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Research Interests

- Interpretable and Universal Representation Learning in vision and NLP
- Parsimonious and Emergent Representation Learning in vision and NLP
- Deep Compositional Grammar Networks in vision and NLP
- Learning to *ALTER* (Ask, Learn, Test, Explain and Refine) in robot autonomy

Education

2011.11 Ph.D. in Statistics **University of California, Los Angeles (UCLA)**
Advisor: Professor Song-Chun Zhu
Dissertation title: *Integration and Goal-guided Scheduling of Bottom-up and Top-Down Computing Processes in Hierarchical Models*

Professional Appointments

Assistant Professor,	Department of ECE, NC State University,	2016.08 - Present
Research Assistant Professor,	Department of Statistics, UCLA,	2014.07 - 2016.06
Assistant Adjunct Professor,	Department of Statistics, UCLA,	2014.07 - 2016.16
Postdoctoral Researcher,	Department of Statistics, UCLA,	2012.02 - 2014.06
Graduate Research Assistant,	Department of Statistics, UCLA,	2008.09 - 2011.11
Research Assistant,	Lotus Hill Research Institute (LHI), China,	2005.11 - 2008.08
Graduate Research Assistant,	Institute of Intelligent Machines, Chinese Academy of Science,	2003.09 - 2005.05
Graduate Research Assistant,	Hefei University of Technology (HFUT), China,	2002.08 - 2005.04

Funding

- (Sole PI) NSF IIS-1909644: *Neural Architecture Search with Deep Compositional Grammatical Structures*, \$448,637.00 2019.08 - 2022.07
- (Sole PI) ARO Award W911NF1810295: *Learning Deep AND-OR Grammar Networks for Object Tracking, Detection and Parsing: a Unified Framework*, \$449,845.00 2018.07 - 2021.06
- (PI) ARO DURIP W911NF1810209: *Building a GPU Computational Infrastructure Platform for Heterogeneous Big Data Analysis and Understanding*, \$200,362.00 2018.05 - 2019.04
- (PI) DoD SBIR/STTR 2018.1 Phase I, AF18A-T014: *HASLOC: Hierarchical And-Or Structures for Localization and Object Recognition*, \$51,672.00 (Subcontract from IAI) 2018.09 - 2019.05
- (PI) DoD SBIR/STTR 2018.1 Phase II, AF18A-T014: *HASLOC: Hierarchical And-Or Structures for Localization and Object Recognition*, \$235,536.00 (Subcontract from IAI) 2019.06 - 2021.05
- (PI) Salesforce Inaugural Deep Learning Research Grant: *Learning Deep Grammar Networks for Visual Question Answering*, \$49,996.00 2019.01 - 2019.12
- (Co-PI) NSF IIS-1822477: *Leverage Augmented Reality for Safety Education in the Logistics Industry*, \$749,542.00 (Professor Xu Xu is the PI) 2018.09 - 2021.08
- (Co-PI) DARPA SIMPLEX Award: *Learning Homogeneous Knowledge Representation from Heterogeneous Data for Quantitative and Qualitative Reasoning in Autonomy*, \$5,230,000 (Professor Song-Chun Zhu is the PI) 2015.03- 2016.07

Publications

Preprints

1. Xilai Li, Wei Sun and Tianfu Wu , “Attentive Normalization”, CoRR, abs/1905.10695, 2019
2. Zekun Zhang and Tianfu Wu , “Adversarial Distillation for Ordered Top-k Attacks”, CoRR, abs/1905.10695, 2019
3. Zeyuan Chen, Shaoliang Nie, Tianfu Wu and Christopher G. Healey, “High Resolution Face Completion with Multiple Controllable Attributes via Fully End-to-End Progressive Generative Adversarial Networks”, CoRR, abs/1801.07632. 2018.
4. Bo Li, Tianfu Wu^{*}, Lun Zhang and Rufeng Chu, “Auto-Context R-CNN”, CoRR, abs/1807.02842, 2018 (* Corresponding author)
5. Bo Li, Tianfu Wu^{*}, Shuai Shao, Lun Zhang and Rufeng Chu, “Object Detection via End-to-End Integration of Aspect Ratio and Context Aware Part-based Models and Fully Convolutional Networks”, arXiv 1612.00534. (* Corresponding author)
6. Hang Qi^{*}, Tianfu Wu^{*}, Mu wai Lee and Song-Chun Zhu, “A Restricted Visual Turing Test for Deep Scene and Event Understanding”, arXiv 1512.01715. (* Equal Contribution)

