잃어버린 얼굴을 찾아서

컴퓨터 비전

이응이들 권정연 유진희 이재웅 홍유리

잃어버린 얼굴...? 🥲

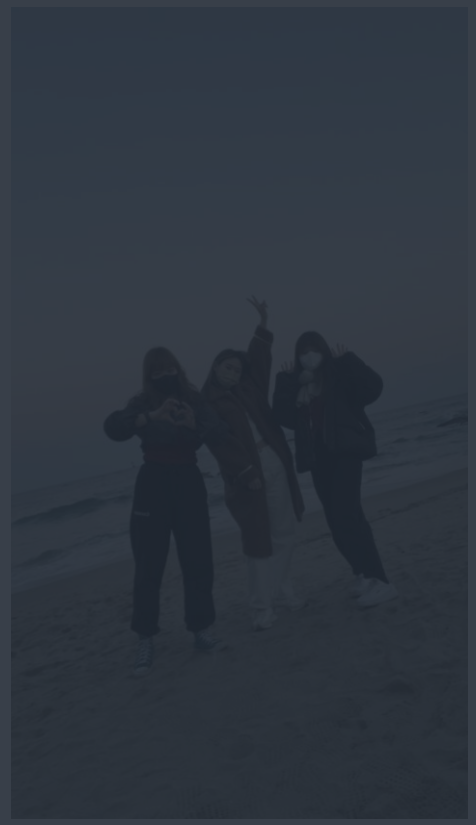
1

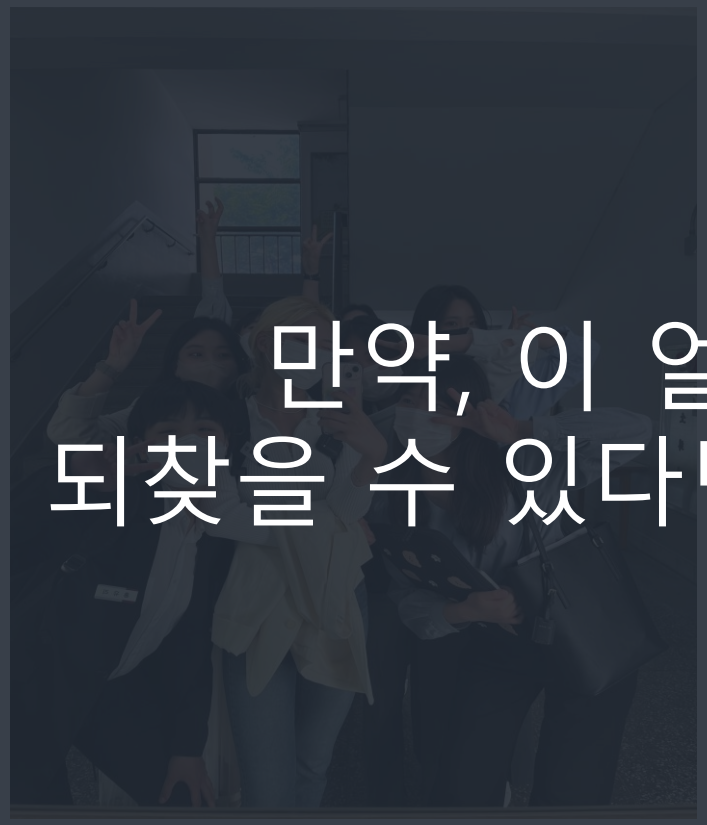
Motivation

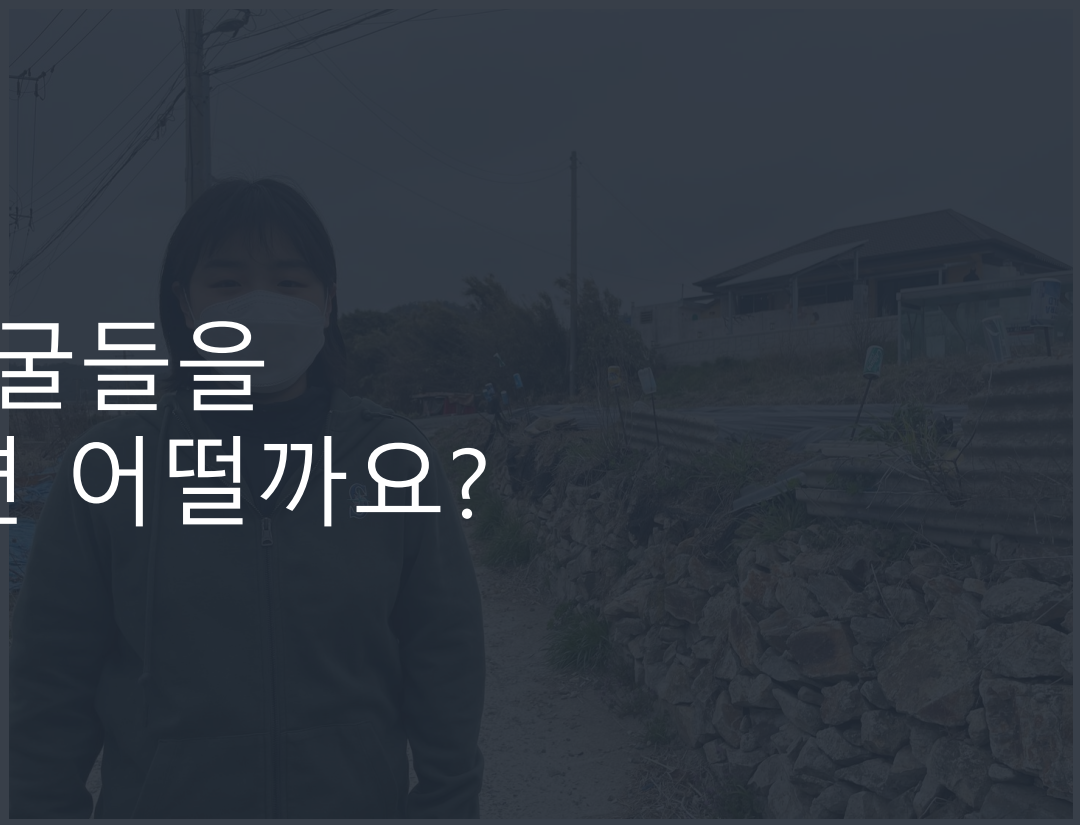
코로나19 시대에,

잃어버린 얼굴들이 많습니다.

