Wenhan LUO, Ph.D.

CONTACT
INFORMATION

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WORKING
EXPERIENCE

Tencent   **Shenzhen, China**
- Applied Scientist   Mar, 2020 – Present

Amazon   **Palo Alto, CA, USA**
- Research Scientist   Jul, 2019 – Jan, 2020

Tencent AI Lab   **Shenzhen, China**
- Senior Researcher   Aug, 2016 – May, 2019

IBM Research Lab (China)   **Beijing, China**
- Intern   Dec, 2015 – Jul, 2016

Microsoft Research Asia (MSRA)   **Beijing, China**
- Intern   Feb, 2015 – Jun, 2015

Sogou. Inc   **Beijing, China**
- Intern   Jun, 2011 – Sep, 2011

EDUCATION

Imperial College London   **London, UK**
- Ph.D. in Computer Science   Oct, 2012 – Jun, 2016

Institute of Automation, Chinese Academy of Sciences   **Beijing, China**
- M.E. in Control Theory and Control Engineering   Sep, 2009 – Jul, 2012

Huazhong University of Science and Technology   **Wuhan, China**
- B.E. in Automation   Sep, 2005 – Jul, 2009

PUBLICATIONS

(† indicates intern working with me, * indicates equal contribution)

1. T. Wang, X. Zhang, R. Jiang, L. Zhao, H. Chen, **W. Luo**, Video Deblurring via Spatiotemporal Pyramid Network and Adversarial Gradient Prior, *Computer Vision and Image Understanding (CVIU)*, 2020.

2. Z. Ren†, **W. Luo**, J. Yan, X. Yang, A. Yuille, H. Zha, STFlow: Self-Taught Optical Flow Estimation Using Pseudo Labels, *IEEE Trans. on Image Processing (**TIP**)*, 2020.

3. T. Liu†, **W. Luo**, L. Ma, J. Huang, T. Stathaki, T. Dai, Coupled Network for Robust Pedestrian Detection with Gated Multi-Layer Feature Extraction and Deformable Occlusion Handling, *IEEE Trans. on Image Processing (**TIP**)*, 2020.

4. K. Zhang†, **W. Luo**, B. Stenger, W. Ren, L. Ma, H. Li, Every Moment Matters: Detail-Aware Networks to Bring a Blurry Image Alive, *The 28th ACM International Conference on Multimedia (**ACM MM**)*, 2020.

5. K. Zhang†, **W. Luo**, W. Ren, J. Wang, F. Zhao, L. Ma, H. Li, Beyond Monocular Deraining: Stereo Image Deraining via Semantic Understanding, *European Conference on Computer Vision (**ECCV**)*, UK, 2020.

6. Z. Zhou†, **W. Luo**, Q. Wang, J. Xing, W. Hu, Distractor-Aware Discrimination Learning for Online Multiple Object Tracking, Pattern Recognition, 2020.

7. K. Zhang†, **W. Luo**, Y. Zhong, L. Ma, B. Stenger, W. Liu, H. Li, Deblurring by Realistic Blurring, *Proc. of IEEE Conf. on Computer Vision and Pattern Recognition (**CVPR**)*, USA, 2020. (**Oral Presentation**)

8. W. Xiong, Y. He, Y. Zhang, **W. Luo**, L. Ma, J. Luo, Fine-grained Image-to-Image Transformation towards Visual Recognition, *Proc. of IEEE Conf. on Computer Vision and Pattern Recognition (**CVPR**)*, USA, 2020.

9. F. Zhong†, P. Sun, **W. Luo**, T. Yan, Y. Wang, AD-VAT+: An Asymmetric Dueling mechanism for learning and understanding Visual Active Tracking, *IEEE Trans. on Pattern Analysis and Machine Intelligence (**TPAMI**)*, 2019.

10. Z. Liu†, **W. Luo**, B. Wu, X. Yang, W. Liu, K-T. Cheng, Bi-Real Net: Binarizing Deep Network Towards Real-Network Performance, *International Journal of Computer Vision (**IJCV**)*, 2019.

