

# Azure Custom Vision과 CoreML

## OSXDEV Enterprise Study

Jongwook Park  
2018. 7. 26

Custom Vision Service | Microsoft Azure

https://azure.microsoft.com/en-us/services/cognitive-services/custom-vision-service/

Contact Sales: 080-822-1383 Search My account Portal Park

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Home > Products > Cognitive Services > Custom Vision

# Custom Vision PREVIEW

Visual Intelligence made easy

[Get started >](#)

[Use with subscription >](#)

Explore Custom Vision Service: [Documentation](#) [Pricing](#) [Try Custom Vision Service](#) [Purchase subscription](#) [Roadmap](#)

Easily customize your own state-of-the-art computer vision models for your unique use case. Just upload a few labeled images and let Custom Vision Service do the hard work. With just one click, you can export trained models to be run on device or as Docker containers.



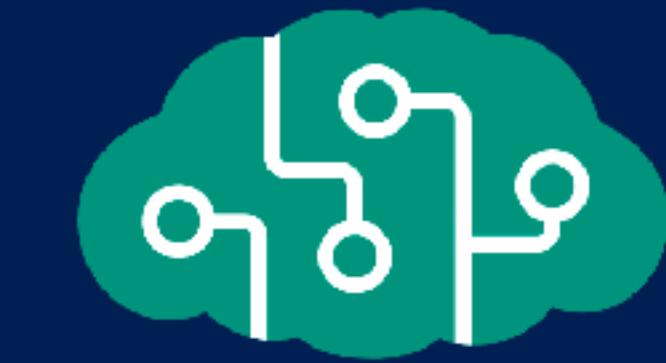
<https://azure.microsoft.com/en-us/services/cognitive-services/custom-vision-service/>

# Cognitive Services 가격 - Custom Vision Service

미리 보기

자신만의 사용 사례에 맞는 가장 종합적인 컴퓨터 비전 모델을 쉽게 만들 수 있습니다.

- ✓ 초기 비용 없음
- ✓ 종료 요금 없음
- ✓ 사용한 만큼만 요금 지불



평가판 >

탐색: [Custom Vision 개요](#) [설명서](#) [계산기](#)

API 선택:

Custom Vision

지역:

미국 중남부

통화:

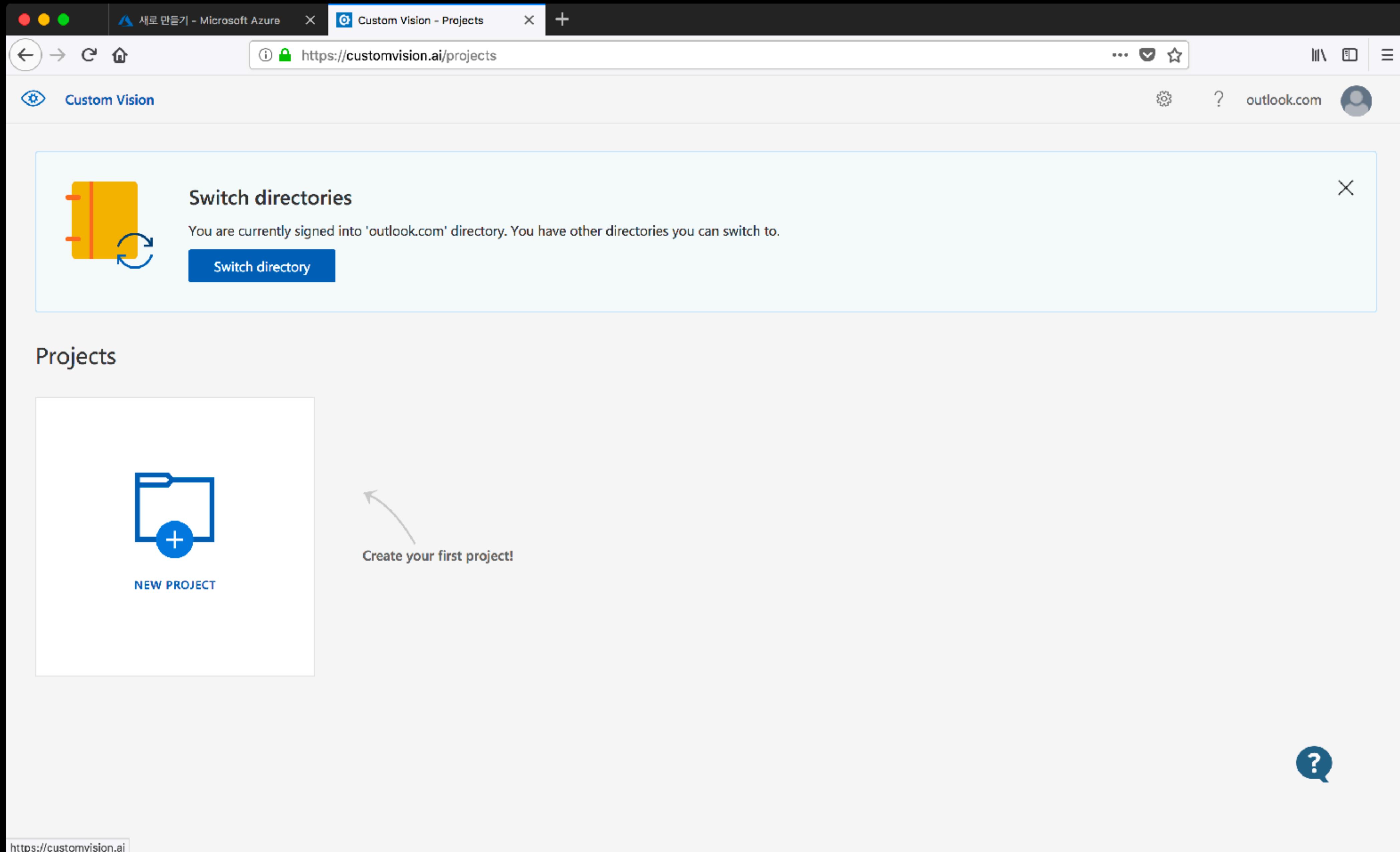
한국 원(₩)

Custom Vision Service를 통해 사용자 지정된 이미지 분류자를 간편하게 빌드하고 구체화하여 이미지의 특정 콘텐츠를 인식할 수 있습니다. 최신 기계 학습을 통해 분류자를 학습시켜 중요한 작업(예: 제품 이미지 분류 또는 웹 사이트의 콘텐츠 필터링)을 인식할 수 있습니다. 레이블이 지정된 이미지를 업로드하고 나머지는 Custom Vision Service에게 맡기세요.

