Lecture 0: Introduction

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Div. AISW
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Introduction

◆ Introduction to computer vision (MME4219-01)

◆ Lecturer
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◆ Grade
- Attendance (10%)
- Midterm Exams (40%)
- Final Exams (40%)
- Homework (10%)

Introduction

◆ Prerequisites—*these are essential!* 선수과목

- Linear algebra
- Vector calculus
- Course assumes a prior imaging experience
  - Image processing

Introduction

◆ Contact
- E-mail (cell-phone ×)

◆ Illegal attendance or cheating in a test
- -3 grades

◆ During the class (offline lecture)
- Cell-phone usage→ OUT (considered absent)
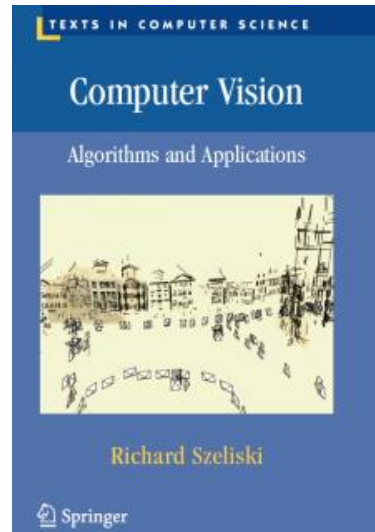
Introduction

◆ Course description

- In this lecture, students will learn the principles and basic techniques of extracting, tracking, and recognizing objects from image / video, and perform computer vision related exercises through S / W.
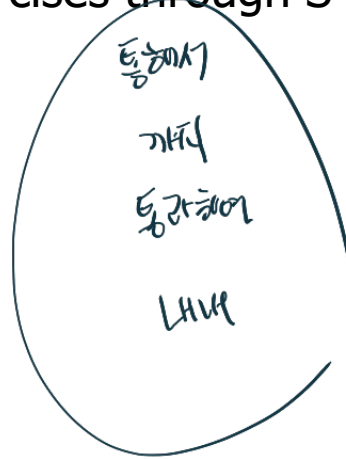
Introduction

◆ Primary texts

- Computer Vision: Algorithms and Applications, by Richard Szeliski.
    - The book is available for free online or available for purchase
        - http://szeliski.org/Book/

- Computer Vision: A Modern Approach (2nd Edition), by David A. Forsyth and Jean Ponce
- **Even if it's not in this book, what I've described in class (presentation materials) can appear on the exam**

Introduction

◆ Reference materials

- http://www.cs.cmu.edu/~16385/s19/
- https://courses.cs.washington.edu/courses/cse576/08sp/
- Etc…

Introduction

◆ Contents of the course

Week	Class Topic & Contents	Remarks
1	Lecture Introduction	
2	Review of image processing (Histogram, Binarization, Morpological, Etc.)	
3	Method for edge detecting 1	
4	Method for edge detecting 2	
5	Feature extraction - 1	
6	Feature extraction - 2	
7	Midterm	
8	Feature matching & tracking 1	
9	Feature matching & tracking 2	
10	Image segmentation - 1	
11	Image segmentation – 2	
12	Machine learning - 1	
13	Machine learning – 2	
14	Machine learning – 3	
15	Final exam	

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Lecture Introduction

What Is Computer Vision?

What a person sees

What Is Computer Vision?

What a computer sees

What Is Computer Vision?

◆ Goal of computer vision

- To give computers **(super) human-level perception**
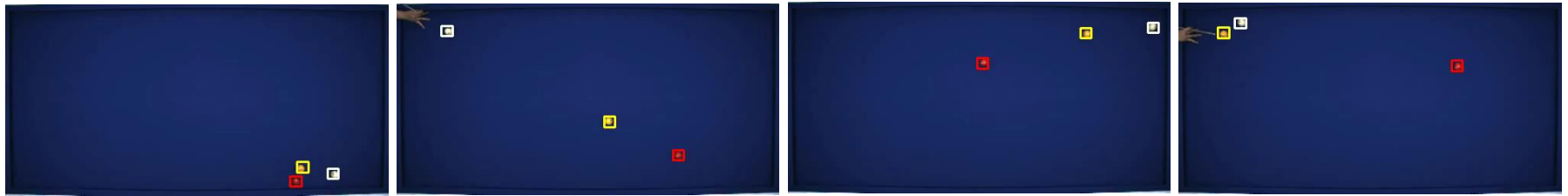- Write computer programs that can interpret images

