

# XIAOWEI HU

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## EDUCATION

<b>The Chinese University of Hong Kong (CUHK)</b> Ph.D. in Computer Science and Engineering Advisor: Prof. Pheng-Ann Heng & Prof. Chi-Wing Fu	08/2016 - 07/2020
<b>South China University of Technology (SCUT)</b> B.Eng. in Computer Science and Technology GPA: 3.95/4.0 ( <b>rank 1<sup>st</sup></b> in All-English-Teaching Union Class) ★ Selected by SCUT for a special class for the most promising students	09/2012 - 07/2016

## RESEARCH INTERESTS

My research interests cover **computer vision** and **deep learning**, with special emphasis on **low-level vision**. Specifically, I am dedicated to designing learning frameworks by exploring the physical properties of various vision applications, including shadow image analysis, rain removal, and saliency detection. I am also interested in exploring robust learning algorithms with less human supervision for image recognition and restoration, which helps to improve scene understanding and enhance camera capability.

## HONORS AND AWARDS

Hong Kong Ph.D. Fellowship (the <b>highest</b> scholarship for students studying in Hong Kong)	2016 - 2020
CVPR Doctoral Consortium Award (31 awardees <b>globally</b> )	2020
Best Oral Presentation Award of Hong Kong Computer Vision Workshop (the <b>only</b> winner)	2019
ICCV Outstanding Reviewer Award (top <b>3.6%</b> )	2019
Excellent Teaching Assistant at CSE Department, CUHK	2018
Top 10 Outstanding Students at SCUT ( <b>rank 1<sup>st</sup></b> , the <b>highest</b> award for students at SCUT)	2016
Gold Award of Pan-Pearl-River-Delta University IT Project Competition in China	2016
Google Excellence Scholarship (one of 58 winners in <b>China</b> )	2015
Tencent Outstanding Scholarship (the <b>only</b> undergraduate winner at SCUT)	2015
National Scholarship (the <b>highest</b> national wide scholarship for undergraduate students in China)	2013
First Prize of Adolescents Science & Technology Innovation Contest in Hebei Province	2011

## PUBLICATION HIGHLIGHTS

**Summary: TPAMI/CVPR/ICCV/ECCV (7), IEEE Transactions (9).**

### Refereed Conference Papers

- [C1] *Instance Shadow Detection*  
Tianyu Wang\*, **Xiaowei Hu**\*, Qiong Wang, Pheng-Ann Heng, and Chi-Wing Fu. (\*joint 1<sup>st</sup> authors)  
IEEE Conference on Computer Vision and Pattern Recognition (**CVPR**), 2020.
- [C2] *GrabAR: Occlusion-aware Grabbing Virtual Objects in AR*  
Xiao Tang, **Xiaowei Hu**, Chi-Wing Fu, and Daniel Cohen-Or.  
ACM Symposium on User Interface Software and Technology (**UIST**), 2020.
- [C3] *Mask-ShadowGAN: Learning to Remove Shadows from Unpaired Data*  
**Xiaowei Hu**, Yitong Jiang, Chi-Wing Fu, and Pheng-Ann Heng.  
IEEE International Conference on Computer Vision (**ICCV**), 2019.
- [C4] *Deep Multi-Model Fusion for Single-Image Dehazing*  
Zijun Deng, Lei Zhu, **Xiaowei Hu**, Chi-Wing Fu, Xuemiao Xu, Qing Zhang, Jing Qin, and Pheng-Ann Heng.  
IEEE International Conference on Computer Vision (**ICCV**), 2019.
- [C5] *Depth-Attentional Features for Single-Image Rain Removal*  
**Xiaowei Hu**, Chi-Wing Fu, Lei Zhu, and Pheng-Ann Heng.  
IEEE Conference on Computer Vision and Pattern Recognition (**CVPR**), 2019.
- [C6] *Probabilistic Multilayer Regularization Network for Unsupervised 3D Brain Image Registration*  
Lihao Liu, **Xiaowei Hu**, Lei Zhu, and Pheng-Ann Heng.  
International Conference on Medical Image Computing and Computer Assisted Intervention (**MICCAI**), 2019.

