Final Presentation of Graduation Project 2

- Diary Emotion based Movie Recommendation System -

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Project Background

- It is normal to suppress inner feelings nowadays.
  → Knowing how to understand and express the emotions is good for the mental health.

➡ Let users analyze the emotions in their diary so that they can understand the emotions of the day

- There are some ways to express emotions such as writing a diary, watching movies, etc.
- Nowadays, OTT platforms can be found anywhere and more people spend their free time watching movies since there is no space and time constraints watching movies anymore.

➡ Let's recommend movies that fit the emotions of the day by analyzing the emotions in the diary!

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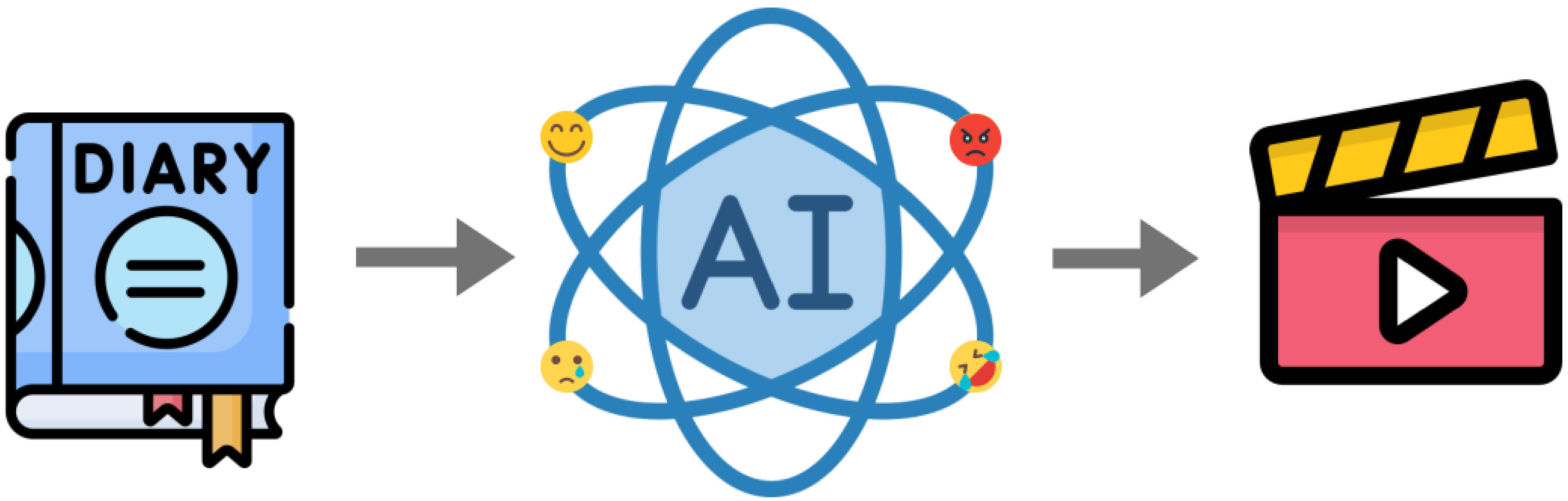
Our Topic