Figure. The human visual system has no problem interpreting the subtle variations in translucency and shading in this photograph and correctly segmenting the object from its background
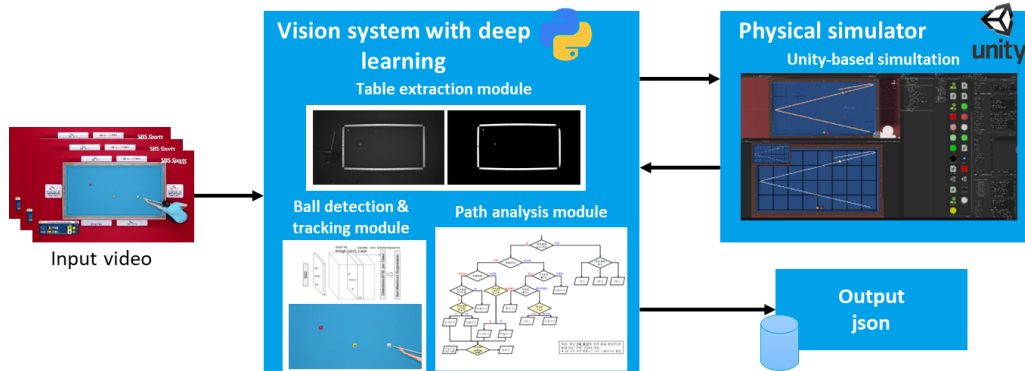
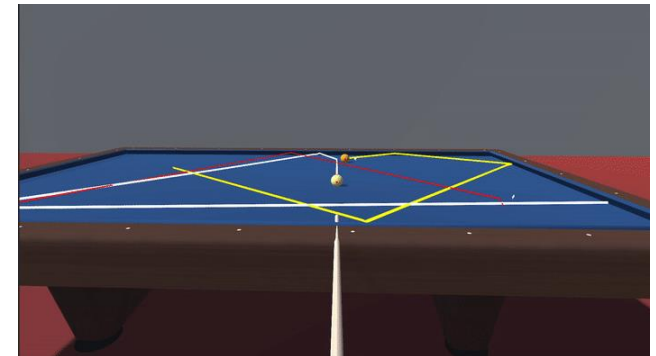# Applications of Computer Vision

◆ Object recognition

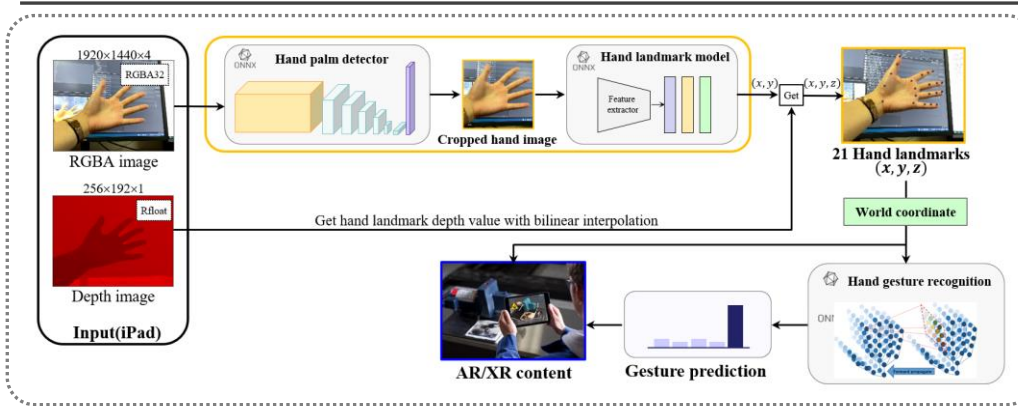**Vision Recognition Example**
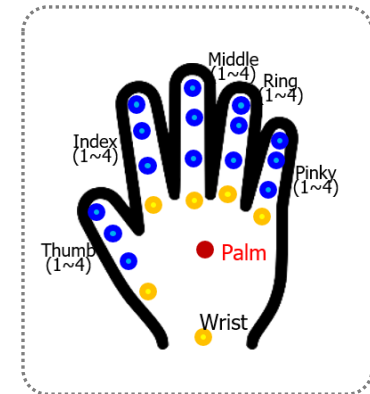

