

# SetMealAsYouLike: Sketch-based Set Meal Image Synthesis with Plate Annotations

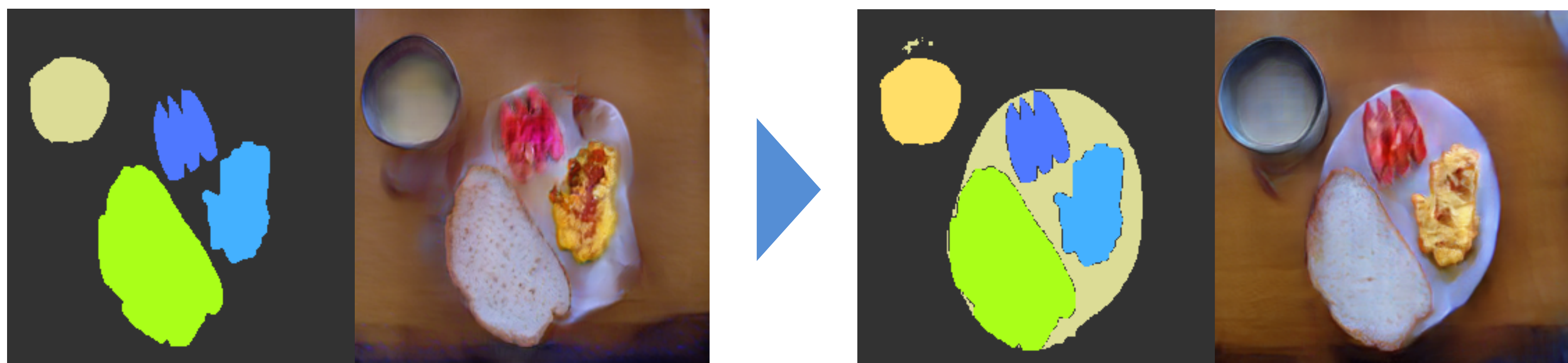


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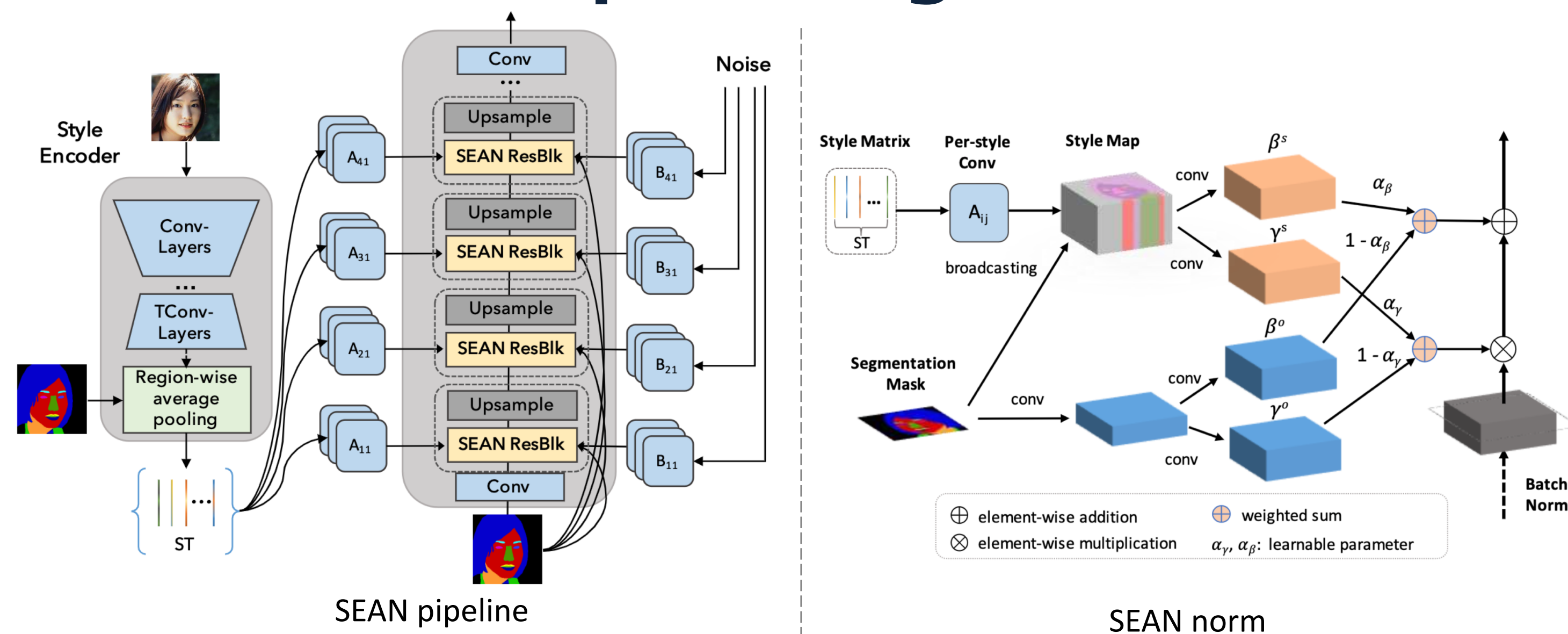
## Abstract : background and purpose

