

Cheng Xu

Address	No. 30, Xueyuan Rd. Haidian Dist., Beijing (China)	Website	http://xucheng.org.cn
Birth	2 February 1988 Liaoning (Chinese)	Telephone	+86 134-0116-9207
		E-mail	xucheng@ustb.edu.cn
		Citizenship	Chinese

Education

- Sept 2016 — Jan 2019* **Doctor of Philosophy (PhD)** • University of Science & Technology Beijing
Human Motion Tracking using Wearables
Thesis: Towards Human Motion Tracking: Study on Performance Evaluation and Algorithms for IMU/TOA Fusion.
- Aug 2012 — Jan 2015* **Master of Science (MSc)** • University of Science & Technology Beijing
TOA Channel Modeling
Thesis: Height Dependent TOA Ranging Error Model For Near Ground Localization Applications.
- Sept 2008 — Jun 2012* **Bachelor of Science (BSc)** • University of Science & Technology Beijing
Wireless Localization using TOA
Thesis: Design and Development of Android-based Computing Engine for Indoor Geolocation system.

Employment & Social Activities

- May 2019 — Now* **Associate Professor** • University of Science & Technology Beijing
My research focuses on the use of statistical inference and cooperative computing methods that allow swarm robots to perform complex tasks collaboratively and intelligently in uncertainty environments.
- May 2019 — Now* **Associate Editor** • International Journal of Wireless Information Networks
Helping the Editor in Chief with submitted articles processing and organize special issues for wireless sensor networks.

Awards & Honours

- 2019* **China National Postdoctoral Program for Innovative Talents** • Ministry of Human Resources and Social Security
I obtained a talent funding program focusing on the research of *Collaborative Localization and Navigation for Emergency Rescue in Blind Environments*.
- 2021* **CWSN2021 Outstanding Paper Award** • China Computer Federation (CCF)
My paper, Reward-Filtering-based Credit Assignment for Multi-agent Deep Reinforcement Learning, was honored by the China Computer Federation (CCF) for the Outstanding Paper Award in the 15th China Conference on Internet of Things (Wireless Sensor Network). My work introduces a credit assignment algorithm based on reward filtering, integrating Bayesian filtering with reinforcement learning methods. We propose a multi-agent deep reinforcement learning framework based on reward filtering (RFMADRL) and validate it successfully in the cooperative navigation environment provided by Open AI.

- 2019 **Excellent Doctoral Dissertation** • University of Science & Technology Beijing
I was honored by the University of Science & Technology Beijing for the Excellent Doctoral Dissertation.
- 2018 **Science and Technology Innovation Award** • China Fire Protection Association
I devote myself to the navigation and positioning for emergency rescue applications. Using TOA, our group developed a searching and rescue device and a supporting command system for first responders.

Research Topics

- Intelligent Computing* **Swarm Robotics & Statistical Inference** • May 2019 — Now
- The use of statistical inference, reinforcement learning and cooperative computing methods that allow swarm robots to perform complex tasks collaboratively and intelligently in uncertainty environments.
 - Theoretical algorithms for cooperative computing with use of Bayesian statistical inference, belief propagation and probability graph model.
- Internet of Things* **Wireless Localization & Human Motion Tracking** • Sept 2015 — Now
- Multi-source fusion navigation using statistical inference and deep learning methods. RFID (CSS/UWB) based wireless localization techniques, including error modeling, protocol and algorithm investigation.
 - Human motion tracking and activity recognition techniques based on wearable sensors (such as inertial sensors and TOA sensors), including the design of recognition and tracking algorithms and the construction of software and hardware platforms.

