

# Joseph Campbell

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## Academic Appointments

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- 2024 – ···· **Assistant Professor**, Purdue University  
Department of Computer Science
- 2021 – 2024 **Postdoctoral Fellow**, Carnegie Mellon University  
Robotics Institute

## Education

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- 2016 – 2021 **Ph.D. in Computer Science**, Arizona State University  
Dissertation: *Probabilistic Imitation Learning for Spatiotemporal Human-Robot Interaction*  
Advisors: *Heni Ben Amor and Georgios Fainekos*
- 2013 – 2016 **M.S. in Computer Engineering**, Arizona State University
- 2006 – 2010 **B.S. in Computer Science**, Arizona State University

## Academic and Industry Experience

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- 2016 – 2021 **Graduate Research Associate**, Arizona State University  
Topic: *Probabilistic machine learning for physical human-robot interaction*
- 2020 **Applied Scientist Intern**, Amazon AWS AI  
Topic: *Visuomotor deep reinforcement learning for mobile robots*
- 2020 **Software Engineer Intern**, Google Brain  
Topic: *Imitation learning for social navigation with mobile robots*
- 2019 **Research Intern**, Honda Research Institute  
Topic: *Imitation learning for physical human-robot social interactions*
- 2017, 2018 **Visiting Researcher**, Osaka University  
Topic: *Robot learning for physical human-robot interaction with soft-robotics*
- 2015 **Visiting Researcher**, National University of Singapore  
Topic: *Real-time machine learning methods for traffic light detection in autonomous vehicles*
- 2014 – 2015 **Systems Engineer Intern**, Intel  
Topic: *Linux kernel driver development for prototype hardware*
- 2011 – 2014 **Software Engineer**, Garmin  
Topic: *Localization and data processing for automotive advanced driver assistance systems*
- 2009 – 2011 **Software Engineer**, WebPT  
Topic: *Back-end and front-end development for an electronic medical record application*

## Publications

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### Conference and Journal Proceedings

C.1 ENERGY-BASED TRANSFER FOR REINFORCEMENT LEARNING.

