

# Computer Vision and Its Applications

(in Home Video Surveillance)

***WHAT WILL BE COVERED?***

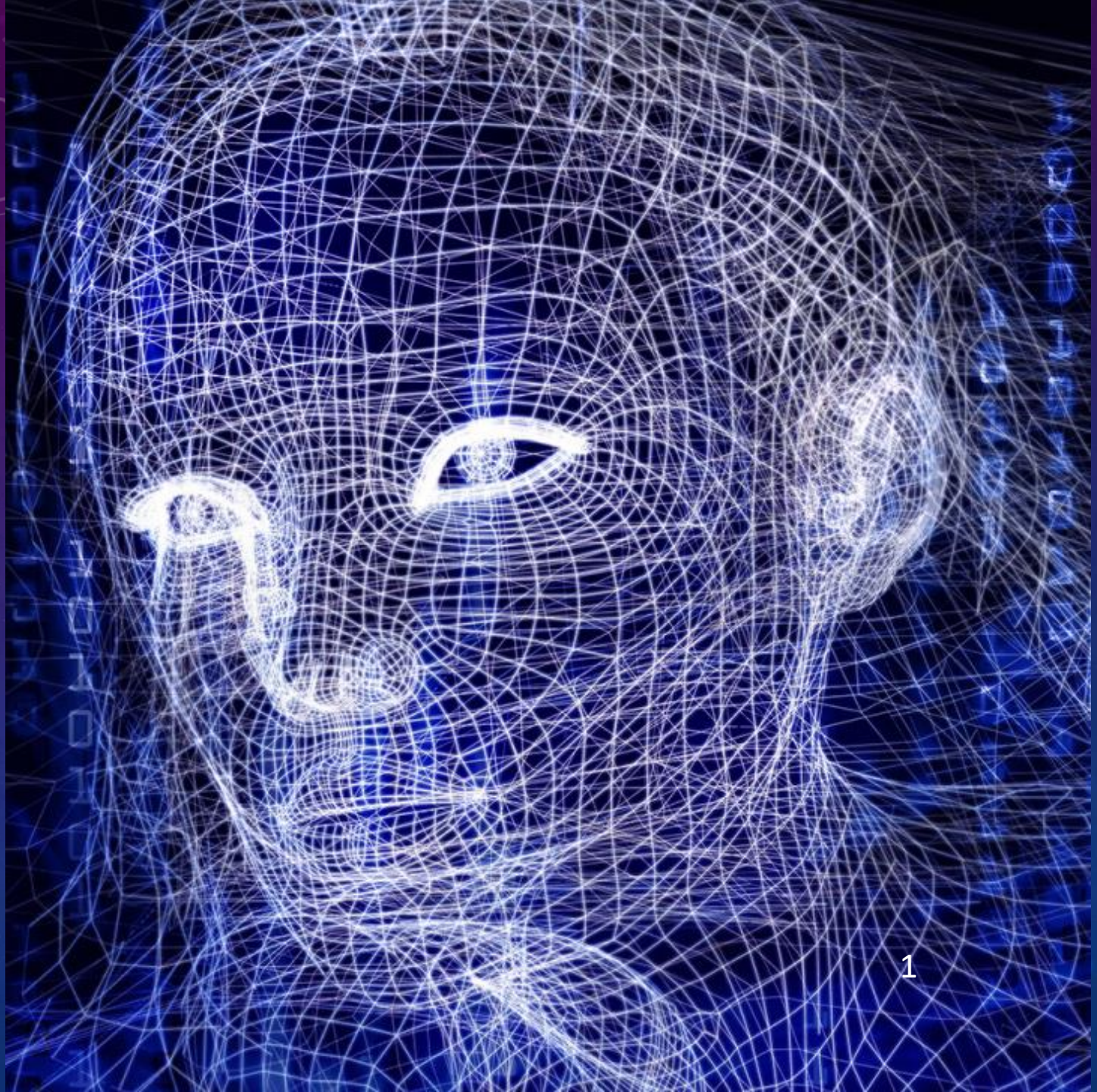
***ANY BACKGROUND REQUIRED?***

***GRADING?***

徐繼聖

Gee-Sern Jison Hsu

National Taiwan University of Science  
and Technology





