

# Tianmin Shu

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CONTACT INFORMATION	Massachusetts Institute of Technology Building 46-4053 77 Massachusetts Avenue Cambridge, MA 02139	Phone: (310) 948-5180 E-mail: tshu@mit.edu Website: <a href="https://www.tshu.io">https://www.tshu.io</a>
EMPLOYMENT	<b>Massachusetts Institute of Technology</b> <i>Postdoc</i>	07/2019 - present <i>Advisor: Joshua B. Tenenbaum, Antonio Torralba</i>
EDUCATION	<b>University of California, Los Angeles</b> , Los Angeles, CA, USA <i>Ph.D. in Statistics</i>	09/2014 - 06/2019 <i>Advisor: Song-Chun Zhu</i>
	<b>Fudan University</b> , Shanghai, China <i>B.S. in Electronic Engineering</i>	09/2010 - 06/2014
EXPERIENCE	<b>Facebook AI Research</b> , Menlo Park, CA, USA <i>Research Intern</i>	06/2018 - 09/2018 <i>Mentor: Yuandong Tian</i>
	<b>Salesforce Research</b> , Palo Alto, CA, USA <i>Research Intern</i>	06/2017 - 09/2017 <i>Mentor: Caiming Xiong, Richard Socher</i>
PUBLICATIONS	(* indicates equal contribution)	
	<b>Preprints &amp; Under Review</b>	
	X. Gao, L. Yuan, <b>T. Shu</b> , H. Lu, and S.-C. Zhu. Show Me What You Can Do: Capability Calibration on Reachable Workspace for Human-Robot Collaboration. <i>Under review, arXiv preprint arXiv:2103.04077, 2021.</i>	
	<b>Peer-reviewed Journal Articles</b>	
	<b>T. Shu</b> , Y. Peng, S.-C. Zhu, and H. Lu. A Unified Psychological Space for Human Perception of Physical and Social Events. <i>Cognitive Psychology</i> , 128: 101398, 2021.	
	Y. Peng, H. Lee, <b>T. Shu</b> , and H. Lu. Exploring Biological Motion Perception in Two-stream Convolutional Neural Networks. <i>Vision Research</i> , 178: 28-40, 2021.	
	Z. Nan, <b>T. Shu</b> , R. Gong, S. Wang, P. Wei, S.-C. Zhu, and N. Zheng. Learning to Infer Human Attention in Daily Activities. <i>Pattern Recognition</i> , 103: 107314, 2020.	
	D. Xie, <b>T. Shu</b> , S. Todorovic, and S.-C. Zhu. Learning and Inferring “Dark Matter” and Predicting Human Intents and Trajectories in Videos. <i>IEEE Trans. on Pattern Analysis and Machine Intelligence (TPAMI)</i> , 40(7): 1639-1652, 2018.	
	<b>T. Shu*</b> , Y. Peng*, L. Fan, H. Lu, and S.-C. Zhu. Perception of Human Interaction Based on Motion Trajectories: from Aerial Videos to Decontextualized Animations. <i>Topics in Cognitive Science (TopiCS)</i> , 10(1): 225 - 241, 2018.	
	<b>Peer-reviewed Conference Papers</b>	
	R. Tejwani*, Y.-L. Kuo*, <b>T. Shu</b> , B. Katz, and A. Barbu. Social Interactions as Recursive MDPs. <i>Conference on Robot Learning (CoRL)</i> , 2021. ( <b>Acceptance rate: 156 / 400 = 38%</b> )	

**T. Shu**, A. Bhandwadar, C. Gan, K. A. Smith, S. Liu, D. Gutfreund, E. Spelke, J. B. Tenenbaum, and T. D. Ullman. AGENT: A Benchmark for Core Psychological Reasoning. *38th International Conference on Machine Learning (ICML)*, 2021. (**Acceptance rate: 1184 / 5513 = 21%**)

X. Puig, **T. Shu**, S. Li, Z. Wang, J. B. Tenenbaum, S. Fidler, and A. Torralba. Watch-And-Help: A Challenge for Social Perception and Human-AI Collaboration. *9th International Conference on Learning Representations (ICLR)*, 2021. (**Spotlight presentation, acceptance rate: 5.6%**; a short version won **Best Paper Award** at NeurIPS Cooperative AI Workshop, 2020)

A. Netanyahu\*, **T. Shu\***, B. Katz, A. Barbu, and J. B. Tenenbaum. PHASE: Physically-grounded Abstract Social Events for Machine Social Perception. *35th AAAI Conference on Artificial Intelligence (AAAI)*, 2021. (**Acceptance rate: 1692/7911=21%**; short version won **Best Paper Award** at NeurIPS Shared Visual Representations in Human and Machine Intelligence Workshop, 2020)

**T. Shu**, M. Kryven, T. D. Ullman, and J. B. Tenenbaum. Adventures in Flatland: Perceiving Social Interactions Under Physical Dynamics. *42nd Annual Meeting of the Cognitive Science Society (CogSci)*, 2020.