- Z. Deng, J. Ghosh, K. Xie Fiona Cheng, Y. Lu, K. Sycara, and **J. Campbell**. *CoLLAs*. 2026.
- C . 2 POSESHIELD: NEURAL COLLISION FIELDS FOR HUMAN SELF-COLLISION RESOLUTION.  
Z. Li, Z. Deng, Y. Shen, L. Gui, M. Xie, **J. Campbell**, X. Gao, K. Wu, Z. Pan, and A. Bera. *ECCV*. 2026.
- C . 3 CDE: CONCEPT-DRIVEN EXPLORATION FOR REINFORCEMENT LEARNING.  
L. Mao, A. Liu, R. Zabounidis, Y. Niu, Z. Kingston, and **J. Campbell**. *IROS*. 2026.
- C . 4 LIECRAFT: A MULTI-AGENT FRAMEWORK FOR EVALUATING DECEPTIVE CAPABILITIES IN LANGUAGE MODELS.  
M. L. Olson, N. Ratzlaff, M. Hinck, T. Nguyen, V. Lal, **J. Campbell**, S. Stepputtis, and S. Y. Tseng. *AAAI*. 2026.
- C . 5 BAYESIAN SOCIAL DEDUCTION WITH GRAPH-INFORMED LANGUAGE MODELS.  
S. Rahimirad, G. Gergerli, L. Romero, A. Qian, M. L. Olson, S. Stepputtis, and **J. Campbell**. *ACL*. 2026.
- C . 6 MODEL-AGNOSTIC POLICY EXPLANATIONS WITH LARGE LANGUAGE MODELS.  
Z. Xi-Jia, Y. Guo, S. Chen, S. Stepputtis, M. Gombolay, K. Sycara, and **J. Campbell**. *COLM*. 2025.
- C . 7 ADAPTIVE ACTION ADVISING WITH DIFFERENT REWARDS.  
Y. Guo, X. Zhang, S. Stepputtis, **J. Campbell**, and K. Sycara. *CoLLAs*. 2024.  
■ **Oral**.
- C . 8 SHAPEGRASP: ZERO-SHOT TASK-ORIENTED GRASPING WITH LARGE LANGUAGE MODELS THROUGH GEOMETRIC DECOMPOSITION.  
S. Li, S. Bhagat, **J. Campbell**, Y. Xie, W. Kim, K. Sycara, and S. Stepputtis. *IROS*. 2024.
- C . 9 NAVIGATING NOISY FEEDBACK: ENHANCING REINFORCEMENT LEARNING WITH ERROR-PRONE LANGUAGE MODELS.  
M. Lin, S. Shi, Y. Guo, B. Chalaki, V. Tadiparthi, E. M. Pari, S. Stepputtis, **J. Campbell**, and K. Sycara. *EMNLP Findings*. 2024.
- C . 10 HiKER-SGG: HIERARCHICAL KNOWLEDGE ENHANCED ROBUST SCENE GRAPH GENERATION.  
C. Zhang, S. Stepputtis, **J. Campbell**, K. Sycara, and Y. Xie. *CVPR*. 2024.
- C . 11 SAMPLE-EFFICIENT LEARNING OF NOVEL VISUAL CONCEPTS.  
S. Bhagat\*, S. Stepputtis\*, **J. Campbell**, and K. Sycara. *CoLLAs*. 2023.  
■ **Oral**.
- C . 12 INTROSPECTIVE ACTION ADVISING FOR INTERPRETABLE TRANSFER LEARNING.  
**J. Campbell**, Y. Guo, F. Xie, S. Stepputtis, and K. Sycara. *CoLLAs*. 2023.
- C . 13 LEARNING AND BLENDING ROBOT HUGGING BEHAVIORS IN TIME AND SPACE.  
M. Drolet, **J. Campbell**, and H. Ben Amor. *ICRA*. 2023.
- C . 14 EXPLAINABLE ACTION ADVISING FOR MULTI-AGENT REINFORCEMENT LEARNING.  
Y. Guo, **J. Campbell**, S. Stepputtis, R. Li, D. Hughes, F. Fang, and K. Sycara. *ICRA*. 2023.
- C . 15 A FRAMEWORK FOR INTERVENTION BASED TEAM SUPPORT IN TIME CRITICAL TASKS.  
D. Hughes, H. Li, M. Chis, I. Oguntola, S. Stepputtis, K. Zheng, **J. Campbell**, K. Sycara, and M. Lewis. *SMC*. 2023.
- C . 16 THEORY OF MIND FOR MULTI-AGENT COLLABORATION VIA LARGE LANGUAGE MODELS.  
H. Li, Y. Q. Chong, S. Stepputtis, **J. Campbell**, D. Hughes, M. Lewis, and K. Sycara. *EMNLP*. 2023.
- C . 17 ENHANCING STATE ESTIMATION IN ROBOTS: A DATA-DRIVEN APPROACH WITH DIFFERENTIABLE ENSEMBLE KALMAN FILTERS.  
X. Liu, G. Clark, **J. Campbell**, Y. Zhou, and H. Ben Amor. *IROS*. 2023.
- C . 18 CHARACTERIZING OUT-OF-DISTRIBUTION ERROR VIA OPTIMAL TRANSPORT.  
Y. Lu, Y. Qin, R. Zhai, A. Shen, K. Chen, Z. Wang, S. Kolouri, S. Stepputtis, **J. Campbell**, and K. Sycara. *NeurIPS*. 2023.

