



ChefAI: From Fridge to Table

*Helping you use what's in your
fridge and pantry to make healthy
meals at home.*

Team

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Introduction

Goal

Overcome the barrier of deciding what to cook at home, promote healthy eating and help discover new recipes and ingredient.

Our Solution

ChefAI

- Image inference at the edge for ingredient detection
- Recipe generation in the cloud

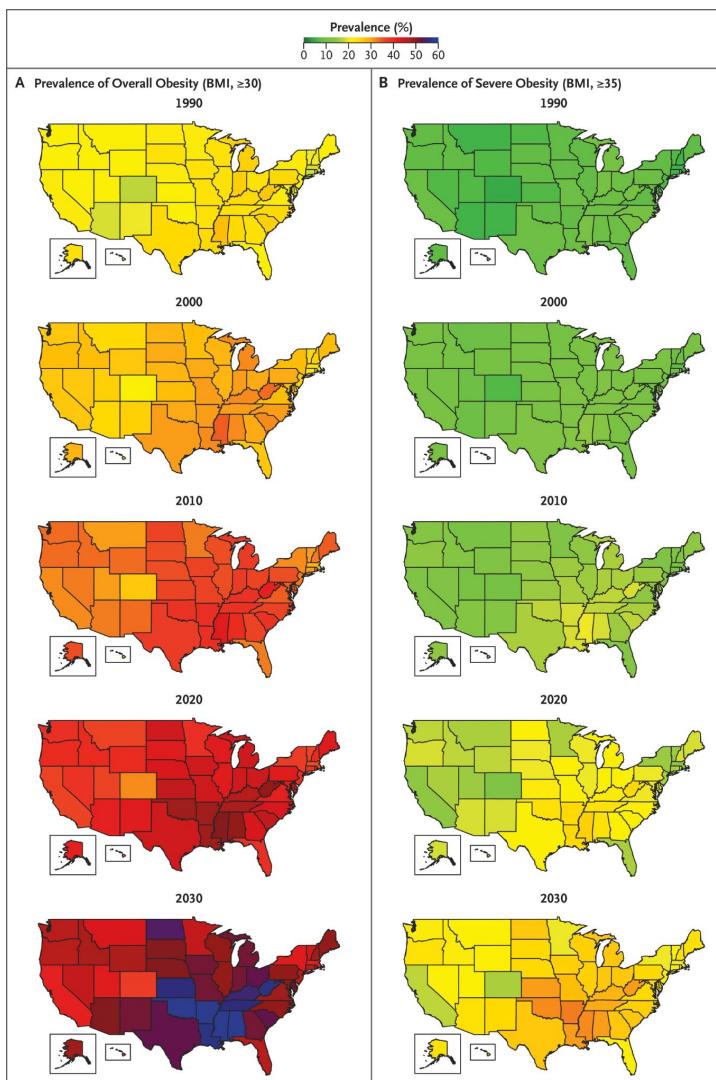


Image Source: b-cafe.net

Background

Estimated Prevalence of Overall Obesity and Severe Obesity in Each State (1990-2030)

(Ward 2019)



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Proof of Concept Application

ChefAI

Welcome to the ChefAI Tool!

From your fridge and pantry to your table.



Welcome kam! [Logout](#)

[Upload a picture of your fridge](#)



Ingredients:

- 1 lb. pork shoulder, cut into thin slices
- 1/2 cup fish sauce

...

Instructions:

1. In a large bowl, whisk together fish sauce, sugar, minced garlic, and sliced jalapeno.

....