X. Gao\*, R. Gong\*, Y. Zhao, S. Wang, **T. Shu**, and S.-C. Zhu. Joint Mind Modeling for Explanation Generation in Complex Human-Robot Collaborative Tasks. *International Conference on Robot & Human Interactive Communication (RO-MAN)*, 2020.

H. Wang, W. Wang, **T. Shu**, W. Liang, and J. Shen. Active Visual Information Gathering for Vision-Language Navigation. *European Conference on Computer Vision (ECCV)*, 2020. (**Acceptance rate: 1360 / 5150 = 26%**)

**T. Shu**, Y. Peng, H. Lu, and S.-C. Zhu. Partitioning the Perception of Physical and Social Events Within a Unified Psychological Space. *41st Annual Meeting of the Cognitive Science Society (CogSci)*, 2019. (**Oral presentation, acceptance rate: 205/810 = 25.3%**)

**T. Shu** and Y. Tian. M<sup>3</sup>RL: Mind-aware Multi-agent Management Reinforcement Learning. *7th International Conference on Learning Representations (ICLR)*, 2019. (**Acceptance rate: 525 / 1591 = 33%**)

P. Wei, Y. Liu, **T. Shu**, N. Zheng, and S.-C. Zhu. Where and Why Are They Looking? Jointly Inferring Human Attention and Intentions in Complex Tasks. *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, 2018. (**Acceptance rate: 979/3303 = 30%**)

**T. Shu**, C. Xiong, and R. Socher. Hierarchical and Interpretable Skill Acquisition in Multi-task Reinforcement Learning. *6th International Conference on Learning Representations (ICLR)*, 2018. (**Acceptance rate: 337 / 935 = 36%**)

**T. Shu\***, Y. Peng\*, L. Fan, H. Lu, and S.-C. Zhu. Inferring Human Interaction from Motion Trajectories in Aerial Videos. *39th Annual Meeting of the Cognitive Science Society (CogSci)*, 2017. (**Oral presentation, acceptance rate: 255/873 = 29%**) **Computational Modeling Prize**

**T. Shu**, S. Todorovic, and S.-C. Zhu. CERN: Confidence-Energy Recurrent Network for Group Activity Recognition. *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, 2017. (**Acceptance rate: 783/2680 = 29%**)

**T. Shu**, X. Gao, M. S. Ryoo, and S.-C. Zhu. Learning Social Affordance Grammar from Videos: Transferring Human Interactions to Human-Robot Interactions. *IEEE International Conference on Robotics and Automation (ICRA)*, 2017. (**Acceptance rate: 939/2289=41%**)

**T. Shu\***, S. Thurman\*, D. Chen, S.-C. Zhu, and H. Lu. Critical Features of Joint Actions that Signal Human Interaction. *38th Annual Meeting of the Cognitive Science Society (CogSci)*, 2016.

**T. Shu**, M. S. Ryoo, and S.-C. Zhu. Learning Social Affordance for Human-Robot Interaction. *25th International Joint Conference on Artificial Intelligence (IJCAI)*, 2016. (**Acceptance rate: 558/2294= 24%**)

**T. Shu**, D. Xie, B. Rothrock, S. Todorovic, and S.-C. Zhu. Joint Inference of Groups, Events and Human Roles in Aerial Videos. *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, 2015. (**Oral presentation, acceptance rate: 71/2123 = 3.3%**)

#### Peer-reviewed Workshop Papers

X. Gao, R. Gong, **T. Shu**, X. Xie, S. Wang, and S.-C. Zhu. VRKitchen: an Interactive 3D Environment for Learning Real Life Cooking Tasks. *ICML Reinforcement Learning for Real Life Workshop*, 2019.

**T. Shu**, C. Xiong, Y. N. Wu, and S.-C. Zhu. Interactive Agent Modeling by Learning to Probe. *NeurIPS 2018 Deep Reinforcement Learning Workshop*, 2018.

#### Peer-reviewed Conference Posters

**T. Shu**, A. Netanyahu, M. Kryven, J. Muchovej, N. Shenoy, B. Katz, A. Barbu, T. D. Ullman, J. B. Tenenbaum. Perceiving social events in a physical world. *The Annual Meeting of the Vision Sciences Society (VSS)*, 2021.

