NPTEL ONLINE CERTIFICATION COURSES

Course Name: Deep Learning

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Topic

Lecture 01: Introduction

CONCEPTS COVERED

Concepts Covered:

- ❑ Deep Learning: An Introduction
- ❑ Descriptors/ Feature Vectors
- ❑ Machine Learning vs. Deep Learning
- ❑ Discriminative/ Generative Model
- ❑ Challenges
- ❑ Power of Deep Learning

What is learning?

Image Source: Internet

Can You Recognize these Pictures ?

- If Yes, How do you Recognize it?

Image Source: Internet

Origin of Machine Learning?

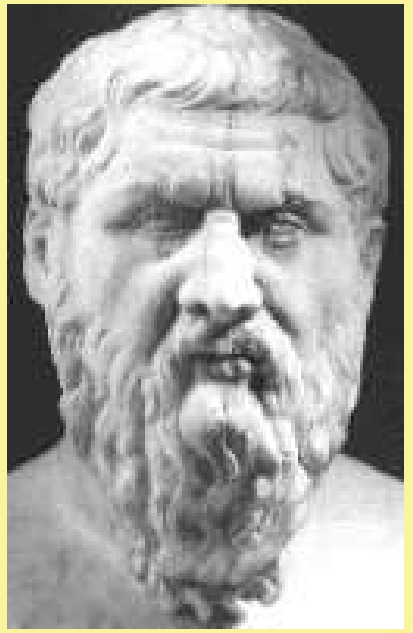
…..Lies in very early efforts of understanding Intelligence.

- What is Intelligence?
- It can be defined as the ability to comprehend; to understand and profit from experience.
- Capability to acquire and Apply Knowledge.

Image Source: Internet

Learning?
2300 Years ago….

- Plato (427-347 BC)
- The concept of Abstract Ideas are known to us a priori, through a Mystic connection with world.
- He concluded that ability to think is found in *a priori* knowledge of the concepts.



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Learning?

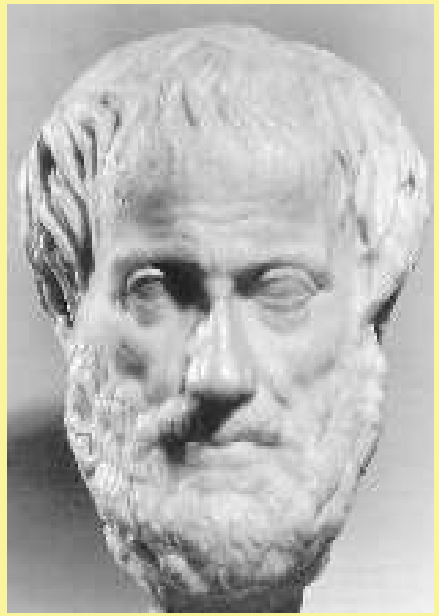
Plato's Pupil…

- Aristotle (384-322 BC)
- Criticized his Teacher's Theory

as it is not taking into account

the important aspect

--- An ability to Learn or Adapt to changing world.



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Descriptors/ Feature Vectors