Project Summary

Unity Simulation

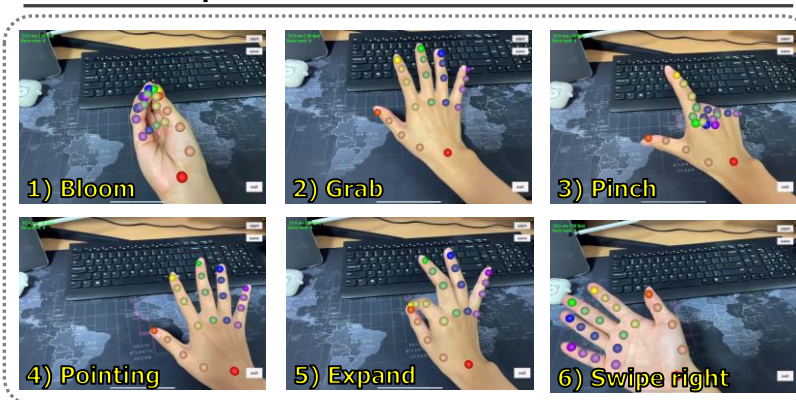# Applications of Computer Vision

◆ Dynamic hand gesture recognition

Flow Chart

22 hand landmarks

Acquisition of Hand Gesture Dataset

1) Bloom
2) Grab
3) Pinch
4) Pointing
5) Expand
6) Swipe right
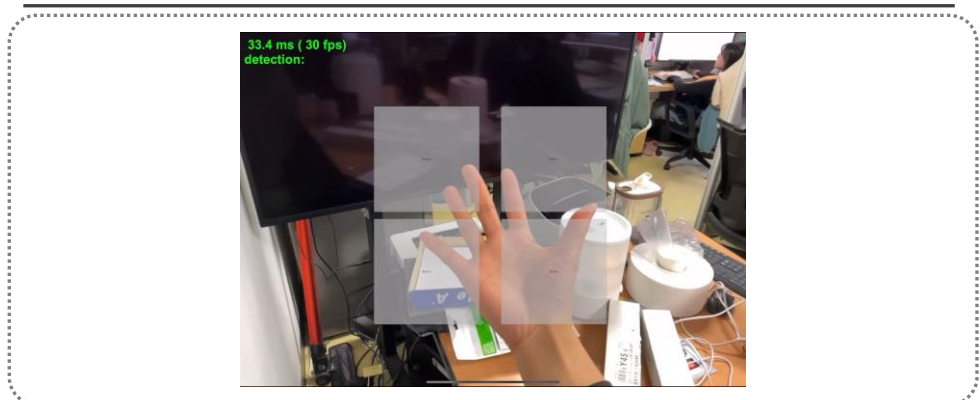
Result

