

Cho-Ying Wu

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RESEARCH INTERESTS

Computer Vision, Image Processing, Statistical Machine Learning, Optimization, Compressive Sensing Theory

EDUCATION

M.S., Grad. Instit. of Communication Eng., National Taiwan University Aug. 2015 – Jun. 2017

- GPA: 4.00/4.00 (4.30/4.30), ranked 1st out of 121 students
- Courses: Data Science, Computer Vision, Time-frequency Analysis and Wavelet Transform, Advanced Digital Signal Processing, Digital Visual Effects, Patent Opposition and Infringement, Numerical Linear Algebra, Special Topics in Data Analytics and Modeling
- Thesis: “Sparse and low-rank model for occluded face recognition and nonconvex optimization”

B.S., Depart. of Electrical Eng., National Taiwan University Sept. 2011 – Jun. 2015

Double-major in Sch. of Laws, group of Judicial Administration

- GPA: 3.73/4.00 (3.78/4.30) (excluding law school courses: 3.77/4.00 (3.83/4.30))
- Selected Courses: Data Structure and Programming, Digital Speech and Processing, Probability and Statistics, Signal and Systems

RESEARCH EXPERIENCE

Digital Image and Signal Processing Laboratory (DISP Lab), National Taiwan University,

Advisor: Prof. Jian-Jiun, Ding, Aug. 2015 – Jun. 2017

- **Occluded face recognition using sparse representation [1]**
 - Proposed occlusion pattern dictionary for sparse representation based classification.
 - Proposed different occlusion patterns, such as stripe, facial traits, and occlusion detection-based pattern.
 - Completed occluded face recognition under large area occlusion comparable to state-of-the-art methods.
- **Occluded face recognition with sparse and low-rank modeling under image gradient direction domain [2]**
 - Proposed hierarchical sparse and low-rank model to occluded face recognition.
 - Used proposed generalized image gradient direction domain.
 - Used hierarchical adaptive weight on the sparse part of the proposed model.
 - Revealed the robustness of ADMM optimization to weak low-rankness problem.
 - Had the best recognition accuracy compared to stated-of-the-art methods including CNNs.
- **Nonconvex surrogate for rank function with low-rank modeling [3]**
 - Proposed novel linear piecewise-typed nonconvex surrogate for rank function.
 - Attained minimum image recovery error with least computational time compared with state-of-the-art

surrogate function.

- **Nonconvex approach on sparse and low-rank model with dual momentum [4]**
 - Proposed nonconvex approach on two well-known sparse and low-rank models as RPCA and LRR.
 - Proposed momentum trick on dual variable under the ADMM framework.
 - Proposed full theoretical convergence analysis of nonconvex approach on RPCA and LRR with dual momentum trick.
 - Conducted extensive experiments including signal recovery, image denoising, robust spectral clustering.
 - Had the best performance compared with other RPCA and LRR-based methods.
- **Subpixel rendering on 2-channel panel in Cooperation with Raydium Semiconductor**
 - Controlled color fringing with Chinese characters.
 - Corrected color fringing and position displacement on the display of color grid.

The Multimedia Processing and Communications Laboratory, National Taiwan University,

Advisor: Prof. Homer Chen, Feb. 2014 – Jun. 2014

- **Study on the Lightfield image deblurring and denoising**
 - Implemented several algorithms for image deblurring and denoising.

PUBLICATIONS

- [1] **C. Y. Wu** and J. J. Ding, "Occlusion pattern-based dictionary for robust face recognition," *IEEE International Conference on Multimedia and Expo*, Seattle, USA, Jul. 2016.
- [2] **C. Y. Wu** and J. J. Ding, "Occluded face recognition using low-rank regression with generalized gradient direction," **recently accepted to Pattern Recognition, Elsevier.**
- [3] **C. Y. Wu** and J. J. Ding, "A fast nonconvex regularizer for low-rank matrix completion," *IEEE Asia-Pacific Signal and Information Processing Association (APSIPA)*, Dec. 2017.
- [4] **C. Y. Wu** and J. J. Ding, "Nonconvex approach for sparse and low-rank constrained models with dual momentum," under main review of *IEEE Trans. Signal Processing*.

HONORS AND SCHOLARSHIPS

- **Rank 1st in the Grad. Inst. Communication Engineering, NTU (Fall 2015 – Summer 2017)**
 - Ranked 1st in my master's program based on my GPA each semester.
- **Honor Student Member of the Phi Tau Phi Scholastic Honor Society of the Republic of China, 2017**
 - Awarded for excellent academic performance.
 - Only one student is selected from all graduating students in Grad. Inst. Communication Engineering in the year for this honor.
- **Chinese Inst. of Electrical Engineering Young Author Best Thesis Award, Second Prize, Oct. 2017**
 - Best and most renowned Master's thesis award on Electrical Engineering in Taiwan.
- **Graduate Student Scholarship, NTU (2016 – 2017)**
 - Top 30% of students per semester are selected for this award in the Grad. Inst. Communication Engineering.
- **Student Travel Grant for ICME 2016, sponsored by Ministry of Science and Technology, R.O.C**

- **Long-Term Scholarship for Talented Students from Taipower Instit. (2012 – 2017)**
 - Scholarship provided each semester for children of employees with excellent academic performance.