Journal

1. Zhao Xie, [Tianfu Wu](#) , Xingming Yang, Luming Zhang and Kewei Wu, “Jointly social grouping and identification in visual dynamics with causality-induced hierarchical Bayesian model”, *J. Visual Communication and Image Representation*, 59 , pp. 6275, 2019. ([h5-index: 44](#))
2. Khashayar Asadi, Pengyu Chen, Kevin Han, [Tianfu Wu](#) and Edgar Lobaton, “LNSNet: Lightweight Navigable Space Segmentation for Autonomous Robots on Construction Sites”, *Data*, 4 (1), pp. 40, 2019.
3. [Tianfu Wu](#) , Yang Lu and Song-Chun Zhu, “Online Object Tracking, Learning, and Parsing with And-Or Graphs”, *IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI)*, vol. 39, no.12, p. 2465–2480, 2017. (arXiv 1509.08067, short version appeared in CVPR2014). ([h5-index: 127](#))
4. [Tianfu Wu*](#) , Bo Li* and Song-Chun Zhu, “Learning And-Or Models to Represent Context and Occlusion for Car Detection”, *IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI)* vol.38, no.9, p.1829-1843, 2016 (arXiv 1501.07359, short versions appeared in ICCV2013 and ECCV2014, * Equal Contribution). ([h5-index: 127](#))
5. [Tianfu Wu](#) and Song-Chun Zhu, “Learning Near-Optimal Cost-Sensitive Decision Policies for Object Detection”, *IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI)*, vol.37, no.5, p.1013-1027, 2015. ([h5-index: 127](#))
6. [Tianfu Wu](#) and Song-Chun Zhu, “A Numerical Study of Bottom-up and Top-down Inference Processes in And-Or Graphs”, *International Journal of Computer Vision (IJCV)*, vol.93, no.2, p.226-252, 2011. ([h5-index: 66](#))
7. Adrian Barbu, [Tianfu Wu](#) and Ying Nian Wu, “Learning Mixtures of Bernoulli Templates by Two-Round EM with Performance Guarantee”, *Electronic Journal of Statistics (EJS)*, vol.8, no.2, p.30043030, 2014.
8. Jun Zhu, [Tianfu Wu*](#) , Song-Chun Zhu, Xiaokang Yang and Wenjun Zhang, “A Reconfigurable Tangram Model for Scene Representation and Categorization”, *IEEE Transactions on Image Processing (TIP)*, vol.25, no.1, p.150-166, 2016 (*Corresponding author). ([h5-index: 102](#))
9. Bo Li, Xi Song, [Tianfu Wu*](#) , Wenzhe Hu and Mingtao Pei, “Coupling-and-Decoupling: A Hierarchical Model for Occlusion-Free Object Detection”, *Pattern Recognition (PR)*, vol.47, no.10, p.3254-3264, 2014. (*Corresponding author) ([h5-index: 79](#))
10. Liang Lin, [Tianfu Wu](#) , Jake Porway and Zijian Xu, “A Stochastic Graph Grammar for Compositional Object Representation and Recognition”, *Pattern Recognition (PR)*, vol.42, no.7, p.1297-1307, 2009. ([h5-index: 79](#))
11. Cheng-Chi Yu, Yong-Jin Liu, [Tianfu Wu](#) , Kai-Yun Li and Xiaolan Fu, “A global energy optimization framework for 2.1D sketch extraction from monocular images”, *Graphical Models*, vo.76, no.5, p.507-521, 2014. ([Impact Factor: 0.967](#))
12. Anlong Ming, [Tianfu Wu](#) , Jianxiang Ma, Fang Sun and Yu Zhou, “Monocular Depth Ordering Reasoning with Occlusion Edge Detection and Couple Layers Inference”, *IEEE Intelligent Systems*, vol.31, no.2, p.54-65, 2015 (Accepted) ([Impact Factor: 1.920](#))