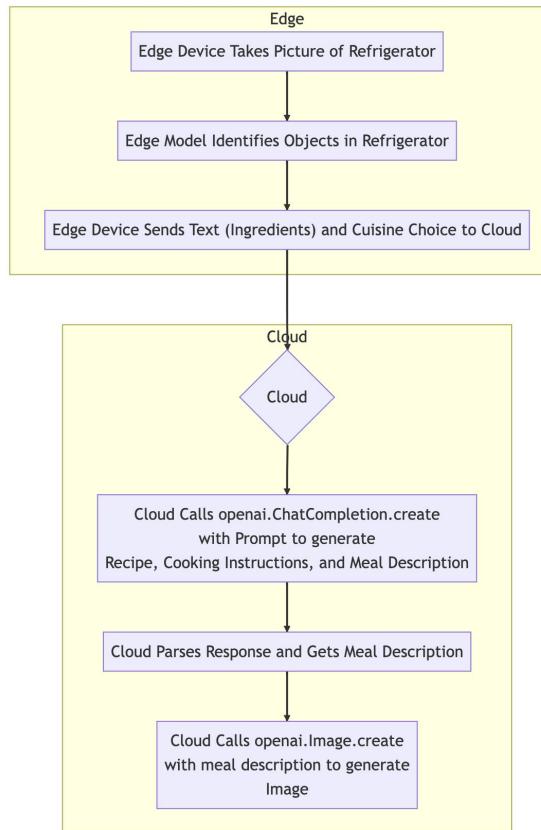
Description:

This Vietnamese-style grilled pork recipe is a t...



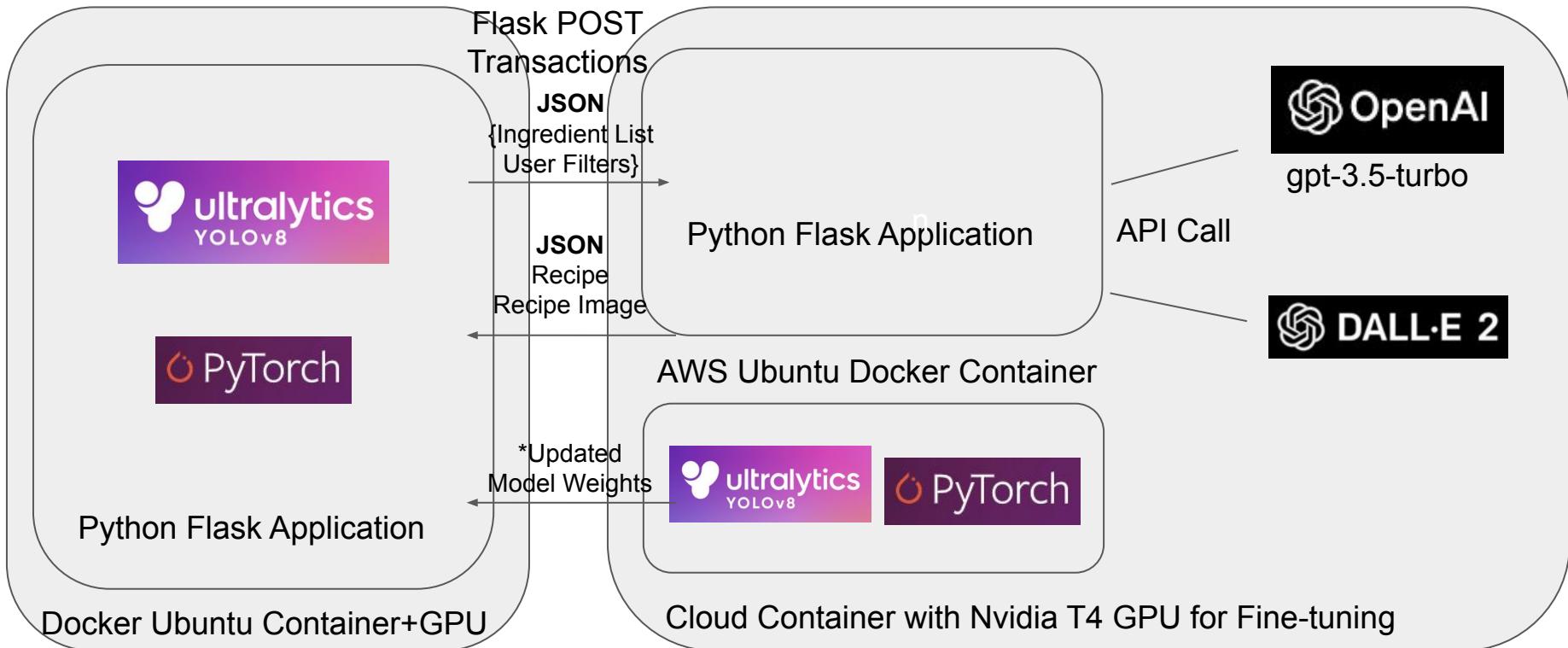
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Pipeline: From Edge to the Cloud