## 가격 정보

아래 가격에는 미리 보기 할인이 반영되어 있습니다.

계층	기능	가격
무료	프로젝트 2개 프로젝트당 학습 이미지 5,000개 예측 10,000개	₩0
표준	프로젝트 100개 업로드, 학습 및 예측 트랜잭션	1,000개의 트랜잭션당 ₩1,124.65
	이미지 저장소(각 최대 6MB)	월별 1000개 이미지당 ₩393.63개



새로 만들기 - Microsoft Azure X Custom Vision - Projects X +

Custom Vision - Projects https://customvision.ai/projects

Custom Vision

Switch directories

You are currently signed into 'outlook.com'

Switch directory

Projects

NEW PROJECT

Create your first project

### Create new project

Name\*

Description

Project Types ⓘ

Classification

Object Detection (preview)

Classification Types ⓘ

Multilabel (Multiple tags per image)

Multiclass (Single tag per image)

Domains ⓘ

General

Food

Landmarks

Retail

Adult

General (compact)

Landmarks (compact)

Retail (compact)

Cancel Create project

?

Custom Vision: Food - Training

https://customvision.ai/projects/da69ad06-5470-40e7-8321-17fea5b952b6#/manage

Food

Training Images Performance Predictions Train Quick Test

Add images Delete Tag images Select all

Iteration Workspace

Tags +  
Tagged Untagged

Showing: all tagged images

Search for

Looks like you don't have any images here!

Go ahead and browse for images to upload to your project, tag them, and they will be ready to be trained.

Add images

JPG, .PNG, .BMP format, up to 6 MB per image

?

Custom Vision: Food - Training

https://customvision.ai/projects/da69ad06-5470-40e7-8321-17fea5b952b6#/manage

Food

Training Images Performance Predictions Train Quick Test

Filter Add images

Add Tags Uploading Summary

Image upload

Tags +

Showing: all tagged images

Search for

10 images will be added...

Add some tags to this batch of images...

My Tags

Add a tag and press enter

Upload 10 files

here!

will be ready to be trained.

?

Custom Vision: Food - Training

https://customvision.ai/projects/da69ad06-5470-40e7-8321-17fea5b952b6#/manage

Food

Training Images Performance Predictions Train Quick Test

Add images

Image upload

Add Tags Uploading Summary

Showing: all tagged images

Search for

Tags +

Tagged Untagged

10 images will be added...

Add some tags to this batch of images...

My Tags

곱창

Upload 10 files

here!

will be ready to be trained.

Custom Vision: Food - Training

https://customvision.ai/projects/da69ad06-5470-40e7-8321-17fea5b952b6#/manage

Food

Training Images Performance Predictions Train Quick Test

Add images Delete Tag images Select all

Iteration

Tags +

Tagged Untagged

Showing:

Search for

Done

?

Image upload

Add Tags Uploading Summary

10 images uploaded successfully

Done

The screenshot shows the Microsoft Azure Custom Vision interface for a project named "Food". The "Training Images" tab is selected. A modal window titled "Image upload" is open, showing a progress bar with three steps: "Add Tags", "Uploading", and "Summary". The "Uploading" step is highlighted. A green message box indicates "10 images uploaded successfully". The background shows a list of training images with a "Tags" sidebar on the left.

Custom Vision: Food - Training

https://customvision.ai/projects/da69ad06-5470-40e7-8321-17fea5b952b6#/manage

Food

Training Images Performance Predictions Train Quick Test

Add images Delete Tag images Select all

Iteration

Workspace

Tags +

Tagged Untagged

Showing:

Search for

10 images

Image upload

Add Tags Uploading Summary

10 images uploaded successfully

Done

?

The screenshot shows the Microsoft Custom Vision Food - Training interface. The main navigation bar includes 'Training Images', 'Performance', and 'Predictions'. Below this, there are buttons for 'Train' and 'Quick Test'. On the left, a sidebar titled 'Iteration' shows a 'Workspace' dropdown and a 'Tags' section with 'Tagged' selected. The main area displays a grid of food images. A central modal window is open, titled 'Image upload', showing a progress bar with three steps: 'Add Tags', 'Uploading', and 'Summary'. A green success message at the bottom of the modal states '10 images uploaded successfully'. At the bottom right of the modal is a 'Done' button.

Custom Vision: Food - Training

https://customvision.ai/projects/da69ad06-5470-40e7-8321-17fea5b952b6#/manage

Food

Training Images Performance Predictions Train Quick Test

Add images

Image upload

Add Tags Uploading Summary

Showing: 10 images will be added...

Add some tags to this batch of images...

My Tags: 삼겹살

Upload 10 files

Filter Iteration Workspace Tags Tagged Untagged Search for 곱 10 ...

Image upload progress: Add Tags (blue dot), Uploading (grey dot), Summary (grey dot).

The main interface shows a list of training images on the left, categorized by workspace and tags (Tagged and Untagged). A modal window titled "Image upload" is open, showing a grid of 10 images being uploaded. Below the images, a message says "10 images will be added...". A section for adding tags is present with a "My Tags" input field containing "삼겹살" and a "Upload 10 files" button.

Custom Vision: Food - Training

https://customvision.ai/projects/da69ad06-5470-40e7-8321-17fea5b952b6#/manage

Food

Training Images Performance Predictions Train Quick Test

Add images

Image upload

Add Tags Uploading Summary

10 images will be added...

Add some tags to this batch of images...

My Tags

돈까스

Upload 10 files

Filter

Iteration

Workspace

Tags

Tagged Untagged

Showing:

곱창 × 삼겹살 ×

Search for

곱창 10

삼겹살 10

Image upload progress: Add Tags (blue dot), Uploading (grey dot), Summary (grey dot)

The main interface shows a list of training images categorized by tags: 곱창 (10 images) and 삼겹살 (10 images). A modal window titled 'Image upload' is open, showing a grid of 10 images being uploaded. Below the images, it says '10 images will be added...'. There is a section to 'Add some tags to this batch of images...' with a text input field containing '돈까스'. A large blue button at the bottom right of the modal says 'Upload 10 files'.

