Automated Halal Product Identification through Ingredient Analysis

By Rasyidah, DSIF-SG-11

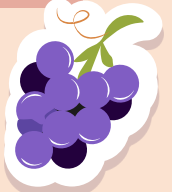# Table of contents

01
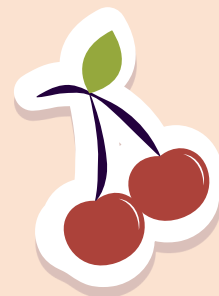
Introduction

Top 4 Challenges of Halal Consumerism in Non-Muslim Countries

The Challenge of Trust

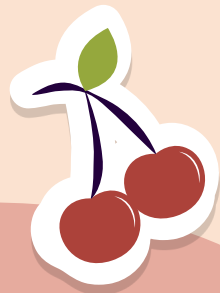Another challenge faced by Muslim consumers in non-Muslim countries is the skepticism and mistrust of halal products among non-Muslim consumers. Many non-Muslim consumers are not familiar with the concept of halal certification and may view it with suspicion, considering it as a niche or exotic product rather than a requirement for Muslims to fulfill their religious obligations.

The Challenge of Labeling

Another challenge faced by Muslim consumers in non-Muslim countries is the lack of clear and consistent labeling of halal products. Many non-Muslim countries do not have specific regulations fo halal labeling, which can lead to confusion and misinterpretation of halal labeling by non-Muslim consumers. This can create a significant obstacle for Muslim consumers, who may have difficulty identifying halal products and ensuring that the products they purchase meet their religious requirements.

The Challenge of Availability

One of the major challenges faced by Muslim consumers in non-Muslim countries is the difficulty of finding halal-certified products. Halal certification is a process that involves ensuring that products ar services comply with Islamic principles and standards. In non-Muslim countries, halal-certified products are often limited and not easily accessible, making it challenging for Muslim consumers to practice their faith and fulfill their religious obligations.

The Challenge of Affordability

In addition to the challenges of access and trust, affordability is another significant challenge for Muslim consumers in non-Muslim countries. Halal-certified products are often more expensive than non-halal options due to the cost of certification and the limited supply of halal products in non-Muslim countries. This can create a significant burden for Muslim consumers, especially those living in areas with limited financial resources.

Unifying Halal Product Certification: ASEAN's Challenge

FAEGHEH SHIRAZI

Halal certification for certain food and drink products is a tricky area and universal standards should be set to better reflect halal consumer needs and religious principles.

ASEAN is home to more than 240 million Muslims. The nation-states of Indonesia, ... e a common adherence to the Shafi'i Sunni ... ification of food, however, holds little common ... nsumer trust and, therefore, impedes halal ... development in Southeast Asia of a trusted ... halal industry.

Problem Statement

Develop an automated system to determine whether food products are halal or not by analyzing and interpreting their ingredients, particularly when purchasing products overseas.

Objectives

Create a model to classify food as halal, non-halal or doubtful

Ingredients not in database will be checked through OpenAI

Accessible Information

Enhancing the ability of consumers, especially Muslims, to make

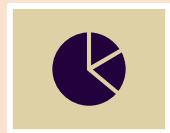informed choices when purchasing food items abroad.
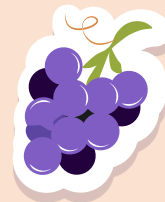
Success Metrics

Answer Relevancy

Measures how relevant the generated answer is to the question
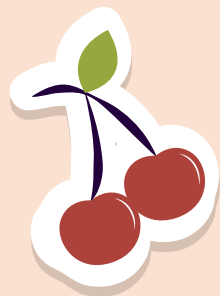
Faithfulness

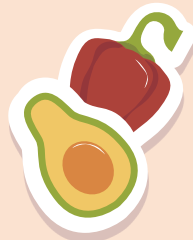Measures how accurate the generated answer, hallucinated or factuality

Data

Workflow, Data Collection, Data Processing

02

Data Sources

MUIS Website	Food and Drink Categories	Food Selection	Food Preparation	Food Additive Listing
World of Islam	Food Additive List
Islamcan.com	Halal Haram Database

Project Workflow

Data Collection on Ingredients
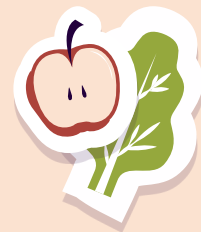
Image Capture