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Infrastructure Pipeline



Edge

*Currently a manual process

Cloud



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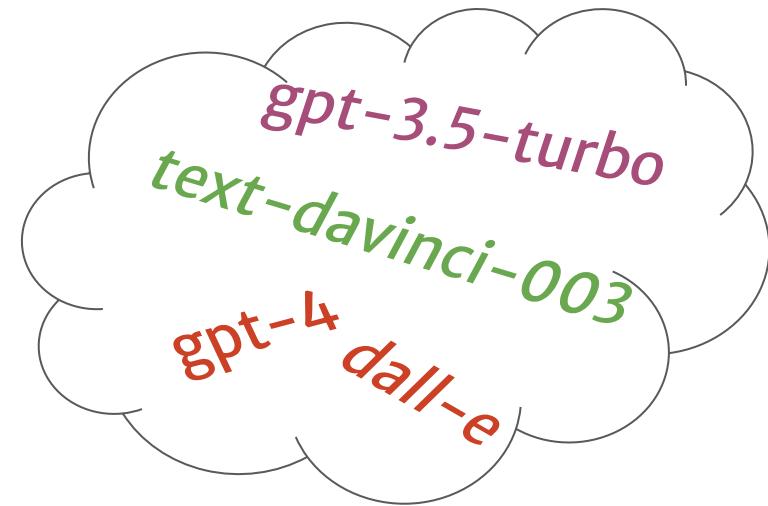
Models

Edge Models

YOLOv5

YOLOv8

Cloud Models



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Dataset



Roboflow dataset: ai-cook-lcv4d ver. 4

Consists images of day-to-day items in an open refrigerator

Classes: 30 common foods

E.g. 'apple', 'beef', 'bread', 'milk', 'spinach', 'tomato' etc.

Total images: 516 images, augmented to 3,050 images

Augmentations: Rotation, exposure, blur, salt and pepper noise and cut-outs

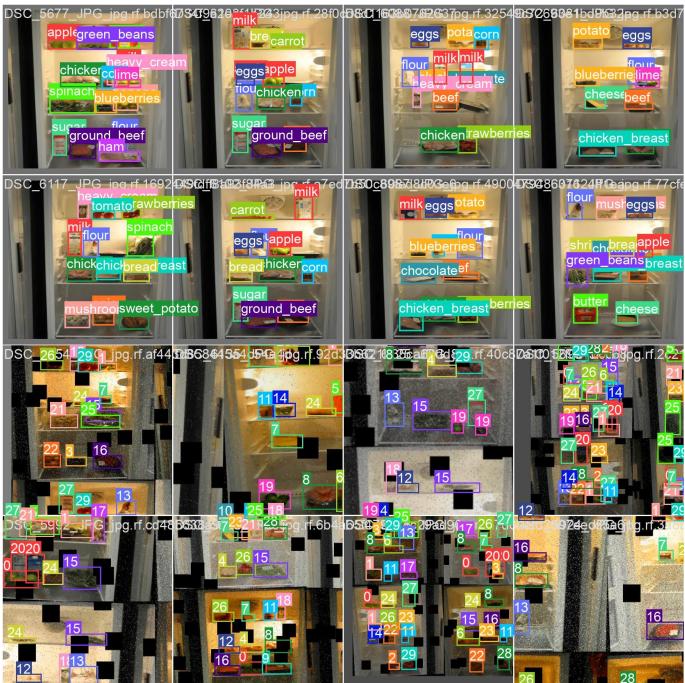
Split: [train: 2896, validation: 103, test: 51]



