# TZU-SHENG KUO

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## RESEARCH INTERESTS

Human-Computer Interaction, Intelligent User Interfaces, Sensing & Interaction Techniques, Machine Learning

## EDUCATION

**Stanford University** — Stanford, CA, USA

Master of Science in Electrical Engineering — 09/2019-06/2021

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

Bachelor of Science in Electrical Engineering**, Summa Cum Laude** — 09/2014-01/2019

GPA: 4.26 / 4.30

**Rank: Top 1%**

## RESEARCH EXPERIENCE

**Undergraduate Researcher, Interactive Graphics / Computer Graphics Lab** — 09/2017-03/2019

*Advisor: Prof. Bing-Yu Robin Chen (Dept. CSIE, NTU), Prof. Xing-Dong Yang (Dept. CS, Dartmouth College)*

- Research Areas: **Human-Computer Interaction**, Intelligent User Interfaces, Haptics, and Electronics Prototyping
- Project 1: Designed a pneumatic interface that emulates physical objects to provide haptic feedbacks in virtual reality
- Project 2: Designed a software tool with an autocomplete feature to assist makers in building virtual breadboard circuits
- Project 3: Designed a pneumatic interface that provides haptic feedback for whole-body interactions in virtual reality
- **3 papers accepted** by ***UIST 2018, UIST 2019,*** and ***CHI 2019.***

**Undergraduate Researcher, Vision and Learning Lab** — 09/2017-01/2019

*Advisor: Prof. Yu-Chiang Frank Wang (Dept. EE, NTU)*

- Research Areas: **Computer Vision**, Deep Learning, and Semantic Segmentation
- Proposed a deep neural network that distinguishes the land covers, such as forests and water, within satellite images
- Modified the decoder of DeepLabv3+ by adopting the concept of Deep Layer Aggregation
- Proposed a soft label loss to mitigate boundary effects and developed a post-processing algorithm to refine predictions
- **1 paper accepted** by ***DeepGlobe Workshop in CVPR 2018***

**Undergraduate Researcher, Multimedia Processing and Communications Lab** — 07/2016-01/2019

*Advisor: Prof. Homer H. Chen (Dept. EE, NTU and IEEE Fellow)*

- Research Areas: **Signal Processing**, Image Processing, and Eye Tracking
- Estimated the depth of gaze using eye trackers to enable 3D interactions
- Approximated the temporal variation of gaze fixation using Gaussian noise and estimated the depth based on eye vergence
- Proposed a model to calculate the minimal distance between two depths that are distinguishable with our method
- **1 paper accepted** by ***ICIP 2018***

## PUBLICATIONS

[5] Shan-Yuan Teng, Cheng-Lung Lin, Chi-huan Chiang, **Tzu-Sheng Kuo**, Liwei Chan, Da-Yuan Huang, and Bing-Yu Chen, "TilePoP: Tile-type Pop-up Prop for Virtual Reality," *Proceedings of the 32nd ACM Symposium on User Interface Software and Technology (UIST 2019)*, 2019. **Honorable Mention Award** (Top 5%) [in press]

[4] Jo-Yu Lo, Da-Yuan Huang, **Tzu-Sheng Kuo**, Chen-Kuo Sun, Jun Gong, Teddy Seyed, Xing-Dong Yang, and Bing-Yu Chen, "AutoFritz: Autocomplete for Prototyping Virtual Breadboard Circuits," *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems (CHI 2019)*, Paper No. 403, 2019. **Honorable Mention Award** (Top 5%) [pdf]

[3] Shan-Yuan Teng, **Tzu-Sheng Kuo**, Chi Wang, Chi-Huan Chiang, Da-Yuan Huang, Liwei Chan, and Bing-Yu Chen, "PuPoP: Pop-up Prop on Palm for Virtual Reality," *Proceedings of the 31st ACM Symposium on User Interface Software and Technology (UIST 2018)*, pp. 5–17, 2018. [pdf]

[2] **Tzu-Sheng Kuo***, Keng-Sen Tseng*, Jia-Wei Yan*, Yen-Cheng Liu, and Yu-Chiang Frank Wang, "Deep Aggregation Net for Land Cover Classification," *IEEE International Conference on Computer Vision and Pattern Recognition Workshop on DeepGlobe (CVPRW 2018)*, 2018. [*co-first authors] [pdf]

[1] **Tzu-Sheng Kuo**, Kuang-Tsu Shih, Sheng-Lung Chung, and Homer H. Chen, "Depth from Gaze," *IEEE International Conference on Image Processing (ICIP 2018),* pp. 2910–2914, 2018. [pdf]

## SELECTED HONORS AND AWARDS

**Honorary Member, Phi Tau Phi Scholastic Honor Society** - Given to students graduated **top 1%** in NTU EECS College — 06/2018

**Dean's List Award (5 times)** - Given to students with top 5% GPA in each semester — 09/2014-06/2018

**Appier Scholarship (2 times)** - Travel grant for ICIP 2018 and UIST 2018 — 08/2018

**Chien Shih-Liang Memorial Scholarship** - Given to 2 students in NTU EECS College each year — 05/2018

**Taiwan Ministry of Science and Technology Research Project Grant** — 07/2017-02/2018

**Irving T. Ho Memorial Scholarship** - Given to 1 senior student in NTUEE each year — 10/2017

## Teaching Experience

(* denotes graduate-level courses)