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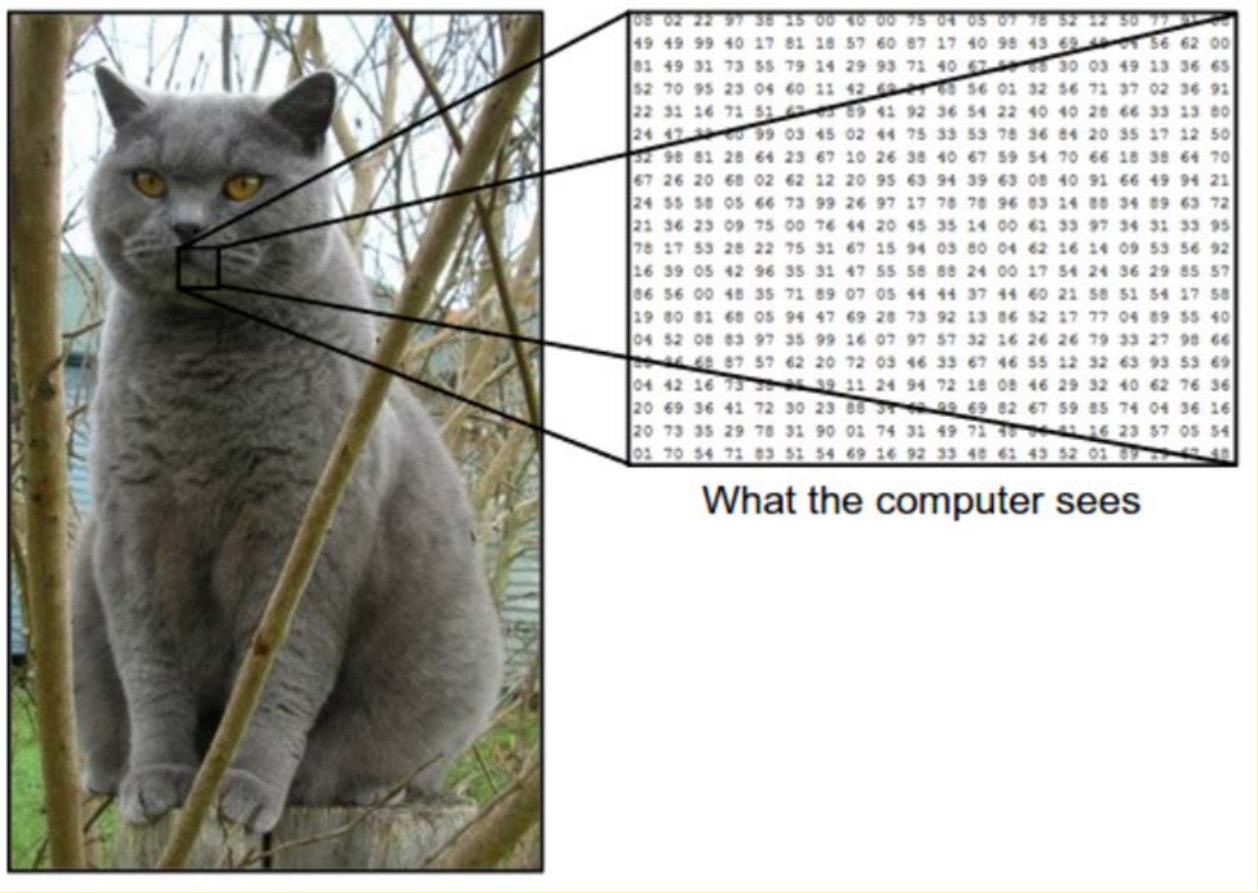

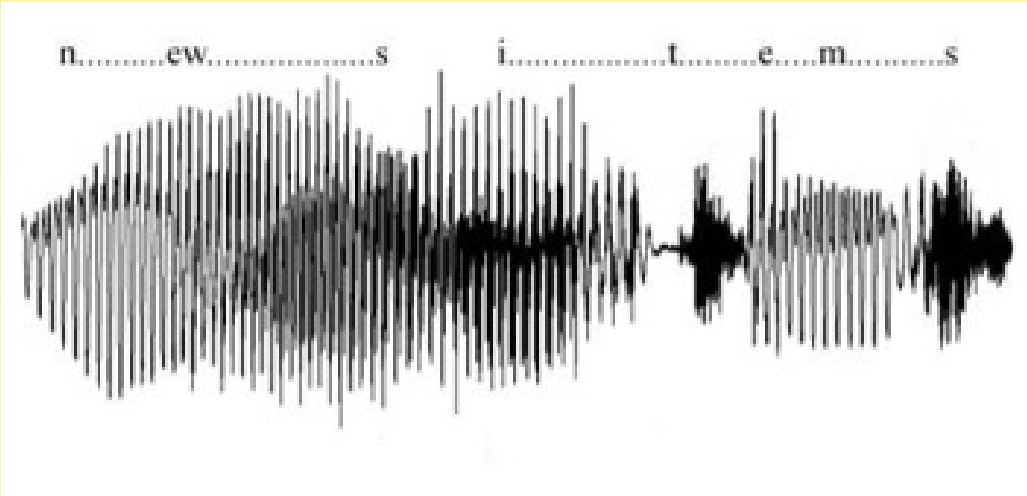

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Descriptors/ Feature Vectors