Text Extraction

Halal Status Check

Handling Unknown Ingredients

Backend Processing

Fine tuning

```
Using CPU. Note: This module is much faster with a GPU.
[INFO] OCR'ing input image...
[INFO] 0.6010: dairy milk milk chocolate.
[INFO] 0.5636: ingredients: full cream milk, sugar, cocoa butter, cocoa mass,
[INFO] 0.7499: milk solids, emulsifiers (soy lecithin, 476), flavours
[INFO] 0.7078: contains milk, soy:
[INFO] 0.6914: may contain wheat, gluten, peanuts, tree nuts.
[INFO] 0.8888: milk chocolate contains cocoa solids 27%,
[INFO] 0.8123: milk solids minimum 24%.
```

DAIRY MILK MILK CHOCOLATE.
INGREDIENTS: FULL CREAM **MILK**, SUGAR, COCOA BUTTER, COCOA MASS,
MILK SOLIDS, EMULSIFIERS (**SOY** LECITHIN, 476), FLAVOURS.
CONTAINS MILK, SOY.
MAY **CONTAIN** WHEAT, **GLUTEN**, PEANUTS, **TREE NUTS**.
MILK CHOCOLATE CONTAINS COCOA SOLIDS 27%,
MILK SOLIDS MINIMUM 24%.

Ingredients are detected correctly
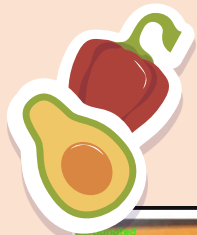
Easy OCR


```
Using CPU. Note: This module is much faster with a GPU.
[INFO] OCR'ing input image...
[INFO] 0.9993: carbonated
[INFO] 0.8239: root
[INFO] 1.0000: beer
[INFO] 0.8749: ingredients: carbonated water cane
[INFO] 0.8911: root beer brew (water; sugar
[INFO] 0.6954: molasses, ginger root; sarsaparila
[INFO] 0.5737: root; licorice root extract; vanilla
[INFO] 0.5514: extract yeast), colour (caramel
[INFO] 0.5334: n, acid (citric acid) preservative
[INFO] 0.8941: (ascorbic acid), flavour:
[INFO] 0.9995: colour
[INFO] 0.7344: contains: permitted fiavouring
[INFO] 0.3838: (caramel), food conditioners (citc
[INFO] 0.9426: c.
[INFO] 0.6905: acid) preservatives and
[INFO] 0.9721: made in australia
[INFO] 0.8606: sugar;
[INFO] 1.0000: bean
```
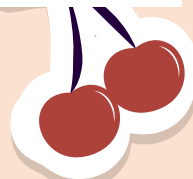
Ingredients text poorly detected

