Machine Learning Team Project Proposal

1. **Team Introduction**
   a. Team Number: 4
   b. Team Members (ID & Name)
      1) 2277007 Sujin Kim(김수진)
      2) 2277018 Seoyeon Ye(예서연)
      3) 2277021 Yoojin Oh(오유진)
      4) 2277031 Ahyun Ji(지아현)
   c. Task Assignment
      1) Ideation: All members
      2) Data Collection: All members
      3) Preprocessing: All members
      4) Modeling: All members
   d. Project Timeline
      1) 9/24~10/3: Topic Selection
      2) 10/3~10/9: collecting raw data, data preprocessing(1)
      3) 10/10~10/16: preparing project proposal presentations
      4) 10/17: project proposal presentation
      5) 10/18~11/6: data preprocessing(2)
      6) 11/7~11/20: training & test several models
      7) 11/21~11/27: model performance comparison & evaluation
      8) 11/28~12/11: implement prototype
      9) 12/12: final presentation
      10) 12/16: final report submission

2. **Topic**: **Unlabeled Food Image based Nearby Restaurant Recommendation System**

3. **Problem Statement**

   When you have a craving for a specific food and find nearby restaurants for it, you must know the name of food if you use Naver Map or Kakaomap. This poses a clear limitation when you only have an image without knowing the name of food. Therefore, we propose a website that can analyze the given image to identify the name or type of food and recommend nearby restaurants that serve that food.

## 4. Introduction to the Data

a. Crawling Naver Place Restaurants

1) Enter Yangjae Station, Gangnam Station, and Samseong Station in Naver Map and search for nearby restaurants.

2) Crawl the restaurant names, telephone numbers, addresses, ratings, menu names, and food photos for the menu.

b. AIHub food image and nutrition text

1) More than 400 classes with over 2000 images each, all with a resolution of at least 5 million pixels, totaling 842,000 images

2) Food names are already labeled.

5. Strategy

a. Brief Summary (Of System)
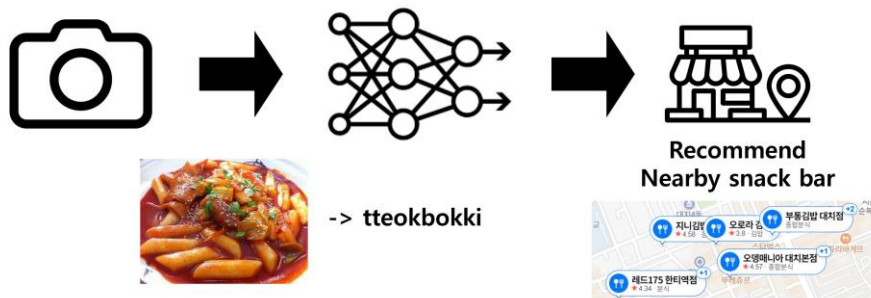
1) The user captures an image of the specific food and inputs it with the nearest subway station name.

2) Using a CNN-based model constructed with a training dataset, derive the food label as an output from the received food image.

3) Search for restaurants in the crawled data that have the identified food label(output).

4) Display information about the discovered restaurants to the user.

b. Data preprocessing

: Normalize and resize images. After, data augmentation will be done by rotation, shifting, horizontal flipping, etc in order to avoid overfitting (only for Naver Place dataset as AIHub dataset is quite huge).

c. Model introduction

: Specifically, we're going to use 4 popular CNN based models which are pretrained on the ImageNet, VGG16, ResNet50, InceptionV3, and DenseNet.

1. VGG16 : Known for low accuracy or slow training, but use as it is simple and classic model.
2. ResNet50 : Famous, it's skip-connection allows to boost the accuracy of the classification.
3. InceptionV3 : Allows to train both global and local information.
4. DenseNet : CNN Model after ResNet, good information flow, and got good performance in other image classification projects I've done before.

In addition, our team is considering to do ensemble on some of these models and then observe the result.

d. Experimental scenario(Pipeline):

At first, load dataset and go on data preprocessing, including data augmentation. Then get pre-trained (CNN) models from Keras library and implement transfer learning to increase the performance. After classifying, simple Content-Based Recommendation will be done to find the restaurant that has short distance and high stars of the corresponding foods based on output of the model. In this case, similarity matrices could be used.
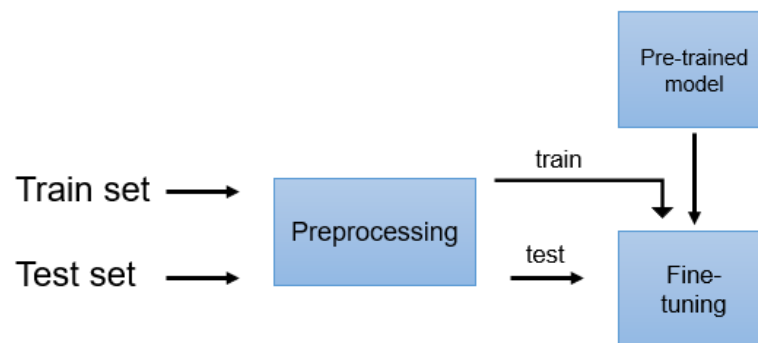
6. Reference

[1] Jiang, M. (n.d.). *Food Image Classification with Convolutional Neural Networks*. Retrieved October 13, 2023, from https://cs230.stanford.edu/projects_fall_2019/reports/26233496.pdf

[2] 음식 추천 분류기 (Meal Planner). (2023, June 6). GitHub.

https://github.com/sejongresearch/FoodRecommender