Motivation





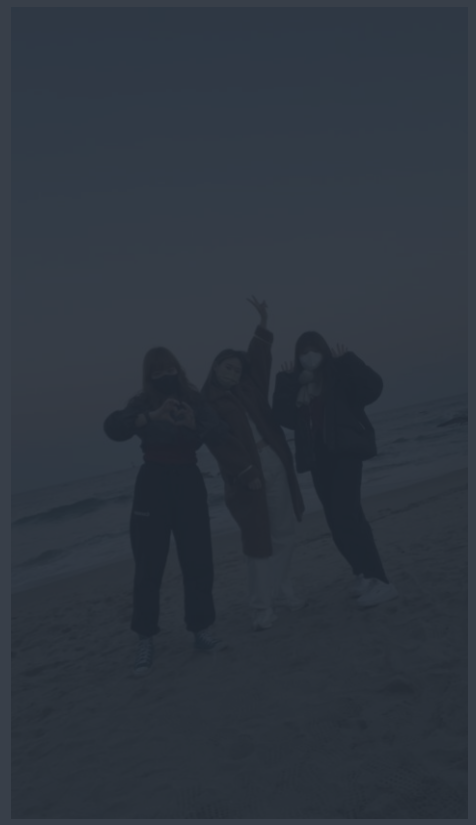


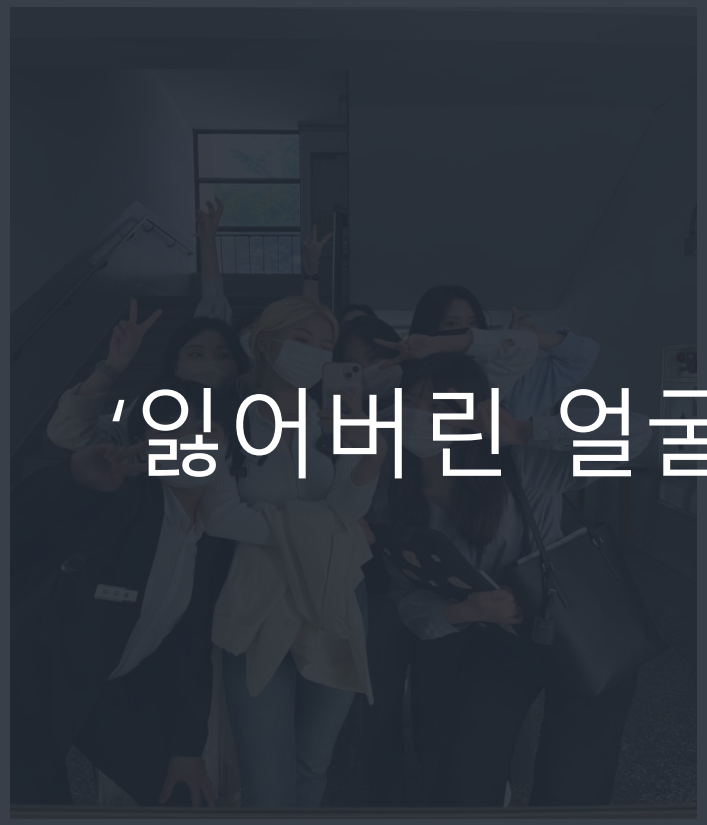
만약, 이 얼굴들을
되찾을 수 있다면 어떨까요?

코로나19 시대에,

잃어버린 얼굴들이 많습니다.

Motivation





‘잃어버린 얼굴을 찾아서’

코로나19 시대에,

잃어버린 얼굴들이 많습니다.

