

# Tianfu (Matt) Wu

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## Research Interests

- Learning interpretability-sensitive models for computer vision and robot Autonomy.
- Pursuing a unified framework for machines to ALTER (Ask, Learn, Test, Explain, and Refine) recursively in a principled Way.

Topics of interest include, but not limited to,

- Computer Vision, Pattern Analysis, Machine Learning
- Statistical Learning, Machine Learning, Big Data,
- Statistical Inference, Sequential Hypothesis Testing, Decision Policy
- Statistical Theory, Performance Guarantee

## Education

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|---------|--|--|
| 2011.11 | Ph.D. in Statistics<br>Advisor:<br>Dissertation title: | <b>University of California, Los Angeles (UCLA)</b><br>Professor Song-Chun Zhu<br><i>Integration and Goal-guided Scheduling of Bottom-up and Top-Down Computing Processes in Hierarchical Models</i> |
| 2005.06 | M.S. in Computer Science,<br>Advisor:<br>Thesis title: | <b>Hefei University of Technology (HFUT), China</b><br>Professor Jun Gao<br><i>A Computational Model of Visual Selective Attention Mechanism and Its Application in Object Recognition</i>           |
| 1999.07 | Associate Degree in EEIS                               | <b>University of Science and Technology of China (USTC)</b>  |

## Professional Appointments

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

## Funding

(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- 2018.07)

## Publications

### Manuscript

1. 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)
2. Diqi Chen, Yizhou Wang, [Tianfu Wu](#) and Wen Gao, “Recurrent Attentional Model for No-Reference Image Quality Assessment”, arXiv 1612.03530.
3. Bo Zhao, Botong Wu, [Tianfu Wu](#) and Yizhou Wang, “Zero-Shot Learning via Revealing Data Distribution”, arXiv 1612.00560.
4. 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

IEEE TPAMI and IJCV have among the highest ISI impact factors across all computer science categories. TPAMI is one of the top ranked publication in IEEE and in all computer science journals.

1. [Tianfu Wu](#), Yang Lu and Song-Chun Zhu, “Online Object Tracking, Learning, and Parsing with Generic and Specific And-Or Graphs”, *IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI)*(Accepted), 2016. (arXiv 1509.08067, short version appeared in CVPR2014). ([Impact Factor: 5.694](#))
2. [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). ([Impact Factor: 5.694](#))
3. [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. ([Impact Factor: 5.694](#))
4. [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. ([Impact Factor: 3.533](#))
5. 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. ([Impact Factor: 0.79](#))
6. 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). ([Impact Factor: 3.111](#))
7. Bo Li, Xi Song, [Tianfu Wu\\*](#), Wenze 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) ([Impact Factor: 2.584](#))
  8. 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. ([Impact Factor: 2.584](#))
  9. 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](#))
  10. 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*, 2015 (Accepted) ([Impact Factor: 1.920](#))

### Conference (Peer Reviewed)

In computer vision, the top three conferences (CVPR, ICCV, ECCV) are considered more important and have greater impact than most SCI journals. Oral presentations have an highly competitive acceptance rate of about 4% and poster presentations about 20%. According to the recent survey of CiteScholar (<http://www.citescholar.org/index.php?c=topai>), their **impact factors are CVPR 5.97, ECCV 5.91 and ICCV 5.05** respectively, which correspond to the top 4% - 7% of all computer science journals and conferences. Note that **CVPR** is the only conference proceedings listed in the top 100 publications in Google Scholar ([http://scholar.google.com/citations?view\\_op=top\\_venues&hl=en](http://scholar.google.com/citations?view_op=top_venues&hl=en)) and is ranked No.1 in Computer Science and Electrical Engineering.

1. 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. ([Impact Factor: 5.91](#))
2. 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) ([Impact Factor: 5.97](#))
3. 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) ([Impact Factor: 5.91](#))
4. 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) ([Impact Factor: 5.97](#))
5. [Tianfu Wu](#) and Song-Chun Zhu, “Learning Near-Optimal Cost-Sensitive Decision Policies for Object Detection”, In *International Conference on Computer Vision (ICCV)*, 2013. ([Impact Factor: 5.05](#))
6. 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) ([Impact Factor: 5.05](#))

7. Xi Song, Tianfu Wu<sup>\*</sup>, 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. (<sup>\*</sup>Corresponding author) (Impact Factor: 5.97)
8. 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. (Impact Factor: 5.97)
9. 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. (Impact Factor: 5.05)
10. 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. (Impact Factor: 1.138)
11. 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. (Impact Factor: 5.97)
12. 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.
13. 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.
14. 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
15. Peng Lei, Tianfu Wu and Mingtao Pei, “Robust Tracking by Accounting for Hard Negatives Explicitly”, In *International Conference on Pattern Recognition (ICPR)*, 2012 (Oral)
16. 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.
17. 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
18. 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.
19. 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.
20. 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

21. 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/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

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

## Professional Services

### 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), 2014*

*IEEE Conference on Computer Vision and Pattern Recognition (CVPR), 2015*

*International Conference on Computer Vision (ICCV), 2015*

*IEEE Conference on Computer Vision and Pattern Recognition (CVPR), 2016*

*Asian Conference on Computer Vision (ACCV), 2016*

*IEEE Conference on Computer Vision and Pattern Recognition (CVPR), 2017*

## Master Admission Review

CS Department, UCLA, 2015

## Ph.D Admission Review

CS Department, UCLA, 2016

## Programming Skills

C, C++, Python, R, Matlab, CUDA, MPI, OpenMP

## References

Available upon request.