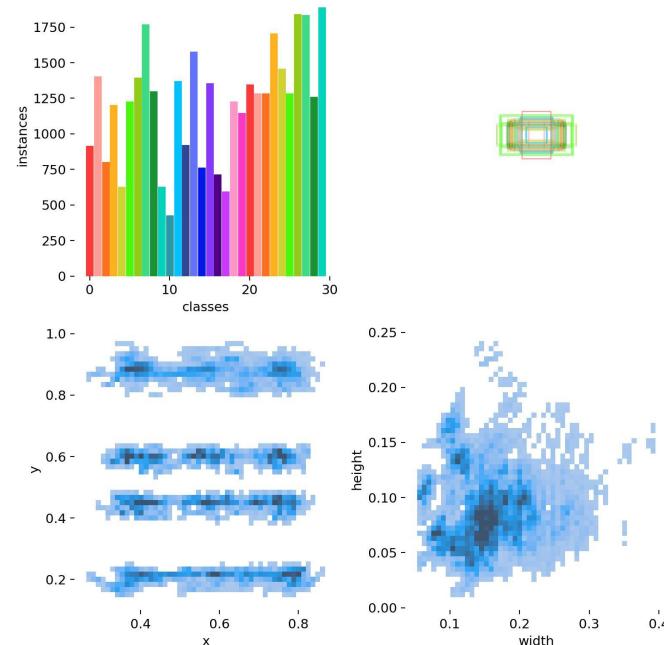
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Dataset

Ground truth



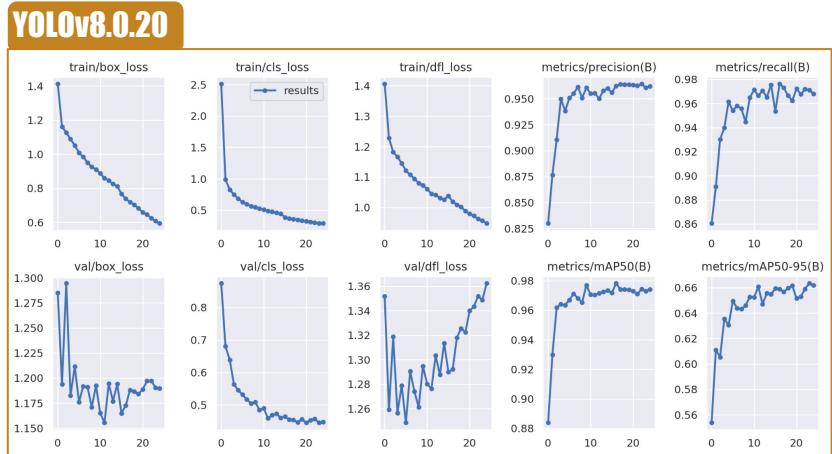
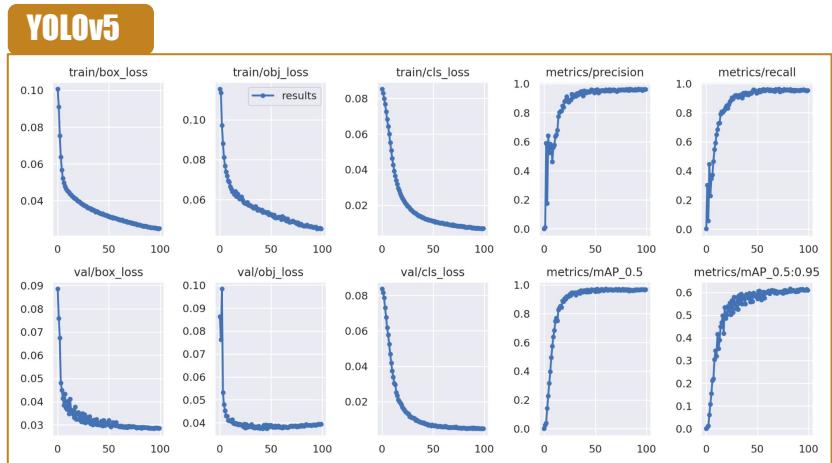
Number and location distribution