- [C7] *Enhancing Augmented VR Interaction via Egocentric Scene Analysis*  
Yang Tian, Chi-Wing Fu, Shengdong Zhao, Ruihui Li, Xiao Tang, **Xiaowei Hu**, and Pheng-Ann Heng.  
Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies (**Ubicomp**), 2019.
- [C8] *Direction-Aware Spatial Context Features for Shadow Detection*  
**Xiaowei Hu**, Lei Zhu, Chi-Wing Fu, Jing Qin, and Pheng-Ann Heng.  
IEEE Conference on Computer Vision and Pattern Recognition (**CVPR**), 2018. (**Oral**)
- [C9] *Recurrently Aggregating Deep Features for Salient Object Detection*  
**Xiaowei Hu**, Lei Zhu, Jing Qin, Chi-Wing Fu, and Pheng-Ann Heng.  
AAAI Conference on Artificial Intelligence (**AAAI**), 2018. (**Spotlight**)
- [C10] *R<sup>3</sup>Net: Recurrent Residual Refinement Network for Saliency Detection*  
Zijun Deng\*, **Xiaowei Hu**\*, Lei Zhu, Xuemiao Xu, Jing Qin, Guoqiang Han, and Pheng-Ann Heng. (\*joint 1<sup>st</sup> authors)  
International Joint Conference on Artificial Intelligence (**IJCAI**), 2018. (**Oral**)
- [C11] *Bidirectional Feature Pyramid Network with Recurrent Attention Residual Modules for Shadow Detection*  
Lei Zhu, Zijun Deng, **Xiaowei Hu**, Chi-Wing Fu, Xuemiao Xu, Jing Qin, and Pheng-Ann Heng.  
European Conference on Computer Vision (**ECCV**), 2018.
- [C12] *Deep Attentional Features for Prostate Segmentation in Ultrasound*  
Yi Wang, Zijun Deng, **Xiaowei Hu**, Lei Zhu, Xin Yang, Xuemiao Xu, Pheng-Ann Heng, and Dong Ni.  
International Conference on Medical Image Computing and Computer Assisted Intervention (**MICCAI**), 2018.

## Refereed Journal Papers

- [J1] *SAC-Net: Spatial Attenuation Context for Salient Object Detection*  
**Xiaowei Hu**, Chi-Wing Fu, Lei Zhu, Tianyu Wang, and Pheng-Ann Heng.  
IEEE Transactions on Circuits and Systems for Video Technology (**TCSVT**, IF: 4.133), 2020.
- [J2] *Saliency-Aware Texture Smoothing*  
Lei Zhu\*, **Xiaowei Hu**\*, Chi-Wing Fu, Jing Qin, and Pheng-Ann Heng. (\*joint 1<sup>st</sup> authors)  
IEEE Transactions on Visualization and Computer Graphics (**TVCG**, IF: 4.558), 2020.
- [J3]  *$\Psi$ -Net: Stacking Densely Convolutional LSTMs for Sub-cortical Brain Structure Segmentation*  
Lihao Liu\*, **Xiaowei Hu**\*, Lei Zhu, Chi-Wing Fu, Jing Qin, and Pheng-Ann Heng. (\*joint 1<sup>st</sup> authors)  
IEEE Transactions on Medical Imaging (**TMI**, IF: 6.685), 2020.
- [J4] *CANet: Cross-disease Attention Network for Joint Diabetic Retinopathy and Diabetic Macular Edema Grading*  
Xiaomeng Li, **Xiaowei Hu**, Lequan Yu, Lei Zhu, Chi-Wing Fu, and Pheng-Ann Heng.  
IEEE Transactions on Medical Imaging (**TMI**, IF: 6.685), 2020.
- [J5] *SALMNet: A Structure-Aware Lane Marking Detection Network*  
Xuemiao Xu, Tianfei Yu, **Xiaowei Hu**, Wing W. Y. Ng, Pheng-Ann Heng.  
IEEE Transactions on Intelligent Transportation Systems (**TITS**, IF: 6.319), 2020.
- [J6] *Direction-Aware Spatial Context Features for Shadow Detection and Removal*  
**Xiaowei Hu**, Chi-Wing Fu, Lei Zhu, Jing Qin, and Pheng-Ann Heng.  
IEEE Transactions on Pattern Analysis and Machine Intelligence (**TPAMI**, IF: 17.861), 2019.
- [J7] *SINet: A Scale-Insensitive Convolutional Neural Network for Fast Vehicle Detection*  
**Xiaowei Hu**, Xuemiao Xu, Yongjie Xiao, Hao Chen, Shengfeng He, Jing Qin, and Pheng-Ann Heng.  
IEEE Transactions on Intelligent Transportation Systems (**TITS**, IF: 6.319), 2019.
- [J8] *Deep Attentive Features for Prostate Segmentation in 3D Transrectal Ultrasound*  
Yi Wang, Haoran Dou, **Xiaowei Hu**, Lei Zhu, Xin Yang, Ming Xu, et al.  
IEEE Transactions on Medical Imaging (**TMI**, IF: 6.685), 2019.
- [J9] *Aggregating Attentional Dilated Features for Salient Object Detection*  
Lei Zhu, Jiaying Chen, **Xiaowei Hu**, Chi-Wing Fu, Xuemiao Xu, Jing Qin, and Pheng-Ann Heng.  
IEEE Transactions on Circuits and Systems for Video Technology (**TCSVT**, IF: 4.133), 2019.
- [J10] *CATARACTS: Challenge on Automatic Tool Annotation for cataRACT Surgery*  
Hassan Al Hajj, Mathieu Lamard, Pierre-Henri Conze, Soumali Roychowdhury, **Xiaowei Hu**, et al.  
Medical Image Analysis (**MedIA**, IF: 11.148), 2019.

