

# Kuan-Wei Tseng

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## Education

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National Taiwan University (NTU), Taipei, Taiwan (Sep. 2016 - Jun. 2020)

*Bachelor of Science in Engineering, major in Mechanical Engineering*

- Last 60-credit GPA: 3.58/4.3
- Coursework: Wireless Networking–Fundamentals and Appl.\*, Adv. Computer Vision\*, Video Communications\*, Robotics\*, Digital Image Processing\*, Operating Systems, Data Structures and Algorithms, Discrete Math., Numerical Methods, Intro. to Computer and Programming. \*graduate-level

University of Oxford, Oxford, UK (Jul. 2017 - Aug. 2017)

*Advanced Humanity and English Language Program*

- Comprehensive academic English program covering topics such as academic and creative writing, debating, British culture, job seeking skills, etc.

## Research Experience

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Dept. of Computer Science & Information Engineering, National Taiwan University (Sep.2019 - Present)

*Research Associate (Feb. 2021 – Present); Research Assistant (Sep. 2019 - Feb. 2021)*

- Developed two deep learning-based video stabilization algorithms, including an offline method, that first utilized 3D computer vision to model and smooth camera motion, and an online method, whose speed (54.6fps) surpassed state-of-the-art methods by 29% with excellent shape preservation. (**Deep Learning**)
- Implemented accurate and light-weight dynamic object-aware visual Simultaneous Localization And Mapping (SLAM) framework based on ORB-SLAM2 and Single Shot Object Detection, reaching comparable performance with mainstream DynaSLAM but with at least 10 times faster processing time. (**Computer Vision for Robotics**)
- Analyzed performance of visual-inertial fusion methods and constructed a higher accuracy (over 95%) and more adaptive framerate (up to 120Hz) 3D object pose tracking system for mobile devices by fusing local IMU propagation with 3D object pose estimation on remote servers. (**Sensor Fusion**)
- Explored practical applications of optical see-through head-mounted display and designed a mixed reality navigation (image-based localization based on structure from motion models) and guidance (3D animation manual) system for outdoor facility maintenance with Microsoft HoloLens 2. (**Augmented Reality**)
- Investigated and conducted user experience studies on multisensory experience in interactive system; developed a precise and versatile olfactory display system that exhausts scented gases by subwoofers to enhance immersive VR experience. (**Human Computer Interaction**)

## Selected Publications

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- [1] Yao-Chih Lee, Kuan-Wei Tseng, Yu-Ta Chen, Chien-Cheng Chen, Chu-Song Chen, Yi-Ping Hung, "3D Video Stabilization with Depth Estimation by CNN-based Optimization", in Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR), 2021. [[CVPR2021 Open Access](#)]
- [2] You-Yang Hu, Yao-Fu Jan, Kuan-Wei Tseng, You-Shin Tsai, Hung-Ming Sung, Jin-Yao Lin, Yi-Ping Hung, "aBio: Active Bi-Olfactory Display Using Subwoofers for Virtual Reality", in Proceedings of the 29th ACM International Conference on Multimedia (MM'21), 2021. [[Accepted as Oral Paper](#), PDF available [here](#)]
- [3] Yu-Ta Chen, Kuan-Wei Tseng, Yao-Chih Lee, Chun-Yu Chen, Yi-Ping Hung, "PixStabNet: Fast Multi-Scale Deep Online Video Stabilization with Pixel-Based Warping", in Proceedings of the IEEE International Conference on Image Processing (ICIP), 2021. [Published by [IEEE](#)]
- [4] Yao-Fu Juan, Kuan-Wei Tseng, Peng-Yuan Kao and Yi-Ping Hung, "Augmented Tai-Chi Chuan Practice Tool with Pose Evaluation", in Proceedings of the IEEE International Conference on Multimedia Information Processing and Retrieval (MIPR), 2021. [[Accepted as Oral Paper](#), PDF available [here](#)]
- [5] Peng-Yuan Kao, Kuan-Wei Tseng, Tian-Yi Shen, Yan-Bin Song, Kuan-Wen Chen, Shih-Wei Hu, Sheng-Wen Shih, and Yi-Ping Hung, "Camera Ego-Positioning Using Sensor Fusion and Complementary Method", Pattern Recognition. ICPR International Workshops and Challenges, 2021. [Published by [Springer](#)]
- [6] Kuan-Wei Tseng, Meng-Wei Hsu, Peng-Yuan Kao and Yi-Ping Hung, "Influence of IMU Quality on Optimization-Based Visual Inertial Odometry", in IPPR Conference on Computer Vision, Graphics, and Image Processing (CVGIP), 2020. [Presented at Conference, PDF available [here](#)]