# About Me and My TAs

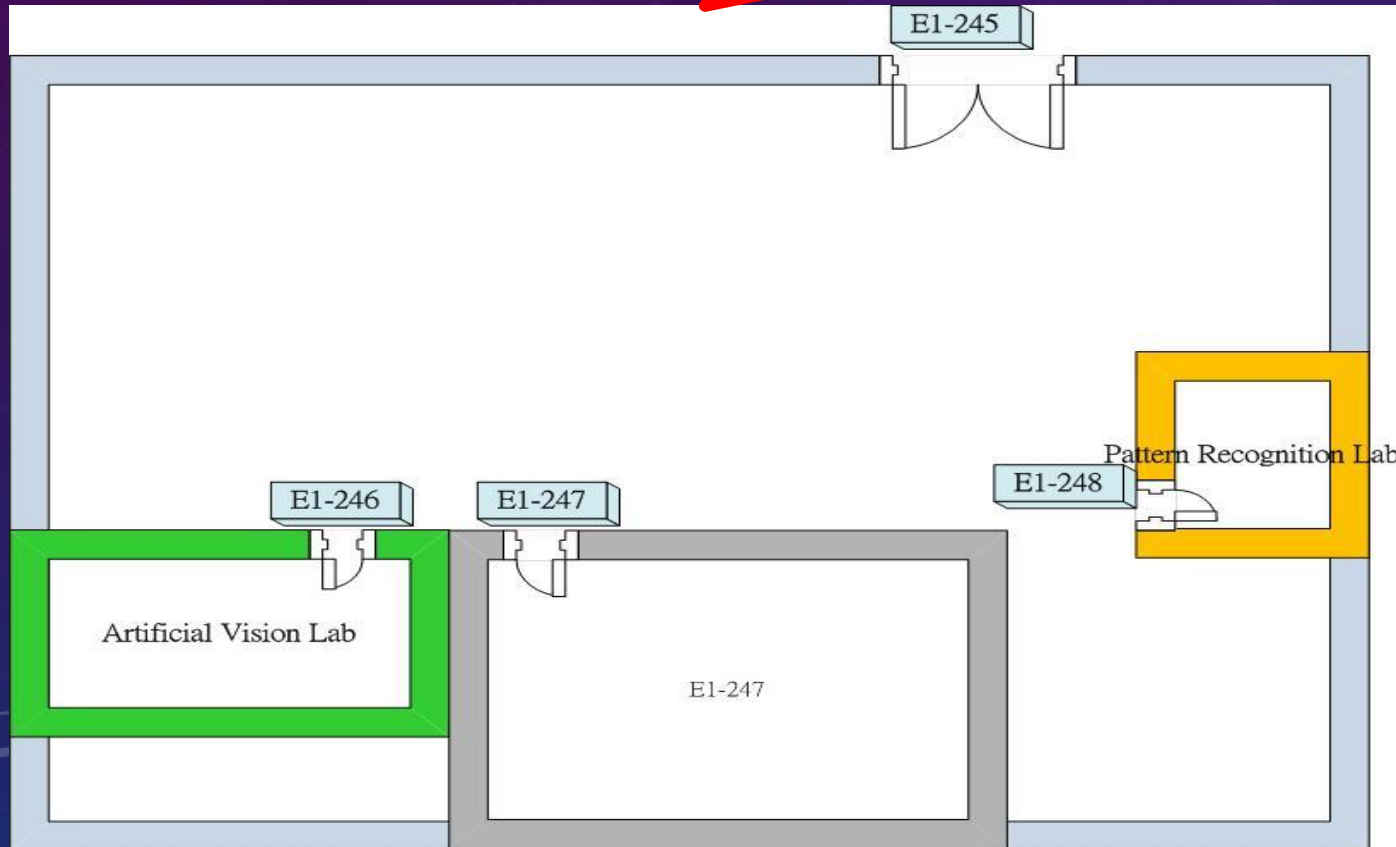
Jison G.S. Hsu, E1-445, Ext. 3234

- My interests: computer vision and machine learning
- <https://sites.google.com/site/jisonhsuprofile2/>
- Office hours (OH): 14:30~15:30 on Wednesday
- [jison@mail.ntust.edu.tw](mailto:jison@mail.ntust.edu.tw)

TA:

- E1-248, E1-246 Ext. 7246 or 3738 , preliminary OH: 13:00~15:00 Friday.
- Josh: [D10803002@mail.ntust.edu.tw](mailto:D10803002@mail.ntust.edu.tw)
- Max: [M10803419@mail.ntust.edu.tw](mailto:M10803419@mail.ntust.edu.tw)

# Pattern Recognition Lab at E1-248



E1-245

2F



E1-building



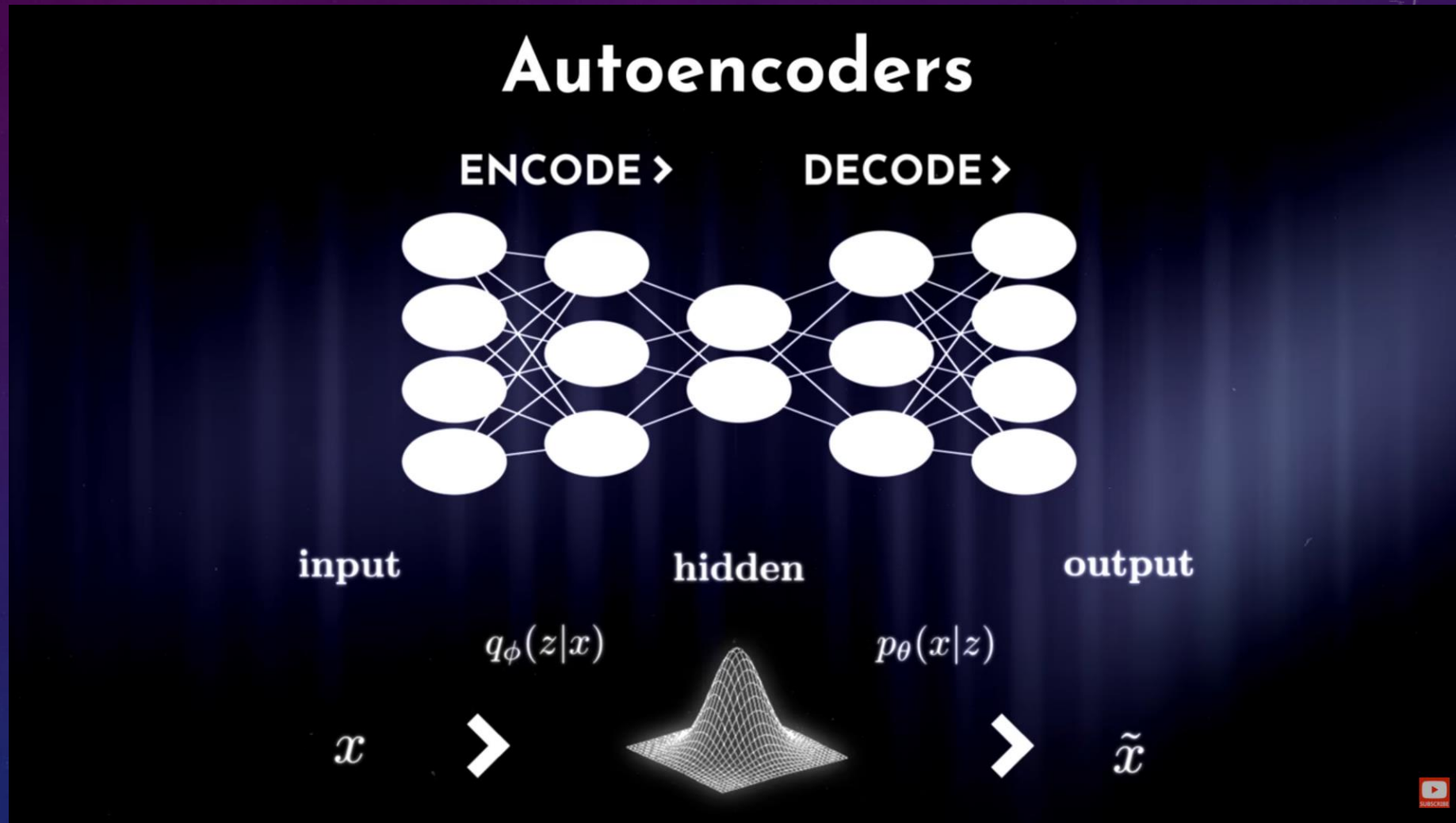
NTUST Campus

# Focus of this Course: GAN

## Generative Adversarial Networks

[https://www.youtube.com/watch?v=-Upj\\_VhjTBs&feature=emb\\_logo](https://www.youtube.com/watch?v=-Upj_VhjTBs&feature=emb_logo) [3:54]