- C . 19 LONG-HORIZON DIALOGUE UNDERSTANDING FOR ROLE IDENTIFICATION IN THE GAME OF AVALON WITH LARGE LANGUAGE MODELS.  
S. Stepputtis, **J. Campbell**, Y. Xie, Z. Qi, W. S. Zhang, R. Wang, S. Rangreji, M. Lewis, and K. Sycara. *EMNLP Findings*. 2023.
- C . 20 CONCEPT LEARNING FOR INTERPRETABLE MULTI-AGENT REINFORCEMENT LEARNING.  
R. Zabounidis\*, **J. Campbell\***, S. Stepputtis, D. Hughes, and K. P. Sycara. *CoRL*. 2022.
- C . 21 LEARNING WHOLE-BODY HUMAN-ROBOT HAPTIC INTERACTION IN SOCIAL CONTEXTS.  
**J. Campbell** and K. Yamane. *ICRA*. 2020.
- C . 22 LEARNING PREDICTIVE MODELS FOR ERGONOMIC CONTROL OF PROSTHETIC DEVICES.  
G. Clark, **J. Campbell**, and H. Ben Amor. *CoRL*. 2020.
- C . 23 PREDICTIVE MODELING OF PERIODIC BEHAVIOR FOR HUMAN-ROBOT SYMBIOTIC WALKING.  
G. Clark, **J. Campbell**, S. M. R. Sorkhabadi, W. Zhang, and H. Ben Amor. *ICRA*. 2020.
- C . 24 LANGUAGE-CONDITIONED IMITATION LEARNING FOR ROBOT MANIPULATION TASKS.  
S. Stepputtis, **J. Campbell**, M. Phielipp, S. Lee, C. Baral, and H. Ben Amor. *NeurIPS*. 2020.  
📌 **Spotlight**.
- C . 25 MULTIMODAL DATASET OF HUMAN-ROBOT HUGGING INTERACTION.  
K. Bagewadi, **J. Campbell**, and H. Ben Amor. *AAAI-HRI*. 2019.
- C . 26 LEARNING INTERACTIVE BEHAVIORS FOR MUSCULOSKELETAL ROBOTS USING BAYESIAN INTERACTION PRIMITIVES.  
**J. Campbell**, A. Hitzmann, S. Stepputtis, S. Ikemoto, K. Hosoda, and H. Ben Amor. *IROS*. 2019.
- C . 27 PROBABILISTIC MULTIMODAL MODELING FOR HUMAN-ROBOT INTERACTION TASKS.  
**J. Campbell**, S. Stepputtis, and H. Ben Amor. *RSS*. 2019.
- C . 28 BAYESIAN INTERACTION PRIMITIVES: A SLAM APPROACH TO HUMAN-ROBOT INTERACTION.  
**J. Campbell** and H. Ben Amor. *CoRL*. 2017.
- C . 29 BIO-INSPIRED ROBOT DESIGN CONSIDERING LOAD-BEARING AND KINEMATIC ONTOGENY OF CHELONIOIDEA SEA TURTLES.  
A. Jansen, K. S. Luck, **J. Campbell**, H. Ben Amor, and D. M. Aukes. *Living Machines*. 2017.
- C . 30 FROM THE LAB TO THE DESERT: FAST PROTOTYPING AND LEARNING OF ROBOT LOCOMOTION.  
K. S. Luck\*, **J. Campbell\***, M. A. Jansen\*, D. M. Aukes, and H. Ben Amor. *RSS*. 2017.
- C . 31 TRAFFIC LIGHT STATUS DETECTION USING MOVEMENT PATTERNS OF VEHICLES.  
**J. Campbell**, H. Ben Amor, M. H. Ang, and G. Fainekos. *ITSC*. 2016.
- C . 32 MODELING CONCURRENCY AND RECONFIGURATION IN VEHICULAR SYSTEMS: A  $\pi$ -CALCULUS APPROACH.  
**J. Campbell**, C. E. Tuncali, P. Liu, T. P. Pavlic, U. Ozguner, and G. Fainekos. *CASE*. 2016.
- C . 33 ADAPTIVE PERFORMANCE PREDICTION FOR INTEGRATED GPUS.  
U. Gupta, **J. Campbell**, U. Y. Ogras, R. Ayoub, M. Kishinevsky, F. Paterna, and S. Gumussoy. *ICCAD*. 2016.
- C . 34 DISCoF+: ASYNCHRONOUS DISCoF WITH FLEXIBLE DECOUPLING FOR COOPERATIVE PATHFINDING IN DISTRIBUTED SYSTEMS.  
K. Kim, **J. Campbell**, W. Duong, Y. Zhang, and G. Fainekos. *CASE*. 2015.

## Journal Articles

- J . 1 HYPERADAPT: SIMPLE HIGH-RANK ADAPTATION.  
A. Gurung and **J. Campbell**. *TMLR*. 2026.
- J . 2 DISENTANGLED CONCEPT-RESIDUAL MODELS: BRIDGING THE INTERPRETABILITY-PERFORMANCE GAP FOR INCOMPLETE CONCEPT SETS.