GPT-4 Vision preview

Images are passed through the model via url or the base64 encoded image

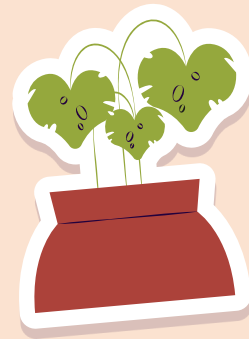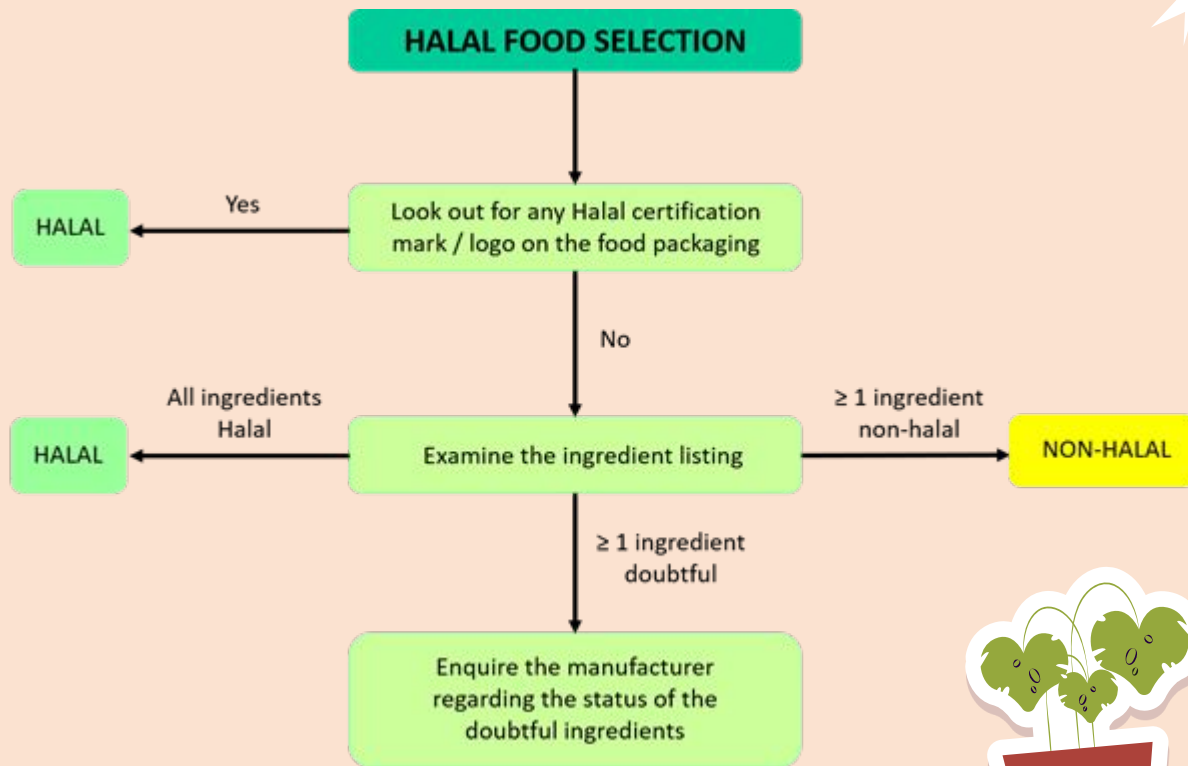
The ingredients listed in the image are:

- Milk Chocolate (35%) [Sugar, Milk Solids, Cocoa Butter, Cocoa Mass, Emulsifiers (Soy Lecithin, 476), Natural Flavour]
- Caramel (26%) [Glucose Syrup, Sugar, Condensed Milk, Coconut Fat, Golden Syrup, Inverted Sugar Syrup, Butter, Cornflour, Salt, Emulsifiers (Soy Lecithin, 470, 471)]
- Wheat Flour
- Sugar
- Vegetable Fat [Palm** (Antioxidant (307b Soy))]
- Inverted Sugar Syrup
- Cocoa Powder
- Raising Agents (500, 450)
- Salt
- Emulsifier (Soy Lecithin)