Methodology

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Methodology

0. Pipeline

1. Object Detection

2. Super Resolution

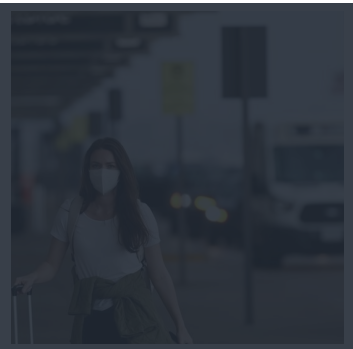
3. Image Segmentation

4. Image Generation

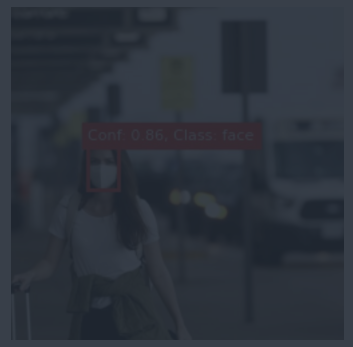
Methodology

0. Pipeline

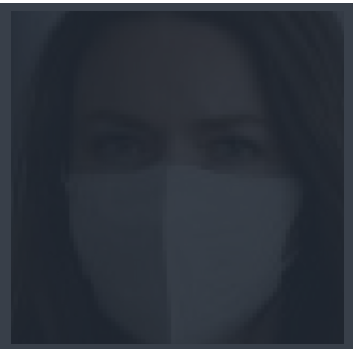
1. Object Detection



YOLOv8



2. Super Resolution



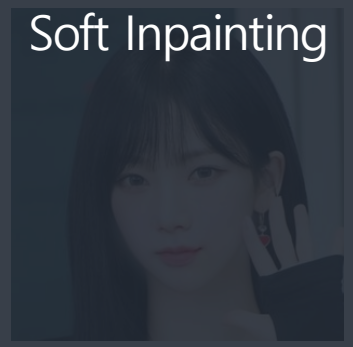
Stable Diffusion

3. Image Segmentation

Segment Anything

4. Image Generation

Stable Diffusion + Realistic Vision + DreamBooth + Soft Inpainting



Methodology

1. Object Detection

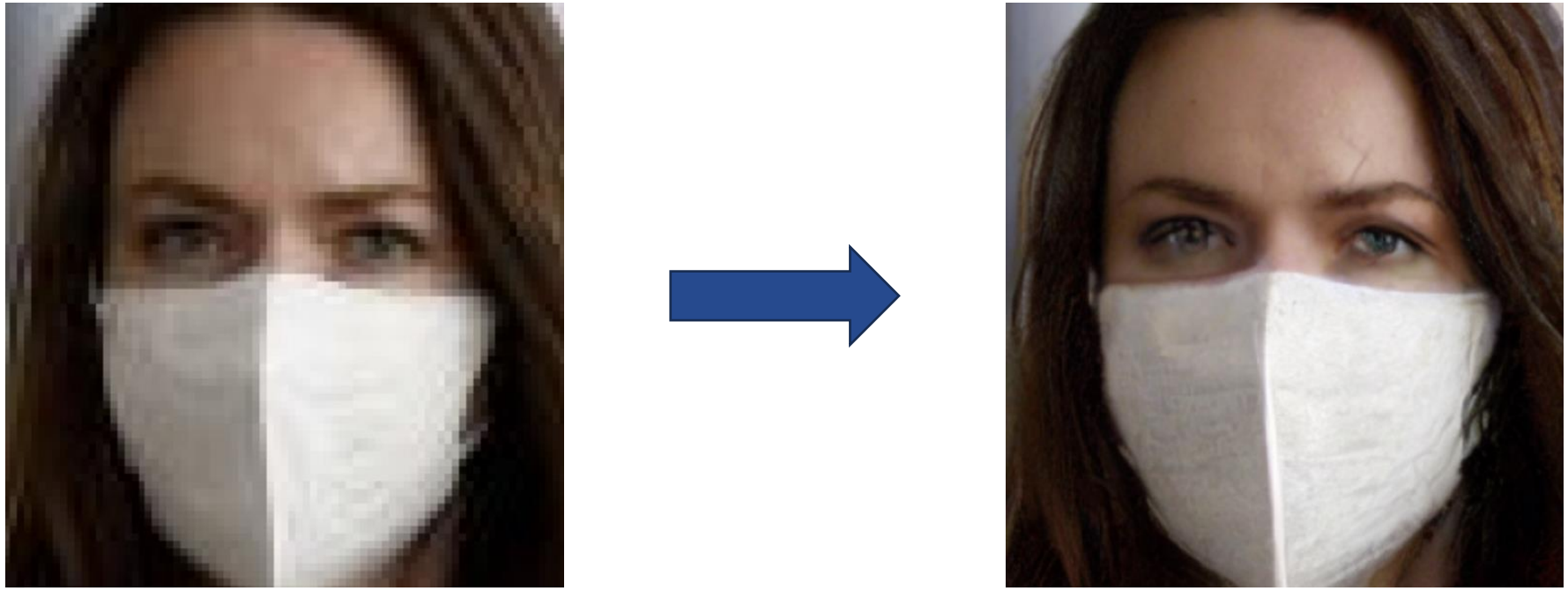
YOLO : You Only Look Once

객체 감지

Methodology

2. Super Resolution

Stable Diffusion : A generative model using a diffusion process for creating images