Custom Vision: Food - Training

Image upload

Add Tags      Uploading      Summary

13 images will be added...

Add some tags to this batch of images...

My Tags: 초밥

Upload 13 files

Food

Add images

Iteration

Workspace

Tags

Tagged Untagged

Showing:

곱창 × 돈까스 ×

삼겹살 ×

Search for

곱창 10

돈까스 10

삼겹살 10

Custom Vision: Food - Training

https://customvision.ai/projects/da69ad06-5470-40e7-8321-17fea5b952b6#/manage

Food

Training Images Performance Predictions Train Quick Test

Add images Delete Tag images Select all

Iteration

Workspace

Tags +

Tagged Untagged

Showing: all tagged images

Search for

□ 곱창 10 ...

□ 돈까스 10 ...

□ 삼겹살 10 ...

□ 초밥 13 ...

Custom Vision: Food - Performance

https://customvision.ai/projects/da69ad06-5470-40e7-8321-17fea5b952b6#/performance

Food

Training Images Performance Predictions Train Quick Test

Iterations Delete Export

Probability Threshold: 100% (i)

Iteration 1

Training...  
Last checked: 2018. 7. 26. 오후 4:10:11

Iteration 1  
Training...

?

Custom Vision: Food - Performance

Training Images Performance Predictions Train Quick Test

Iterations Prediction URL Make default Delete Export

Probability Threshold: 100%

Iteration 1

Finished training on 2018. 7. 26. 오후 4:10:22 using General (compact) domain  
Classification type: Multilabel (Multiple tags per image)

Precision: 97.2%      Recall: 85.7%

Performance Per Tag

Tag	Precision	Recall
초밥	100.0%	80.0%
삼겹살	100.0%	91.7%
고기	100.0%	88.6%

?

Custom Vision: Food - Performance

https://customvision.ai/projects/da69ad06-5470-40e7-8321-17fea5b952b6#/performance

Food

Training Images Performance Predictions Train Quick Test

Iterations Prediction URL Make default Delete Export

Iteration 1

Probability Threshold: 100% (i)

Iteration 1

Trained : moments ago with General (compact) domain

Precision (i) 97.2%

Recall (i) 85.7%

Performance Per Tag

Tag	Precision	Recall
초밥	100.0%	80.0%
삼겹살	100.0%	91.7%
곱창	100.0%	80.6%

?

Custom Vision: Food - Performance

Choose your platform

iOS  
CoreML  
iOS 11

TF  
TensorFlow  
Android

ONNX  
ONNX  
Windows ML

Train Quick Test

?

Food

Iterations

Probability Threshold: 100%

Iteration 1

Trained : moments ago  
with General (compact) domain

Performance

Tag

초밥

삼겹살

곱창

Custom Vision: Food - Performance

https://customvision.ai/projects/da69ad06-5470-40e7-8321-17fea5b952b6#/performance

Food

Training Images Performance Predictions Train Quick Test

Iterations Prediction URL Make default Delete Export

Iteration 1

Probability Threshold: 100% (i)

Iteration 1

Trained : 1 minutes ago with General (compact) domain

Choose your platform

iOS CoreML

Export

How to use?

CoreML documentation Sample code Licenses

Tag	Precision	Recall
초밥	100.0%	80.0%
삼겹살	100.0%	91.7%
곱창	100.0%	80.6%

?

새로 만들기 - Microsoft Azure Custom Vision: Food - Performance

https://customvision.ai/projects/da69ad06-5470-40e7-8321-17fea5b952b6#/performance

Food

Training Images Performance Predictions Train Quick Test

Iterations Prediction URL Make default Delete Export

Probability Threshold: 100% (i)

Iteration 1

Finished training on 2018. 7. 26. 오후 4:10:22 using General (compact) domain  
Classification type: Multilabel (Multiple tags per image)

Iteration 1

Trained : 1 minutes ago with General (compact) domain

Choose your platform

iOS CoreML

Download

How to use?

CoreML documentation Sample code Licenses

Tag Precision Recall

Tag	Precision	Recall
초밥	100.0%	80.0%
삼겹살	100.0%	91.7%
곱창	100.0%	80.6%

?

https://irisscuprodstore.blob.core.windows.net/m-da69ad06547040e7832117fea5b952b6/11cce163842d4da6921f700fd1017ddf.mlmodel?sv=2017-04-17&sr=b&sig=Rng05BxD8Ix0xHotGBrCj10WZ5xiD9Zl6QgvDuLk6I=&se=2018-07-27T07:11:46Z&sp=r

CustomVision > iPhone SE      CustomVision | Build CustomVision: **Succeeded** | Today at 오후 4:22      1

CustomVision > CustomVision > Foods.mlmodel

**Machine Learning Model**

- Name: Foods
- Type: Neural Network Classifier
- Size: 2.9 MB
- Author: unknown
- Description: description not included
- License: unknown

**Model Class**

- Foods: Automatically generated Swift model class

**Model Evaluation Parameters**

Name	Type	Description
<b>Inputs</b>		
data	Image (Color 227 x 227)	
<b>Outputs</b>		
loss	Dictionary (String → Double)	
classLabel	String	

**Identity and Type**

- Name: Foods.mlmodel
- Type: Default - CoreML Model
- Location: Relative to Group
- Foods.mlmodel
- Full Path: /Users/nedpark/Downloads/cognitive-services-ios-customvision-sample-master/CustomVision/Foods.mlmodel

**On Demand Resource Tags**

- Only resources are taggable

**Localization**

- Localize...

