

# TAO SUN

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## SUMMARY

I obtained a doctoral degree in mechanical and electrical engineering from Nanjing University of Aeronautics and Astronautics in April 2021. My PhD research focused on investigating adaptive neural control based on central pattern generators, reflex chains, sensory feedback, and learning mechanisms. Currently, I am performing postdoctoral research on wearable artificial intelligence at Shanghai Jiao Tong University, supervised by Professor Peter B. Shull. My postdoctoral research aims to investigate biomechanic estimation using **deep learning and data augmentation** techniques in landing tasks. I am expected to complete my postdoctoral research work by June 2023. I have a strong background in biomechanics, embedded programming, robotics, machine learning, and IMUs. **I am seeking a full-time research and development position related to deep learning and data augmentation.** In this position, I can further my research and apply my skills and experiences in industrial applications.



## EDUCATION

### Shanghai Jiao Tong University

*Postdoctoral researcher in Wearable IMU AI Algorithms*

Shanghai, China

*Jun. 2021 – Present*

### Nanjing University of Aeronautics and Astronautics

*PhD in Mechanical and Electrical Engineering*

Nanjing, China

*Apr. 2016 – Apr. 2021*

### Nanjing University of Aeronautics and Astronautics

*Master in Mechanical and Electrical Engineering*

Nanjing, China

*Sep. 2014 – Sep. 2016*

### Anhui Polytechnic University

*Bachelors of Science in Process Equipment and Control Engineering*

Wuhu, China

*Sep. 2010 – May 2014*

## PUBLICATIONS

1. **Sun, T.**, Li, DX, Fan, BF., Tian, T., Shull, P., (2023). Real-time ground reaction force and knee extension moment estimation during drop landings via modular LSTM modeling and wearable IMUs. *IEEE Journal of Biomechanical and Health Informatics*.
2. **Sun, T.**, Dai, Z., & Manoonpong, P. (2023). Robust and reusable self-organized locomotion of legged robots under adaptive physical and neural communications. *Frontiers in Neural Circuits*, doi:10.3389/fncir.2023.1111285
3. **Sun, T.**, Dai, Z., & Manoonpong, P. (2020). Distributed-force-feedback-based reflex with online learning for adaptive quadruped motor control. *Neural Networks*, <https://doi.org/10.1016/j.neunet.2021.06.001>.
4. **Sun, T.**, Xiong, X., Dai, Z., & Manoonpong, P. (2020). Small-Sized Reconfigurable Quadruped Robot With Multiple Sensory Feedback for Studying Adaptive and Versatile Behaviors. *Frontiers in Neurorobotics*, 14, 14.
5. **Sun, T.**, Xiong, X., Dai, Z., Dai O., & Manoonpong, P. (2020). A comparative study of adaptive interlimb coordination mechanisms for self-organized robot locomotion. *Frontiers in Robotics and AI*.
6. Calandra, M., Patane, L., **Sun, T.**, Arena, P, Poromate, M. (2020). Echo State Networks for estimating exteroceptive conditions from proprioceptive states in quadruped robots. *Frontiers in Neurorobotics*.
7. **Sun T.**, Dai Z. & Manoonpong, P. (2018) Self-organized quadruped locomotion and body attitude stabilization under adaptive neural control and reflexes. In 2nd International Youth Conference of Bionic Engineering (pp. 41-42).

8. **Sun, T.**, Shao, D., Dai, Z., & Manoonpong, P. (2018). Adaptive neural control for self-organized locomotion and obstacle negotiation of quadruped robots. In 27th IEEE International Symposium on Robot and Human Interactive Communication (RO-MAN) (pp. 1081-1086).

## EXPERIENCE

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### Visiting researcher

*RWTH Aachen University*

Feb. 2023 – Present

*Aachen, Germany*

- Development of drop landing training system using haptic feedback and deep learning model
- Investigation of IMU data augmentation to improve kinetic estimation model accuracy

### Senior Embedded Software Engineer

*SageMotion*

Oct. 2021 – Present

*Shanghai, China*

- Developed firmware for Wearable IMU system
- Developed applications for estimating duty factor of gait using wearable IMUs

### Visiting Researcher

*SDU Biorobotics, University of Southern Denmark*

Oct. 2019 – Sep. 2020

*Odense, Denmark*

- Developed a distributed force feedback-based reflex with online learning for adaptive quadruped robot control
- Performed a comparative study of adaptive interlimb coordination mechanisms for self-organized robot locomotion

### Robotic Control Engineer (intern)

*The 609 Research Institute of China Aviation Industry*

Apr. 2016 – Dec. 2017

*Nanjing, China*

- Developed control algorithms for high-slope walking of hydraulic quadruped robots
- Developed joint sensory system of a hydraulic quadruped robot

## PRESENTATIONS

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- International Youth Conference of Bionic Engineering (IYCBE 2018), "Adaptive neural control for self-organized locomotion and obstacle negotiation of quadruped robots", 7th - 9th Nov. 2018, Odense, Denmark.
- China Denmark Bio-inspired Engineering Seminar, "Adaptive neural control with adaptive physical and neural communications for quadruped locomotion", 15th Oct. 2018, Nanjing, China.
- The 2nd National Robot Innovation and Design Competition, "A small-sized quadruped robot for studying bio-inspired locomotion control", 23rd – 26th Sep. 2020, Xi'an, China.
- The 27th IEEE International Symposium on Robot and Human Interactive Communication (RO-MAN 2018), "Adaptive neural control for self-organized locomotion and obstacle negotiation of quadruped robots", Aug. 2018, Nanjing, China.

## AWARDS

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- The third prize in the 2nd Robot Innovation and Design Competition of China Graduate Students, 23rd – 26th Sep. 2020, Xi'an, China.
- The third prize of "Jerry Cup" in the Energy Equipment Innovation Design Competition of China Graduate Students, Sep. 2020, China.
- Scholarship for supporting visiting research in Denmark from China Scholarship Council, Apr. 2019, China.
- The third prize in the 7th "Tiangong Cup" of Postgraduate Innovative Experiment Competition, 30th Nov. 2018, China.

## TEACHING

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1. Guest lecture "Basic principles of bio-inspired robot design" in Design and Manufacture Course, Shanghai Jiao Tong University, 8th Dec. 2022.
2. Guest lecture "Basic principles of bio-inspired robot design" in Design and Manufacture Course, Shanghai Jiao Tong University, 28th Nov. 2021.
3. Guest lecture "Decoupled CPGs-based control for self-organized locomotion of legged robot" in Adaptive Locomotion Control Course, Nanjing University of Aeronautics and Astronautics, 5th Dec. 2020.
4. Guest lecture "Phase adaptation under physical and neural communication for stable self-organized locomotion" in Embodied AI and Robotics Course, University of Southern Denmark, 7th Nov. 2019.

## TECHNICAL SKILLS

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**Languages:** Python, C/C++, Lua, Latex.

**Platforms:** Linux, ADAMAS, ROS, CoppeliaSim, LpzRobots, Webots.

**Developer Tools:** Git, Github, Eclipse, Vim, UG NX, KEIL, Catkin.

**Libraries:** Pytorch, Tensorflow, Scikit-learn.