GAN can generate meal image with the shape and meal category specified by the user. However, there are problems with distortion and merging of plates, because only the food region is specified and generated. Furthermore, there is no food dataset that includes a plate region.

### Adding a Plate Region Mask with Few-shot Segmentation Generate high quality meal images



## 2. Training SEAN on the food dataset with added plate regions



### About SEAN [3]

SEAN is a method that allows different styles to be adapted for each region. Multiple normalizations dependent on segment masks and style features for high-quality generation.

## Method : Extract Plate Region using HSNet. SEAN trained on Food dataset with plate and generate.

1. Extracting Plate regions by Few-shot Segmentation(FSS) [2]
2. SEAN[3] trained on food dataset with plate regions

### 1. Plate regions extraction with FSS



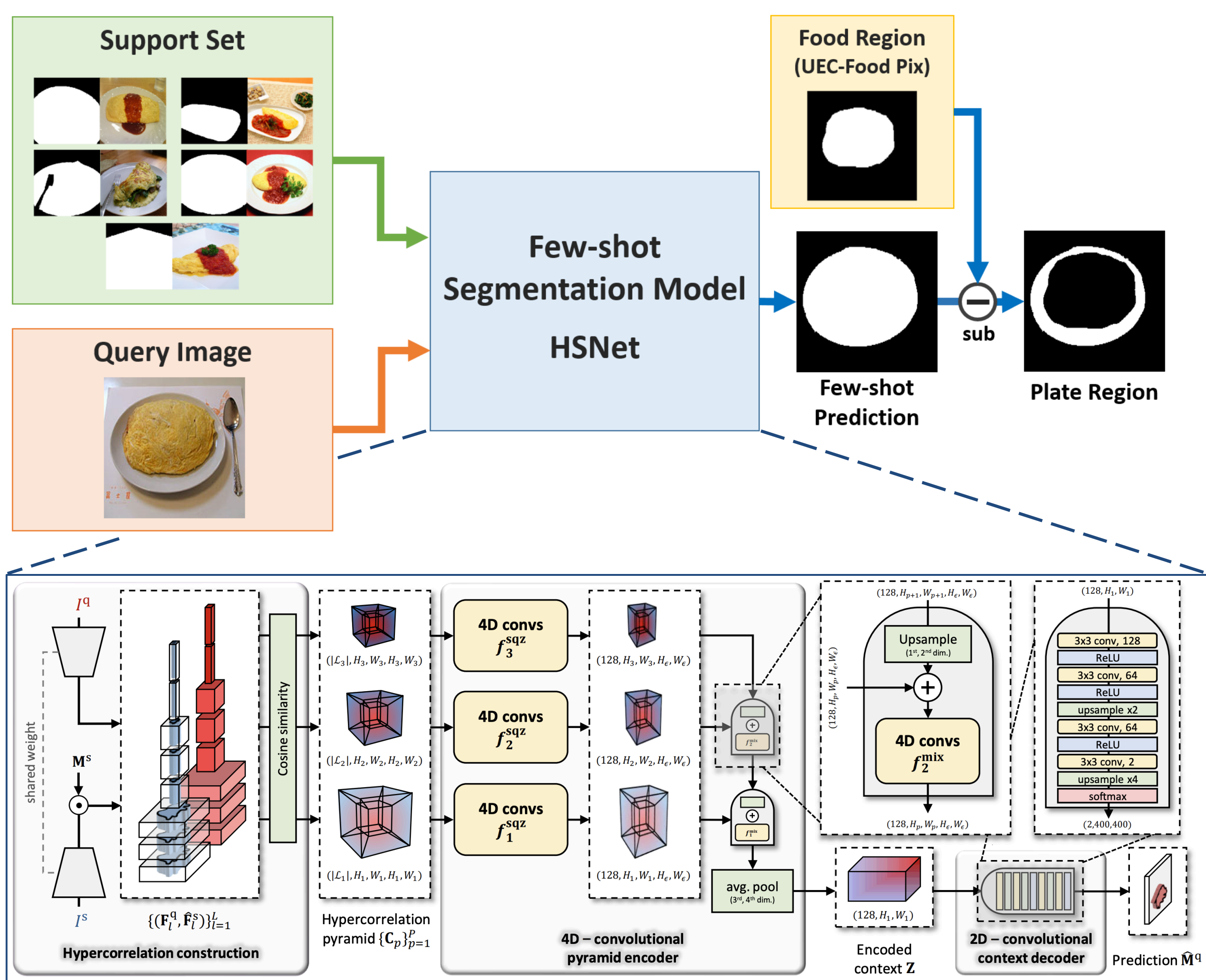
#### UEC-FoodPix Complete[1] dataset

Pixel-level annotations included  
100 food class, over 10K large dataset

9000 images for train, 1000 for validation

Manually annotate 5 images of each class in the food+plate region for Few-shot

#### Network for extracting plate region



#### About HSNet[2]

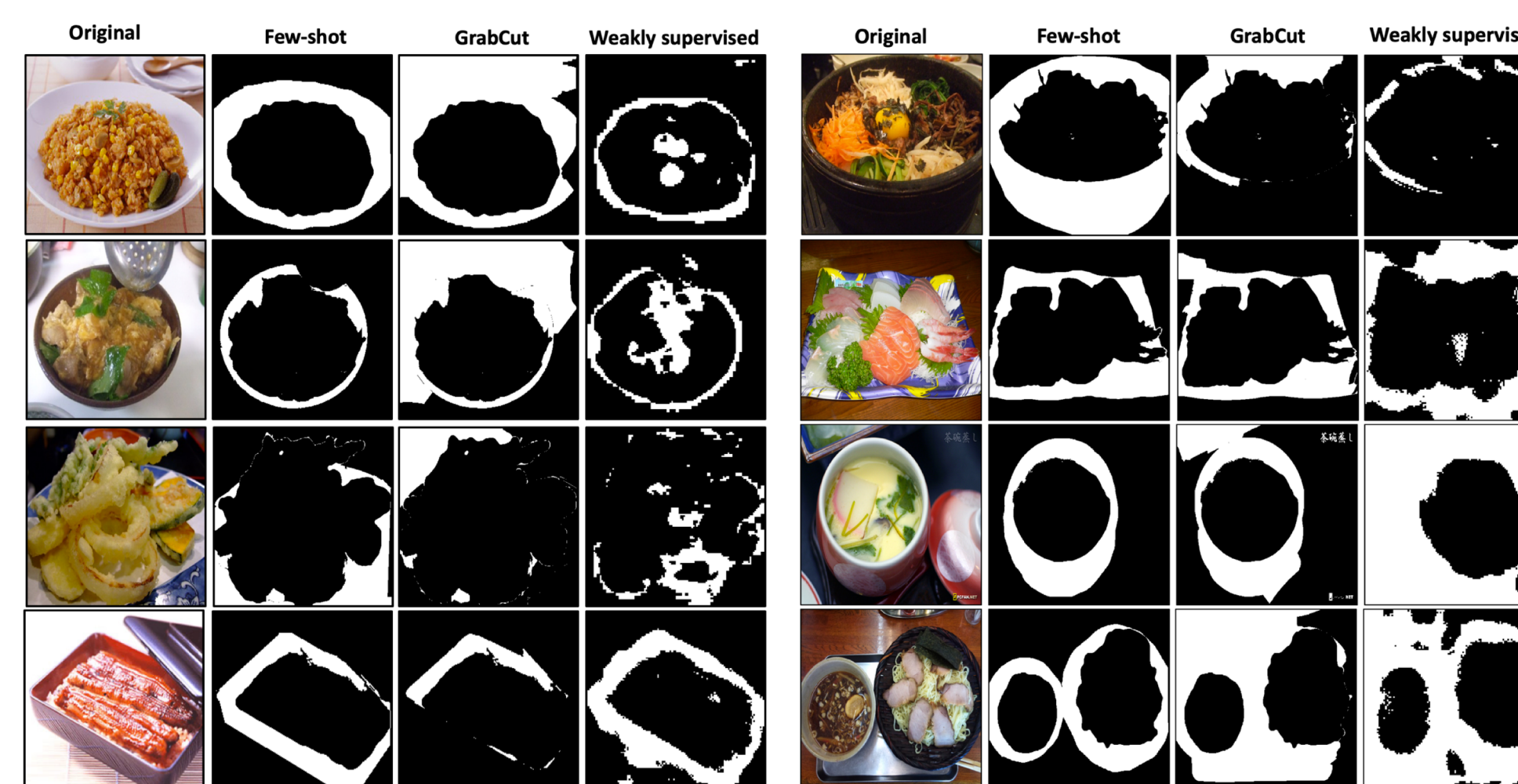
Similarity between queries and support features from the backbone can be used as new features to enable class-independent inference. Using pre-trained HSNet trained on Pascal-5<sup>i</sup> dataset.

#### Plate region extraction

5-shot segmentation in food+plate region with 5 support sets. Remove food regions from segmented regions.