Research Fundings

- Jan 2022 — Dec 2024* **Research on collaborative searching model and key algorithms for emergency rescue in uncertain environment**
• National Science Foundation of China (NSFC)
- July 2020 — June 2021* **Research on TOA Signal Model and Key Algorithms for Emergency Rescue Localization**
• China Postdoctoral Science Foundation
- Jan 2020 — Dec 2021* **Research on Key Technologies of Wearable Human Movement Tracking**
• Guangdong Basic and Applied Basic Research Foundation
- July 2019 — June 2021* **Collaborative Localization and Navigation for Emergency Rescue in Blind Environments**
• China National Postdoctoral Program for Innovative Talents
- May 2019 — April 2022* **Research on Key Technologies of Cooperative Target Tracking**
• Fundamental Research Funds for the Central Universities
- Jan 2020 — June 2020* **Research on Collaborative Architecture of Cluster Tasks in Unstable Environment**
• Institute of Automation, Chinese Academy of Sciences

Selected Publications

Refereed Journal Papers:

- J25** Wan J, **Xu C***, Chen W, et al. Abrupt Moving Target Tracking Based on Quantum Enhanced Particle Filter, submitted to **IEEE Internet of Things Journal**. (Under review)
- J24** Wang R, **Xu C***, He H, et al. Toward Source Navigation: A Coordination Graph based Monte Carlo Tree Search Method, submitted to **IEEE Sensors Journal**. (Under review)
- J23** Wang R, **Xu C***, Wu H, et al. Gaussian Condensation Filter Based on Cooperative Constrained Particle Flow, submitted to **IEEE Internet of Things Journal**. (Under review)
- J22** Duan S, Wu Q, **Xu C***, et al. Multi-Agent Collaborative Mapping Method Based on Graph Matching, submitted to **IEEE Robotics and Automation Letters**. (Under review)
- J21** Duan S, Chen L, **Xu C***, et al. A cooperative localization algorithm for multi-agents based on reinforcement learning compensated filter, submitted to **IEEE Infocom 2022**. (Under review)
- J20** **Xu C***, Ye F, Duan S, et al. Multi-agent Cooperative Localization Based on Federated Learning, submitted to **IEEE Infocom 2022**. (Under review)
- J19** **Xu C***, Yin N, Duan S, et al. Reward-Filtering-based Credit Assignment for Multi-agent Deep Reinforcement Learning. CWSN2021 Outstanding Paper Award, recommended to **Chinese Journal of Computers**, Top CS journal in Chinese. (Under review 3rd round revision)
- J18** Duan S, He H, **Xu C***, et al. DS-MCTS: A Deep Sequential Monte Carlo Tree Search Method for Source Navigation in Unknown Environments. **Acta Electronica Sinica**, 2022. (in press, in Chinese)
- J17** **Xu C***, Shi Y, Wan J, et al. Uncertainty Constrained Belief Propagation for Cooperative Target Tracking[J]. **IEEE Internet of Things Journal**, 2022: 1–1. (Early Access)
- J16** **Xu C***, Wu H, Duan S. Constrained Gaussian Condensation Filter for Cooperative Target Tracking[J]. **IEEE Internet of Things Journal**, 2022, 9(3): 1861–1874.
- J15** **Xu C***, Wang X, Duan S, et al. Spatial-temporal constrained particle filter for cooperative target tracking[J]. **Journal of Network and Computer Applications**, 2021, 176: 102913.
- J14** Wan J, **Xu C***, Qiao Y, et al. Error Constraint Enhanced Particle Filter Using Quantum Particle Swarm Optimization[J]. **IEEE Sensors Journal**, 2021, 21(21): 24431–24439.
- J13** Duan S, Su R, **Xu C***, et al. Ultra-wideband radio channel characteristics for near-ground swarm robots communication[J]. **IEEE Transactions on Wireless Communications**, 2020, 19(7): 4715–4726.
- J12** Wang X[#], **Xu C^{#*}**, Duan S, et al. Error-Ellipse-Resampling-Based Particle Filtering Algorithm for Target Tracking[J]. **IEEE Sensors Journal**, 2020, 20(99):5389–5397.
- J11** Ma F[#], **Xu C^{#*}**, Zhang X*, et al. Iterative Reweighted DOA Estimation for Impulsive Noise Processing Based on Off-Grid Variational Bayesian Learning[J]. **IEEE Access**, 2019, 7: 104642–104654.
- J10** **Xu C**, Ji M, Qi Y, et al. MCC-CKF: A Distance Constrained Kalman Filter Method for Indoor TOA Localization Applications[J]. **Electronics**, 2019, 8(4): 478.
- J9** **Xu C**, He J, Zhang X, et al. 3D Localization Performance Evaluation using IMU/TOA Fusion Methods[J]. **International Journal of Wireless Information Networks**, 2019, 26(2): 67–79.
- J8** **Xu C**, He J, Zhang X, et al. Human Motion Tracking Performance Evaluation Method Based on IMU/TOA Fusion. **Acta Electronica Sinica**, 2019, 47(8): 1748–1754. (in Chinese)
- J7** **Xu C**, He J, Zhang X, et al. Recurrent Transformation of Prior Knowledge Based Model for Human Motion Recognition[J]. **Computational Intelligence & Neuroscience**, 2018, 2018:1–12.