**Target Membership**

- CustomVision

**Cocoa Touch Class** - A Cocoa Touch class

**UI Test Case Class** - A class implementing a unit test

**Unit Test Case Class** - A class implementing a unit test



## CustomVision

## CustomVision

AppDelegate.swift

ViewController.swift

Fruit.mlmodel

Foods.mlmodel

Main.storyboard

Assets.xcassets

LaunchScreen.storyboard

Info.plist

BubbleLayer.swift

BubbleLabelLayer.swift

## Products

## Machine Learning Model

Name Foods

Type Neural Network Classifier

Size 2.9 MB

Author unknown

Description description not included

License unknown

## Model Class

C Foods

Automatically generated Swift model class

## Model Evaluation Parameters

Name	Type	Description
<b>Inputs</b>		
data	Image (Color 227 x 227)	
<b>Outputs</b>		
loss	Dictionary (String → Double)	
classLabel	String	

The screenshot shows the Xcode interface with the following details:

- Project Navigator:** Shows the project structure under "CustomVision". The "Foods.mlmodel" file is selected.
- Editor:** Displays the contents of the "Foods.swift" file. The code defines two classes: "FoodsInput" and "FoodsOutput", both conforming to the "MLFeatureProvider" protocol. These classes handle image processing and model prediction for CoreML.
- Identity and Type:** A panel on the right showing the file's properties:
  - Name: Foods.mlmodel
  - Type: Default - CoreML Model
  - Location: Relative to Group
  - Full Path: /Users/nedpark/Downloads/cognitive-services-ios-customvision-sample-master/CustomVision/Foods.mlmodel
- On Demand Resource Tags:** A panel showing "Only resources are taggable".
- Localization:** A panel with a "Localize..." button.
- Target Membership:** A panel showing "CustomVision" checked.
- Quick Help:** A sidebar at the bottom with three entries:
  - Cocoa Touch Class - A Cocoa Touch class
  - UI Test Case Class - A class implementing a unit test
  - Unit Test Case Class - A class implementing a unit test

CustomVision > ned\_iPhone\_X Finished running CustomVision on iPhone SE 1

CustomVision > CustomVision > ViewController.swift > classificationRequest

Find: model 12 matches + Aa Contains < > Done

CustomVision

CustomVision

ViewController.swift

Fruit.mlmodel

Foods.mlmodel

Main.storyboard

Assets.xcassets

LaunchScreen.storyboard

Info.plist

BubbleLayer.swift

BubbleLabelLayer.swift

Products

```
16 class ViewController: UIViewController {
17
18     @IBOutlet weak var previewView: UIView!
19     @IBOutlet weak var stackView: UIStackView!
20     @IBOutlet weak var lowerView: UIView!
21
22     var previewLayer: AVCaptureVideoPreviewLayer!
23     let bubbleLayer = BubbleLayer(string: "")
24
25     let queue = DispatchQueue(label: "videoQueue")
26     var captureSession = AVCaptureSession()
27     var captureDevice: AVCaptureDevice?
28     let videoOutput = AVCaptureVideoDataOutput()
29     var unknownCounter = 0 // used to track how many unclassified images in a row
30     let confidence: Float = 0.7
31
32     // MARK: Load the Model
33     let targetImageSize = CGSize(width: 227, height: 227) // must match model data input
34
35     lazy var classificationRequest: [VNRequest] = {
36         do {
37             // Load the Custom Vision model.
38             // To add a new model, drag it to the Xcode project browser making sure that the "Target Membership" is checked.
39             // Then update the following line with the name of your new model.
40             let model = try VNCoreMLModel(for: Foods().model)
41             let classificationRequest = VNCoreMLRequest(model: model, completionHandler:
42                 self.handleClassification)
43             return [classificationRequest]
44         } catch {
45             fatalError("Can't load Vision ML model: \(error)")
46         }
47     }()
48
49     // MARK: Handle image classification results
50
51     func handleClassification(request: VNRequest, error: Error?) {
52         guard let observations = request.results as? [VNClassificationObservation]
53         else { fatalError("unexpected result type from VNCoreMLRequest") }
54
55         guard let best = observations.first else {
56             fatalError("classification didn't return any results")
57         }
58
59         // Use results to update user interface (includes basic filtering)
```

Identity and Type

Name: ViewController.swift

Type: Default - Swift Source

Location: Relative to Group

ViewController.swift

Full Path: /Users/nedpark/Downloads/cognitive-services-ios-customvision-sample-master/CustomVision/ViewController.swift

On Demand Resource Tags

Only resources are taggable

Target Membership

CustomVision

Text Settings

Text Encoding: No Explicit Encoding

Line Endings: No Explicit Line Endings

Indent Using: Spaces

Widths: 4 Tab Indent

Wrap lines

Cocoa Touch Class - A Cocoa Touch class

UI Test Case Class - A class implementing a unit test

Unit Test Case Class - A class implementing a unit test

```
24
25 let queue = DispatchQueue(label: "videoQueue")
26 var captureSession = AVCaptureSession()
27 var captureDevice: AVCaptureDevice?
28 let videoOutput = AVCaptureVideoDataOutput()
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43             self.handleClassification)
44         return [ classificationRequest ]
45     } catch {
46         fatalError("Can't load Vision ML model: \(error)")
47     }
48 }()
49
```