STANDARDIZED TEST SCORE

- **TOEFL, taken on Sept. 17, 2017**
 - Total: 102 (Reading: 28 / Listening: 26 / Speaking: 22 / Writing: 26)
- **GRE, taken on Nov. 5, 2017**
 - Verbal: 162 (Percentile: 91)
 - Quantitative: 170 (Percentile: 97)
 - Analytical Writing: 3.5
 - Total: 332 / AWA: 3.5

WORKING AND TEACHING EXPERIENCE

- **Teaching Assistant** Sept. 2016 – Jun. 2017
 - Differential Equation, National Taiwan University, Fall 2016
 - ✓ Taught and summarizing the core concepts of class.
 - ✓ Helped grade the exams and homework.
 - Advanced Digital Signal Processing, National Taiwan University, Spring 2017
 - ✓ Answered questions on class materials during TA office hours.
 - ✓ Helped grade the exams and homework.
- **Civil Service, Longdu Junior High School, Kaoshiung City, Taiwan** Jul. 2017 – present
 - Assisting school administration.
 - Teaching condensed classes to help students prepare for the admission examination.
- **Short-Term Engineering Assistant, Inst. for Information Industry, Taipei** Sept. 2015 – Nov. 2015
 - Assisted with projects:
 - ✓ Image Retrieval: taking pictures of goods to search for similar objects on the Internet.
 - ✓ Foot arch recognition using a depth camera with cushions.

RELATED SKILL

- Programming skill: C/C++, Matlab, Python, Java, JavaScript, PHP, R, MySQL
- Tools and Libraries: Caffe, TensorFlow, Weka, Hadoop, Spark

RELATED EXPERIENCE

- **Course Projects**
 - Analysis and Prediction of the Main Factors of Western American Traveling
 - Stochastic Process with Time Frequency Analysis
 - Made Zombie Movie Clip with 3D Model Introduction and Scene Match Move
 - Face Detection with Complexion Color and Face Contour
 - Filter-Controlling Image Deblurring and Denoising
 - Social Network Service Webpage: non-Facebook

- **Studying Groups**
 - Statistical Machine Learning held by Prof. I-Hsiang Wang, Fall 2016
- **Tutorial Reports**
 - Introduction to sparsity and statistical machine learning, Fall 2015
 - Parameter estimation of multivariate normal and multivariate exponential distributions, Fall 2016
 - Reviews and talks on ICME 2016 – covering visual intelligence quest, high efficiency coding, and graph signal processing for image compression and soft-decoding, Fall 2016
 - Boosting and linear classifiers interpreted based on VC-dimension, Fall 2016
 - Sparse and low-rank model with nonconvex nonsmooth relaxation for high dimensional data analysis, Spring 2017
- **Conference Attendance**
 - IEEE International Conference on Multimedia and Expo, Seattle, USA, Jul. 2016

OTHER PROFICIENCIES

- **Qualified the Higher Examination of Attorney, Dec. 2016**
 - Qualification rate: less than 10% every year
 - People who pass this test are licensed to be an attorney in Taiwan.
- **Qualified the Japanese Language Proficiency Test N1 level, Dec. 2013**
 - Top level of Japanese Language Proficiency Test
 - Able to succeed after only three and half months of self-study.

EXTRACURRICULAR ACTIVITIES

- Tour guide for senior high students in Taipei: Part-time, Sept. 2015 - Feb. 2017
- 24th National Taiwan University International Business Camp, Jan. 2014
- 19th National Taiwan University ArtFest, dancer and actor of “A Rosy Country,” May 2013
- 25th National Taiwan University Pop Dance Club, member of Information Section, Sept. 2013 – May 2014
- Tutoring in Math and Science, Oct. 2013 – Jun. 2015

REFERENCES

- Prof. Jian-Jiun Ding, Professor, National Taiwan University Graduate Institute Communication Engineering, jjding@ntu.edu.tw
- Prof. Soo-Chang Pei, Distinguished Professor, National Taiwan University Graduate Institute Communication Engineering, peisc@ntu.edu.tw
- Prof. Yung-Yu Chunag, Professor and Chairman, National Taiwan University Computer Science and Information Engineering, cyu@csie.ntu.edu.tw
- Prof. Biing-Hwang Juang, Professor, Georgia Institute of Technology School of Electrical & Computer Engineering juang@ece.gatech.edu
- Prof. Jing-Ming Guo, Distinguished Professor and Vice Dean, National Taiwan University of Science and Technology College of Electrical Engineering and Computer Science, jmguo@seed.net.tw