**Teaching Assistant**, **Computer Vision: from Recognition to Geometry*** - *Instructor: Prof. Yu-Chiang Frank Wang* 09/2018-01/2019

**Teaching Assistant**, **Deep Learning for Computer Vision*** - *Instructor: Prof. Yu-Chiang Frank Wang* 02/2018-06/2018

**Teaching Assistant**, **Machine Learning*** - *Instructor: Prof. Hung-Yi Lee* 09/2017-01/2018

**Teaching Assistant**, **Signals and Systems** - *Instructor: Prof. Lin-Shan Lee* 02/2017-06/2017

**Teaching Assistant**, **Electronics I** - *Instructor: Prof. Liang-Hung Lu* 09/2016-01/2017

## Working Experience

**Software Engineering Intern**, **Cadence Design Systems**, **Inc.** San Jose, CA, USA

*Manager: Mr. Danny Ho, Mr. Kei-Yong Khoo* 07-09/2017

- Verification and Development of Cadence Conformal Logic Equivalence Checking (LEC) Tool
- Focused on Gate-Level and RTL circuit design automation
- Received **Full-Time Return Offer**

## Professional Services

**External Reviewer** - Reviewed conference papers for ICIP 2018, ICASSP 2018, and ACCV 2018 12/2017-01/2019

**External Reviewer** - Reviewed a research grant proposal for Taiwan Ministry of Science and Technology 02/2017

## Selected Term Projects

(details available on my website)

**iTeach** - Implemented an ios app in ReactNative and Redux to assist teachers in bringing a class together on mobile devices 02-06/2018

**Action Recognition** - Implemented CNN and RNN to recognize and localize actions in first-person videos 06/2018

**Berkeley Pacman AI** - Designed a Pacman AI that played the game by itself using reinforcement learning 09-12/2017

**Visualization of CNN** - Implemented and compared popular CNN models using five visualization methods 06/2017

**Music Mixer** - Designed a digital circuit as a music mixer on FPGA using Verilog 06/2017

**Image Generation** - Generated anime images from text using Conditional Generative Adversarial Network (CGAN) 05/2017

**Image Stitching** - Implemented algorithms that generated a panorama from multiple images 05/2017

**Video to Caption** - Designed CNN and RNN to generate captions from videos automatically 04/2017

**High Dynamic Range Imaging** - Implemented algorithms that generated an HDR image from multiple images 04/2017

**Single Cycle MIPS Processor** - Implemented a MIPS CPU in RTL using Verilog 12/2016

**Functionally Reduced And-Inverter Graph (FRAIG)** - Optimized digital circuit automatically using SAT engine 12/2015

## Leadership and Teamwork Experience

(details available on my website)

**Founder, MakerSpace of NTUEE** 08/2016-06/2018

- Motivated by the need for rapid prototyping tools outside restricted research labs of individual faculty, I founded this makerspace to assist students in doing their side projects. Beyond providing equipments, my team and I also organized workshops in the makerspace to teach students basic prototyping skills, such as the usages of Arduino and 3D Printers.

**Chair, 2017 MakeNTU Makeathon** 08/2016-02/2017

- Inspired by the global maker movement and the democratization of technology, I launched the 1st nationwide makeathon in Taiwan with 200 participants and 70k USD in the arrangement. I led 60 student volunteers and cooperated with Taipei City Government and 22 international companies, including Google, Microsoft, Intel, etc.

**Director, Academic Department** of NTUEE Student Association 06/2016-06/2017

- I led a team of 30 students to organize various academic affairs, including speeches, awards, NTU festival, NTUEE+ Project, etc., for over 800 students in the EE department.

## Skills and Languages

Programming Languages/Tools: C++/C#, Python, Matlab, Javascript, CSS, html, Verilog, Tensorflow, PyTorch, React, Unity, OpenCV, etc.
Languages: English (fluent), Chinese (native), Japanese (basic)

## Selected Courses

(* denotes graduate-level courses)

**Software:** Deep Learning for Computer Vision*, Machine Learning and Having It Deep and Structured*, Machine Learning*, Introduction to Artificial Intelligence and Machine Learning, Networking and Multimedia Lab, Digital Visual Effects*, Web Programming, Digital Speech Processing, Data Structure and Programming, Algorithms, Operating System

**Hardware:** Computer Architecture, IC Design, Digital Circuit Design Lab, Switching Circuit and Logic Design, Circuits, Electronics, Electromagnetic, Signals and Systems, Introduction to Wireless and Mobile Networking, RF Microwave Wireless Systems

**HCI:** Human-Computer Interaction, Psychology, Design Thinking Workshop, Creative Thinking, Biology, Clinical Observation and Demand Exploration*

**Mathematics:** Calculus, Linear Algebra, Probability and Statistics, Differential Equation, Discrete Math, Complex Analysis