CustomVision &gt; ned\_iPhone\_X

Finished running CustomVision on iPhone SE

⚠ 1 ⚠ 1



CustomVision &gt; CustomVision &gt; Foods.mlmodel

## CustomVision

## CustomVision

AppDelegate.swift

ViewController.swift

Fruit.mlmodel

Foods.mlmodel

Main.storyboard

Assets.xcassets

LaunchScreen.storyboard

Info.plist

BubbleLayer.swift

BubbleLabelLayer.swift

## Products

## Machine Learning Model

Name Foods

Type Neural Network Classifier

Size 2.9 MB

Author unknown

Description description not included

License unknown

## Model Class

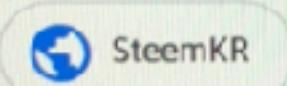
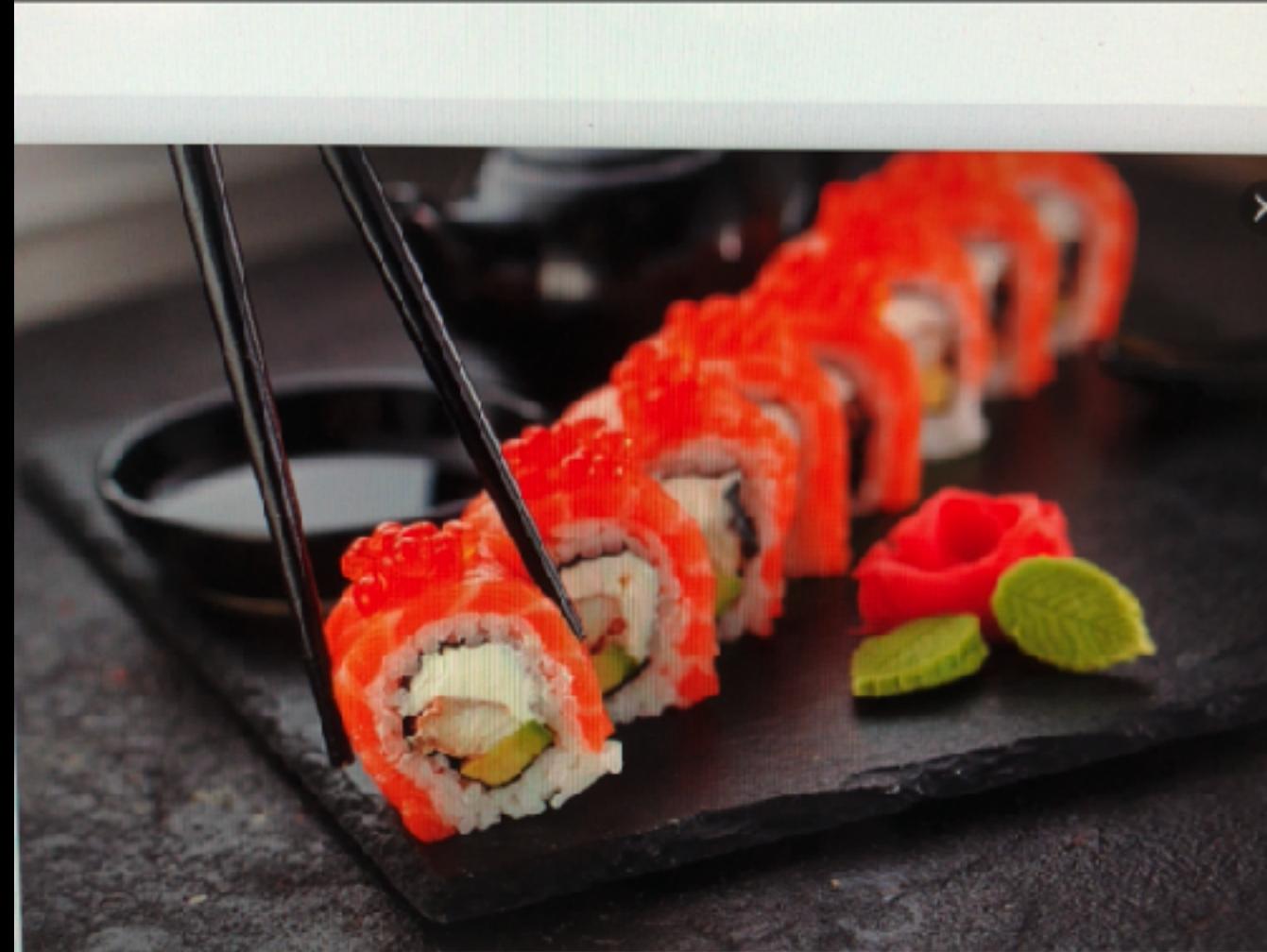
C Foods ↗

Automatically generated Swift model class

## Model Evaluation Parameters

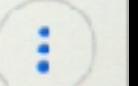
Name	Type	Description
<b>Inputs</b>		
data	Image (Color 227 x 227)	
<b>Outputs</b>		
loss	Dictionary (String → Double)	
classLabel	String	

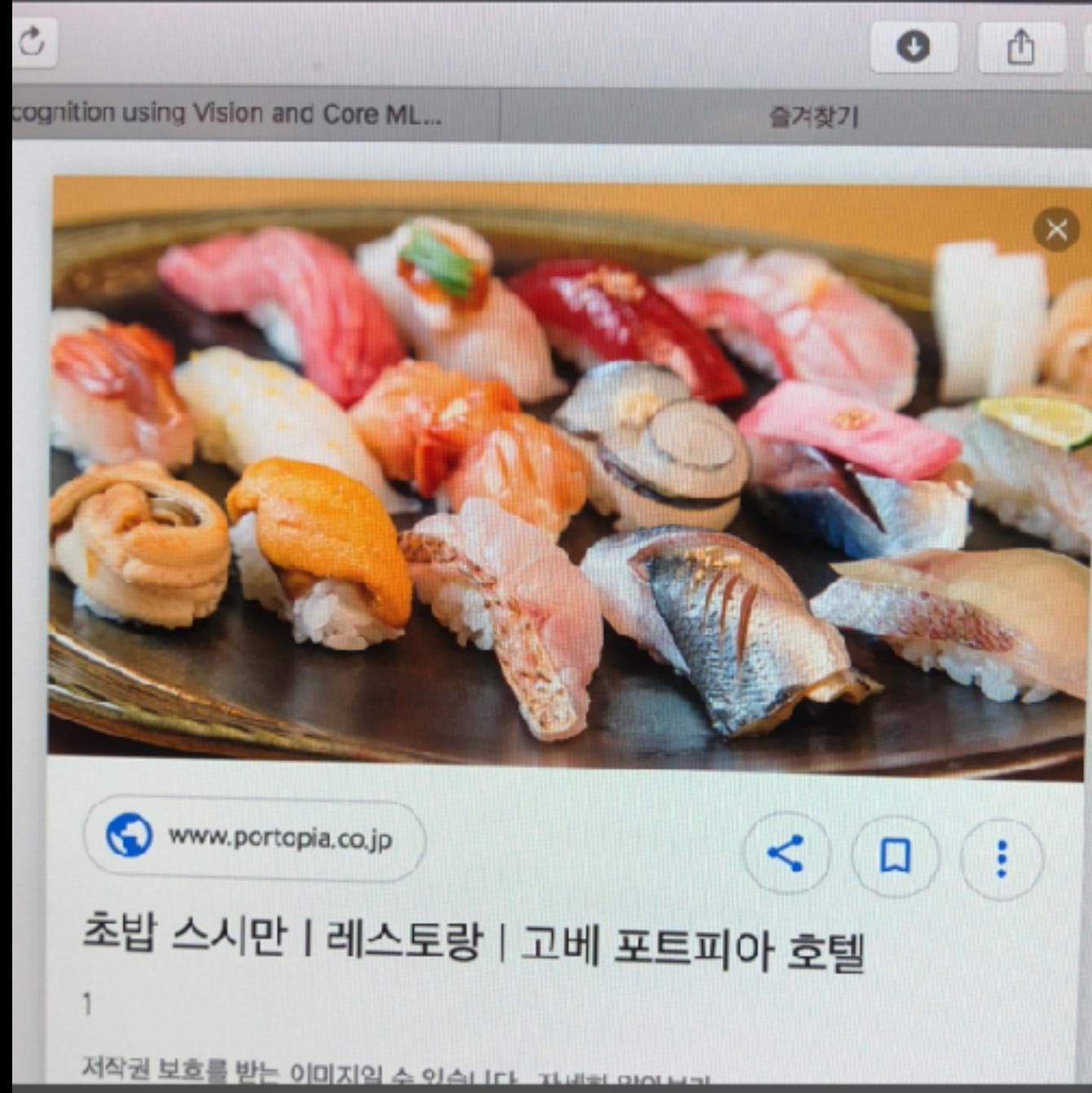
```
25    let queue = DispatchQueue(label: "VideoQueue")
26    var captureSession = AVCaptureSession()
27    var captureDevice: AVCaptureDevice?
28    let videoOutput = AVCaptureVideoDataOutput()
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36        do {
37            // Load the Custom Vision model.
38            // To add a new model, drag it to the Xcode project browser making sure that the "Target Membership" is checked.
39            // Then update the following line with the name of your new model.
40            let model = try VNCoreMLModel(for: Foods().model)
41            let classificationRequest = VNCoreMLRequest(model: model, completionHandler:
42                self.handleClassification)
43            return [classificationRequest]
44        } catch {
45            fatalError("Can't load Vision ML model: \(error)")
46        }
47    }()
48
49    // MARK: Handle image classification results
```