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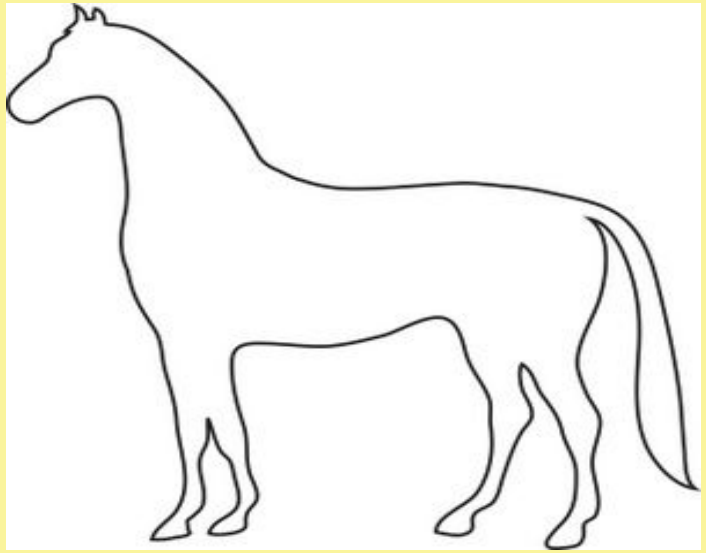
Descriptors/ Feature Vectors



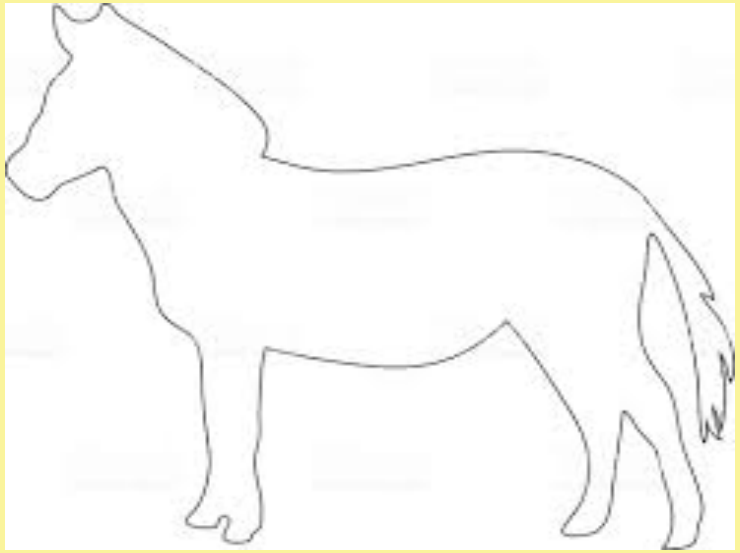


Image Source: Internet

Descriptors/ Feature Vectors

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Machine Learning
vs
Deep Learning

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Discriminative vs. Generative Model

Image Source: Internet

Discriminative Model


Cat


Dog


Dog


Cat


Cat


Dog

$x_i \sim P(x)$

P (X)

Learning Algorithm (θ)

Error Backprop

Loss

Predicted	**P (Y | X)**
Cat	Cat
Cat	Dog
Dog	Cat

Image Source: Internet

Generative Model

"What I can not create, I do not understand."

- Richard Feynman

- Collect a large amount of data in some domain
- Train a model to generate data like it.