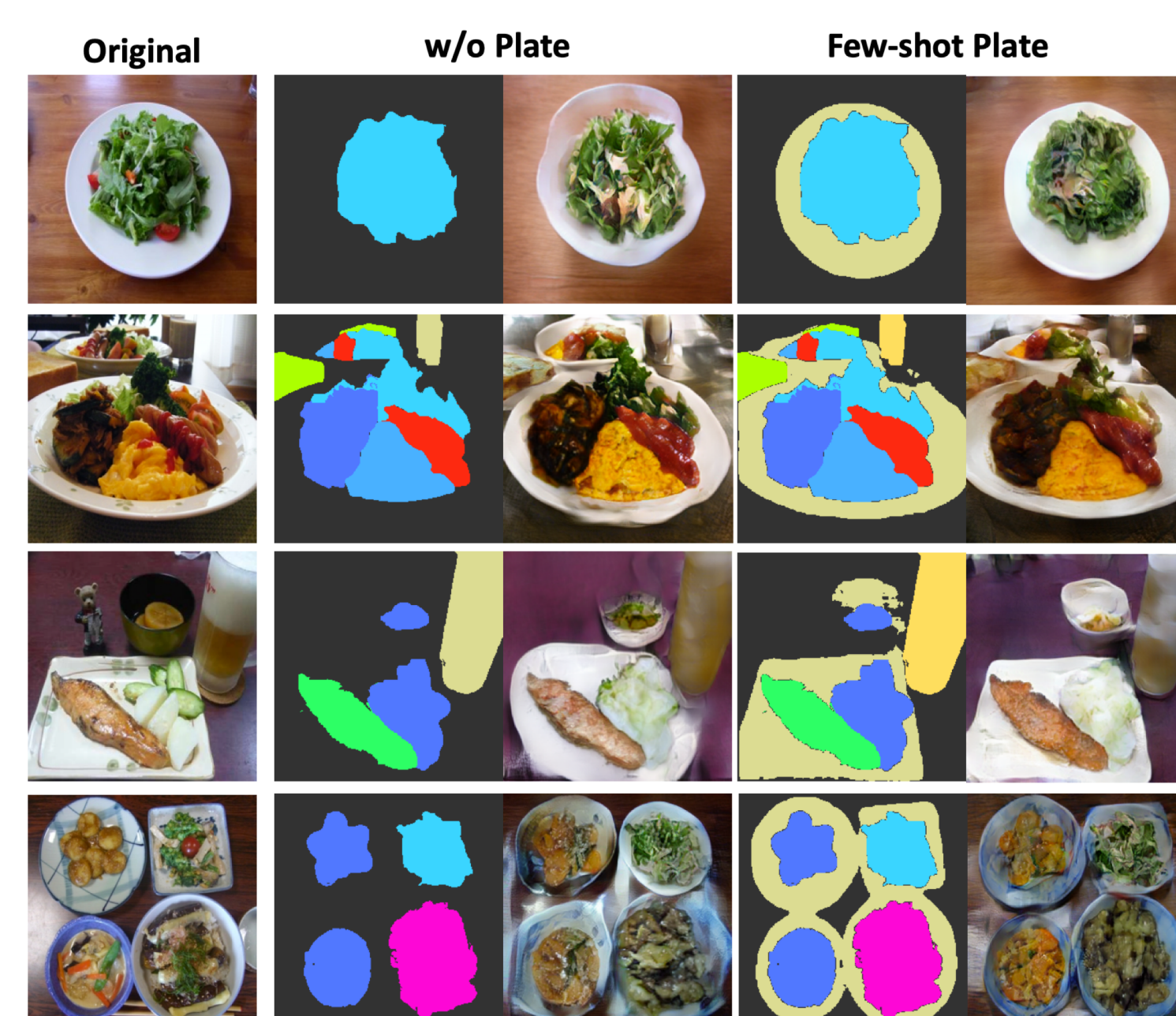
**Few-shot Segmentation enables robust plate region segmentation**