#### SELECTED HONORS AND AWARDS

**Best Paper Award**, NeurIPS Shared Visual Representations in Human and Machine Intelligence Workshop 2020  
**Best Paper Award**, NeurIPS Cooperative AI Workshop 2020  
**Computational Modeling Prize in Perception/Action**, Cognitive Science Society 2017

#### MEDIA COVERAGE

“Can you teach AI common sense?” *VentureBeat*. July 27, 2021  
“AI can learn real-world skills from playing StarCraft and Minecraft.” *Science News*. May 14, 2019  
“VRKitchen: An interactive virtual environment to train and test AI agents.” *Tech Xplore*. Mar. 27, 2019  
“Robots taught to work alongside humans by giving high fives.” *New Scientist*. Apr. 27, 2017

#### INVITED TALKS

“Benchmarking Machine Social Intelligence.” *Sony Computer Science Laboratories, Paris*, Feb. 17, 2021  
“Perceiving Social Interactions Under Physical Dynamics.” *Virtual Computational Neuroscience (VCN) Journal Club hosted by Stanford, MIT/Harvard, and Princeton*, Nov. 18, 2020  
“A Unified Modeling of Physical and Social Events.” *The Annual Meeting of Multidisciplinary University Initiative (MURI), Edinburgh, UK*, Sep. 4, 2019  
“Towards a Better Agent Modeling for Multi-agent Reinforcement Learning.” *CLVR Speaker Series, University of Southern California*, Nov. 29, 2018  
“Social Perception on Heider-Simmel Animations.” *The Annual Meeting of Multidisciplinary Uni-*

versity Initiative (MURI), White Mountain, NH, Sep. 26, 2018

“Modeling Human Social Interactions.” *The Annual Meeting of Multidisciplinary University Initiative (MURI)*, UCLA, Aug. 23, 2017

“Inferring Human Interactions.” *3rd Vision Meets Cognition Workshop in Conjunction with CVPR 2017*, Honolulu, HI, Jul. 21, 2017

PROFESSIONAL  
SERVICE

**Conference Reviewer:**

- CVPR (2017-2021)
- ICCV (2017, 2019, 2021)
- ECCV (2018, 2020)
- ICLR (2021)
- NeurIPS (2020-2021)
- ICML (2021)
- AAAI (2019-2021)
- ICRA (2019)
- IROS (2017, 2019, 2021)
- WACV (2021)
- BMVC (2019-2020)
- ACCV (2019)
- PRCV (2019-2020)

**Journal Reviewer:**

- IEEE Transactions on Image Processing (TIP)
- IEEE Robotics and Automation Letters
- Autonomous Robotics
- Frontiers in Psychology
- Quarterly Journal of Experimental Psychology
- Computers in Industry

**Workshop Organizers & Committee:**

- ICRA 2021 Workshop on Social Intelligence in Humans and Robots
- ICLR 2021 Workshop on Embodied Multimodal Learning
- NeurIPS 2019 Workshop on Learning with Rich Experience: Integration of Learning Paradigms
- ICML 2018 Workshop on Theoretical Foundations and Applications of Deep Generative Models
- 3rd Vision Meets Cognition Workshop in Conjunction with CVPR 2017

**Department and University Services:**

- Student Reviewer, UCLA Computer Science Graduate Admission (2017-2019)
- Grad Student Consultant, the American Statistical Association (ASA) DataFest (2015)

TEACHING  
EXPERIENCE

**University of California, Los Angeles, Department of Statistics**

*STATS 232C: Cognitive Artificial Intelligence* Spring 2018  
- Teaching Assistant

*STATS 102A: Introduction to Computational Statistics with R* Fall 2017, Winter 2018  
- Teaching Assistant

*STATS 232A: Statistical Modeling and Learning in Vision and Cognition* Winter 2016  
- Teaching Assistant

*STATS 130: Getting Up to Speed with SPSS, Stata, SAS, and R* Spring 2015

- Teaching Assistant

## MENTORING

### **At MIT**

#### **Undergraduate Research:**

- Karen Chung (2021 - present; Currently UROP, MIT)
- Nakul Shenoy (2020 - present; Currently UROP, MIT)
- Annika Magaro (2020 - present; Currently UROP, MIT)
- Arpan Kaphle (2021)

### **At UCLA**

#### **Undergraduate Research:**

- Qingyi Zhao (2018; Master's in Computer Science, UCLA)
- Adam Brownell (2017 - 2018)
- Xiaofeng Gao (2016 Summer; currently Ph.D. student in Statistics at UCLA)
- Xiaopei Zhang (2015 - 2018; Master's in Electrical Engineering, UCLA)
- Peimeng Sui (2015 - 2016; Master's in Data Science, NYU)
- Zhe Ji (2015; Master's in Industrial Engineering & Operations Research, UC Berkeley)

#### **Master's Research:**

- Yixin Chen (2017 - 2018; currently Ph.D. student in Statistics at UCLA)