# Generative Modeling Applications



<https://www.youtube.com/watch?v=FZBFV7xfGaY> [12:28]



# Lecture 13 | Generative Models



<https://www.youtube.com/watch?v=5WoltGTWV54> [1:17:40]

# More recommendations about CV and GANs:

- FeiFei Li, Researcher from Stanford  
<https://www.youtube.com/watch?v=40riCqvRoMs>
- Computerphile Channel from YouTube:  
<https://www.youtube.com/watch?v=Sw9r8CL98N0&t=1017s>
- 2 Minute Papers: Face Swapping GAN  
<https://www.youtube.com/watch?v=duo-tHbSdMk>

# Deep Learning for Computer Vision (1/2)

- Introduction to Convolutional Neural Network (CNN) and Deep Learning
  - [Youtube : What is Neural Network? – 3BLUE1Brown](#) and others
  - Materials from DSS (Digital Surveillance Systems)
  - Exercises from PyTorch Libraries and Colab
- Fundamentals on Encoder and Decoder
  - Auto Encoder
  - Deep Convolution GAN (DCGAN)
- Coding Exercises
  - Python <https://www.youtube.com/watch?v=mpnBNGOSplA>
  - Githubs, <https://github.com/>
    - labelme (Segmentation) <https://github.com/wkentaro/labelme>
    - labellmg (Bounding Box) <https://github.com/tzutalin/labellmg>
  - MATLAB <https://www.youtube.com/watch?v=LclJuVSAxL4>



# Deep Learning for Computer Vision (2/2) – The GAN-Zoo

- CycleGAN
  - Youtube: <https://www.youtube.com/watch?v=ICR9sT9mbis>
  - Github: <https://github.com/junyanz/CycleGAN>
- DR-GAN [https://www.youtube.com/watch?time\\_continue=2&v=ljsBTZqCu-l&feature=emb\\_logo](https://www.youtube.com/watch?time_continue=2&v=ljsBTZqCu-l&feature=emb_logo)
- Conditional GAN to create Anime Characters (AnimeGAN)
  - homepage: <https://make.girls.moe/#/>
  - paper: <https://arxiv.org/pdf/1708.05509.pdf>
  - github: <https://github.com/m516825/Conditional-GAN>
- Image-to-Image Translation with Conditional Adversarial Nets
  - Two Minute Paper Channel: <https://www.youtube.com/watch?v=u7kQ5INfUfg>, source code: <https://phillipi.github.io/pix2pix/>
- Progressive GAN, Face Generation: <https://www.youtube.com/watch?v=XOxxPcy5Gr4>
- StyleGAN v2. Style transfer: <https://www.youtube.com/watch?v=9QuDh3W3IOY>
- Head Reenactment: <https://www.youtube.com/watch?v=st3YdiTIVtc>
- Further read: [https://medium.com/@jonathan\\_hui/gan-some-cool-applications-of-gans-4c9ecca35900](https://medium.com/@jonathan_hui/gan-some-cool-applications-of-gans-4c9ecca35900)

# Python Tutorial for Beginners



## Tutorial

<https://www.youtube.com/watch?v=mpnBNGOSpIA> [08:21]



# CVPR Tutorial : Variational Autoencoders and GANs

The screenshot displays a video player interface. On the left, a slide titled "Variational autoencoders" shows a diagram of a Variational Autoencoder (VAE) architecture. The diagram includes an "Encoder" (green box) that takes input  $x$  and produces a latent variable  $z$  (represented by a circle with a dot). The encoder is labeled  $q(z|x)$ . A "Generator" (red box) takes  $z$  and produces a reconstructed image  $\hat{x}$ , labeled  $p(x|z)$ . A "KL" divergence box (blue) is connected to the latent variable  $z$  and a target distribution  $p(z)$  (represented by a circle with a dot). The text "stay close to  $p(z)$ " is next to the KL box. A loss function  $\mathcal{L}$  (blue box) is connected to the encoder and the generator, with the text "explain  $x$ " below it. On the right, a video feed shows a presenter, a woman with long dark hair, sitting at a desk. Below the video feed is a logo for "CVPR 2018 SALT LAKE CITY - JUNE 18-22".