iOS App that Recommends Movies by Analyzing Emotions of the User's Diary



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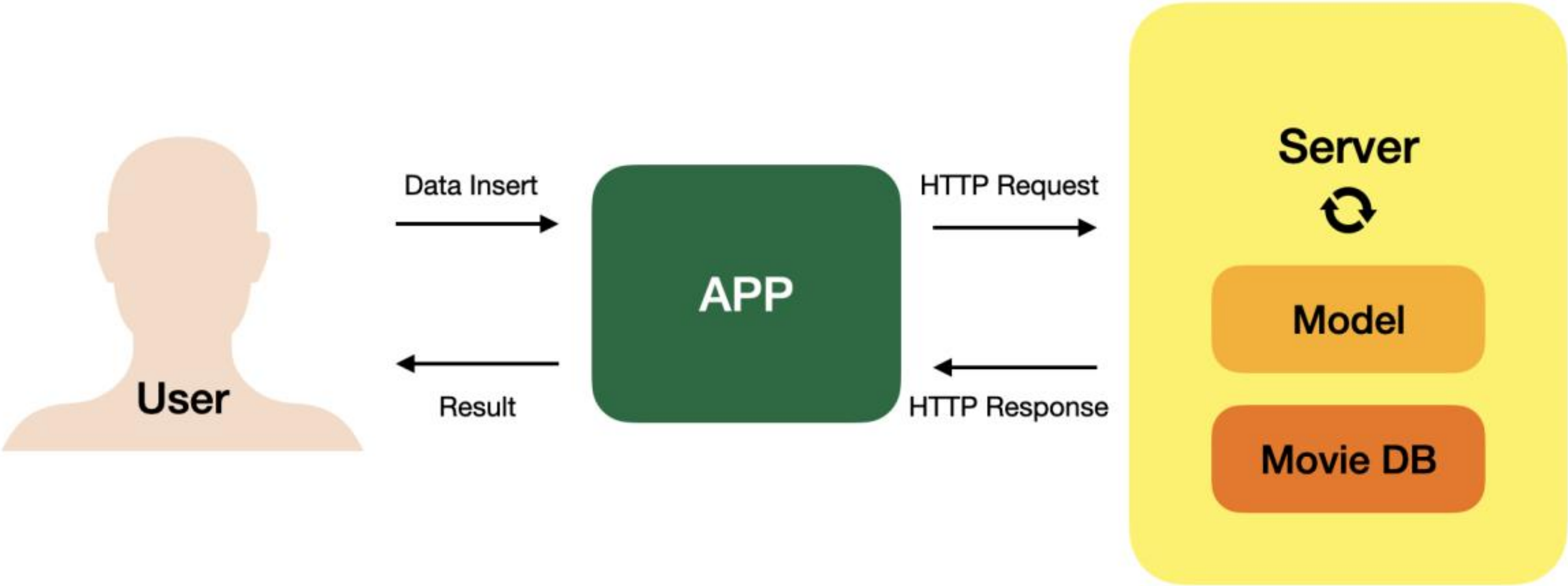
System Architecture



User

Data Insert

Result

APP

HTTP Request

HTTP Response

Server

Model

Movie DB

- When user writes a diary in the app, the pre-trained model returns the emotion vectors of the diary from the server
- Return recommended movies and emotion probabilities by calculating similarities between the emotion vector of diary and emotion vectors of movies