Applications of Computer Vision

◆ Vision in cars

BMW 5 series

"Around view" camera

Overall Architecture

Overall Results

🟩	차도
🟥	인도
🟦	Yellow solid/dashed
⬜	White solid/dashed

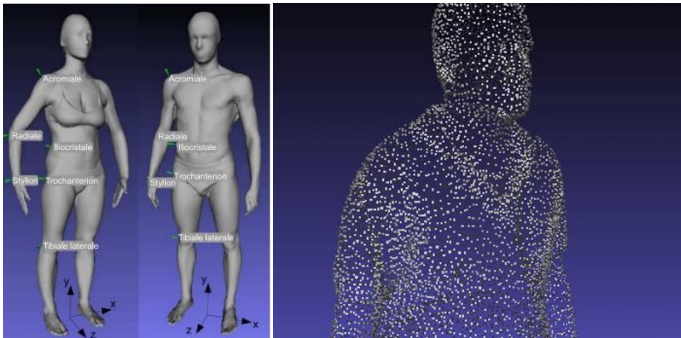Dongguk UNIVERSITY
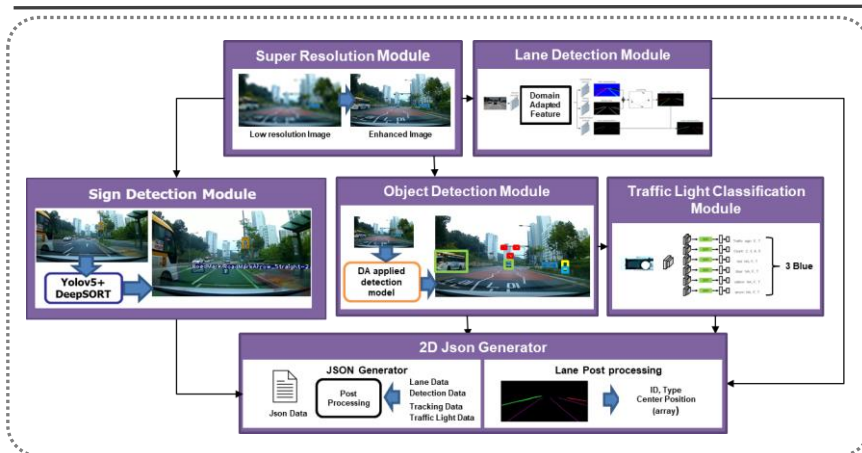
Applications of Computer Vision

◆ Anthropometric landmark detection

Landmarks on 3D Point Cloud Data

Landmark Detection Results
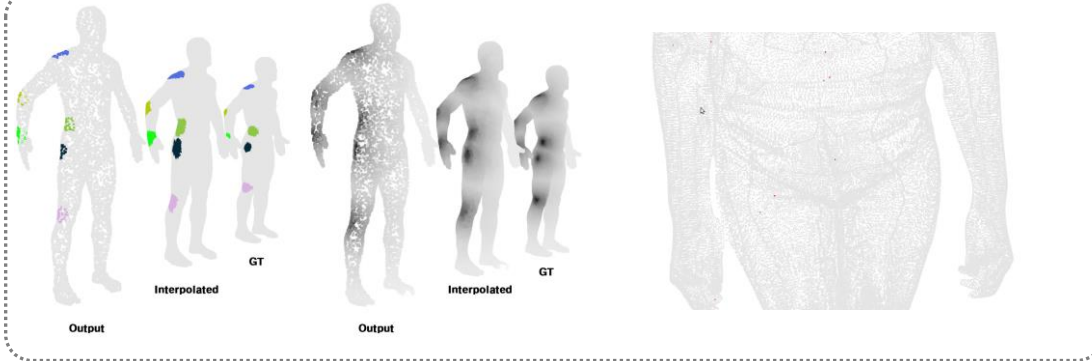
3D Human Scanning
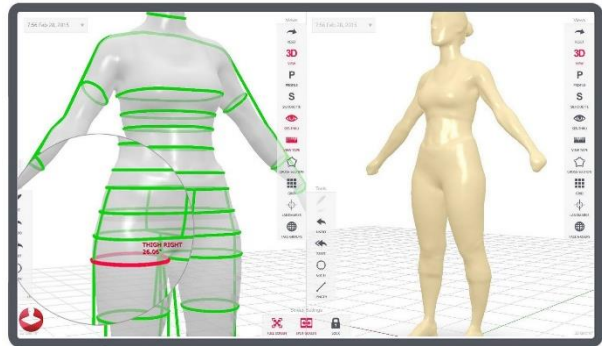
Overall Architecture
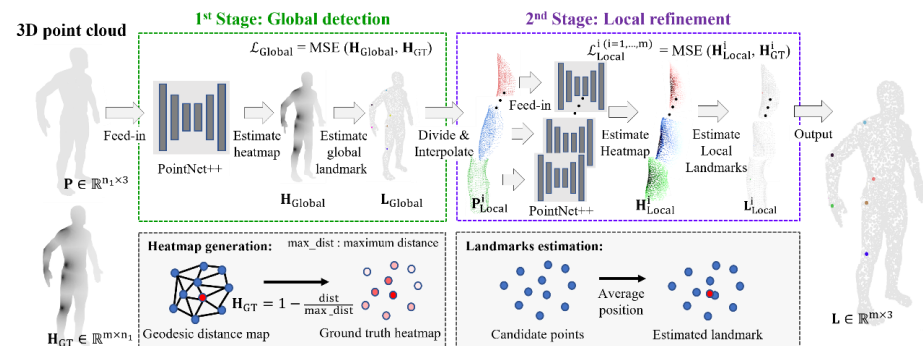
Applications of Computer Vision