R. Zabounidis, I. Oguntola, K. Zhao, **J. Campbell**, W. Kim, S. Stepputtis, and K. Sycara. *TMLR*. 2026.

J . 3 LET ME HELP YOU! NEURO-SYMBOLIC SHORT-CONTEXT ACTION ANTICIPATION.  
S. Bhagat, S. Li, **J. Campbell**, Y. Xie, K. Sycara, and S. Stepputtis. *RA-L*. 2024.

## Workshop Papers

- W . 1 LET ME HELP YOU! NEURO-SYMBOLIC SHORT-CONTEXT ACTION ANTICIPATION.  
S. Bhagat, S. Li, **J. Campbell**, Y. Xie, K. Sycara, and S. Stepputtis. *ICRA Workshop on Nonverbal Cues for Human-Robot Collaboration*. 2025.  
🏆 **Best Paper Award.**
- W . 2 SPARSE MIXTURE-OF-EXPERTS FOR NON-UNIFORM NOISE REDUCTION IN MRI IMAGES.  
Z. Deng and **J. Campbell**. *WACV Workshop on Image Quality*. 2025.
- W . 3 ENERGY-BASED TRANSFER FOR REINFORCEMENT LEARNING.  
Z. Deng, J. Ghosh, F. Xie, Y. Lu, K. Sycara, and **J. Campbell**. *RSS Workshop on Out-of-Distribution Generalization in Robotics*. 2025.
- W . 4 HYPERADAPT: SIMPLE HIGH-RANK ADAPTATION.  
A. Gurung and **J. Campbell**. *NeurIPS Workshop on Continual and Compatible Foundation Model Updates*. 2025.  
🏆 **Best Paper Award.**
- W . 5 SPEAKING THE LANGUAGE OF TEAMWORK: LLM-GUIDED CREDIT ASSIGNMENT IN MULTI-AGENT REINFORCEMENT LEARNING.  
M. Lin, S. Shi, Y. Guo, B. Chalaki, V. Tadiparthi, E. M. Pari, S. Stepputtis, **J. Campbell**, and K. Sycara. *NeurIPS Workshop on Aligning Reinforcement Learning Experimentalists and Theorists*. 2025.
- W . 6 BAYESIAN SOCIAL DEDUCTION WITH GRAPH-INFORMED LANGUAGE MODELS.  
S. Rahimirad, G. Gergerli, L. Romero, A. Qian, M. L. Olson, S. Stepputtis, and **J. Campbell**. *NeurIPS Workshop on Efficient Reasoning*. 2025.
- W . 7 SYMBOLIC GRAPH INFERENCE FOR COMPOUND SCENE UNDERSTANDING.  
A. Fnu, S. Stepputtis, S. Bhagat, **J. Campbell**, K. Lee, H. N. Mahjoub, and K. Sycara. *ICRA Workshop on Ontologies and Standards for Robotics and Automation*. 2024.
- W . 8 GEOMETRIC SHAPE REASONING FOR ZERO-SHOT TASK-ORIENTED GRASPING.  
S. Li, S. Bhagat, **J. Campbell**, Y. Xie, W. Kim, K. Sycara, and S. Stepputtis. *ICRA Workshop on 3D Visual Representations for Robot Manipulation*. 2024.
- W . 9 A REWARD ANALYSIS OF REINFORCEMENT LEARNING FROM LARGE LANGUAGE MODEL FEEDBACK.  
M. Lin, S. Shi, Y. Guo, B. Chalaki, V. Tadiparthi, S. Stepputtis, **J. Campbell**, and K. Sycara. *RLC Workshop on Reinforcement Learning Beyond Rewards*. 2024.
- W . 10 TRANSFER LEARNING VIA TEMPORAL CONTRASTIVE LEARNING.  
W. Zeng, **J. Campbell**, S. Stepputtis, and K. Sycara. *ICRA Workshop on Multi-Agent Dynamic Games*. 2024.
- W . 11 KNOWLEDGE-GUIDED SHORT-CONTEXT ACTION ANTICIPATION IN HUMAN-CENTRIC VIDEOS.  
S. Bhagat, S. Stepputtis, **J. Campbell**, and K. Sycara. *ICCV Workshop on AI for Creative Video Editing and Understanding*. 2023.
- W . 12 CHARACTERIZING OUT-OF-DISTRIBUTION ERROR VIA OPTIMAL TRANSPORT.  
Y. Lu, Y. Qin, R. Zhai, A. Shen, K. Chen, Z. Wang, S. Kolouri, S. Stepputtis, **J. Campbell**, and K. Sycara. *NeurIPS Workshop on Optimal Transport and Machine Learning*. 2023.
- W . 13 PREDICTING OUT-OF-DISTRIBUTION ERROR WITH CONFIDENCE OPTIMAL TRANSPORT.