The packaging also indicates that milk chocolate contains a minimum of 28% cocoa solids and 20% minimum milk solids.
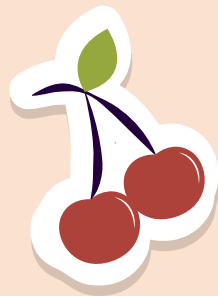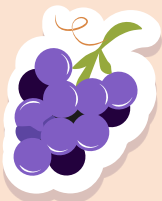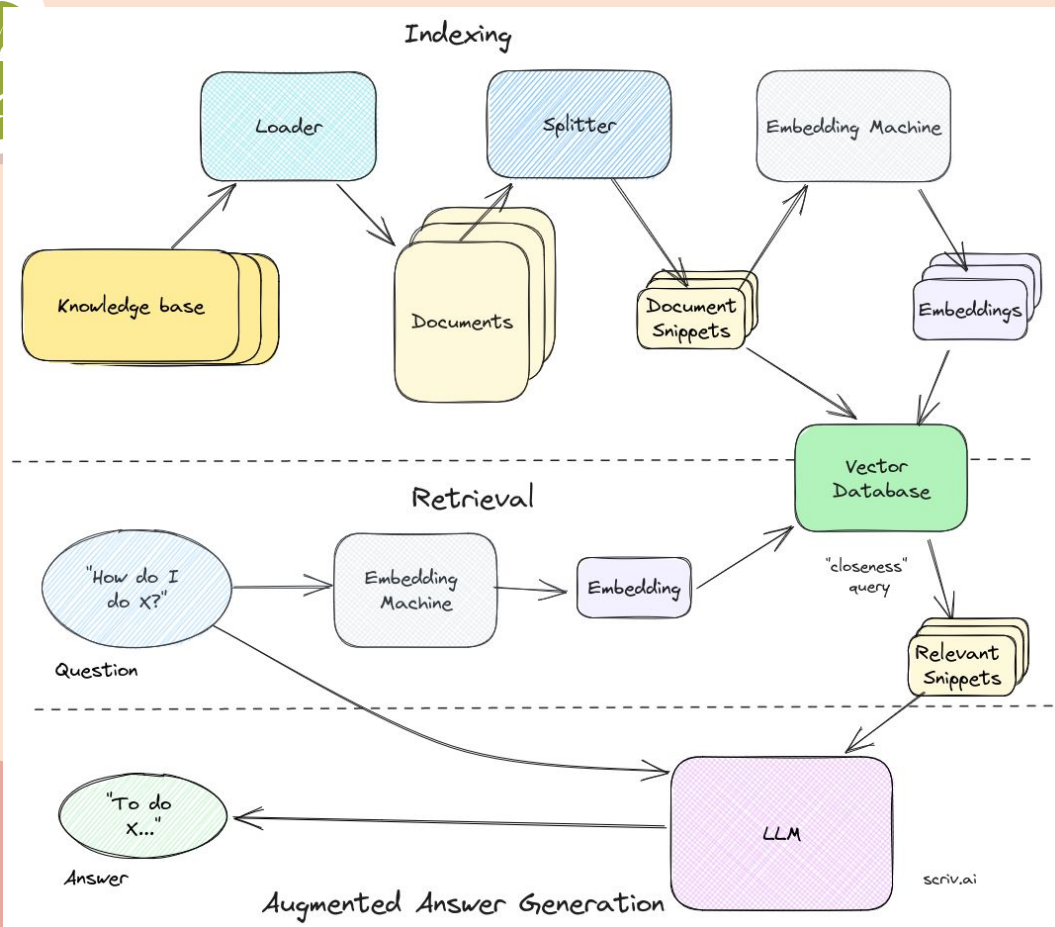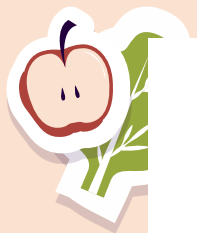
Halal Food Selection

HALAL FOOD SELECTION

↓

Look out for any Halal certification mark / logo on the food packaging

— Yes → **HALAL**

No ↓

Examine the ingredient listing

— All ingredients Halal → **HALAL**

— ≥ 1 ingredient non-halal → **NON-HALAL**

≥ 1 ingredient doubtful ↓

Enquire the manufacturer regarding the status of the doubtful ingredients

03

Feature Engineering

GPT Open Ai Model

# Retrieval-Augmented Generation (RAG) pipeline

General Task Overview

question_gen_query = (

    "Given your expertise in Halal food certification, I need you to analyze the ingredients of a specific food product for Halal compliance. Please provide a clear and detailed assessment for each ingredient based on the information available in the provided documents. Consider factors such as the source and processing methods of each ingredient, as these can impact its Halal status. If any ingredient is non-Halal, doubtful, or lacks sufficient information for assessment, please categorize the entire food product accordingly. Your goal is to determine the overall Halal status of the food product. Please provide concise and factually accurate responses."

)
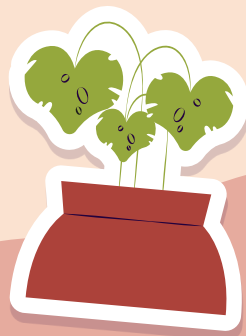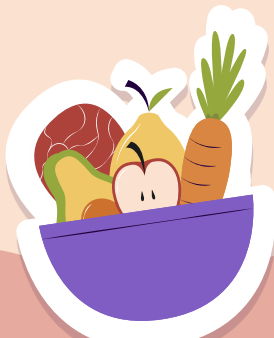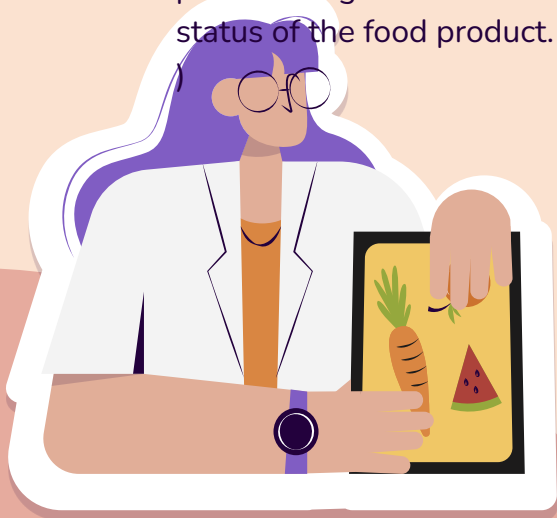
Detailed Task Instruction