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Team Members and Roles

Yeji Gim

Model Design &
Data Labelling

Soyeong Sohn

Model Design &
Implementation

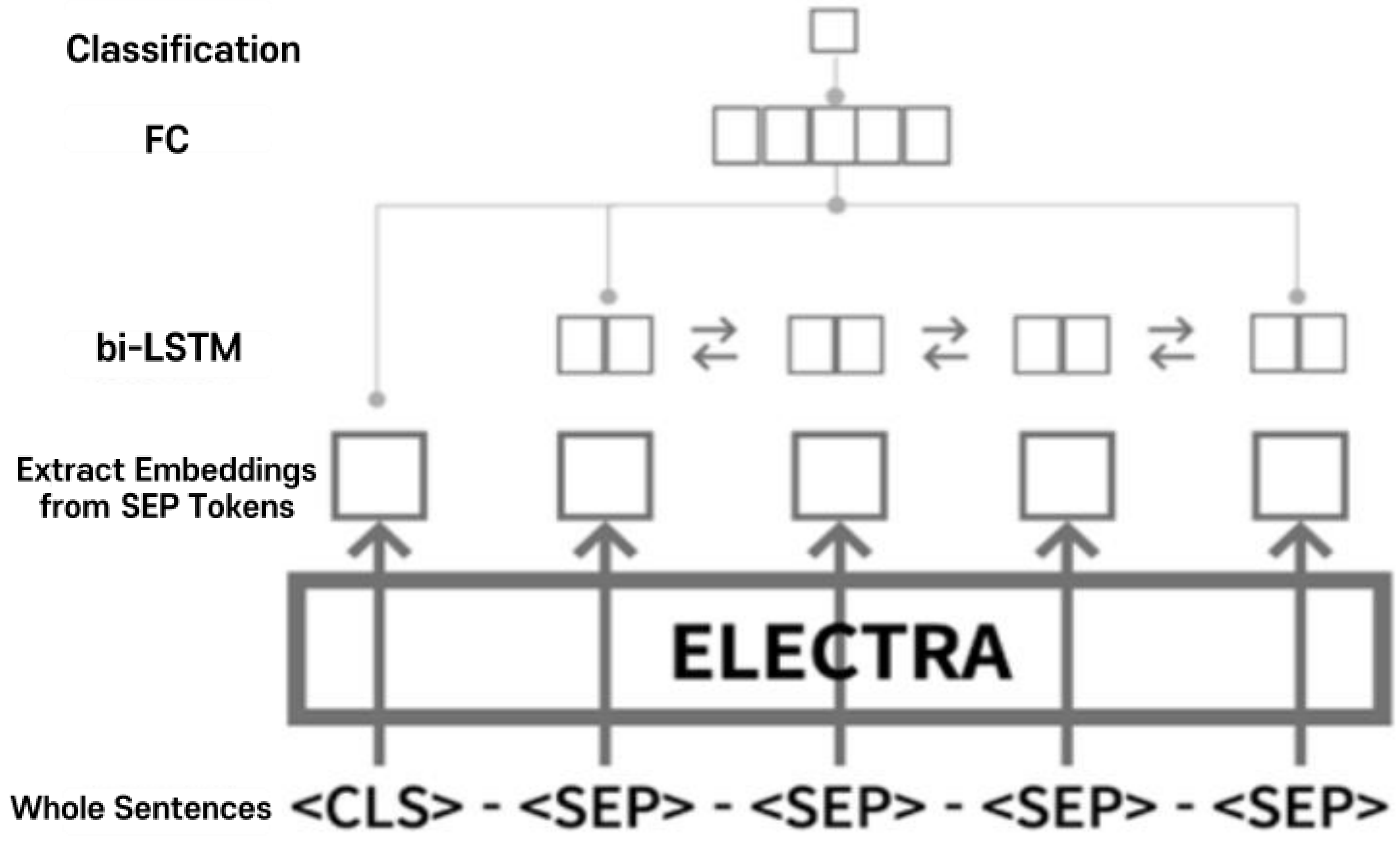
Inwoo Park

iOS App & Server
Development

Changhae Jung

Model Design &
Implementation

Emotion Analysis Model - ELECTRA + LSTM


Classification
FC
bi-LSTM
Extract Embeddings from SEP Tokens
ELECTRA
Whole Sentences
<CLS> - <SEP> - <SEP> - <SEP> - <SEP>