- Y. Lu, Z. Wang, R. Zhai, S. Kolouri, **J. Campbell**, and K. Sycara. *ICLR Workshop on Pitfalls of Limited Data and Computation for Trustworthy ML*. 2023.
- W . 14 THEORY OF MIND AS INTRINSIC MOTIVATION FOR MULTI-AGENT REINFORCEMENT LEARNING.  
I. Oguntola, **J. Campbell**, S. Stepputtis, and K. Sycara. *ICML Workshop on Theory of Mind in Communicating Agents*. 2023.
- W . 15 HiKER-SGG: HIERARCHICAL KNOWLEDGE ENHANCED ROBUST SCENE GRAPH GENERATION.  
C. Zhang, S. Stepputtis, **J. Campbell**, K. Sycara, and Y. Xie. *NeurIPS Workshop on New Frontiers in Graph Learning*. 2023.
- W . 16 EXPLAINING AGENT BEHAVIOR WITH LARGE LANGUAGE MODELS.  
X. Zhang, Y. Guo, S. Stepputtis, K. Sycara, and **J. Campbell**. *IROS Workshop on Human Multi-Robot Interaction*. 2023.
- W . 17 IMITATION LEARNING OF ROBOT POLICIES BY COMBINING LANGUAGE, VISION AND DEMONSTRATION.  
S. Stepputtis, **J. Campbell**, M. Phielipp, C. Baral, and H. Ben Amor. *NeurIPS Workshop on Robot Learning*. 2019.
- W . 18 TOWARD MODELING CONCURRENCY AND RECONFIGURATION IN VEHICULAR SYSTEMS.  
**J. Campbell**, C. Tuncali, T. Pavlic, and G. Fainekos. *Interaction and Concurrency Experience Satellite Workshop of DisCoTec*. 2016.

## Book Chapters

- B . 1 INTRODUCTION TO MACHINE LEARNING.  
H. Kerner, **J. Campbell**, and M. Strickland. *Machine Learning for Planetary Science*. 2022.

## Preprints

- U 1 MAPL: MULTI-OBJECTIVE PREFERENCE LEARNING FOR ROBOT LOCOMOTION.  
X. Chen, M. Lin, S. Shi, and **J. Campbell**. *Preprint*. 2026.
- U 2 BI-PHASE TRAINING: LEARNING EFFICIENTLY IN HIGH DIMENSIONS.  
A. Gurung and **J. Campbell**. *Preprint*. 2026.
- U 3 SPARSE AUTOENCODERS FOR INTERPRETABLE OUT-OF-DISTRIBUTION DETECTION.  
A. Karmacharya, L. Luschwitz, L. Romero, Y. Niu, and **J. Campbell**. *Preprint*. 2026.
- U 4 SYMANT: ACTION ANTICIPATION WITH SYMBOLIC KNOWLEDGE DIFFUSION.  
A. Fnu, S. Stepputtis, Y. Xie, **J. Campbell**, W. Kim, K. Lee, H. Mahjoub, E. M. Pari, and K. Sycara. *Preprint*. 2025.
- U 5 SPEAKING THE LANGUAGE OF TEAMWORK: LLM-GUIDED CREDIT ASSIGNMENT IN MULTI-AGENT REINFORCEMENT LEARNING.  
M. Lin, S. Shi, Y. Guo, B. Chalaki, V. Tadiparthi, E. M. Pari, S. Stepputtis, **J. Campbell**, and K. Sycara. *Preprint*. 2025.