Edge Model Training

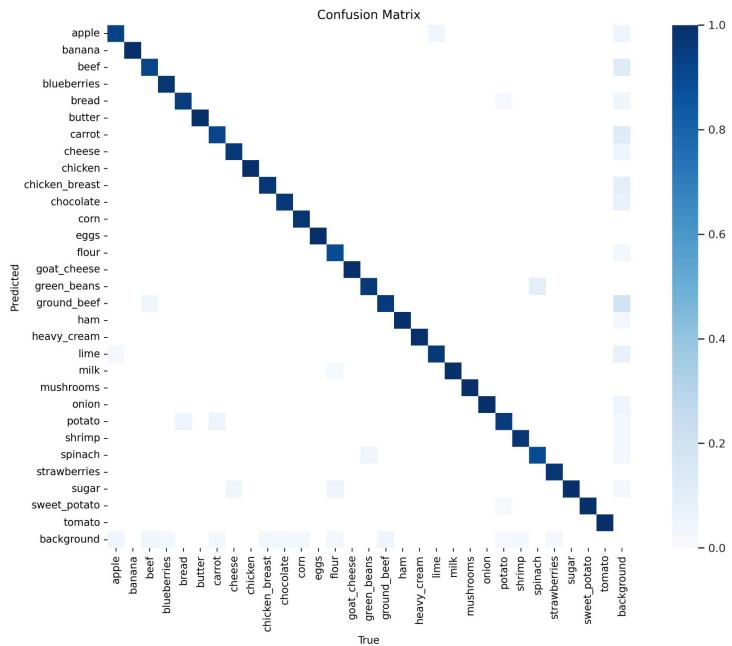
- Transfer learning approach
- Fine-tuned two models on the cloud (Tesla T4, 15102MiB)
- Imported fine-tuned weights in the edge server for inference

<u>Model</u>	<u>Summary</u>	<u>Epochs</u>	<u>P & R</u>	<u>mAP50</u>	<u>mAP50-95</u>
YOLOv5	182 lyrs, 7324731 par	100	0.96, 0.96	0.96	0.616
YOLOv8.0.20	168 lyrs, 11137194 par	25	0.96, 0.97	0.97 🚀	0.663 🚀