◆ Automated visual inspection

Overall Architecture

Radiography image data → PPNet (Predicted parameters for contrast enhancement) → Object Detection Network (YOLOV5) → Defects detected from region of interest
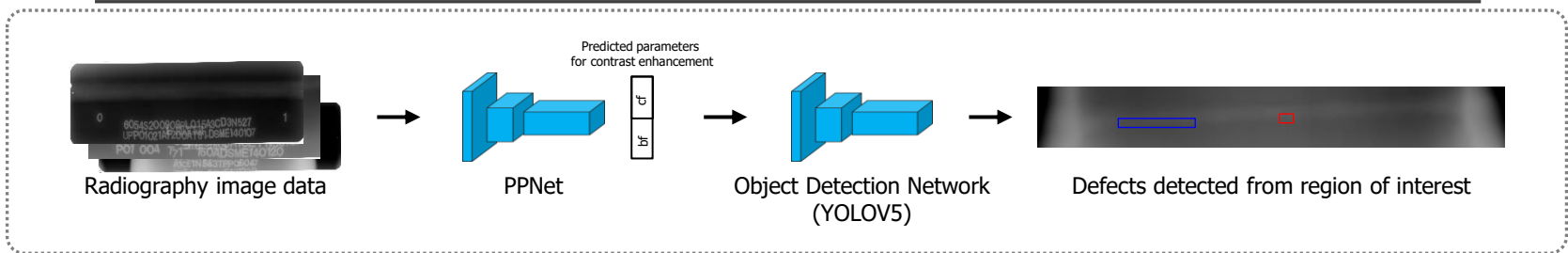
Examples of defects in weld region

Porosity (기공)

Slag inclusion (슬래그 혼입)

Undercut (언더컷)