Conference (Peer Reviewed)

1. Tianfu Wu and Xi Song, “Towards Interpretable Object Detection by Unfolding Latent Structures”, *International Conference on Computer Vision (ICCV)*, 2019 ([h5-index: 129](#))
2. Wei Sun and Tianfu Wu, “Image Synthesis from Reconfigurable Layout and Style”, *International Conference on Computer Vision (ICCV)*, 2019 ([h5-index: 129](#))
3. Xilai Li, Xi Song and Tianfu Wu, “AOGNets: Compositional Grammatical Architectures for Deep Learning”, *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, 2019 ([h5-index: 240](#))
4. Nan Xue, Song Bai, Fudong Wang, Gui-Song Xia, Tianfu Wu and Liangpei Zhang, “Learning Attraction Field Representation for Robust Line Segment Detection”, *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, 2019 ([h5-index: 240](#))
5. Xilai Li, Yingbo Zhou, Tianfu Wu, Richard Socher and Caiming Xiong, “Learn to Grow: A Continual Structure Learning Framework for Overcoming Catastrophic Forgetting”, *International Conference on Machine Learning (ICML)*, 2019
6. Wei Sun, Jawadul Bappy, Shanglin Yang, Yi Xu, Tianfu Wu and Hui Zhou, “Pose Guided Fashion Image Synthesis Using Deep Generative Model”, *The fourth international workshop on fashion and KDD*, 2019
7. Hang Qi, Yuanlu Xu, Tao Yuan, Tianfu Wu and Song-Chun Zhu, “Joint Parsing of Cross-view Scenes with Spatio-temporal Semantic Parse Graphs”, *AAAI Conference on Artificial Intelligence (AAAI)*, 2018
8. Bo Li, Caiming Xiong, Tianfu Wu, Yu Zhou, Lun Zhang and Rufeng Chu, “Neural Abstract Style Transfer for Chinese Traditional Painting”, *Asian Conference on Computer Vision (ACCV)*, 2018
9. Sameera Lanka and Tianfu Wu, “ARCHER: Aggressive Rewards to Counter bias in Hindsight Experience Replay”, *NeurIPS 2018 Deep RL workshop*, 2018
10. Bo Zhao, Botong Wu, Tianfu Wu and Yizhou Wang, “Zero-shot learning posed as a missing data problem”, *Proceedings of ICCV Workshop*, 2616-2622, 2017.
11. Yunzhu Li, Benyuan Sun, Tianfu Wu, and Yizhou Wang, “Face Detection with End-to-End Integration of a ConvNet and a 3D Model”, In *European Conference on Computer Vision (ECCV)*, 2016. ([h5-index: 137](#))
12. Bo Li, Tianfu Wu, Caiming Xiong and Song-Chun Zhu, “Recognizing Car Fluents from Videos”, In *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, 2016. (Oral) ([h5-index: 240](#))
13. Bo Li, Tianfu Wu* and Song-Chun Zhu, “Integrating Context and Occlusion for Car Detection by Hierarchical And-Or Model”, In *European Conference on Computer Vision (ECCV)*, 2014 (Oral presentation, *Corresponding author) ([h5-index: 137](#))
14. Yang Lu, Tianfu Wu* and Song-Chun Zhu, “Online Object Tracking, Learning and Parsing with And-Or Graphs”, In *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, 2014. (*Corresponding author) ([h5-index: 240](#))
15. Tianfu Wu and Song-Chun Zhu, “Learning Near-Optimal Cost-Sensitive Decision Policies for Object Detection”, In *International Conference on Computer Vision (ICCV)*, 2013. ([h5-index: 129](#))