Sushi in a quiet place — Steemkr

전자기 보증을 받는 이미지와 스마트폰 사진은 차별화된 인터페이스





??

Custom Vision: Food - Training X Vision | Apple Developer Docum X GitHub - Azure-Samples/cognit X +

https://customvision.ai/projects/da69ad06-5470-40e7-8321-17fea5b952b6#/manage

Food

Training Images Performance Predictions Train Quick Test Filter Add images Delete Tag images Select all

Iteration

Workspace

Tags +

Tagged Untagged

Showing: all tagged images

Search for

Giblet 10 ...  
Pork Belly 10 ...  
Pork Cutlet 10 ...  
Sushi 13 ...

?

Custom Vision: Food - Performance

Vision | Apple Developer Documentation

GitHub - Azure-Samples/cognitive-vision

Food

Training Images Performance Predictions Train Quick Test

Iterations

Probability Threshold: 100%

Prediction URL Make default Delete Export

Iteration 2  
Trained : moments ago  
with General (compact) domain

Iteration 1  
Trained : 26 minutes ago  
with General (compact) domain

Precision: 100.0% Recall: 61.1%

Performance Per Tag

Tag	Precision	Recall
Pork Cutlet	100.0%	75.0%
Pork Belly	100.0%	61.1%
Giblet	100.0%	50.0%
Sushi	66.7%	58.3%

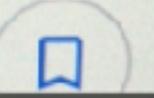
?