Question_gen_query = "As an expert in halal food certification, your task is to meticulously analyze the ingredients of food products. "

"A user is looking to determine if a specific food product is halal. "

"For each ingredient listed in a product, provide a detailed assessment based on the information available in the uploaded documents. "

"Some ingredients may have different halal statuses depending on their sources or processing methods. "

"Evaluate each ingredient to determine if it is halal, non-halal, or doubtful. "

"Consider the source and processing of each ingredient, as this can influence its halal status. "

"Your goal is to ensure that each ingredient in the product is halal. If any ingredient is non-halal, doubtful, not identifiable, or lacks sufficient information to ascertain its halal status, then the entire food product should be considered non-halal. "
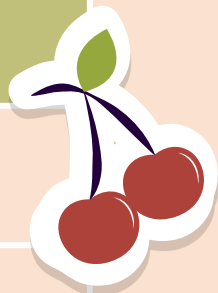
"Provide a conclusive assessment for each ingredient, thereby determining the overall halal status of the food product."
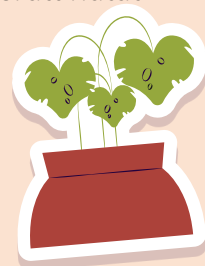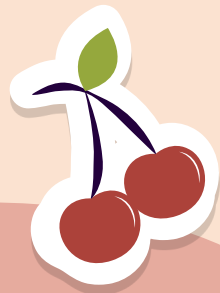
Success Metrics

Prompts	Models	Answer Relevancy	Faithfulness
General	ft:gpt-3.5-turbo-1106	0.969	0.8
General	gpt-3.5-turbo-0613	0.9591	0.75
Task Oriented	gpt-3.5-turbo-0613	0.944	0.6
Task (CSV,pdfhtm)	gpt-3.5-turbo-0613	0.961	0.55

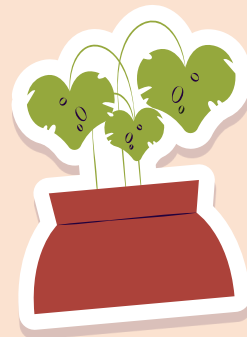# 04

Conclusion

Conclusion

Effective in Simple Ingredient Detection:
- performs efficiently in identifying basic ingredients,
- demonstrating its effectiveness in simpler scenarios of ingredient analysis.

Optimal Model Performance:
- Gpt-3.5-turbo-1106
- Formulation of prompts, a pivotal role in influencing model performance

Future Developments

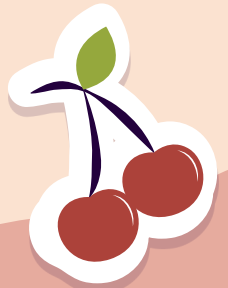**Streamlining Phrase Recognition for removal**

Detailed Analysis of Sub-Ingredients
Enhancing the Precision of Halal Status Determination

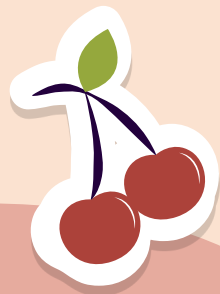**Ongoing Model Improvement**

Incorporating User Feedback

Thanks!

Q & A

References

Here's an assortment of alternative resources whose style fits that of this template:

Vectors:

- [Top 4 Challenges of Halal Consumerism in Non-Muslim Countries - The Halal Times](#)

- [Unifying Halal Product Certification: ASEAN's Challenge | FULCRUM](#)

- [Halal consumerism from a wider perspective (nst.com.my)](#)