Crack (균열)
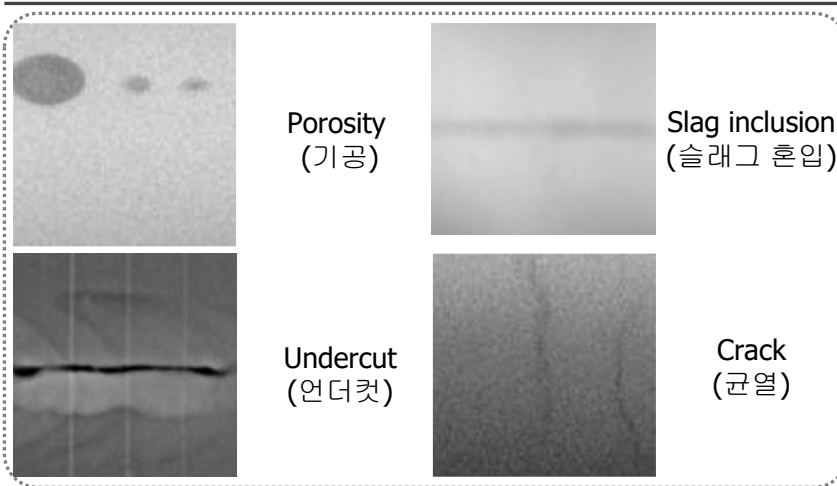
Detection result example

Ground truth

Proposed
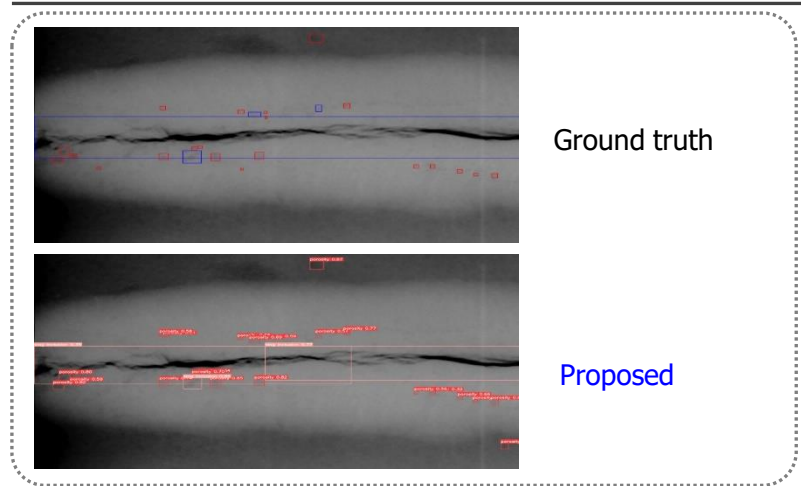
Applications of Computer Vision

◆ 3D character generation

Process

| Photo image | | 2D caricature | Hair removal | 3D reconstruction |

DualStyleGAN[1]　　　HairMapper[2]　　　NextFace[3]
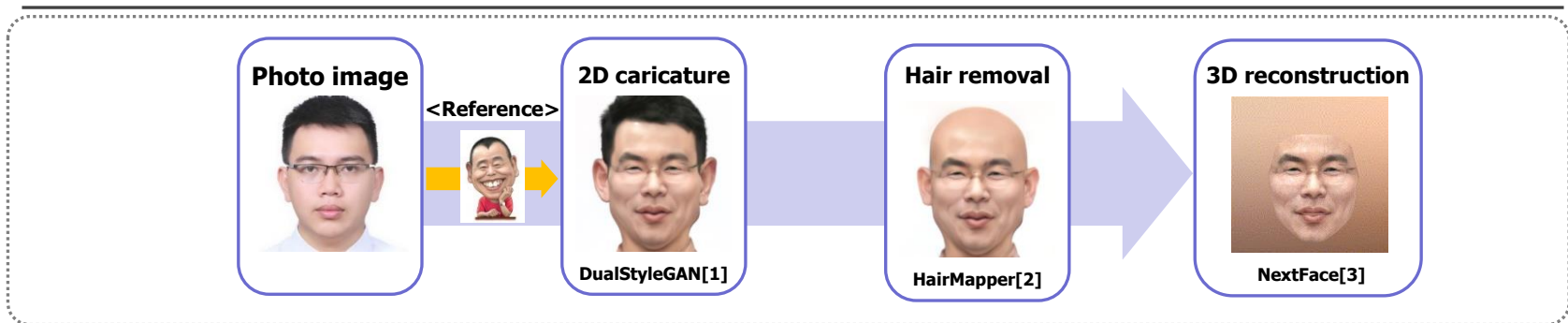
2D Caricature Generation