Sushi



SteemKR



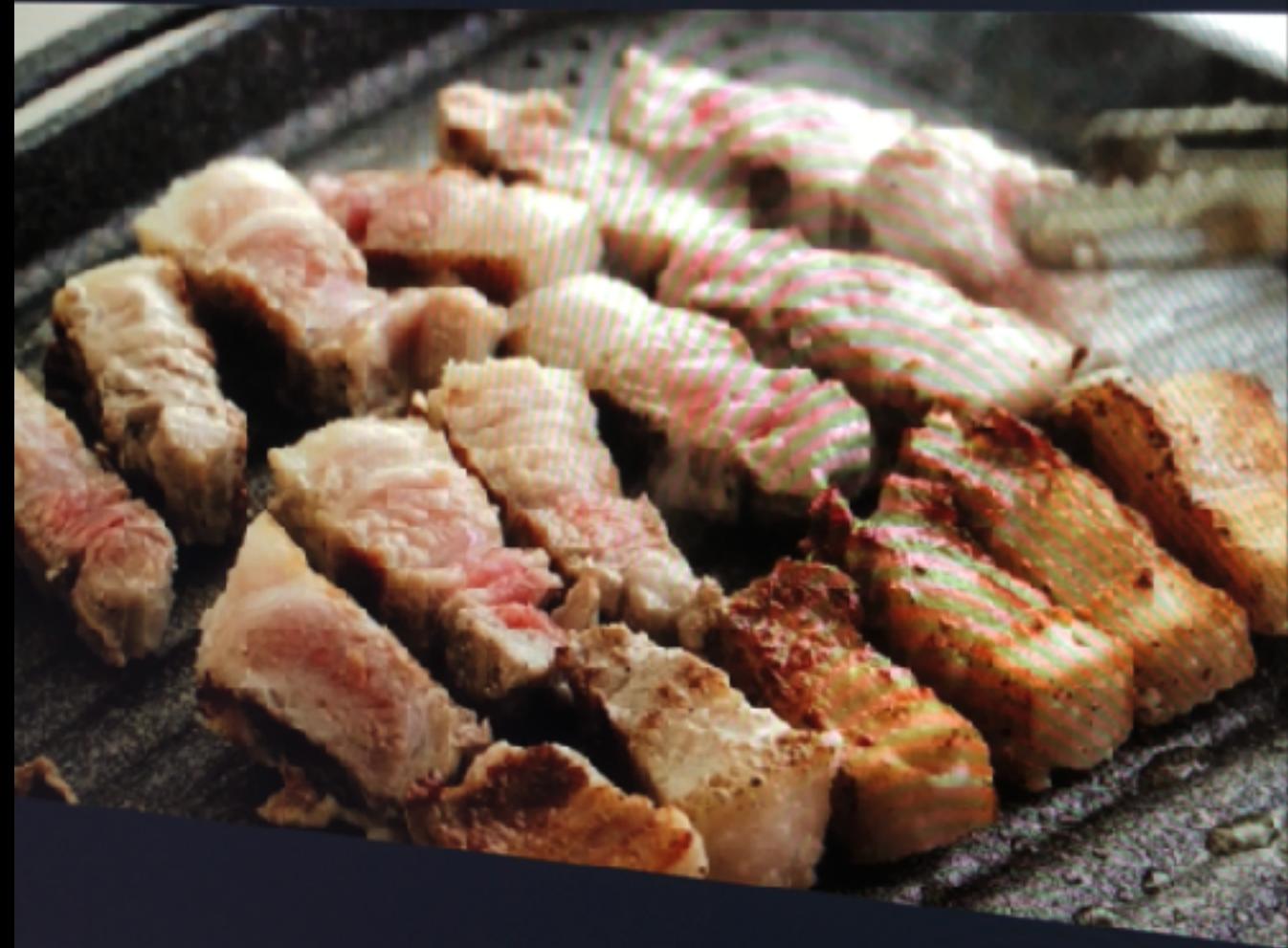
Sushi



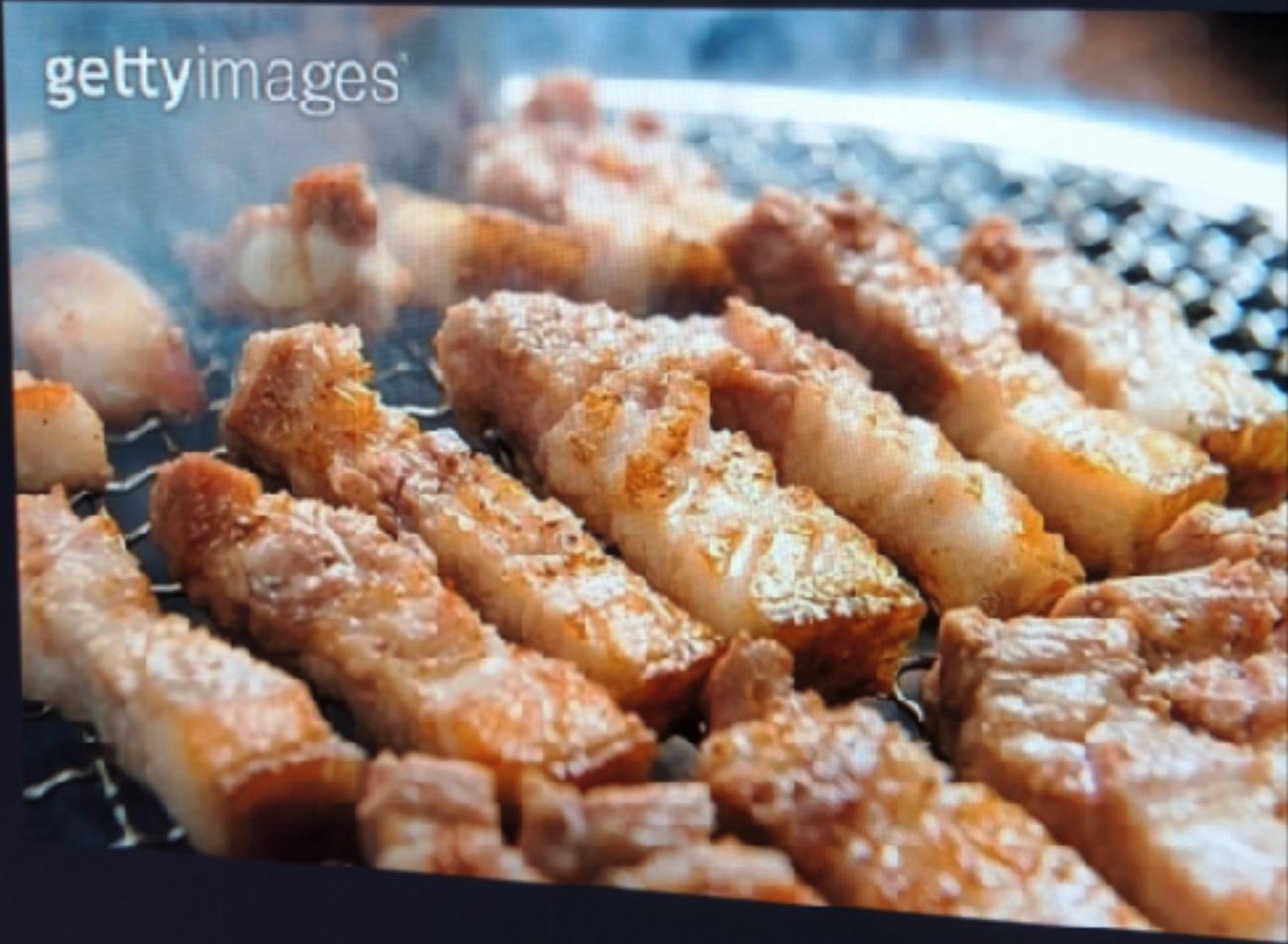
Giblet



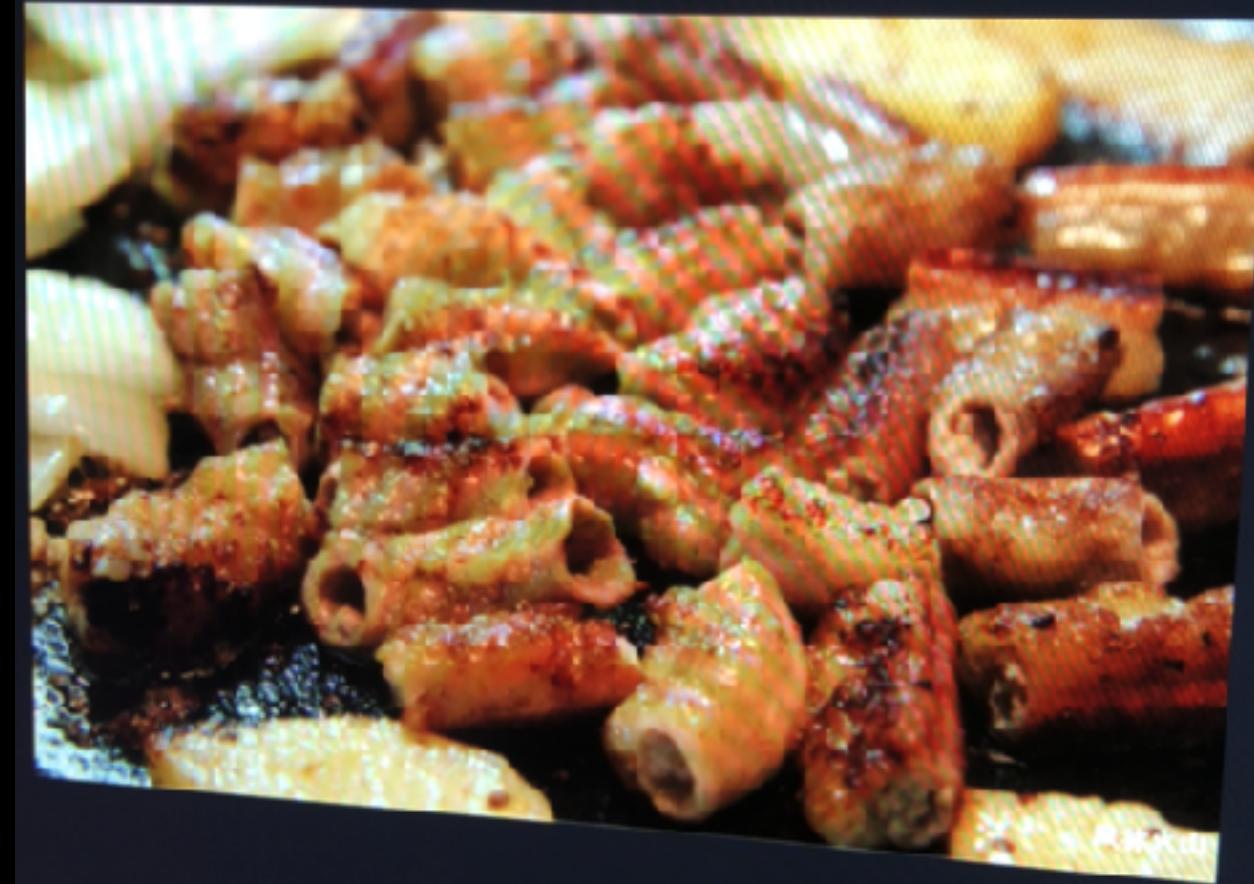
Sushi