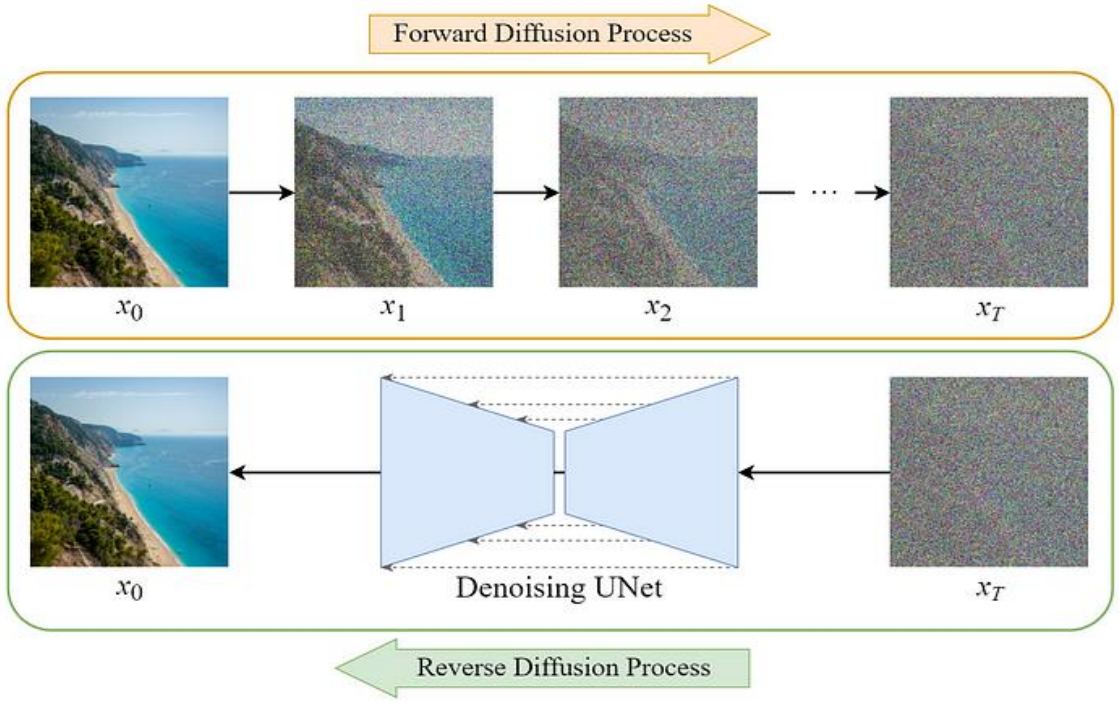


저해상도 input의 세부 정보를 복구하여 해상도를 높여주는 과정

Methodology

2. Super Resolution

Stable Diffusion : A generative model using a diffusion process for creating images



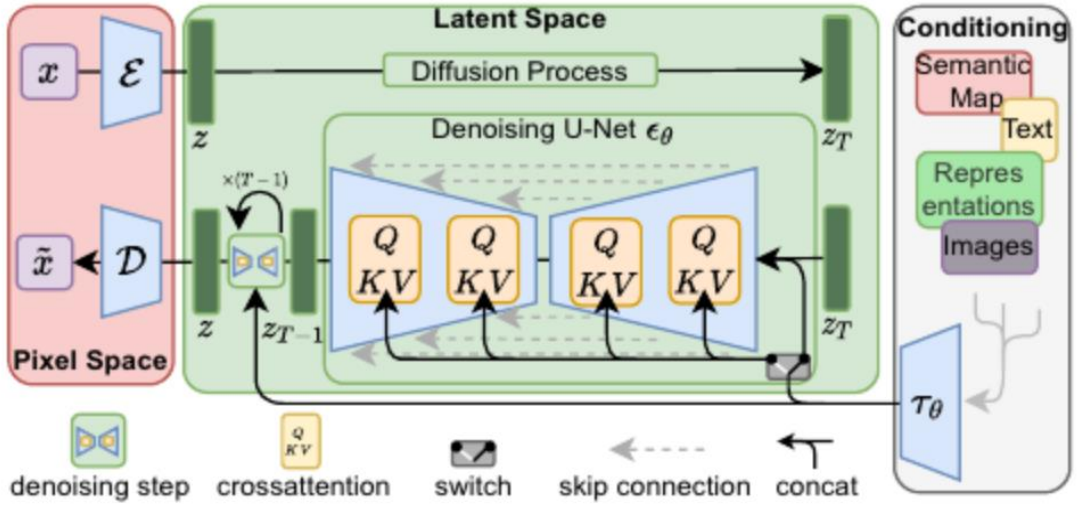


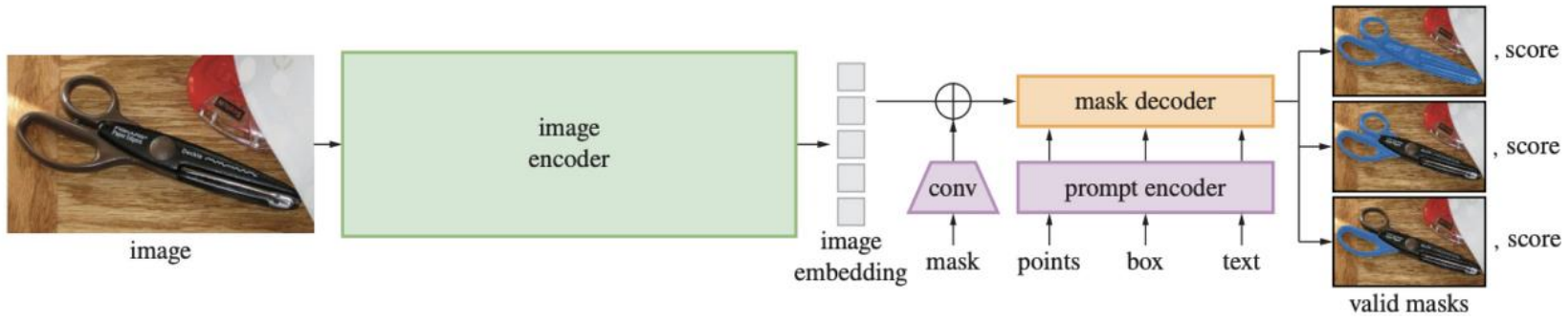
Figure 3. We condition LDMs either via concatenation or by a more general cross-attention mechanism. See Sec. 3.3