11. W. Liu†, Z. Piao, J. Min, **W. Luo**, L. Ma, S. Gao, Liquid Warping GAN: A Unified Framework for Human Motion Imitation, Appearance Transfer and Novel View Synthesis, *Proc. of International Conference on Computer Vision (**ICCV**)*, Korea, 2019.

12. Z. Chen†, L. Ma, **W. Luo**, K.-Y. K. Wong, Weakly-Supervised Spatio-Temporally Grounding Natural Sentence in Video, *The 57th Annual Meeting of the Association for Computational Linguistics (**ACL**)*, Italy, 2019.

13. X. Yang*, **W. Luo***, L. Bao, Y. Gao, D. Gong, S. Zheng, Z. Li, W. Liu, Face Anti-Spoofing: Model Matters, So Does Data, *Proc. of IEEE Conf. on Computer Vision and Pattern Recognition (**CVPR**)*, USA, 2019.

14. K. Zhang†, **W. Luo**, L. Ma, W. Liu, H. Li, Learning Joint Gait Representation via Quintuplet Loss Minimization, *Proc. of IEEE Conf. on Computer Vision and Pattern Recognition (**CVPR**)*, USA, 2019. (**Oral Presentation**)

15. J. Wan†, **W. Luo**, B. Wu, A. Chan, W Liu, Residual Regression with Semantic Prior for Crowd Counting, *Proc. of IEEE Conf. on Computer Vision and Pattern Recognition (**CVPR**)*, USA, 2019.

16. K. Tang†, H. Zhang, B. Wu, **W. Luo**, W. Liu, Learning to Compose Dynamic Tree Structures for Visual Contexts, *Proc. of IEEE Conf. on Computer Vision and Pattern Recognition (**CVPR**)*, USA, 2019. (**Oral Presentation, Best Paper Finalist**)

17. N. Li, Y. Zhang, L. Zhu, **W. Luo**, S. Kwong, Reinforcement Learning Based Coding Unit Early Termination Algorithm for High Efficiency Video Coding, *Journal of Visual Communication and Image Representation*, 2019.

18. **W. Luo***, P. Sun*, F. Zhong*, W. Liu, T. Zhang and Y. Wang, End-to-end Active Object Tracking and Its Real-world Deployment via Reinforcement Learning, *IEEE Trans. on Pattern Analysis and Machine Intelligence (**TPAMI**)*, 2019.

19. F. Zhong†, P. Sun, **W. Luo**, T. Yan, Y. Wang, AD-VAT: An Asymmetric Dueling mechanism for learning Visual Active Tracking, *International Conference on Learning Representations (**ICLR**)*, 2019.

20. K. Zhang†, **W. Luo**, L. Ma, H. Li, Cousin Network Guided Sketch Recognition via Latent Attribute Warehouse, *Proc. of the Association for the Advancement of Artificial Intelligence (**AAAI**)*, 2019. (**Spotlight Presentation**)

21. **W. Luo**, B. Stenger, X. Zhao, T-K. Kim, Trajectories as Topics: Multi-Object Tracking by Topic Discovery, *IEEE Trans. on Image Processing (**TIP**)*, 2019.

22. K. Zhang†, **W. Luo**, Y. Zhong, L. Ma, W. Liu, H. Li, Adversarial Spatio-Temporal Learning for Video Deblurring, *IEEE Trans. on Image Processing (**TIP**)*, 2019.

23. F. Zhong†, P. Sun, **W. Luo**, T. Yan, Y. Wang, AD-VAT: An Asymmetric Dueling mechanism for learning Visual Active Tracking, *Neural Information Processing Systems (**NIPS**), workshop on Deep Reinforcement Learning*, 2018.

24. Z. Liu†, B. Wu, **W. Luo**, X. Yang, W. Liu, K-T. Cheng, Bi-Real Net: Enhancing the Performance of 1-bit CNNs with Improved Representational Capability and Advanced Training Algorithm, *European Conference on Computer Vision (**ECCV**)*, Germany, 2018.

