

# 增強學習初探以及最新發展趨勢

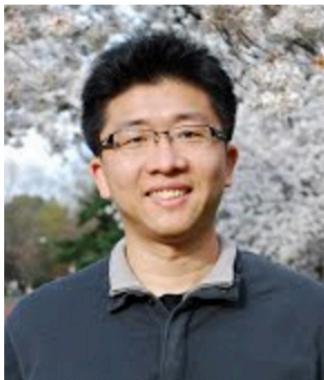
台灣清華大學  
孫民教授



**VSLab**

# Min Sun (孫民)

RESEARCH PUBLICATIONS LAB TEACHING ARCHIVE



Assistant Professor in Electrical Engineering  
at National Tsing Hua University (Sept. 2014)  
[\[CV\]](#),[\[Google Scholar\]](#)



Postdoctoral Researcher with Steve Seitz and Ali Farhadi  
in CSE at University of Washington (Jan. 2013 - Aug. 2014)



Microsoft  
**Research**  
Cambridge



Sep 09-Dec 12

Jul 11-Sep 11

Jul 09-Sep 09

Sep 07-Jul 09

Sep 05-Sep

Sep 99-Jul 03



# Vision Science Lab@ NTHU Taiwan

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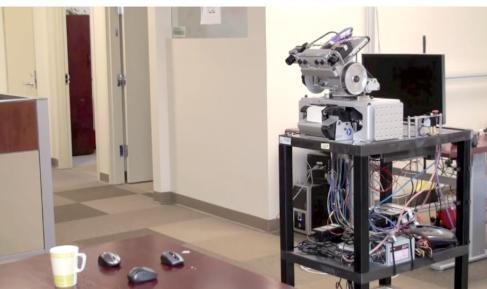
## Research Topics

### Understanding Personal Videos

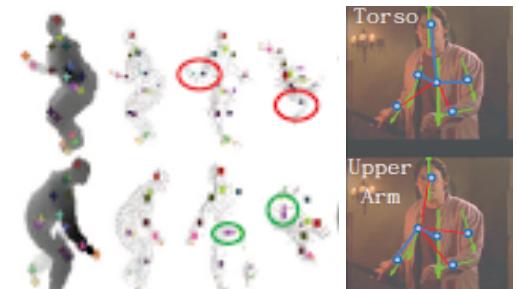


**Make3D**

### 3D & Robot Vision



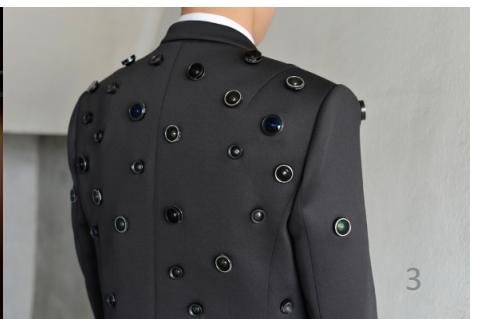
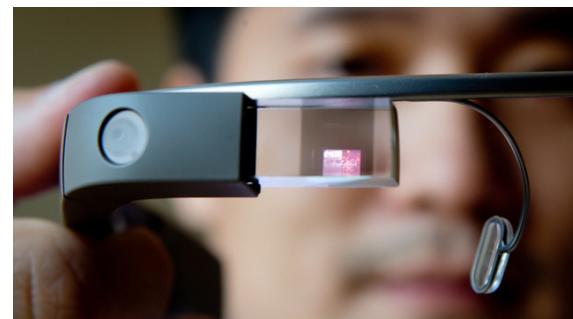
### Human Sensing



### Analyzing Street Views



### Wearable Camera Applications



# My Journey on Learning Reinforcement Learning (RL)

- Courses during my graduate study
  - CS229 Machine Learning:  
<http://cs229.stanford.edu/syllabus.html>

## Reinforcement learning and control (4 classes)

Lecture 16	11/15	1. MDPs. Bellman equations. 2. Value iteration and policy iteration.	<b>Class Notes</b> <ul style="list-style-type: none"><li>• Reinforcement Learning and Control [<a href="#">ps</a>] [<a href="#">pdf</a>]</li><li>• LQR, DDP and LQG [<a href="#">pdf</a>]</li></ul>
Lecture 17	11/27	3. Linear quadratic regulation (LQR). LQG. 4. Q-learning. Value function approximation.	
Lecture 18	11/29		<b>Problem Set 4</b> Out 11/15. Due 12/6.