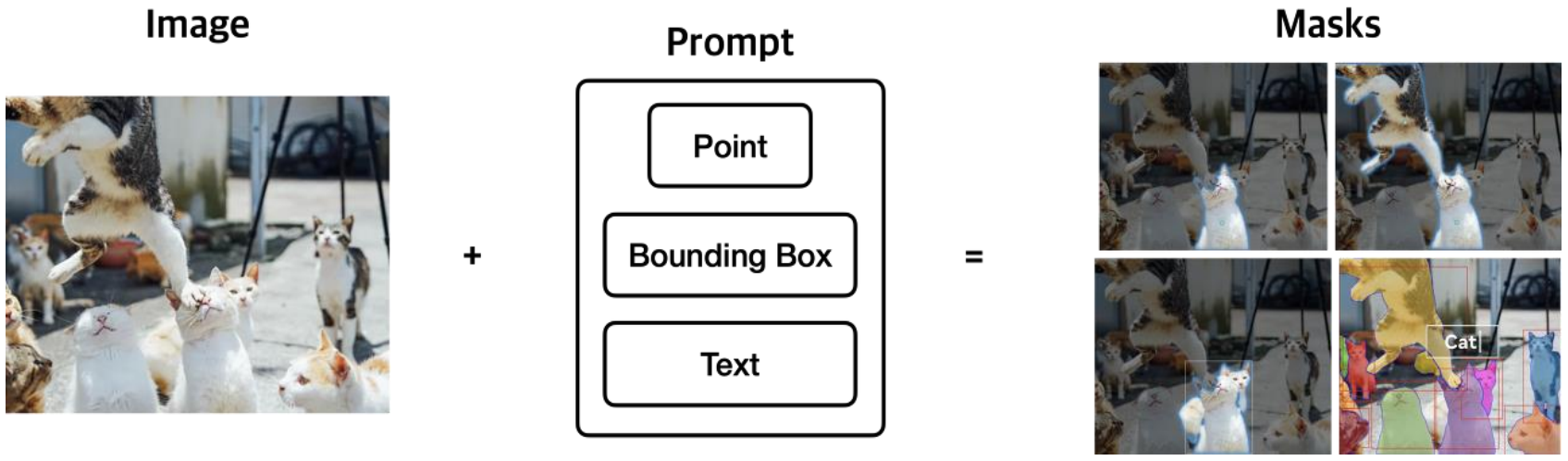
Text-to-Image 생성, Image Inpainting, Style Transfer 등의 task 수행 가능

