소개 개발 과정 서비스 적용

| 나만의 식탁 분위기 찾기

#요리의같은_플레이팅 #이건 혁명이야

[컬리플레이팅 메인 페이지]

- 3가지 분위기의 식탁 대리석, 얼은원목, 짙은 원목으로 3가지 분위기 식탁 연출
- 3가지 주방용품(식기 및 테이블 웨어) 컬리의 플레이팅, 테이블 매트, 커트러리 종류별로 나열 되어 있으며 사용자가 원하는 상품을 직접 테이블에서 구원할 수 있음
- 식탁 가운데 연출될 음식 예 그곳에 연출 될 음식 예시 목록

[컬리플레이팅 서비스 예시]

- Top View로 식탁의 분위기가 연출 되기에 구매에 앞서 확인 가능
- 서비스를 사용하여 자신이 원하는 식탁의 취향과 분위기를 찾을 수 있음
- 마음에 드는 상품은 장바구니로 담아 비식품류(주방용품) 구매 유도
- 식탁을 꾸미기 때문에 세트 구매를 기대할 수 있음

[서비스 기능 확장성]
(업로드 기능) 사용자가 직접 사진을 업로드 한 후 식탁을 연출 있도록 (더 많은 상품) 3가지 주방용품 외 다른 상품 추가 가능 (자동 분위기) 사용자가 사진만 업로드 한 후 원하는 분위기에 맞춰 자동 변환

Implemented image upload/view using multipart/form-data and built key UI pages including login, signup, carousel-based main, detail views, cart, and post creation.



THANK YOU

THAT'S MY PORTFOLIO SO FAR.

