

# Food Scanner Application

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# Outline

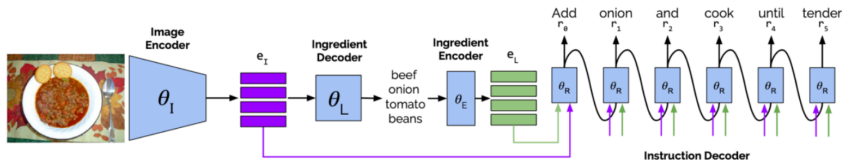
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- Deep learning can be defined as the method of machine learning and artificial intelligence that is intended to imitate humans and their actions based on certain human brain functions to make effective decisions.
- Deep learning is one of the only methods by which we can circumvent the challenges of feature extraction. This is because deep learning models are capable of learning to focus on the right features by themselves, requiring little guidance from the programmer.
- Convolutional Neural Networks are one of the most popular deep neural networks. Neural networks are made of artificial neurons. Artificial neurons are mathematical functions that calculate the weighted sum of multiple inputs and outputs an activation value.

- In the past, algorithms have been using simple systems of recipe retrieval based on image similarities in some embedding space. This approach is highly dependent on the quality of the learned embedding, dataset size and variability.
- Therefore, these approaches fail when there is no match between the input image and the static dataset .

- Inverse cooking algorithm instead of retrieving a recipe directly from an image, proposes a pipeline with an intermediate step where the set of ingredients is first obtained.
- This allows the generation of the instructions not only taking into account the image, but also the ingredients.

- Inverse Cooking recipe generation model with the multiple encoders and decoders, generating the cooking instructions



- MODULE 1
  - Encoder
    - 1.1 Image Encoder
    - 1.2 Ingredient Encoder
- MODULE 2
  - Decoder
    - 2.1 Instruction Decoder
    - 2.1 Ingredient Decoder

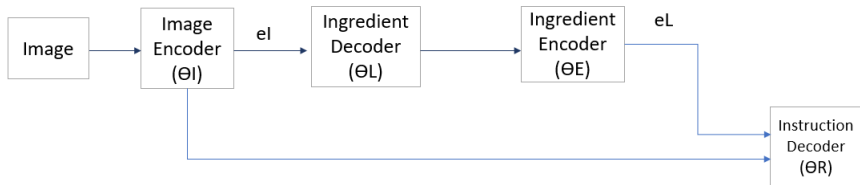
# Module Description

- Image Encoder - We extract image features  $e_I$  with the image encoder, parametrized by  $\theta_I$ .
- Ingredient Decoder - Ingredients are predicted by  $\theta_L$
- Ingredient Encoder - encoded into ingredient embeddings  $e_L$  with  $\theta_e$ .
- Cooking instruction decoder - parametrized by  $\theta_R$  generates a recipe title and a sequence of cooking steps by attending to image embeddings  $e_I$ , ingredient embeddings  $e_L$ , and previously predicted words ( $r_0, \dots, r_{t-1}$ ).



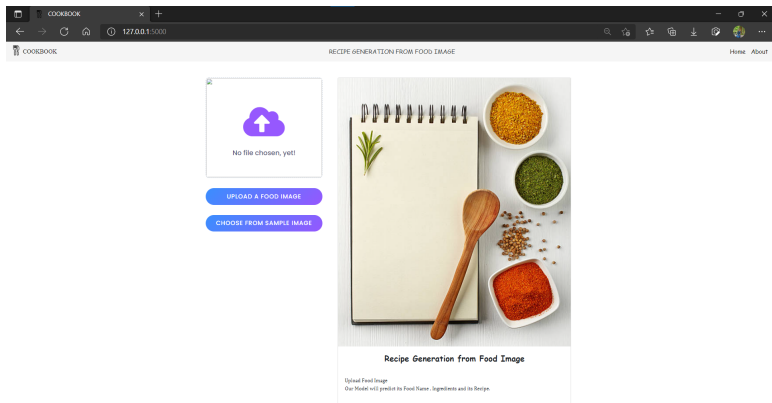
- This recipe retrieval algorithm was developed by the Facebook AI Research and it is able to predict ingredients, cooking instructions and a title for a recipe, directly from an image .
- PyTorch : All models are implemented with PyTorch.
- Resnet50 is a pre-trained Deep learning model. A pre-trained model is trained on a different task than the task at hand and provides a good starting point since the features learned on the old task are useful for the new task.

# Data Flow Diagram I

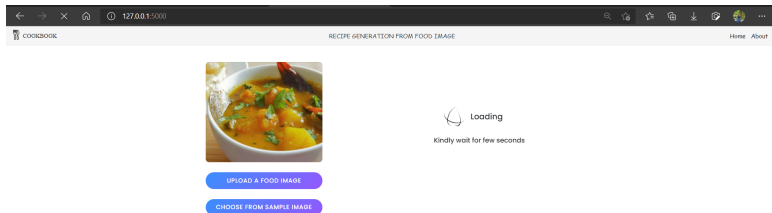


- Python flask is used
- Flask is a web framework that provide libraries to build light weight web applicaions in python.

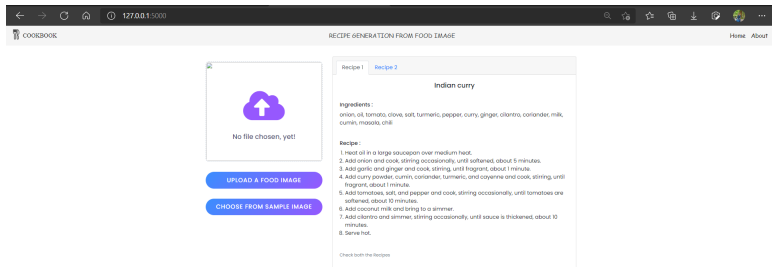
# Sample Result



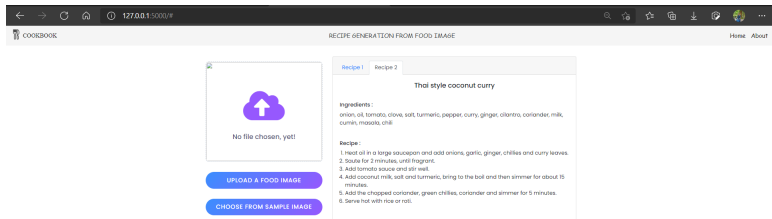
# Sample Result Cont...



# Sample Result Cont...



# Sample Result Cont...



- The image-to-recipe application, which takes a food image as input and produces a recipe consisting of a title, ingredients and sequence of cooking instructions.





1. *Recipe1M+: A Dataset for Learning Cross-Modal Embeddings for Cooking Recipes and Food Images – MIT*
2. *Food Detection with Image Processing Using Convolutional Neural Network (CNN) Method — IEEE Conference Publication — IEEE Xplore*
3. (PDF) *Food Image Recognition by Using Convolutional Neural Networks (CNNs) (researchgate.net)*
4. *simplified-recipes-1M Dataset - Dominik Schmidt*  
*Slide 1 (nvidia.com)*
5. [PDF] *Deep Learning Based Food Recognition — Semantic Scholar*
6. *Food Ingredients and Recipes Dataset with Images — Kaggle*

*Thank You*