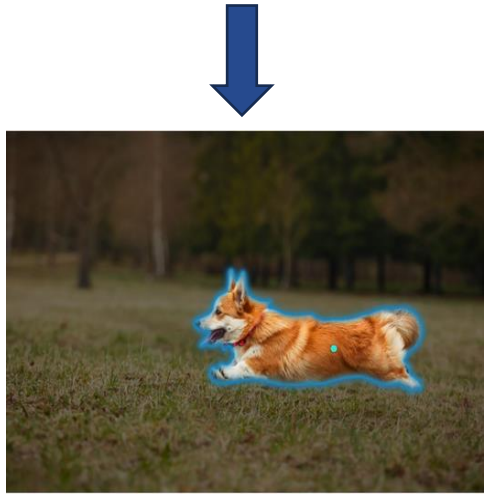
Methodology

3. Image Segmentation

Segment Anything Model : Zero-shot foundation model for segmentation



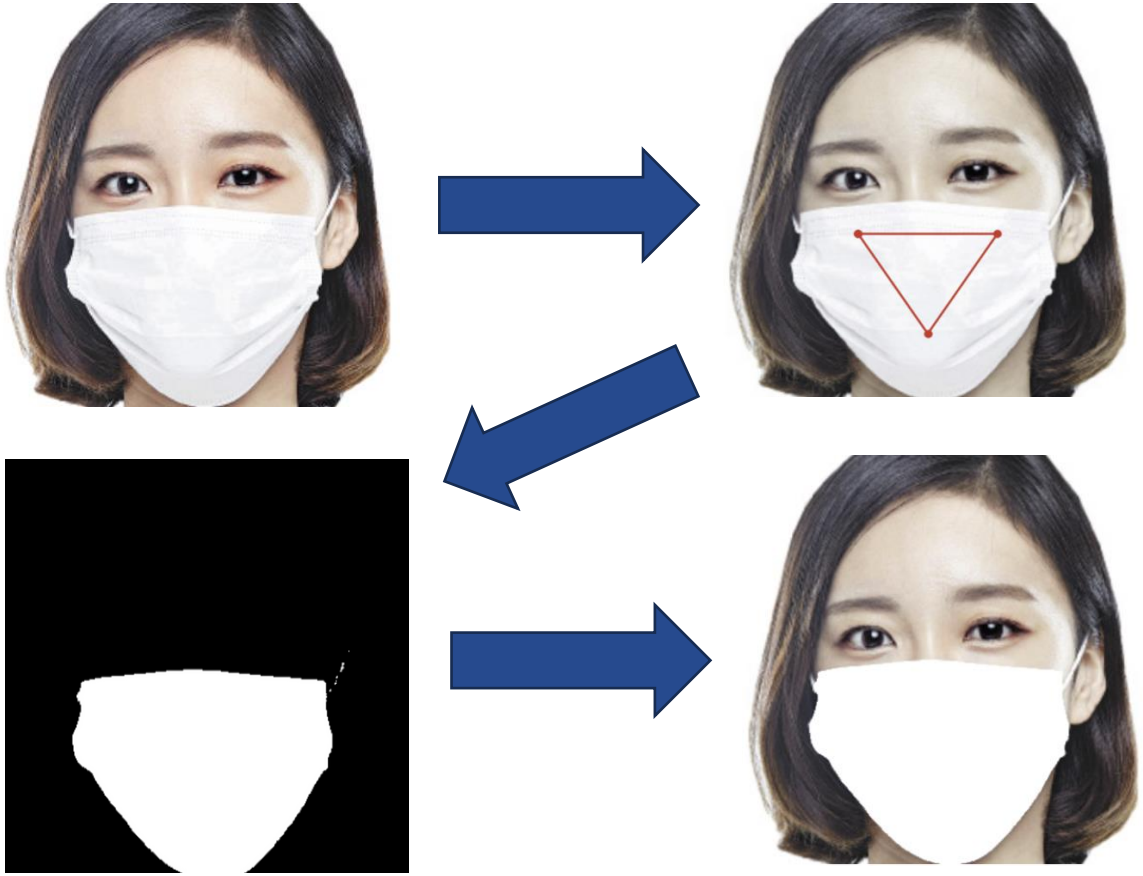




Methodology

3. Image Segmentation

Segment Anything Model : Zero-shot foundation model for segmentation



Methodology

4. Image Generation - Model Configuration 1 : Stable-Diffusion, RealisticVision

Stable-Diffusion
Trained on the LAION-5B dataset

prompt: art, flower picking cat
by artist Carmen Medlin

RealisticVision (SD Pretrained)
Trained for realistic images

prompt: an asian woman,
photorealistic, 8k uhd, dslr, lighting, high quality, … etc

Methodology

4. Image Generation - Model Configuration 2 : Stable-Diffusion-Inpainting

Stable-Diffusion-Inpainting (LAION-5B Pretrained)

Image

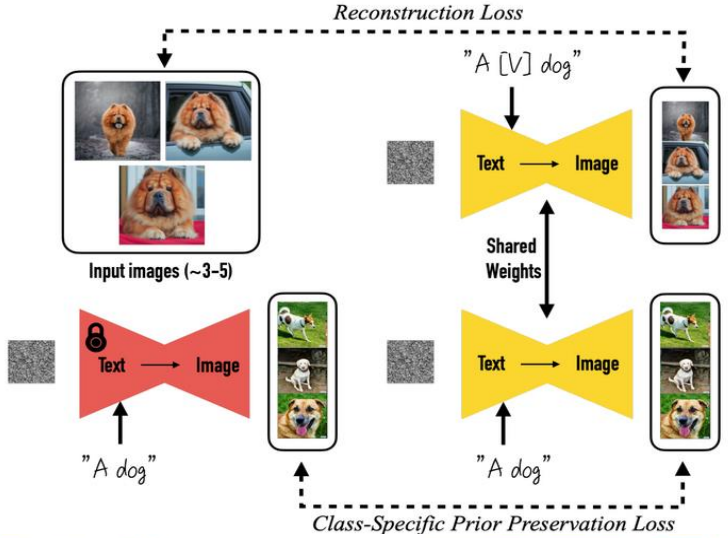
Mask Image

LAION-5B dataset을 random erasing 하여 학습

prompt : a tiger sitting on a park bench

Methodology

4. Image Generation - Model Configuration 3 : Fine-tuning with DreamBooth



Stable Diffusion Model 을 Fine-tuning 하는 방법론
객체의 특성을 유지한 채 다양한 이미지 생성 가능
→ 몇 장의 이미지만으로 개인화된 얼굴 생성