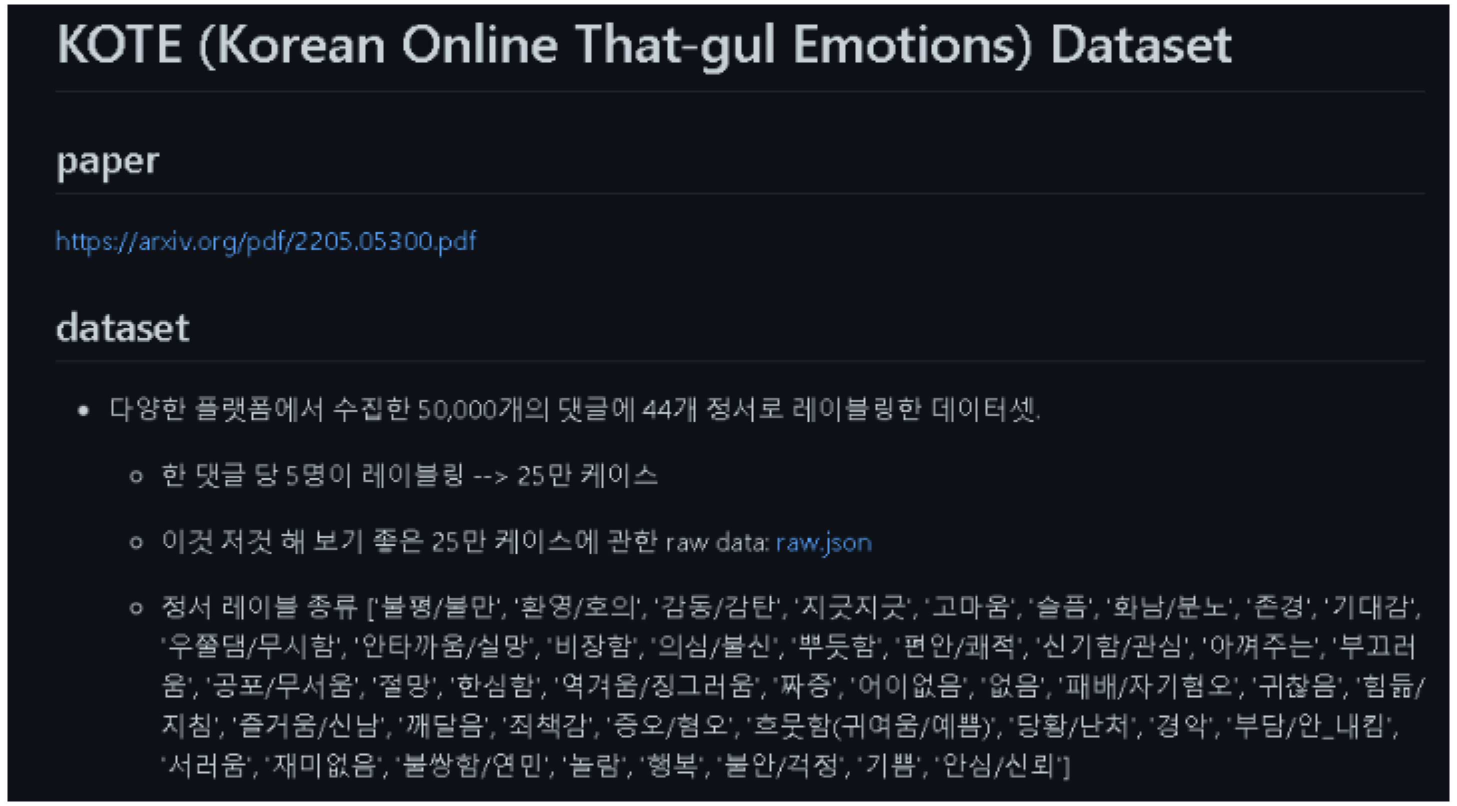
- ELECTRA: Pre-trained Language Model, which is one of the derived models of BERT
- Added bi-LSTM layer to reflect the flow of the diary
- Added <SEP> token between the sentences by using KSS(Korean Sentence Split), concatenate the embeddings from <SEP> tokens of the first sentence and the last sentence and put it in bi-LSTM layer
- Trained the model with the loss which is the sum of the loss from <CLS> token and the losses from <SEP> tokens of first sentence and last sentence

Emotion Analysis Model - Fine Tuning

- Due to the feature of diary written in the App, the vocabularies used to pre-train must be used frequently in daily life or online

→ Used kcELECTRA which is pre-trained with Korean online comments

- Used KOTE dataset, which multi-labeled sentences into 44 emotions, to classify the emotions
- Created silver label of each sentence which is retrieved by PLM, then made gold label by editing silver label by ourselves



KOTE (Korean Online That-gul Emotions) Dataset

paper

https://arxiv.org/pdf/2205.05300.pdf

dataset

- 다양한 플랫폼에서 수집한 50,000개의 댓글에 44개 정서로 레이블링한 데이터셋.
  - 한 댓글 당 5명이 레이블링 --> 25만 케이스
  - 이것 저것 해 보기 좋은 25만 케이스에 관한 raw data: raw.json
  - 정서 레이블 종류 ['불평/불만', '환영/호의', '감동/감탄', '지긋지긋', '고마움', '슬픔', '화남/분노', '존경', '기대감', '우쭐댐/무시함', '안타까움/실망', '비장함', '의심/불신', '뿌듯함', '편안/쾌적', '신기함/관심', '아껴주는', '부끄러움', '공포/무서움', '절망', '한심함', '역겨움/징그러움', '짜증', '어이없음', '없음', '패배/자기혐오', '귀찮음', '힘듦/지침', '즐거움/신남', '깨달음', '죄책감', '증오/혐오', '흐뭇함(귀여움/예쁨)', '당황/난처', '경악', '부담/안_내킴', '서러움', '재미없음', '불쌍함/연민', '놀람', '행복', '불안/걱정', '기쁨', '안심/신뢰']

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Emotion Analysis Model - Scheduler