<https://www.youtube.com/watch?v=5R28W5FnSxM> [1:33:59]

# Introduction to GANs, ICLR 2019 | Ian Goodfellow

facebook research

## Adversarial Machine Learning

Ian Goodfellow  
ICLR  
2019-05-07



[\(58\) Ian Goodfellow: Adversarial Machine Learning \(ICLR 2019 invited talk\) – YouTube](#)  
[43:06]



# How Are You Graded?

- Quiz for CNN (in class, March 16) ----- 10%
- Project Mid-term Presentation (in class April 13)----- 20%
- Exam (120~150 mins on May 25) ----- 30%
- Project Final Presentation (in class June 15) ----- 20%
- Exercises and Homework ----- 20%

# Presentation and Problem Solving Skills







- All topics are delivered with references collected from the web, and many are from YouTube, e.g., CVPR/ICCV/ECCV tutorials
- The course materials will be available on Moodle
- You will form a study group of 2 teammates. Please submit your team members by March 16.
- We will assign each team a problem, and you have to solve it with your team. Your problem, on-going progress and solution will be presented in the mid-term and final presentations.
- Refer to *CV\_Project\_Group\_Introduction.pdf*



# Presentation Example





## Disentangled Person Image Generation

Paper ID: 1801    Project page: [https://homes.esat.kuleuven.be/~liqianma/CVPR18\\_DPIG/](https://homes.esat.kuleuven.be/~liqianma/CVPR18_DPIG/)




Liqian<sup>1</sup>    Qianru<sup>2</sup>    Stamatios<sup>1</sup>    Luc<sup>1,3</sup>    Bernt<sup>2</sup>    Mario<sup>2</sup>


<sup>1</sup>KU Leuven    <sup>2</sup>MPI for Informatics    <sup>3</sup>ETH Zürich



Recorded By  
**facebook**



CVPR 2018  
SALT LAKE CITY • JUNE 18-22



<https://www.youtube.com/watch?v=vy2KgNdVRfo> [04:01]

# Movies Menu

- <https://youtu.be/aircAruvnKk> 3Blue1Brown series1
- <https://youtu.be/IHZwWFHWA-w> 3Blue1Brown series2
- <https://youtu.be/Ilg3gGewQ5U> 3Blue1Brown series3
- <https://youtu.be/tleHLnjs5U8> 3Blue1Brown series4
- Python, <https://youtu.be/rfscVS0vtbw>
- GAN by Pytorch, <https://youtu.be/xjdMgerRxWs>
- Stanford Lecture13 – Generative Models:  
<https://www.youtube.com/watch?v=5WoltGTWV54>
- [https://youtu.be/EPAIUW\\_A4sU](https://youtu.be/EPAIUW_A4sU) (Chinese) GAN PyTorch Tutorial
- <https://youtu.be/DQNNMiAP5lw> GAN by Hung-yi Lee(李宏毅)
- <https://youtu.be/qbW-X6iW5jE> Deep Learning Basics: Introduction and Overview
- <https://youtu.be/YJnddoa8sHk> Deep Learning: Practice and Trends
- <https://youtu.be/O5xeyoRL95U> (good for 1st time)



## *Attention*

The class on March 2 (next Tuesday) will begin at 13:20 as I am requested to join a meeting at the College of Engineering at 12:30.

# Supplementary Materials

# Learning Python - Beginners Tutorial



<https://youtu.be/rfscVS0vtbw> [4:26:51]