25. **W. Luo***, P. Sun*, F. Zhong, W. Liu, T. Zhang and Y. Wang, End-to-end Active Object Tracking via Reinforcement Learning, *International Conference on Machine Learning (**ICML**)*, Sweden, 2018.

26. W. Xiong†, **W. Luo**, L. Ma, W. Liu and J. Luo, Learning to Generate Time-Lapse Videos Using Multi-Stage Dynamic Generative Adversarial Networks. *IEEE*

*Conference on Computer Vision and Pattern Recognition (**CVPR**)*, 2018.

27. H. Huang†, H. Wang, **W. Luo**, L. Ma, W. Jiang, X. Zhu, Z. Li, W. Liu, Real-Time Neural Style Transfer for Videos. *IEEE Conference on Computer Vision and Pattern Recognition (**CVPR**)*, 2017.

28. N. Li, Y. Zhang, **W. Luo**, N. Guo, Instant Coherent Group Motion Filtering by Group Motion Representations, *Neurocomputing*, 2017

29. **W. Luo**, B. Stenger, X. Zhao, T-K. Kim. Automatic Topic Discovery for Multi-object Tracking. *Proc. of the Association for the Advancement of Artificial Intelligence (**AAAI**)*, 2015. (**Oral Presentation**)

30. **W. Luo**, T-K. Kim, B. Stenger, X. Zhao, R. Cipolla. Bi-label Propagation for Generic Multiple Object Tracking. *IEEE Conference on Computer Vision and Pattern Recognition (**CVPR**)*, 2014.

31. X. Zhao, T-K. Kim, **W. Luo**. Unified Face Analysis by Iterative Multi-Output Random Forests. *IEEE Conference on Computer Vision and Pattern Recognition (**CVPR**)*, 2014.

32. **W. Luo**, T-K. Kim. Generic Object Crowd Tracking by Multi-Task Learning. *British Machine Vision Conference (BMVC)*, 2013.

33. W. Hu, X. Zhou, W. Li, **W. Luo**, X. Zhang, S. Maybank. Active Contour-Based Visual Tracking by Integrating Colors, Shapes and Motions. *IEEE Trans. on Image Processing (**TIP**)*, 2013.

34. W. Hu, X. Li, **W. Luo**, X. Zhang, S. Maybank, Z. Zhang. Single and Multiple Object Tracking Using Log-Euclidean Riemannian Subspace and Block-Division Appearance Model. *IEEE Trans. on Pattern Analysis and Machine Intelligence (**TPAMI**)*, 2012.

35. **W. Luo**, X. Li, W. Li, W. Hu. Robust Visual Tracking via Transfer Learning. *IEEE International Conference on Image Processing (ICIP)*, 2011.

36. **W. Luo**, X. Zhang, Y. Liu, X. Li, W. Hu, W. Li. Efficient Block-division Model for Robust Multiple Object Tracking. *IEEE International Conference on Acoustics,Speech, and Signal Processing (ICASSP)*, 2011.

37. X. Zhang, **W. Luo**, L. Zhao, W. Li, W. Hu. Semantic Shape Similarity Based Contour Tracking Evaluation. *Optical Engineering*, vol. 50, no. 10, pp. 107003-107003, 2011.

38. W. Li, X. Zhang, **W. Luo**, W. Hu, H. Ling, O. Wu. Robust Object Tracking with Boosted Discriminative Model via Graph Embedding. *International Workshop on Visual Surveillance (VS)*, pp. 1666-1672, 2011.

39. W. Li, X. Zhang, N. Xie, W. Hu, **W. Luo**, H. Ling. Probabilistic Index Histogram for Robust Object Tracking. *International Workshop on Visual Surveillance (VS)*, pp. 184-194, 2011.

PREPRINT

1. W. Liu†, Z. Piao, Z. Tu, **W. Luo**, L. Ma, S. Gao, Liquid Warping GAN with Attention: A Unified Framework for Human Image Synthesis, *arXiv:2011.09055*, 2020.