Cosine Annealing Scheduler

$$\eta_t = \eta_{\min} + \frac{1}{2}(\eta_{\max} - \eta_{\min})\left(1 + \cos\left(\frac{T_{cur}}{T_{\max}}\pi\right)\right)$$

- Scheduler for solving Local Minimum problem
- The Learning Rate drops to eta_min along the Cosine function, then rises to the initial Learning Rate

Emotion Analysis Model - Testing Result

모델	micro F1	차이
kcELECTRA	0.57	
kcELECTRA + bi-LSTM	0.62	+0.05
kcELECTRA + bi-LSTM + CosineAnnealingLR Scheduler	0.65	+0.03

- When kcELECTRA + bi-LSTM is applied, there was 5% improvement in performance compare to kcELECTRA only model
- Changing the scheduler to the Cosine Annealing LR scheduler added 3% improvement in performance
- 8% improvement in total

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Movie Recommendation - Cosine Similarities

$$\text{similarity} = \cos(\theta) = \frac{A \cdot B}{\|A\|\|B\|} = \frac{\sum_{i=1}^{n} A_i \times B_i}{\sqrt{\sum_{i=1}^{n} (A_i)^2} \times \sqrt{\sum_{i=1}^{n} (B_i)^2}}$$

- Metrics that compute the closeness between two vectors
- Compute similarities between the diary written by users and the plots of the movies

- Recommend 5 movies which are most similar to emotion of diary based on cosine similarity

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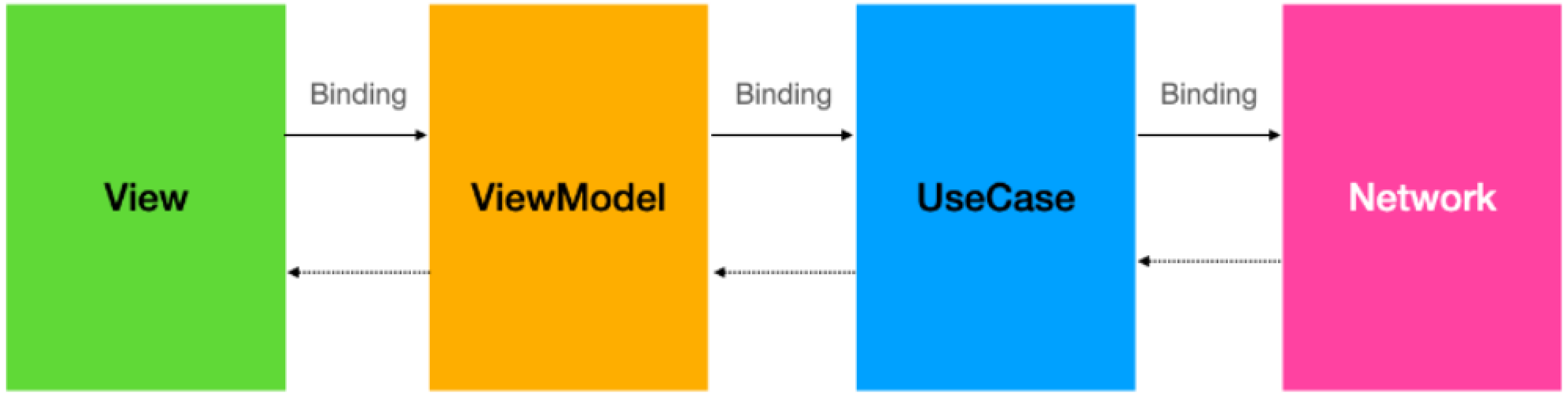
App & Server Description


View
Binding
ViewModel
Binding
UseCase
Binding
Network

App

- System based on MVVM architecture
- UseCase layer in the middle → reduce redundant code for the same task
- Data Binding in Combine → be able to receive data asynchronously

Server

- Implemented with Flask
- Check and export the data when the app requests the data
- The request consists of HTTP Reqeust in the form of REST API

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Scalability

Service Side

- Link to psychiatric counseling based on emotions derived from the diary
- Expand to recommendation not only movies but also contents such as TV series, book, music, etc.

Performance Side

- Recreating the dataset from scratch to improve accuracy
- Improvement in the recommendation system by reflecting user history such as a list of watched movies, review, etc.
- Experiment models with new approaches

Thank You