## Papers under Review

- [U1] *Revisiting Shadow Detection: A New Benchmark Dataset for Complex World*  
**Xiaowei Hu**, Tianyu Wang, Chi-Wing Fu, Yitong Jiang, Qiong Wang, and Pheng-Ann Heng.  
Submitted to IEEE Transactions on Image Processing (**TIP**, IF: 9.340).

- [U2] *Single-Image Real-Time Rain Removal Based on Depth-Guided Non-Local Features*  
**Xiaowei Hu**, Lei Zhu, Tianyu Wang, Chi-Wing Fu, and Pheng-Ann Heng.  
 Submitted to IEEE Transactions on Image Processing (**TIP**, IF: 9.340).
- [U3] *Rotation-Oriented Collaborative Self-Supervised Feature Learning for Fundus Disease Diagnosis*  
 Xiaomeng Li, **Xiaowei Hu**, Xiaojuan Qi, Lequan Yu, Pheng-Ann Heng, and Lei Xing.  
 Submitted to Medical Image Analysis (**MedIA**, IF: 11.148).
- [U4] *Recurrent Residual Refinement Network for Saliency Detection*  
 Zijun Deng, Lei Zhu, **Xiaowei Hu**, Xuemiao Xu, Jing Qin, Guoqiang Han, and Pheng-Ann Heng.  
 Submitted to IEEE Transactions on Circuits and Systems for Video Technology (**TCSVT**, IF: 4.133).
- [U5] *Learning Gated Global Residual for Single-Image Rain Streak Removal*  
 Lei Zhu, Zijun Deng, **Xiaowei Hu**, Xuemiao Xu, Jing Qin, and Pheng-Ann Heng.  
 Submitted to IEEE Transactions on Circuits and Systems for Video Technology (**TCSVT**, IF: 4.133).
- [U6] *Dually Guided Non-Local Network for Breast Lesion Segmentation in Ultrasound*  
 Cheng Xue, Lei Zhu, Yunzhu Wu, **Xiaowei Hu**, Xiaomeng Li, Hai Zhang, and Pheng-Ann Heng.  
 Submitted to Medical Image Analysis (**MedIA**, IF: 11.148).

## WORK EXPERIENCE

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- Research Intern, The Chinese University of Hong Kong** 06/2015 - 08/2015  
 Advisor: Prof. Pheng-Ann Heng  
 Worked on the deep learning techniques for vehicle detection.
- Research Intern, Hong Kong Baptist University** 08/2014  
 ★ Selected by the outstanding undergraduate research opportunity program  
 Advisor: Prof. Yiu-Wing Leung & Doc. Hai Liu  
 Worked on the fault-tolerant algorithms for cognitive radio networks.
- Undergraduate Research Assistant, South China University of Technology** 01/2013 - 07/2016  
 Advisor: Prof. Xuemiao Xu  
 Led a team and worked on the intelligent transportation system (authorized three Chinese invention patents).

## TEACHING AND SUPERVISION

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- Teaching Assistant at CUHK**
- ◇ Advanced Topics in Computer Graphics and Visualization (Excellent Teaching Assistant) Spring 2018
  - ◇ Digital Logic and Systems Fall 2016-2018
  - ◇ Linear Algebra and Vector Calculus for Engineers Spring 2017
- Supervision**
- ◇ Supervise junior Ph.D. (Tianyu Wang and Xiao Tang), M.Phil. (Zijun Deng, Lihao Liu, and Tianfei Yu), and undergraduate (Yitong Jiang) students to publish research papers on top-tier conferences and journals.

## PROFESSIONAL ACTIVITIES

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### Invited Talks

- ◇ Peng Cheng Laboratory Overseas Young Scientist Forum, “Shadow Detection and Removal with Deep Learning” July 2020
- ◇ Talk at Shantou University, “Deep Learning for Shadow Detection and Removal” December 2019
- ◇ Hong Kong Computer Vision Workshop, “Mask-ShadowGAN: Learning to Remove Shadows from Unpaired Data” (Best Oral Presentation Award) October 2019
- ◇ AI Massive Open Online Course, “Direction-Aware Spatial Context Features for Shadow Detection” July 2018

### Conference Reviews

- ◇ ECCV’20, CVPR’20, AAAI’20, PG’20, MICCAI’20, ICCV’19 (Outstanding Reviewer), CVPR’19, MICCAI’19.

### Journal Reviews

- ◇ IJCV, IEEE TIP, IEEE TMM, IEEE TITS, IEEE TMI, IEEE TCSVT, Neurocomputing, IEEE Access, etc.