T.M. Harry **Hsu**

Tzu-Ming Harry Hsu, Graduate Institute of EECS, Massachusetts Institute of Technology, MA, USA

(+886) 928-82-0924 | stmharry@mit.edu | stmharry.github.io | stmharry

Upcoming Research

Signal Kinetics Signals are everywhere in our daily lives, and some of them is visible while others cannot be seen. Ranging from WiFi signals to brain waves, the pervasiveness of these signals results in networking the whole world through both natural and man-made links. The aim of my upcoming researches is to explore ways to link the natural and man-made links such that not only computers but humans can extend their abilities in communicating, sensing, and actuation. Tools from multiple fields are applied in order to extract the information of physical world and to explicitly relate them.

Computer networks aids us in sensing the status of a remote target, a patient, for example. We are able to collect the reflected signal from the subject's body, and then translate the signal into interpretable features with signal processing algorithms. The algorithms have to be carefully tailored to filter out unwanted influences of the outside world, which could be millions of times stronger than the desired signal. Having obtained the features, we thus apply machine learning techniques to learn and predict the subject's attributes such as health status, gesture, or even mood.

In my upcoming research starting September 2017, the aforementioned techniques will be applied to further strengthen the connection between humans and machines via interactions through signals.

Research Interests

1. Deep Learning
2. Pattern Recognition

Skills

Programming Python (TensorFlow), MATLAB, C / C++, Java, HTML / CSS / JS, Verilog

Languages Mandarin Chinese (Native), Taiwanese (Native), English (Fluent), Spanish (Intermediate)

GRE Verbal (153 / 170), Quantitative (170 / 170), Analytical Writing (4.0 / 6.0)

TOEFL iBT Reading (29 / 30), Listening (30 / 30), Speaking (22 / 30), Writing (27 / 30)

Education

Massachusetts Institute of Technology (MIT) — *Cambridge, MA, USA*

Ph.D. Student in Electrical Engineering and Computer Science — *Starting Sep. 2017*

National Taiwan University (NTU) — *Taipei, Taiwan*

B.S.E. in Electrical Engineering and B.S. in Physics — *Sep. 2011 - Jun. 2016*

GPA Overall (3.99 / 4.00), Last 60 units (3.99 / 4.00)

Overall ranking 1 / 190

Relevant courses **Deep and Structured Machine Learning**, **Digital Visual Effects**, Design and Analysis of Algorithms, Data Structure and Programming, Probability and Statistics, Linear Algebra (**bold** denotes graduate level)

Publications

Conference Paper

[1] Wei-Yu Chen, **Tzu-Ming Harry Hsu**, Yao-Hung Hubert Tsai, and Yu-Chiang Frank Wang, "Transfer Neural Trees for Heterogeneous Domain Adaptation", in *ECCV* 2016.

[2] **Tzu-Ming Harry Hsu**, Wei-Yu Chen, Cheng-An Hou, Yao-Hung Hubert Tsai, Yi-Ren Yeh, and Yu-Chiang Frank Wang, "Unsupervised Domain Adaptation With Imbalanced Cross-Domain Data", in *ICCV* 2015.

[3] Wei-Yu Chen, **Tzu-Ming Harry Hsu**, Cheng-An Hou, Yi-Ren Yeh and Yu-Chiang Frank Wang, "Connecting the dots without clues: Unsupervised domain adaptation for cross-domain visual classification", in *ICIP* 2015.

[4] **Tzu-Ming Harry Hsu**, Wei-Yu Chen, Kuan-Lin Chen, Mong-Chi Ko, You-Cheng Liu, An-Yeu Andy Wu, "Robust Motion Artifact Reduction of Photoplethysmographic Signal with Trajectory Space Circular Model", in *ICASSP Signal Processing Cup* 2015.

Honors & Awards

Group

2015 **Silver Medal Award**, Altera Innovate Asia FPGA Design Competition — *Wu Han, China*
- Ranked 2nd among 20 teams with self-designed PCB integration

2015 **10th Place**, ICASSP Signal Processing Cup
- Ranked 10th globally in sports heartbeat detection with an error of 4.89 beats per minute (BPM)

Individual

2011 - 14 **Presidential Award (5 times)**, Department of Electrical Engineering, NTU
- Awarded per semester to the top 5% students

2011 **World's 1st Place and Gold Medal Award**, International Physics Olympiad (IPhO) — *Bangkok, Thailand*
- Ranked 1st in both theory section and experiment section among 500 national representatives from over 80 countries

2008 **Gold Medal Award**, International Junior Science Olympiad (IJSO) — *Gyeong-Nam, South Korea*

Research Experiences

Multimedia and Machine Learning Lab — *CITI, Academia Sinica, Taiwan*
Intern student under the instruction of Dr. Yu-Chiang Frank Wang — *Apr. 2014 - Jun. 2016*

- **Deep Learning for Feature Transformation**
  - Build specific neural networks on target tasks to properly transform images to feature vectors, allowing recognition, neighbor querying, and possibly other tasks to be done.
- **Deep Learning for Heterogeneous Domain Adaptation**
  - Transfer knowledge across different feature domains and build classifiers above the transferred knowledges
  - An algorithm **[1]** is proposed to transfer classifiers to a different dimensional space with deep neural network
- **Unsupervised Domain Adaptation with Imbalanced Cross-domain Data**
  - Information of labeled source-domain data is transferred to the unlabeled target-domain, which may be a small set with imbalanced label counts
  - An algorithm **[2]** is proposed to combine sub-domain level classifiers to identify better source data applicability
- **Unsupervised Domain Adaptation with Balanced Cross-domain Data**
  - A set of labeled source-domain data is used to construct classifier for the unlabeled target-domain data
  - An algorithm **[3]** is proposed to address source-target mismatch and project them to a common space
- **External Review**
  - Review papers as external reviewer for *IEEE ICCV*, *IEEE ECCV*, *IEEE AAAI*, and *IEEE IJCAI*

Access IC Lab

National Taiwan University

Intern student under the instruction of Dr. An-Yeu Andy Wu

Sep. 2014 - Jun. 2015

- **Noise Removal of Photoplethysmographic (PPG) Signals**
  - Remove noises in PPG signals induced by motions by decorrelating the PPG with accelerometer signal
  - An algorithm is proposed to project the signal into a complex plane, in which a temporal filter will be performed, followed by ensemble voting for the optimal beat counts

Laboratory for Applied Logic and Computation in System Design (ALCom Lab)

National Taiwan University

Intern student under the instruction of Dr. Jie-Hong Roland Jiang

Jul. 2013 - Jun. 2014

- **Compressed Sensing**
  - Compress the data perceived by a sensor array using less data storage than what it used to consume
- **Mathematical Neural models**
  - Establish a time-continuous model of human neurons to simulate the biological effects at stimulus and message passing

Work & Teaching Experiences

Digital Drift Corporation

Taipei, Taiwan

Backend Engineer

Mar. 2016 - Now

- **Deep Neural Networks for Image Interpretation**
  - Build deep models for cuisine images using TensorFlow on multi-GPU machines, providing a backend with an API

Olympiad Tutoring Community

Taipei, Taiwan

Private Tutor

Sep. 2011 - Jun. 2015

- Offer tutoring for high school physics, competition physics, GRE subject test (physics), and SAT II subject test (physics)
- Two students became the national representatives for Taiwan for International Physics Olympiad (IPhO)