Challenges

Image Source: Internet

Viewing Angle

Image Source: Internet

Pose

Image Source: Internet

Illumination

Image Source: Internet

Intraclass Variation






Image Source: Internet

Distortion and Occlusion

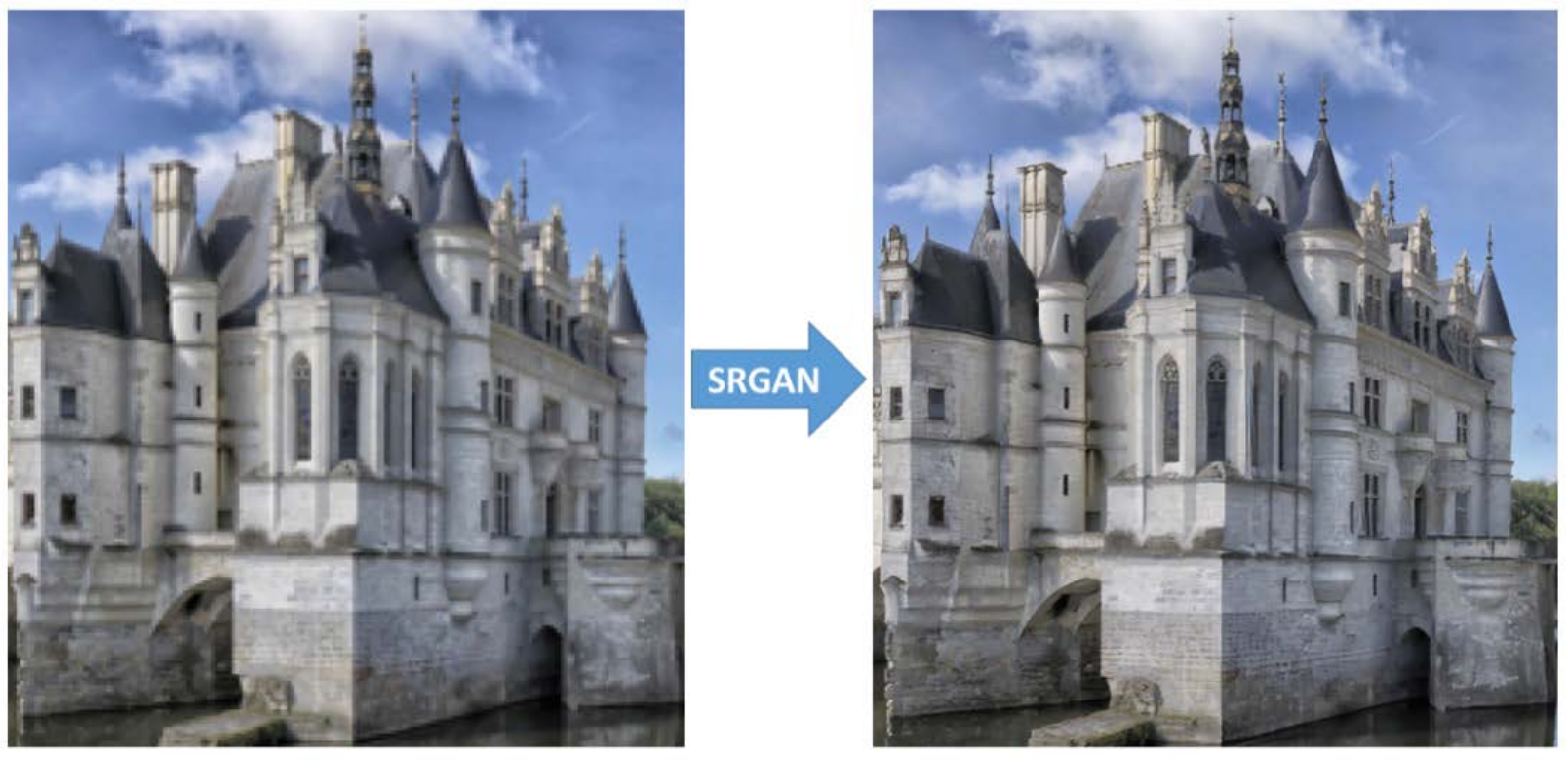
Image Source: Internet

Power of Deep Learning

High Resolution Image Synthesis*

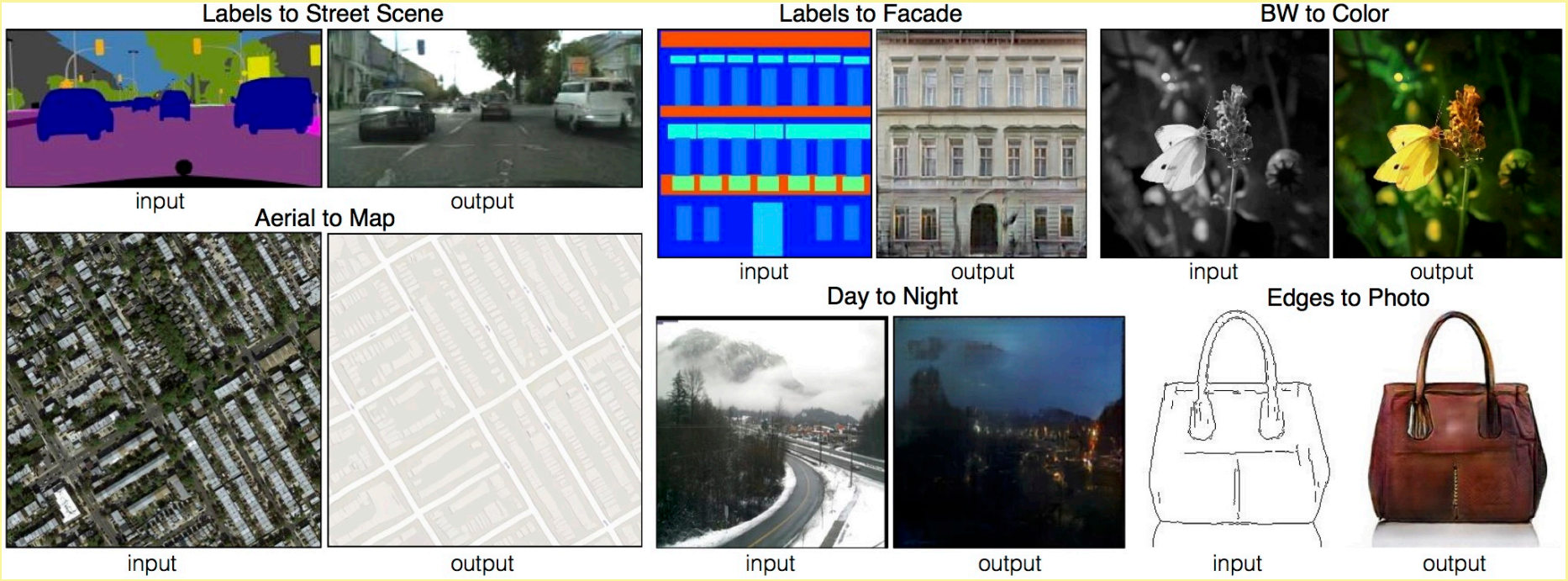
** Karras, Tero, Timo Aila, Samuli Laine, and Jaakko Lehtinen. "Progressive growing of gans for improved quality, stability, and variation." ICLR, 2018.*