## Research Interest

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3D Computer Vision (visual odometry, structure from motion, view synthesis), Deep Learning for Computer Vision (camera relocalization, video stabilization, neural style transfer), Robotics (odometry, simultaneous localization and mapping, sensor fusion), Interaction Technologies (augmented reality, virtual reality, olfactory display)

## Teaching Experience

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Dept. of Computer Science & Information Engineering, National Taiwan University (Spring 2021)

*Teaching Assistant*

3D Computer Vision with Deep Learning Applications [CSIE 5249, Graduate Level, Instructor: Dr. Chu-Song-Chen]

- Developed learning materials and gave lectures on assigned topics such as structure from motion, SLAM algorithms, and bundle adjustment.
- Held problem-solving Q&A sessions and advised on projects such as camera relocalization and visual odometry.

Pattern Analysis and Classification [CSIE 5079, Graduate Level, Instructor: Dr. Yi-Ping Hung]

- Conducted a research survey on latest pattern recognition techniques for a reading list for students' final project.
- Held problem-solving Q&A sessions and evaluated students' performance on homework, exams, and final projects.

## Selected Coursework

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**Visible Light Communication via Frequency Shift Keying** (Fall 2019), Wireless Network: Fundamentals & Appls.

- Designed and manufactured a visible light communication system based on LED frequency modulation; utilized the rolling shutter effect to decode messages from ultrahigh LED blinking frequencies that human cannot perceive with naked eye, showing strong transmission signals within 50cm at the speed of 16bps.

**Video Inpainting Using Temporal Information** (Spring 2019), Video Communication

- Designed and implemented a video inpainting technique that could remove arbitrary dynamic objects selected by the users; utilized motion segmentation to track the moving objects, and filled the vacant area with background pixels obtained from adjacent frames, successfully achieving effective removal and satisfying visual quality with few artifacts.

**Morphing Robot and Its Biomedical Applications** (Fall 2019), Introduction to Biomedical Engineering

- Devised and fabricated a magnified model of a biomedically applicable morphing robot; utilized airbags, solenoid valve, and air pump to make a locomotion layer, as well as deformable clay controlled by servo motor for a transformation layer, demonstrating strong mobility and ability to avoid obstacles on its way.

**Autonomous Robot Car based on Ultrasonic and Visual Sensors** (Fall 2018), Robotics

- Designed and fabricated an self-driving robot car with camera, ultrasonic sensor, and Raspberry Pi ; utilized image processing technique to perform lane departure detection with automatic recovery and traffic sign recognition; utilized ultrasonic sensor to detect and avoid obstacles.

## Honors

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- **Best Paper Award** in 33rd IPPR Conference on Computer Vision, Graphics, and Image Processing (CVGIP), "Camera Relocalization Using Deep Learning Method", Chinese Image Processing and Pattern Recognition (IPPR) Society, Taiwan, 2020.
- **3rd Place** in Propeller-Powered Racing Vehicles Competition, "Formula Air: Propeller-Powered Racing Vehicles", College of Engineering at National Taiwan University, Taiwan, 2019.
- **Kobe University Funds** for Summer Program in Japanese Language and Culture, Kobe University, Japan, 2019.
- **JASSO Scholarship** for Nagoya University Short-Term Japanese Language Program (NUSTEP), Japan Student Services Organization, Japan, 2018.

## Area of Knowledge & Skills

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- **Programming Language:** C/C++, Python, MATLAB, SQL, HTML, LATEX
- **Software and Tool:** ROS, Gazebo, OpenCV, PyTorch, LATEX, Git, AutoCAD, Inventor
- **Hardware:** Raspberry Pi, Arduino
- **Language Proficiency:** Mandarin (Native), English (Fluent), Japanese (Fluent)