16. Bo Li, Wenze Hu, Tianfu Wu* and Song-Chun Zhu, “Modeling Occlusion by Discriminative AND-OR Structures”, In *International Conference on Computer Vision (ICCV)*, 2013. (*Corresponding author) ([h5-index: 129](#))
17. Xi Song, Tianfu Wu*, Yunde Jia and Song-Chun Zhu, “Discriminatively Trained And-Or Tree Models for Object Detection”, In *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, 2013. (*Corresponding author) ([h5-index: 240](#))
18. Dengxin Dai, Tianfu Wu and Song-Chun Zhu, “Discovering Scene Categories by Information Projection and Cluster Sampling”, In *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, 2010. ([h5-index: 240](#))
19. Xiong Yang, Tianfu Wu and Song-Chun Zhu, “Evaluating Information Contributions of Bottom-up and Top-down Processes”, In *International Conference on Computer Vision (ICCV)*, 2009. ([h5-index: 129](#))
20. Jin-Li Suo, Tianfu Wu, Song-Chun Zhu, Shiguang Shan, Xilin Chen and Wen Gao, “Design Sparse Features for Age Estimation using Hierarchical Face Model”, In *IEEE International Conference on Automatic Face and Gesture Recognition (FG)*, 2008.
21. Tianfu Wu, Guisong Xia and Song-Chun Zhu, “Compositional Boosting for Computing Hierarchical Image Structures”, In *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, 2007. ([h5-index: 240](#))
22. Jun Zhu, Tianfu Wu, Song-Chun Zhu, Xiaokang Yang and Wenjun Zhang, “Learning Reconfigurable Scene Representation by Tangram Model”, In *IEEE Workshop on the Applications of Computer Vision (WACV)*, 2012.
23. Bo Li, Tianfu Wu, Wenze Hu and Mingtao Pei, “Coupling-and-Decoupling: A Hierarchical Model for Occlusion-Free Car Detection”, In *Asian Conference on Computer Vision (ACCV)*, 2012.
24. Yi Xie, Mingtao Pei, Zhao Liu and Tianfu Wu, “Tracking Pedestrian with Multi-Component Online Deformable Part-Based Model”, In *Asian Conference on Computer Vision (ACCV)*, 2012
25. Peng Lei, Tianfu Wu and Mingtao Pei, “Robust Tracking by Accounting for Hard Negatives Explicitly”, In *International Conference on Pattern Recognition (ICPR)*, 2012 (Oral)
26. Linjie Zhang, Haifeng Gong, Tianfu Wu and Junyu Dong “Deformable Template Combining Alignable and Non-alignable Sketches”, In *International Conference on Pattern Recognition (ICPR)*, 2008.
27. Hongwei Li, Liang Lin, Tianfu Wu, Xiaobai Liu and Lanfang Dong, Object-of-interest Extraction by Integrating Stochastic Inference with Learnt Active Shape Sketch, In *International Conference on Pattern Recognition (ICPR)*, 2008
28. Ruxin Gao, Tianfu Wu, Nong Sang, and Song-Chun Zhu, “Bayesian Inference for Layer Representation with Mixed Markov Random Field”, *International Conference on Energy Minimization Methods in Computer Vision and Pattern Recognition (EMMCVPR)*, 2007.
29. Tianfu Wu, Jun Gao and Qin Zhao “A Computational Model of Object-based Visual Selective Attention Mechanism in Visual Information Acquisition”, *International Conference of Information Acquisition*, 2004.

30. Qin Zhao, Jun Gao, Tianfu Wu and Lu lu, The Grey Theory and the Preliminary Probe into Information Acquisition Technology, In *International Conference of Information Acquisition*, June, 2004
31. Tianfu Wu, Jun Gao and Ronggui Wang, SR Order Selection Filter and Its Application in Image Zooming-in, In *The 13th National Conference on Neural Network*, 2003. (Best paper nomination, Chinese version)