2. Z. Chen†, L. Ma, **W. Luo**, P. Tang, K.-Y. K. Wong, Look Closer to Ground Better: Weakly-Supervised Temporal Grounding of Sentence in Video, arXiv: 2001.09308, 2020.

3. **W. Luo**, J. Xing, A. Milan, X. Zhang, W. Liu, X. Zhao, and T-K. Kim, Multiple Object Tracking: A Literature Review, arXiv:1409.7618, 2017.

PROJECTS

OCR for Game Videos   **Mar, 2020 − Present**
- Task: to develop the OCR technologuy for the usage of understanding game videos
- Role: tech leader
- Design the feasible technology path of knowledge distill from a teacher network specialized for common knowledge, develop technologies for text correction to provide

better ground truth
- The OCR model outperforms the counterparts in Tencent for the application of game videos

Material (image/video) Understanding in User Growth   **Mar, 2020 – Oct, 2020**
- Task: to label material, produce advertisement videos/images, review advertisement videos/images, and develop the relevant technologies such as OCR (see above)
- Role: tech leader
- position analysis, smart cropping, video highlight detection, construct label system, label material videos/images, review
- Serve our game and Tencent APP advertisement well.

Visual Attention Guided Semantic Product Search   **Jul, 2019 – Jan, 2020**
- Task: to improve the semantic relevance between user query and Amazon goods
- Role: project owner
- Model design, model development and evaluation
- The model demonstrates improvements in terms of MRR and NDCG

Salient Face Anti-spoof   **Feb, 2018 – Mar, 2019**
- Task: to develop algorithm for salient face anti-spoof (face liveness detection without user cooperation), and deploy it to Tencent products
- Role: project leader
- Data plan, preparation & clean, model modification, model speedup
- 99% positive pass rate, and nearly 100% rejection rate of negative samples. In real-world products, success rate of engine call is improved from 50% to 70%, success rate of user call is improved from 85% to 90%

Active Tracking   **Mar, 2017 – May, 2018**
- Task: to control a camera to follow a target
- Role: project joint leader
- Tracking algorithms, reward function design, Unreal environment development
- ICML paper entitled "End-to-end Active Object Tracking via Reinforcement Learning", deployment to a TurtleBot robot

Portrait Segmentation   **Jan, 2017 – Feb, 2017**
- Task: to segment person from an image, paste it to a template
- Role: project leader
- Model adaptation, data collection, result refinement
- An event H5 page, PV 370K+, usage 53K+

Video Style Transfer   **Sep, 2016 – Apr, 2017**
- Task: to develop style transfer algorithm for real-time video style transfer, and deploy it to Tencent products
- Role: core algorithm developer
- Data preparation & clean, the first version algorithm, model compression
- CVPR paper entitled "Real-Time Neural Style Transfer for Videos", deployment to Mobile QQ

Industrial Defect Detection   **Feb, 2016 – Jun, 2016**
- Goal: to develop real-time algorithms for detecting defect of industrial equipments, and deliver to clients
- Role: core algorithm developer
- Prototype algorithm development and debug

- Recall rate of common defect types is 95%, deliver to Foxconn for quality control of iPhone product

PROFESSIONAL SERVICE	**Journal Guest Editor** - Computer Vision and Image Understanding (CVIU) **Senior Program Committee** - International Joint Conference on Artificial Intelligence (IJCAI) 2021 **Program Committee**

Journal Guest Editor
- Computer Vision and Image Understanding (CVIU)

Senior Program Committee
- International Joint Conference on Artificial Intelligence (IJCAI) 2021

Program Committee
- The workshop of Vision Meets Drones 2019: A Challenge in conjunction with ICCV2019.
- The 2nd Workshop and Challenge on Target Re-identification and Multi-Target Multi-Camera Tracking in conjunction with CVPR2019.
- The 4th BMTT MOT Challenge Workshop in conjunction with CVPR2019
- The 33rd AAAI Conference on Artificial Intelligence (AAAI 2019)
- International Conference on Internet Multimedia Computing and Service (ICIMCS) 2018
- The workshop of Correspondence Problem in Computer Vision and Pattern Recognition in conjunction with ICPR2018
- The workshop of Vision Meets Drone: A Challenge in conjunction with ECCV2018
- The First Joint BMPP-PETS Workshop on Tracking and Surveillance in conjunction with CVPR2017
- The workshop Benchmarking Multi-Target Tracking: MOTChallenge in conjunction with ECCV2016