# Building Generative Adversarial Networks with Pytorch



WELCOME TO AI ONLINE TECH TALK SERIES #56

Dec. 10, 2018, 10:00am PT

This webinar is brought to you by AICamp

## Building Generative Adversarial Networks with Pytorch

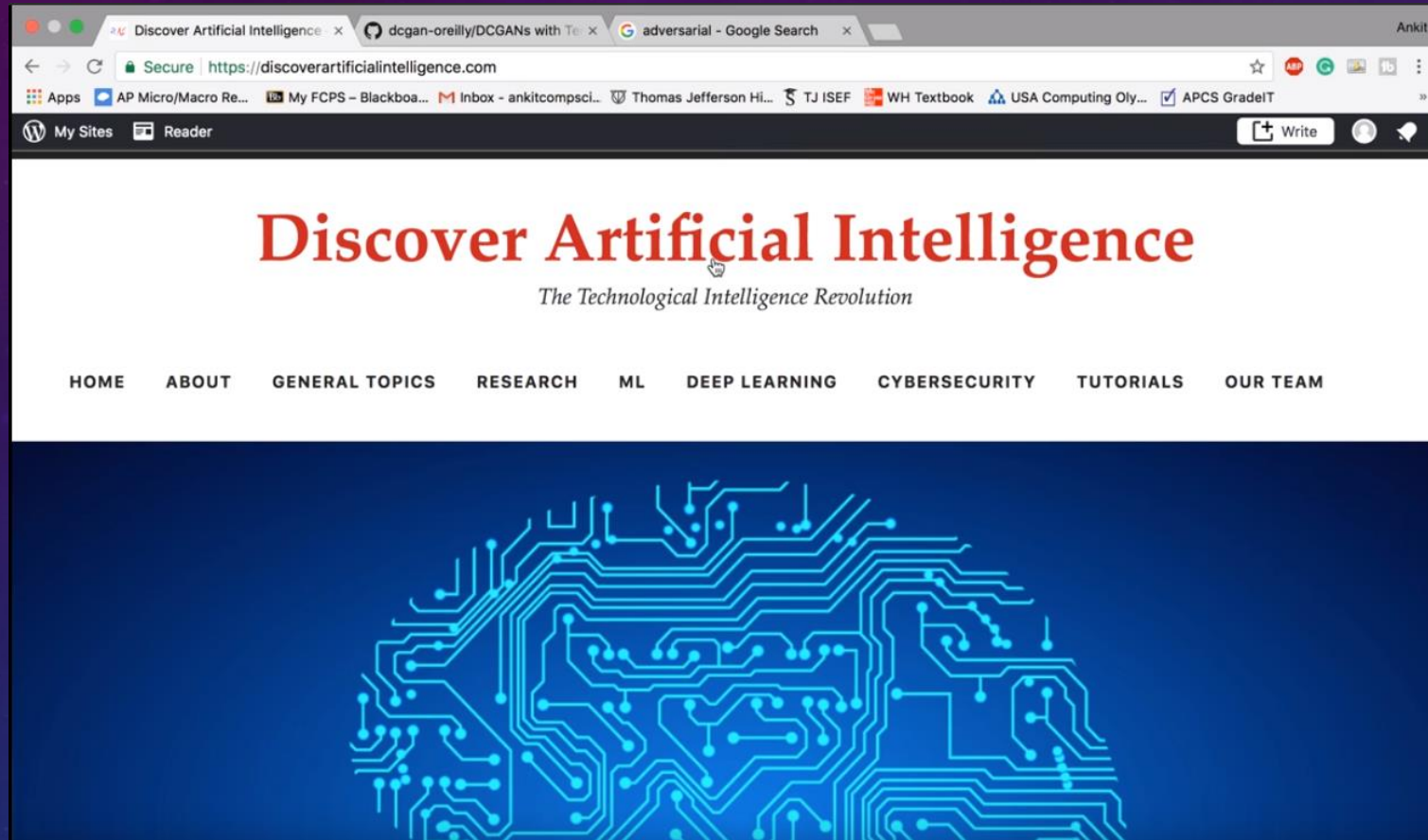
Speaker: Reza Katebi, Ohio University

Hang tight, the webinar will start soon.....

For more online AI tech talks, courses, bootcamps, <http://learn.xnextcon.com>

<https://youtu.be/xjdMgerRxWs> [1:00:07]

# Make a Face Generative Adversarial Network in 15 MINUTES!



<https://youtu.be/qbW-X6iW5jE> [16:23]

## #4.6 GAN (PyTorch tutorial) (Chinese)



[https://youtu.be/EPAIUW\\_A4sU](https://youtu.be/EPAIUW_A4sU) [15:21]



# GAN Lecture 1 (2018): Introduction (Chinese)

## Introduction of Generative Adversarial Network (GAN)

李宏毅

Hung-yi Lee

<https://youtu.be/DQNNMiAP5lw> [1:33:14]