- EE363 Linear Dynamical System:  
<http://stanford.edu/class/ee363/courseinfo.html>
  1. [Linear quadratic regulator: Discrete-time finite horizon](#)
  2. [LQR via Lagrange multipliers](#)
  3. [Infinite horizon LQR](#)
  4. [Continuous-time LQR](#)

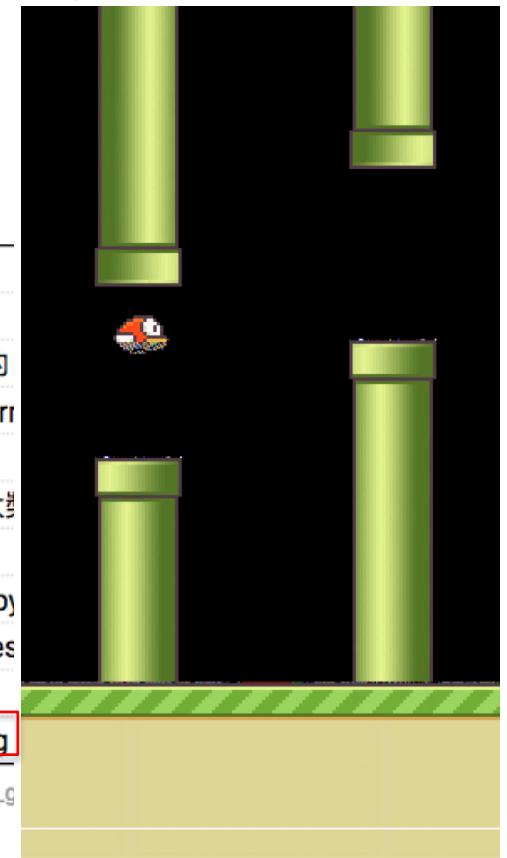
# My Journey on Learning Reinforcement Learning (RL)

- In Early 2016, my student (Yen Chen Lin) tried RL to play video games (e.g., Flappy Bird)
  - Playing Atari with Deep Reinforcement Learning (Mnih et al. NIPS workshop 2013)

## Top GitHub projects by stars for Taiwan (2016, special rank)

Total GitHub stars from Taiwan: 87,435

Rank	Stars	GitHub Project	Description
1	322	abalone0204/Clairvoyance	Make the Taiwan a Better Place to Work
2	294	kdchang/reactjs101	從零開始學 React (ReactJS 101) 是一本給初學者的
3	231	hackmdio/hackmd	Realtime collaborative markdown notes on all platforms.
4	142	detailyang/awesome-cheatsheet	useful cheat sheets as reference.
5	137	doggy8088/Learn-Git-in-30-days	這是 Will 保哥在 2013 第 6 屆 iT 邊幫忙鐵人賽年度大賽
6	122	shiningjason1989/react-quick-tutorial	
7	110	hexojs/hexo	A fast, simple & powerful blog framework, powered by Node.js.
8	108	yahoo/AppDevKit	AppDevKit is an iOS development library that provides
9	106	jserv/facebookoc	Yet another Facebook clone written in C
10	106	yenchenlin1994/DeepLearningFlappyBird	Flappy Bird hack using Deep Reinforcement Learning



# **My Journey on Learning Reinforcement Learning (RL)**

- Watch a few online/offline courses (2016, 2017)
  - Reinforcement Learning from UCL by David Silver
    - <http://www0.cs.ucl.ac.uk/staff/d.silver/web/Teaching.html>
    - <https://www.youtube.com/playlist?list=PLbWDNovNB5mqFBgq7i3MY6Ui4zudcvNFJ>
  - Deep Reinforcement Learning from Berkeley by Sergey Levine
    - <http://rll.berkeley.edu/deeprlcourse/>
  - Deep Reinforcement Learning bootcamp
    - <https://sites.google.com/view/deep-rl-bootcamp/lectures>

# My Journey on Learning Reinforcement Learning (RL)

- Many research results leverage RL
  - Interact through Language
    - Video Title Generation
    - Transferring Sentence Style
  - Interact through Actions
    - Deep 360-degree Pilot
    - Target Driven Navigation
  - Interact through Attacks
    - Adversarial Attacks

2017



Training a Deep Agent to See and Interact  
孫民 / 清華大學電機系助理教授

<https://www.slideshare.net/aliensun/training-a-deep-agent-to-see-and-interact-83796512>

# Acknowledgement

- 教材使用
  - David Silver RL slides
  - Deep Reinforcement Learning Bootcamp slides
  - Our Lab material contributed by Yen Chen Lin, Mark Dong, Gina Wu, Wan-Ting Hsu, and myself.  
<http://aliensunmin.github.io/lab/info.html>

# 議程

- Markov Decision Process 以及傳統增強學習的算法
- 不需環境資訊 (Model-free) 的增強學習 (包含 DQN)
- 直接優化動作政策 (Action Policy) 的 (PG) 演算法以及不需Gradient的Evolution Strategies(ES)演算法
- 最新研究發展、應用範例以及使用增強學習的小訣竅