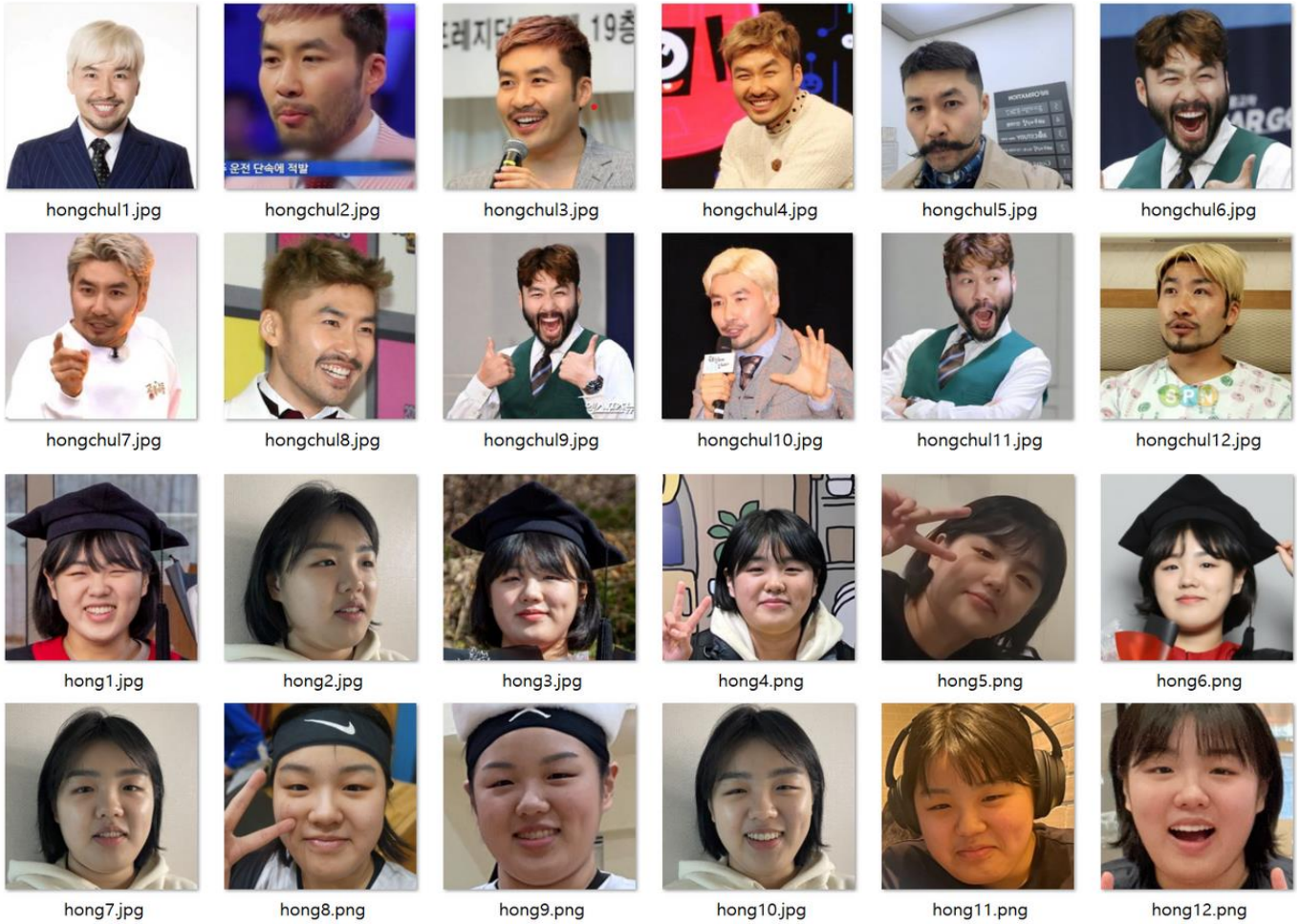
photo of a woman
→ photo of a **[karina]** woman

DreamBooth
Training

photo of a karina woman

Methodology

4. Image Generation - Model Configuration 3 : Fine-tuning with DreamBooth



prompt : photo of a hongchul man

prompt : photo of a glasshong woman

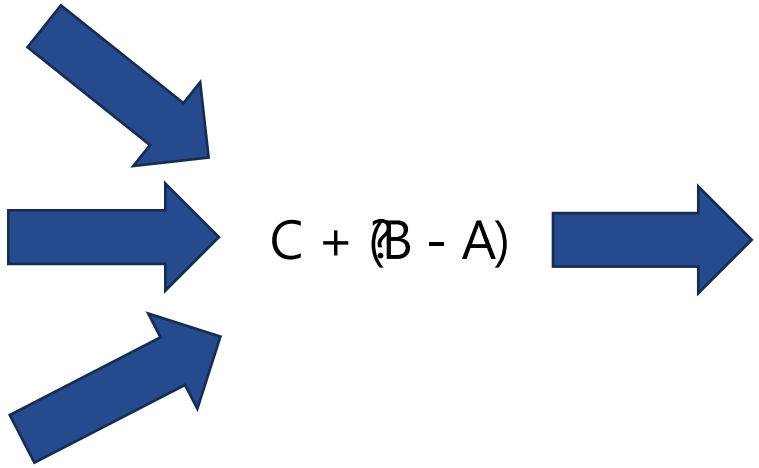
Methodology

4. Image Generation – Model Merging

Weight A: **Stable Diffusion V1.5**

Weight B: Stable Diffusion V1.5
+ Inpainting

Weight C: Stable Diffusion V1.5
+ RealisticVision
+ DreamBooth



C + (B - A)

Final Model : **Stable Diffusion V1.5**
+ Inpainting
+ RealisticVision
+ DreamBooth

Q. 모델의 가중치를 내부에서 각각 더하는 것이 의도된 동작을 할까?
A. 같은 weight로 Initialization된 모델에 한해 가능 (Editing Models With Task Arithmetic, ICLR 2023, MS Research)

Methodology

4. Image Generation – Soft Inpainting

prompt: photo of karina woman, RAW photo, photo realistic, dslr, 8k uhd, high quality