reference 1

reference 2

Hair Removal

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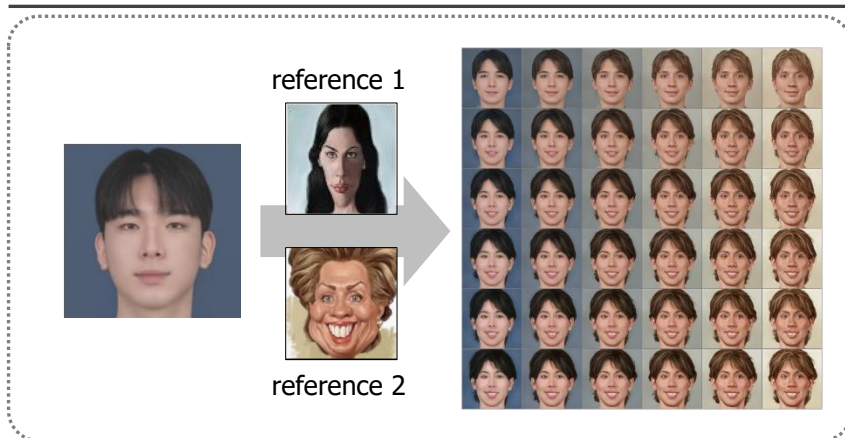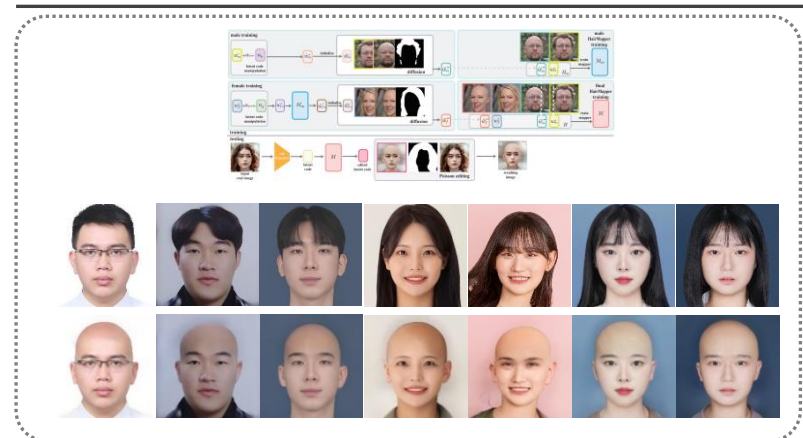
Applications of Computer Vision

◆ Style transfer

* Zhu, Jun-Yan, et al. "Unpaired image-to-image translation using cycle-consistent adversarial networks." arXiv. 2017.

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Industry aggressively hiring CV graduates, or even students!
(strong dominant industrial presence at conferences for recruitment)