Giblet



Giblet





GIBLET



Giblet



Giblet

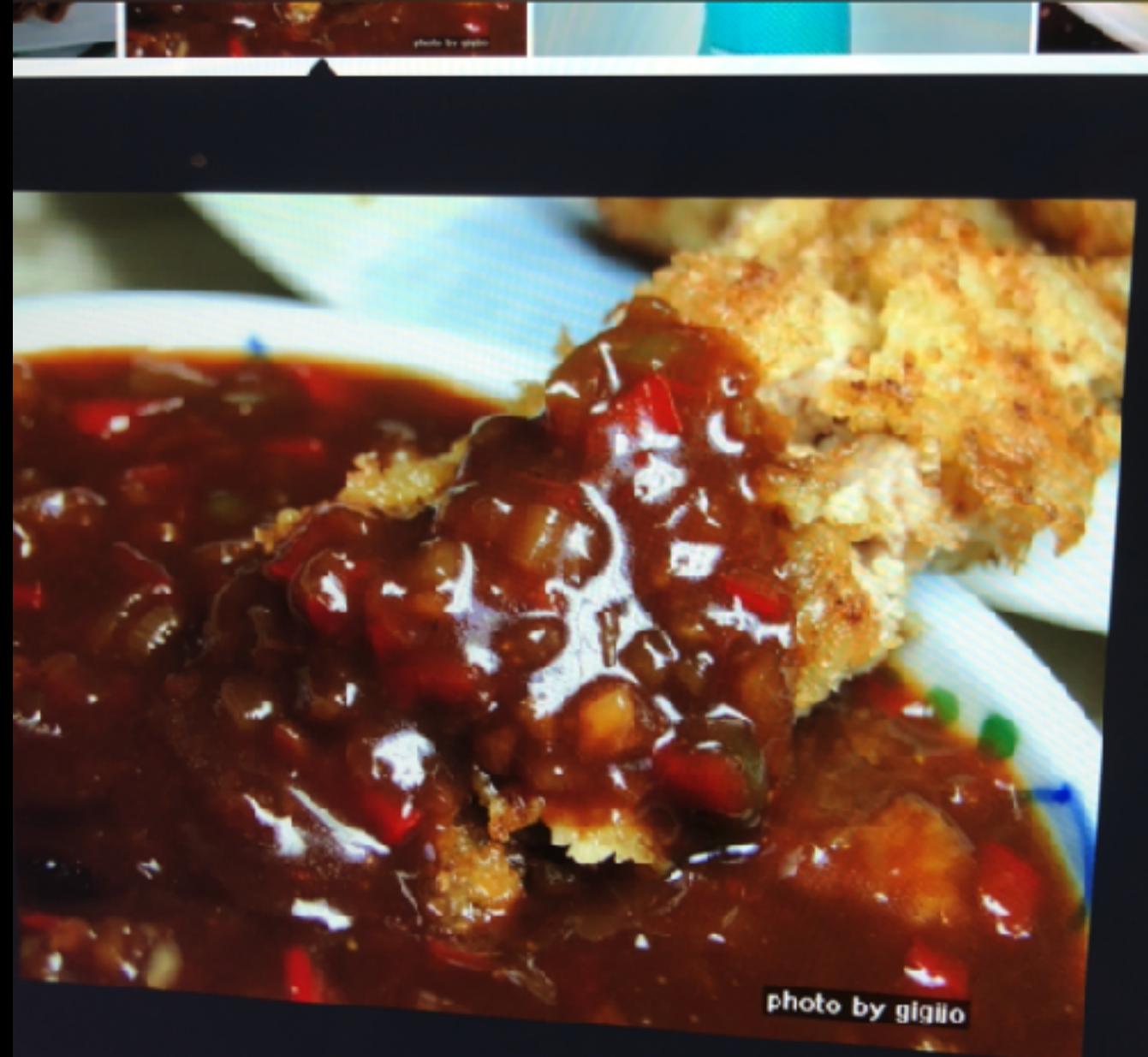




Giblet



Pork Cutlet



Pork Cutlet



Pork Cutlet



Pork Cutlet