Journal Reviewer
- International Journal of Computer Vision
- IEEE Transactions on Image Processing
- IEEE Transactions on Neural Networks and Learning System
- IEEE Transactions on Multimedia
- IEEE Transactions on Circuits and Systems for Video Technology
- Neurocomputing
- Pattern Recognition
- Pattern Recognition Letters

Conference Reviewer
- International Conference on Machine Learning (ICML)
- Annual Conference on Neural Information Processing Systems (NIPS)
- IEEE Conference on Computer Vision and Pattern Recognition (CVPR)
- Annual Conference of the Association for Computational Linguistics (ACL)
- European Conference on Computer Vision (ECCV)
- International Conference on Computer Vision (ICCV)
- AAAI Conference on Artificial Intelligence (AAAI)
- International Joint Conference on Artificial Intelligence (IJCAI)
- Conference of the North American Chapter of the Association for Computational Linguistics (NAACL)
- British Machine Vision Conference (BMVC)
- ACM International Conference on Multimedia (ACM MM)
- Winter Conference on Applications of Computer Vision (WACV)
- Asian Conference on Computer Vision (ACCV)

TALKS
- Southern University of Science and Technology (SUSTech), hosted by Prof. Xiaoying Tang, Sep, 2020.
- The Shenzhen Institutes of Advanced Technology (SIAT), Chinese Academy of Science (CAS), hosted by Prof. Yun Zhang, Sep, 2018.
- The Institute of Automation, Chinese Academy of Science (CAS), hosted by Prof.

Weiming Hu, Aug, 2018.
- International Conference on Machine Learning (ICML), Stockholm, Sweden. Oral, July, 2018.
- Graduate School of Shenzhen, Tsinghua University, hosted by Prof. Yujiu Yang, June, 2018.
- Association for the Advancement of Artificial Intelligence (AAAI), Austin, TX, USA. Oral, 2015.

PATENTS
- Target Tracking Method, Apparatus and Electron Equipment. **W. Luo**. Chinese Patent. CN107392937A, 2017.
- Image Processing Method and Device. X. Zhu, Y. Zheng, H. Wang, K. Huang, **W. Luo**, Y. Gao, Z. Yang, Y. Hua, Y. Zeng, F. Wu, X. Huang. Chinese Patent. CN107025457A, 2017.
- Image Tracking Method Based on Sequential Particle Swarm Optimization. X. Zhang, **W. Luo**, W. Hu. Chinese Patent. CN102194234A, 2011.
- Appearance Block-based Occlusion Handling Method. W. Hu, **W. Luo**. Chinese Patent. CN201010244948.3, 2010.

AWARDS AND HONORS
- Peacock Talents (level C), Shenzhen Government, Jan, 2017.
- Excellent Student of Graduate University of Chinese Academy of Sciences. Jul, 2012.
- Third Prize in the Seventh National Post-Graduate Mathematical Contest in Modeling. Dec, 2010.
- Excellent Student of Graduate University of Chinese Academy of Sciences. Jul, 2010.
- Second Prize in the south China of the third Smart Car Competition sponsored by Freescale. Jul, 2008.
- National Encouragement Scholarship, Ministry of Education,P.R. China. (top **4%**). Nov, 2007.
- National Scholarship, Ministry of Education, P.R. China. (top **2%**). Oct, 2005.

COMPUTER SKILLS
Familiar with Python, experiences with C/C++, knowledge of data structure and algorithm, technical skills in HTML and some software engineering

THESIS
W. Luo, Generic Multiple Object Tracking, Dept. of Electrical and Electronic Engineering, Imperial College London, 2016.

LANGUAGE
Mandarin (mother tongue)
English (strong at reading and writing, good at listening, fluent in speaking)
German (elementary knowledge)