## Patents

- P . 1 SYSTEMS AND METHODS FOR RAPID-PROTOTYPED ROBOTIC DEVICE.  
D. M. Aukes, H. Ben Amor, K. Luck, M. Jansen, and **J. Campbell**. *US Patent No. 11,148,286*. 2022.
- P . 2 PHYSICAL HUMAN-ROBOT INTERACTION.  
K. Yamane and **J. Campbell**. *US Patent No. 11,440,194*. 2022.

## Honors and Awards

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- 2025 **Amazon** Research Award  
Project: *Open-World Probabilistic Theory of Mind*
- 2025 **ICRA Workshop:** Nonverbal Cues for Human-Robot Collaboration 📌 **Best Paper Award**  
**NeurIPS Workshop:** Continual and Compatible Foundation Model Updates 📌 **Best Paper Award**
- 2017 **National Science Foundation** EAPSI Fellowship  
East Asia and Pacific Summer Institutes - Japan  
Project: *Multimodal Interaction Algorithm for Human-Robot Interaction with Biologically Inspired Robots*
- 2015 **National Science Foundation** EAPSI Fellowship  
East Asia and Pacific Summer Institutes - Singapore  
Project: *Object Recognition for the Purpose of Traffic Compliance of Autonomous Vehicles*
- 2016-2020 **Arizona State University** Dean's Fellowship 📌 **Awarded to ~4% of PhD students**
- 2006-2010 **Arizona State University** Provost's Scholarship

## Invited Talks

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- 2026 **Agents That Know What They Know**  
EPFL
- 2024 **Explainable Machine Learning for Robotics**  
Columbia University  
Purdue University  
University of Colorado Boulder  
Tufts University  
Polytechnique Montréal  
University of Massachusetts Lowell
- 2024 **Human-Robot Interaction: Learning from People**  
Carnegie Mellon University: 18-867 Human-Robot Interaction  
University of Pittsburgh: INFSCI 2935 Human-Robot Interaction
- 2021 **Imitation Learning for Human-Robot Interaction**  
Waymo Research
- 2020 **Social Navigation from Human Demonstrations**  
Google Brain Robotics
- 2019 **Machine Learning and Predictive Biomechanics for Human-Robot Collaboration**  
IROS Workshop: Progress in Ergonomic Physical Human-Robot Collaboration
- 2019 **Learning Whole-Body Human-Robot Haptic Interaction**  
Honda Research Institute
- 2019 **Learning Interaction Primitives for Human-Robot Collaboration and Symbiosis**  
RSS Workshop: AI + ACR
- 2017 **Bayesian Interaction Primitives: A SLAM Approach to Human-Robot Interaction**  
Samsung Research
- 2015 **Object Recognition for the Purpose of Traffic Compliance of Autonomous Vehicles**  
National University of Singapore: NSF EAPSI Research Program

## Teaching

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CS 55700: Reinforcement Learning	Fall 2024, Fall 2025, Fall 2026
CS 24300: Artificial Intelligence Basics	Spring 2026
CS 55800: Introduction to Robot Learning	Spring 2025

## Service

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### Organizing Committees

2025 – . . . .	<b>IEEE RAS Technical Committee on Multi-Robot Systems</b> Junior Co-Chair
2023	<b>RSS Workshop</b> Articulate Robots: Utilizing Language for Robot Learning
2022	<b>IROS Workshop</b> Human Theory of Machines and Machine Theory of Mind for Human-Agent Teams

### Conference Chairing

2026	<b>NeurIPS</b> Area Chair
2025, 2026	<b>ICRA</b> Tutorials Associate Editor

### Conference and Journal Reviewing

AAAI Conference on Artificial Intelligence (AAAI)  
ACL Rolling Review (ARR)  
IEEE International Conference on Automation Science and Engineering (CASE)  
Conference on Robot Learning (CoRL)  
IEEE/CVF Computer Vision and Pattern Recognition Conference (CVPR)  
Human-Robot Interaction (HRI)  
International Conference on Learning Representations (ICLR)  
International Conference on Machine Learning (ICML)  
IEEE International Conference on Robotics and Automation (ICRA)  
IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)  
Conference on Neural Information Processing Systems (NeurIPS)  
IEEE Robotics and Automation Letters (RA-L)  
Robotics and Automation Magazine (RAM)  
Robotics: Science and Systems (RSS)  
International Journal of Social Robotics (SORO)  
IEEE Transactions on Human-Machine Systems (THMS)