Talks

1. From Statistical Modeling and Computing to Communicative Learning
 - Joint Statistical Meeting (JSM), 2016.07 (invited talk)
 - Department of ECE Colloquium, NCSU, 2016.04
 - Joint Seminar of Department of Statistics and Department of Communication Studies, UCLA, 2016.04
2. Learning Near-Optimal Cost-Sensitive Decision Policies for Fast Inference
 - Department of Statistics Seminar, UCLA, 2015.01
3. Learning to compute faster: bottom-up and top-down inference processes and near-optimal cost-sensitive decision policy
 - Academia Sinica, Taiwan, 2014.09
 - National Cheng Kung University, Taiwan, 2014.09
4. Learning Hierarchical and Compositional Models and Fast Inference Algorithms for Object Detection and Tracking
 - Center for Imaging Science, JHU, 2014.04

Tutorial

(**Full day tutorial**): Short Course on Search and Planning for Inference and Learning (SPIL) in Computer Vision (*in conjunction with CVPR 2015 and co-organized with Professor Iasonas Kokkinos and Professor Sinisa Todorovic*), 2015.06

Demo

Visual Turing Testing for Deep Scene and Event Understanding, CVPR2016, 2016.06

Code

<https://github.com/ivmcl> and <https://github.com/tfwu>

Honors and Awards

ICCV2015 Outstanding Reviewer Award	2015
UCLA Chancellor Fellowship	2008- 2009
UCLA Fellowship	2008- 2009
HFUT Exceptional Graduate	2005
AnHui Province Exceptional Student	1999
USTC Exceptional Student	1999

Teaching Experience

Instructor,	ECE763 <i>Computer Vision: Models, Learning and Inference (including Deep Learning)</i> , NCSU	Spring 2018 - Now
Instructor,	ECE558 <i>Digital Imaging System</i> , NCSU	Fall 2017 - Now
Instructor,	ECE592-064 <i>Digital Image Processing and Introduction to Computer Vision</i> , NCSU	Spring, 2017
Instructor,	ECE592-062/CE592-002 <i>Design of a Robotic Computer Vision System for Autonomous Navigation (joint course)</i> , NCSU	Spring, 2017 / 2018
Instructor,	Stat 232B - CS266B: <i>Statistical Computing and Inference in Vision and Image Science</i> , UCLA	Spring, 2016
Instructor,	Stat 232B - CS266B: <i>Statistical Computing and Inference in Vision and Image Science</i> , UCLA	Spring, 2015
Instructor,	Stat 100B: <i>Introduction to Mathematical Statistics</i> , UCLA	Winter, 2015
Teaching Assistant,	Stat 100A: <i>Introduction to Probability Theory</i> , UCLA (Lecturer: Professor Kerchau Li)	Spring 2010
Teaching Assistant,	Stat 100B: <i>Introduction to Mathematical Statistics</i> , UCLA (Lecturer: Dr. Juana Sanchezn)	Winter 2010
Teaching Assistant,	Stat 13: <i>Introduction to Statistical Methods for the Life and Health Sciences</i> , UCLA (Lecturer: Professor Mark H. Hansen)	Winter 2009
Teaching Assistant,	Stat 100A: <i>Introduction to Probability Theory</i> , UCLA (Lecturer: Professor Ying Nian Wu)	Spring 2009
Teaching Assistant,	<i>Introduction to Neural Network</i> , HFUT (Lecturer: Professor Jun Gao)	Fall 2004

Professional Services

Associate Editor

J. Image and Vision Computing

Journal Reviewer

IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI)

International Journal of Computer Vision (IJCV)

Electronic Journal of Statistics (EJS)

IEEE Transactions on Image Processing (TIP)

Pattern Recognition (PR)

Computer Vision and Image Understanding (CVIU)

Machine Vision and Applications

IEEE Transactions on Circuits and Systems for Video Technology (TCSVT)

Conference Reviewer

European Conference on Computer Vision (ECCV)

IEEE Conference on Computer Vision and Pattern Recognition (CVPR)

International Conference on Computer Vision (ICCV)

IEEE Conference on Computer Vision and Pattern Recognition (CVPR)

Asian Conference on Computer Vision (ACCV)

References

Available upon request.