## Result



	IoU
Few-shot	<b>78.5</b>
GrabCut [4]	66.1
Weakly [5]	50.2

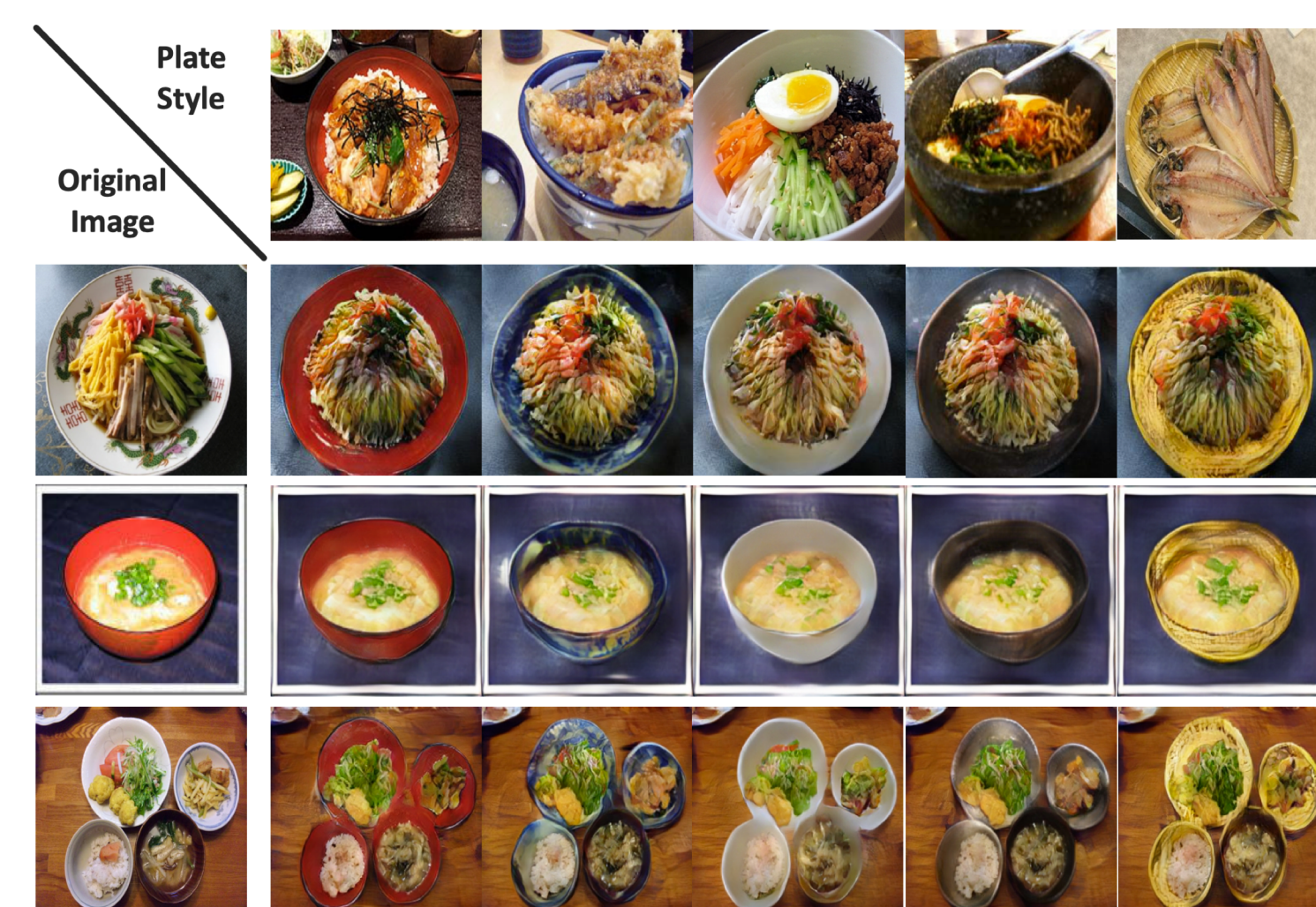
**IoU of the plate region is over 70**



#### FID ↓ to eval generation quality

	w/o plate	FSS Plate
SPADE	71.5	68.4
SEAN	51.1	<b>50.9</b>

**Using the plate region improved the quality of the generated.**

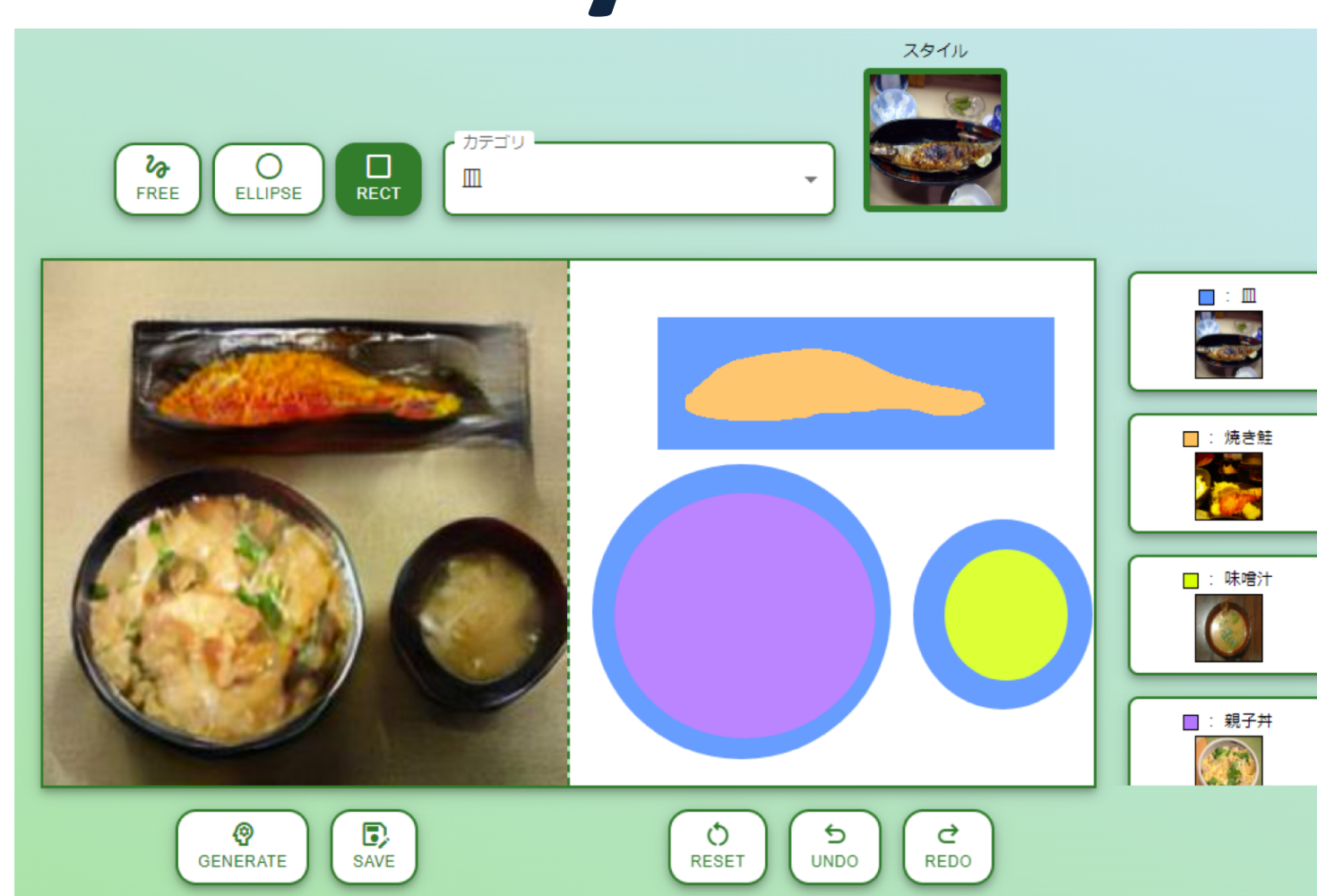


#### Plate style conversion result

The impression of the dish is considered to change depending on the style of the plate area.

**Easier to imagine before serving food.**

## Demo System : Web-based application operated by tablet or PC



#### Web App

1. Select the class and style image you want to draw.
2. Draw a mask and generate an image by SEAN.

**You can generate set meal in any shape and style**

[1] K. Okamoto and K Yanai. UEC-FoodPix Complete: A Large-scale Food Image Segmentation Dataset. In Proc. of the ICPR Workshop on Multimedia Assisted Dietary Management, 2021.

[2] J. Min, D. Kang, and M. Cho. Hypercorrelation Squeeze for Few-Shot Segmentation. In Proc. of the IEEE/CVF International Conference on Computer Vision, 2021.

[3] P. Zhu and R. Abdal and Y. Qin and P. Wonka. SEAN: Image Synthesis with Semantic Region-Adaptive Normalization. In Proc. of the IEEE Conference on Computer Vision and Pattern Recognition.

[4] C. Rother, V. Kolmogorov, and A. Blake. "GrabCut": interactive foreground extraction using iterated graph cuts. Proc. of ACM Trans. 2004.

[5] W. Shimoda and K. Yanai. Predicting Plate Regions for Weakly-supervised Food Image Segmentation. In Proc. of IEEE International Conference on Multimedia and Expo. 2020.