Image Super resolution*



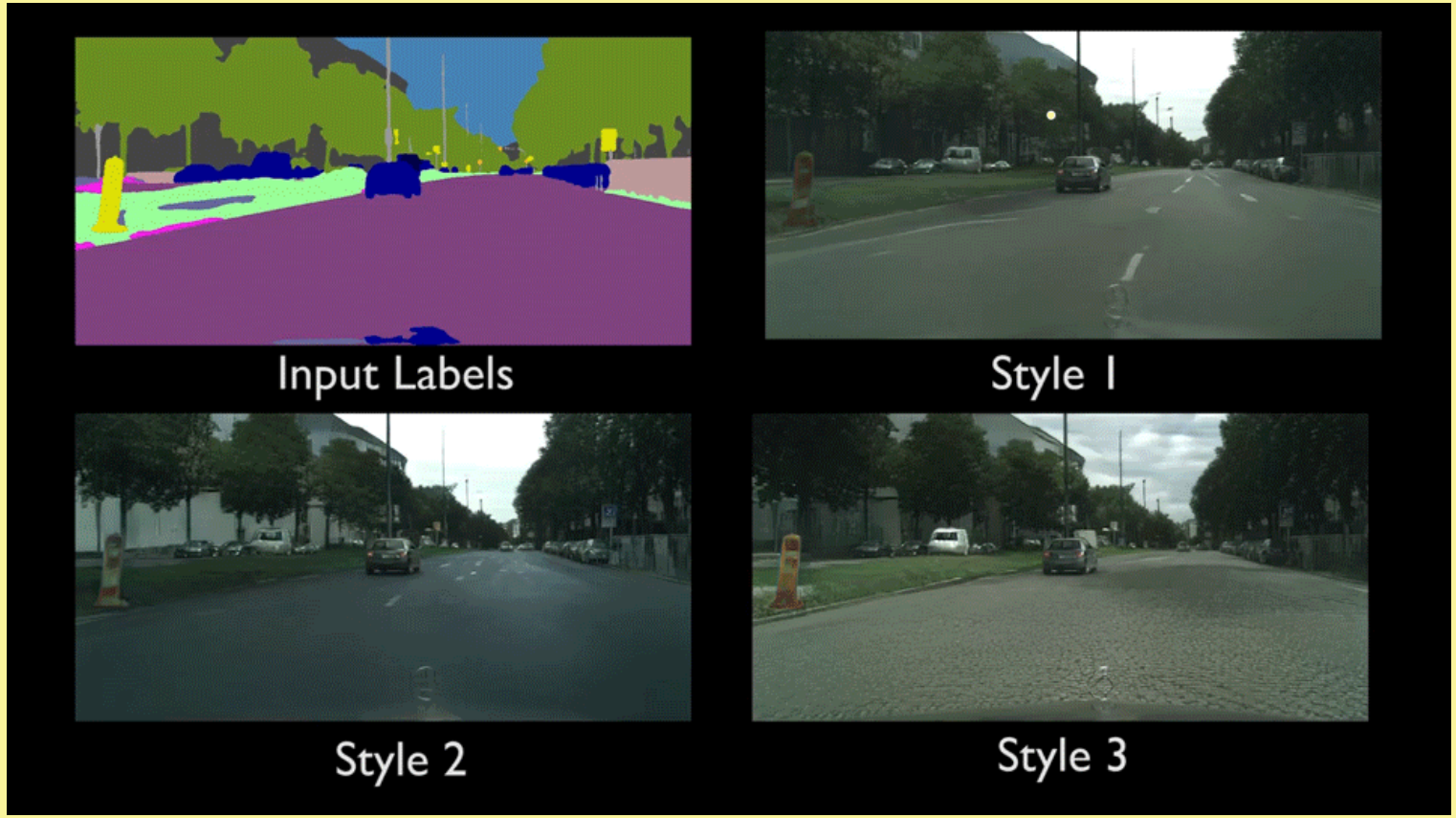
** Ledig et al.. "Photo-Realistic Single Image Super-Resolution Using a Generative Adversarial Network" CVPR 2016*