Edge Model Validation

Confusion Matrix

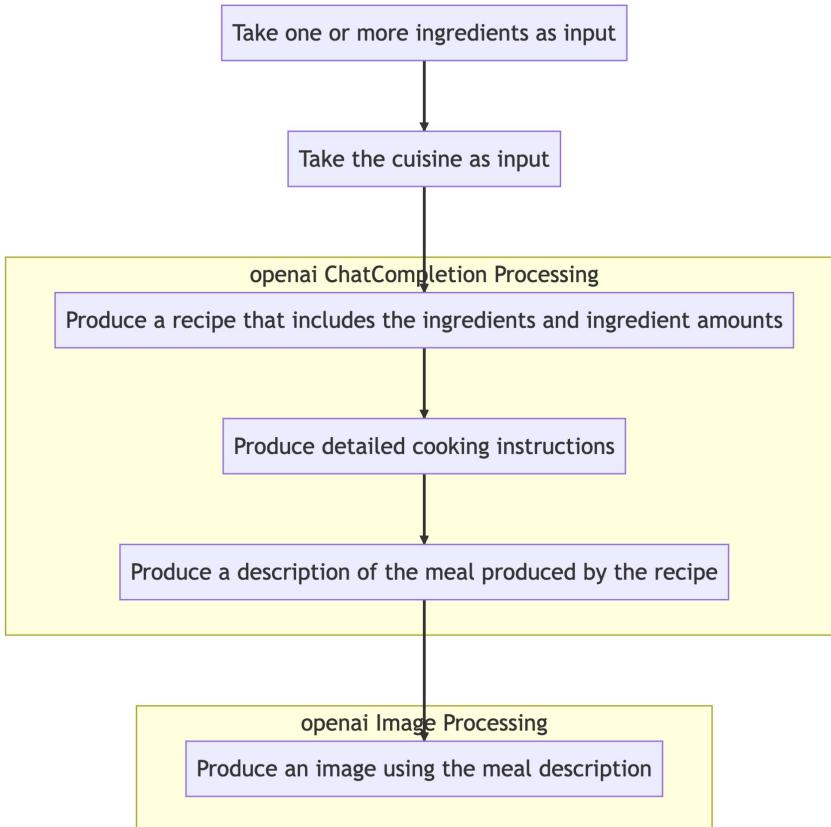


Validation Detection

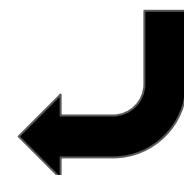
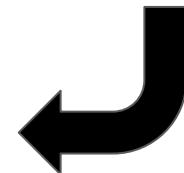


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Cloud Deployment - Pipeline Flow



Yellow boxes are where processing is natural language driven



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ChatCompletion API Instructions - Prompt Eng.

prompt

You are an expert in cooking and cuisine. You are instructed to do the following:

1. Take one or more ingredients as input.
2. Take the cuisine as input.
3. Produce a recipe that includes the ingredients and ingredient amounts.
4. Produce detailed cooking instructions.
5. Produce a description of the meal produced by the recipe.

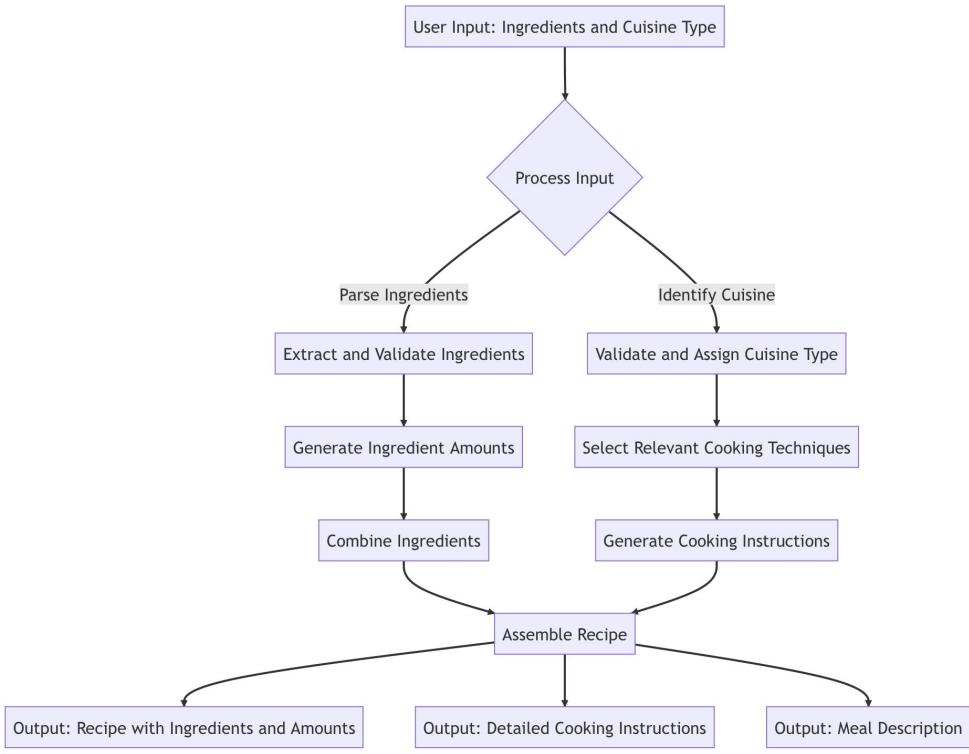


text

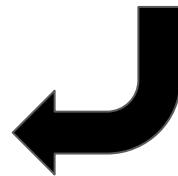


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ChatCompletion API Processing (implicit)



If this were hand coded the result would be something like this



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ChatGPT Plugins

LIMITED BETA

Plugin store

Featured plugins Unverified plugins

The screenshot shows a grid of eight plugin cards:

- Instacart**: Ask about recipes and discover the ingredients you need—then get it all delivered from local stores. [Uninstall](#)
- Milo Family AI**: Curating the wisdom of village to give parents ideas that turn any 20 minutes from meh to magic. [Install](#)
- FiscalNote**: FiscalNote enables access to select market-leading, real-time data sets for legal, political, and regulatory... [Install](#)
- Wolfram**: Access computation, math, curated knowledge & real-time data through Wolfram|Alpha and Wolfram Language. [Install](#)
- Zapier**: Interact with over 5,000+ apps like Google Sheets, Gmail, HubSpot, Salesforce, and thousands more. [Uninstall](#)
- Expedia**: Bring your trip plans to life – get there, stay there, find things to see and do. [Install](#)
- KAYAK**: Search flights, stays & rental cars or get recommendations where you can go on your budget. [Install](#)
- Klarna Shopping**: Search and compare prices from thousands of online shops. [Install](#)

< Prev 1 2 Next >

Install an unverified plugin | Develop your own plugin | About plugins

We were granted access to the limited beta of chatgpt plugin API.

ChatGPT Plugin Generation Instructions

prompt

You are creating a Chat GPT plugin.

You will generate the code for a Typescript and Express server that will be called by a chatbot. You should make the api as simple as possible and only return the minimally required information. Assume that there is no auth required and the developer will hardcode any keys. The plugin consists of 3 parts an `index.ts` a `openapi.yaml` file, and an `ai-plugin.json` file. Here is an example of each:

...

→ **code**



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ChatGPT ChefAI example



Used Instacart



REQUEST TO INSTACART

```
{  
  "title": "Mexican Chicken Fajitas",  
  "ingredients": [  
    "1 pound chicken breast",  
    "1 large onion",  
    "3 cloves garlic",  
    "1 bell pepper",  
    "2 tablespoons olive oil",  
    "1 tablespoon chili powder",  
    "1 teaspoon ground cumin",  
    "1/2 teaspoon paprika",  
    "Salt and pepper to taste",  
    "Flour tortillas",  
    "Optional toppings: sour cream",  
    "Optional toppings: salsa",  
    "Optional toppings: guacamole",  
    "Optional toppings: shredded cheese"  
],  
  "question": "Ingredients: chicken breast, onions, garlic, bell pepper\nCuisine:  
Mexican",  
  "partner_name": "OpenAI"  
}
```

RESPONSE FROM INSTACART

```
{  
  "url": "https://inst.cr/t/bU80emEwakln"  
}
```

Here's your Instacart shopping list for Mexican Chicken Fajitas: [Instacart Shopping List](#).

You can use this link to purchase the ingredients and have them delivered to your doorstep.

Enjoy cooking and savoring your delicious Mexican Chicken Fajitas!

ili
the spicy flavor. The onions, garlic,
ch to the dish. Served on warm
ipe?

the spice mixture. Cook, stirring
the vegetables are tender, about 6-

opped with your favorite optional
shredded cheese.



Generative AI - DALLE - 2



Version 1
Meal name only



Version 2
Meal + All ingredients

Meal - Mexican Chicken Fajita



Version 3
Meal + description

Next steps

- Expanding inputs to chatGPT for example (Prep time, Difficulty level, serves, no of ingredient)
- Federated learning
- Self-labelled fridge / pantry images (in progress)
- Integrate with smart fridges (Samsung Bespoke)
- Edge mobile app deployment

Conclusion

- End to end pipeline incorporating image to text generation at the edge, generative language and text-to-image functions in the cloud
- Evaluated performance of YOLOv5 and YOLOv8 for improved mAP on Fine-tuning with ingredient data set
- Exploration of GPT4 plugins for contextual response



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Thank you!

Questions?

References

- Ward, Zachary J., et al. "Projected U.S. State-Level Prevalence of Adult Obesity and Severe Obesity." New England Journal of Medicine, vol. 381, no. 25, 2019, pp. 2440–2450., <https://doi.org/10.1056/nejmsa1909301>.
- Dataset: <https://universe.roboflow.com/karel-cornelis-q2qqg/aicook-lcv4d/dataset/2>
- <https://arxiv.org/ftp/arxiv/papers/2304/2304.02016.pdf>

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