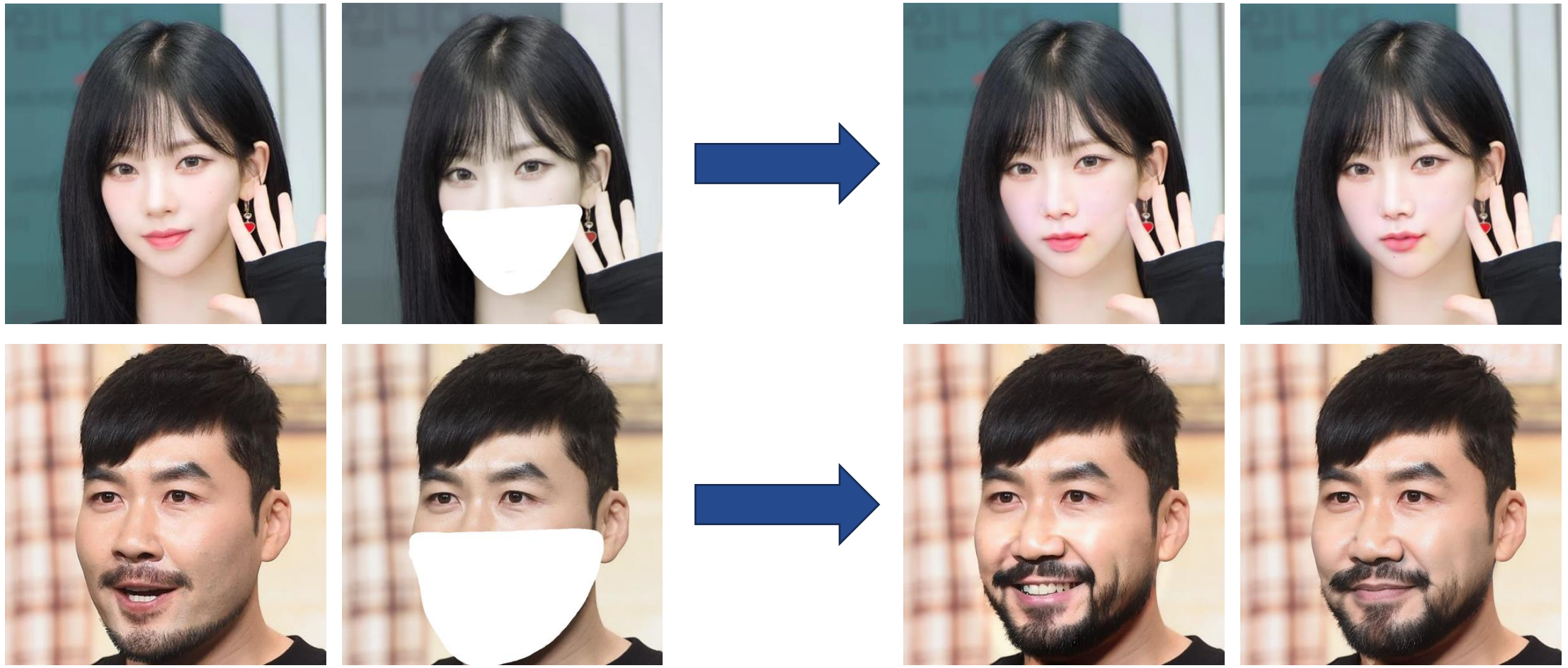
Mask blurring +
Referencing surrounding pixels during denoising process

Results

3

Results

Ground Truth | Masked Image | Inpainting 1 | Inpainting 2



Negative: open mouth

Results

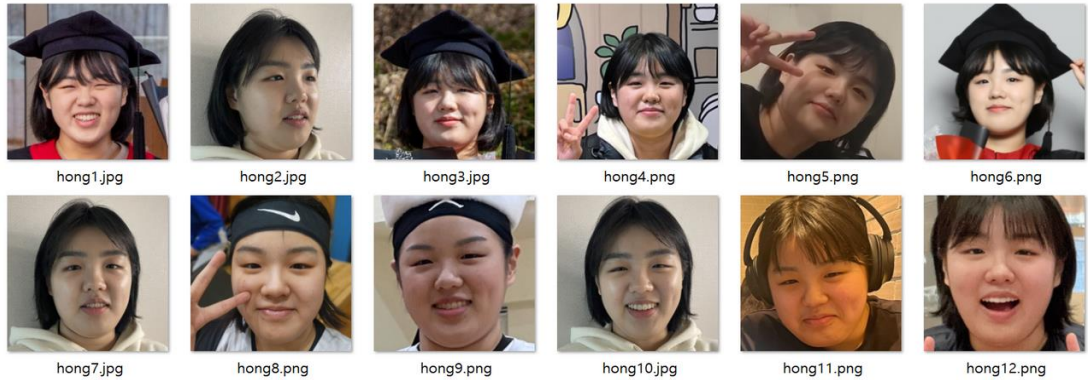
1. Object Detection

2. Super Resolution

3. Image Segmentation

4. Image Generation

Results


hong1.jpg
hong2.jpg
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hong7.jpg
hong8.png
hong9.png
hong10.jpg
hong11.png
hong12.png

Contributions & Limitations

4

Contributions & Limitations

Contributions

- YOLOv8, Segment Anything Model 등을 활용한 마스크 속 얼굴 생성 파이프라인 구축
- Stable diffusion 및 DreamBooth를 사용하여, 적은 수의 데이터로 효과적인 Class-specific Fine-tuning 수행
- 새로운 denoising method를 이용한 자연스러운 inpainting 방법론 제시

Limitations and Future works

- 다양한 각도(측면 등)의 얼굴 이미지 생성에 어려움
- 거대 모델(Stable Diffusion XL) 사용 시 조금 더 좋은 퀄리티의 이미지 생성 기대

감사합니다