Image to Image Translation*



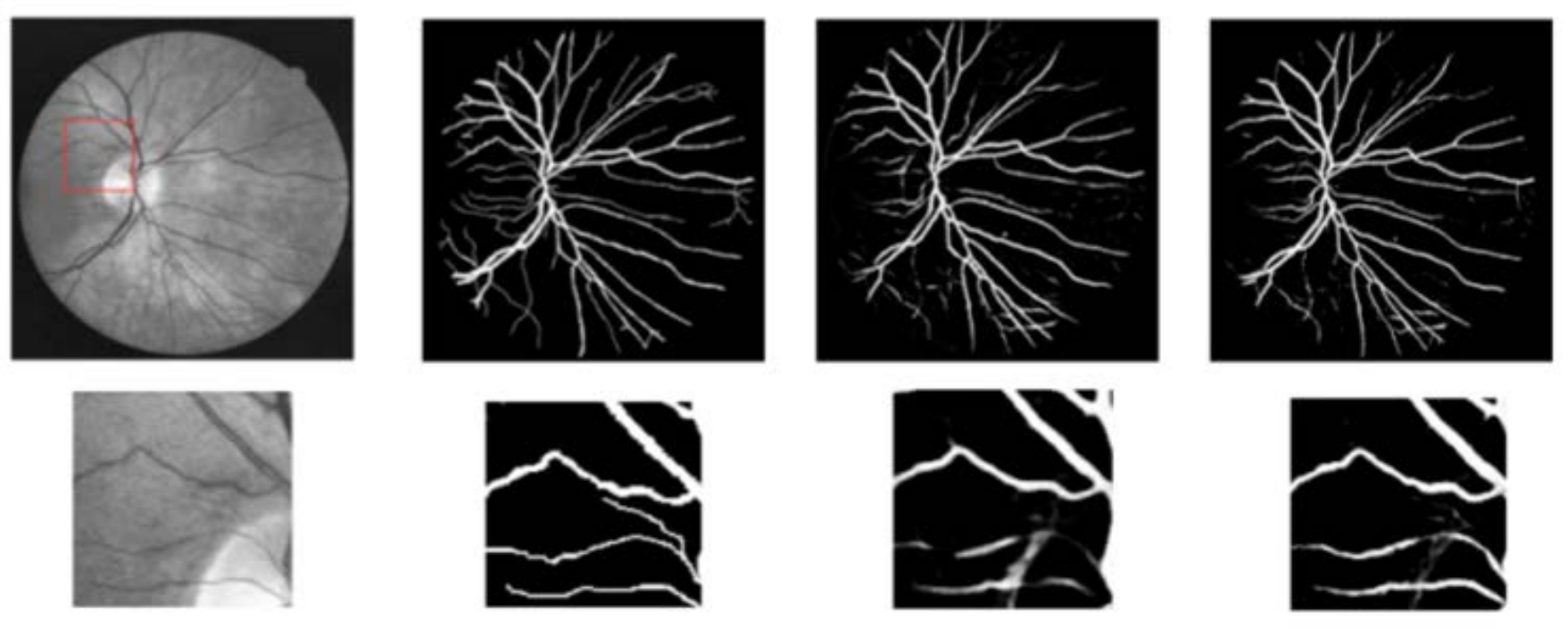
*Isola, Phillip, Jun-Yan Zhu, Tinghui Zhou, and Alexei A. Efros. "Image-to-image translation with conditional adversarial networks." *CVPR, 2017*

Video to Video Translation*



*Wang, Ting-Chun, Ming-Yu Liu, Jun-Yan Zhu, Guilin Liu, Andrew Tao, Jan Kautz, and Bryan Catanzaro. "Video-to-video synthesis." *NeurIPS, 2018*

Medical Image Processing



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Thank you