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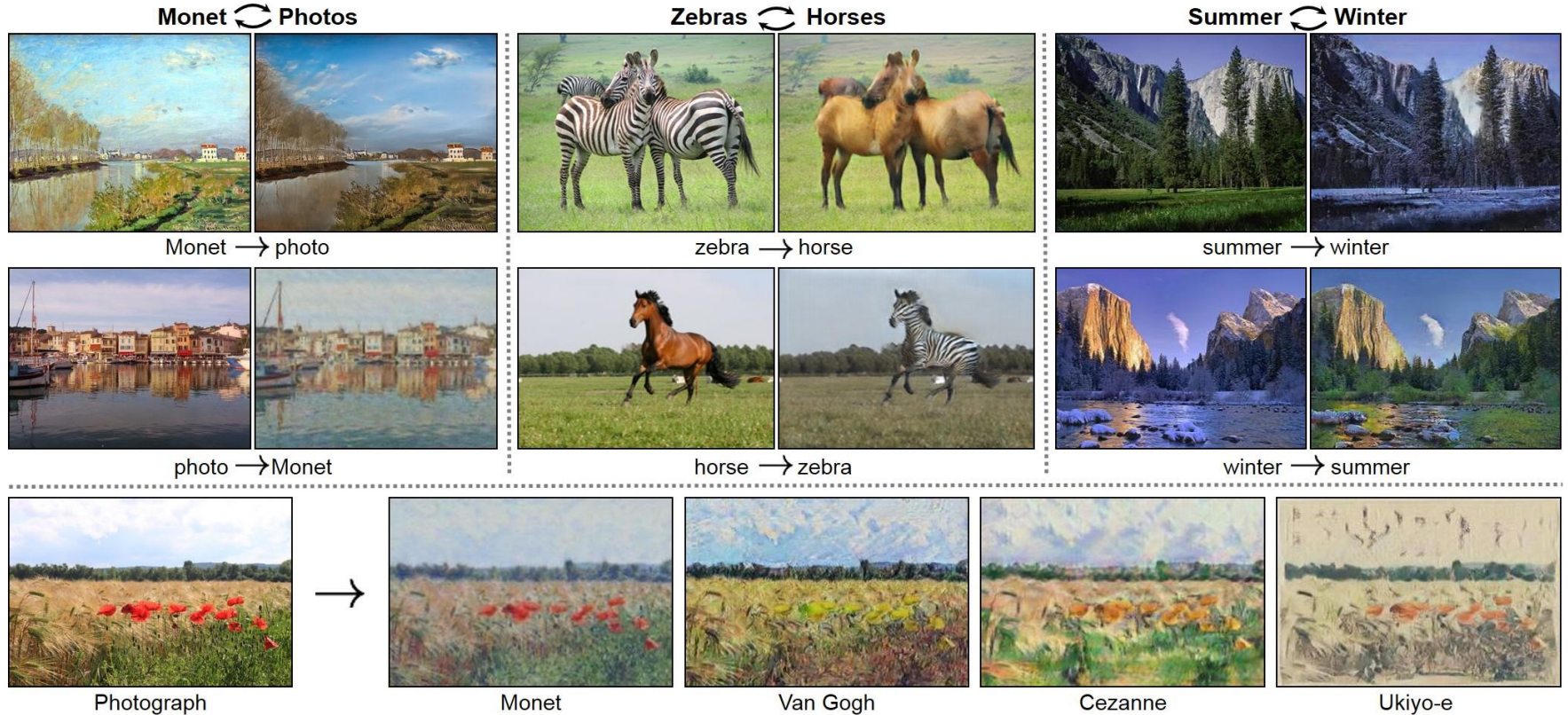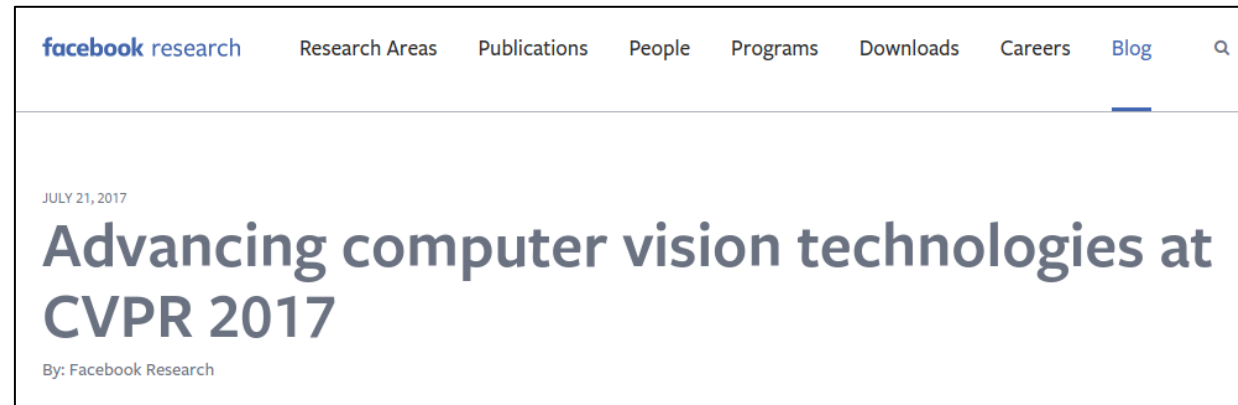BODY LABS Second Spectrum Lunit OMRON Springer ELSEVIER
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Computer Vision and Pattern Recognition (CVPR)

◆ Top conference

Computer Vision and Pattern Recognition (CVPR)

CVPR Acceptance Rate