- J6 Xu C, He J, Zhang X, et al. Detection of Freezing of Gait Using Template-Matching-Based Approaches[J]. **Journal of Sensors**, 2017, 2017(2):1-8.
- J5 Xu C, He J, Zhang X, et al. Towards Human Motion Tracking: Multi-Sensory IMU/TOA Fusion Method and Fundamental Limits[J]. **Electronics**, 2019, 8(2): 142.
- J4 Xu C, He J, Li Y, et al. Optimal Estimation and Fundamental Limits for Target Localization using IMU/TOA Fusion Method[J]. **IEEE Access**, 2019, 7: 28124-28136.
- J3 Xu C, Chai D, He J, et al. InnoHAR: A Deep Neural Network for Complex Human Activity Recognition[J]. **IEEE Access**, 2019, 7: 9893-9902.
- J2 Xu C, He J, Zhang X, et al. Toward Near-Ground Localization: Modeling and Applications for TOA Ranging Error[J]. **IEEE Transactions on Antennas & Propagation**, 2017, 65(10):5658-5662.
- J1 Xu C, He J, Zhang X, et al. Geometrical kinematic modeling on human motion using method of multi-sensor fusion[J]. **Information Fusion**, 2018, 41: 243-254.

Refereed Conference Papers:

- C6 Wan J, Xu C*, Chen W, et al. Diversity-preserving quantum-enhanced particle filter for abrupt-motion tracking, **IEEE International Conference on Communications (IEEE ICC 2022)**, May 16-22, 2022, Seoul, South Korea.
- C5 Duan S, Wu H, Xu C*, et al. Toward swarm robots tracking: A constrained Gaussian condensation filter method[C]//**International Conference on Swarm Intelligence (ICSI)**. Springer, Cham, 2021: 129-136.
- C4 Xu C, Chen Y, Duan S, et al. Towards Human Motion Tracking: An Open-source Platform based on Multi-sensory Fusion Methods, **IEEE INTERNATIONAL CONFERENCE ON SYSTEMS, MAN, AND CYBERNETICS (IEEE SMC 2020)**, October 11-14, 2020, Toronto, Canada.
- C3 Xu C, Chen Y, Duan S, et al. Cooperative Source Seeking in Scalar Field: A Virtual Structure-based Spatial-Temporal Method, **International Conference on Collaborative Computing: Networking, Applications and Worksharing (CollaborateCom 2020)**, October 16-18, 2020, Cyberspace.
- C2 Zhou X, Xu C*, He J, et al. A Cross-region Wireless-synchronization-based TDOA Method for Indoor Positioning Applications, **28th Wireless and Optical Communications Conference (WOCC 2019)**, Beijing, China.
- C1 Xu C, He J, Zhang X, et al. DFSA: A Classification Capability Quantification Method for Human Action Recognition, **IEEE Ubiquitous Intelligence and Computing (UIC 2017)**, Aug.4-8, 2017, San Francisco, USA.

References available on request.