

## Junpei Zhong

<b>Department</b>	Department of Rehabilitation Sciences
<b>Current Position</b>	Research Assistant Professor
<b>Research Interests</b>	My research interests center around adaptive assistive technologies and robotics for elderly, patients and disabled people. The adaptation is realized by the involvement of individual's difference by human-in-the-learning loop learning. We recognize their differences in physiology and behaviours. This require inter-disciplinary research across cognitive sciences, cognitive robotics and machine learning.
<b>Education</b>	<b>Dr.rer.nat.</b> 2010 - 2015 Department of Computer Science, Uni. of Hamburg, DE.
	<b>M.Phil</b> 2007 - 2009 Department of Electrical Engineering, The Hong Kong Polytechnic Uni., HK.
	<b>B.Eng</b> 2002 - 2006 Double degrees in Control Science and Computer Science, South China Uni. of Tech., CN.
<b>Experience</b>	<b>Research Assistant</b> , Uni. of Hertfordshire, UK 2014
	<b>Postdoc Researcher</b> , Uni. of Plymouth, UK 2015
	<b>Junior Researcher</b> , Waseda University, Japan 2016
	<b>Research Scientist</b> , AIST, Japan 2017- 2019
	<b>Independent Research Fellow</b> , Nottingham Trent University, UK 2019 - 2020
	<b>Research Assistant Professor</b> , The Hong Kong Polytechnic University, HK 2020-
<b>Research Grants</b>	<b>Marie Curie Early Stage Fellowship</b> , 2010 - 2013
	<b>Waseda SGU International Collaborative Grant</b> , April-Sep 2015
	<b>JSPS-NSFC International Seminar</b> , Feb 2018
	<b>Rutherford Visiting Fellowship</b> , January 2019
	<b>Nottingham Trent Independent Research Fellowship</b> , (PI) March 2019
	<b>Nottingham Trent University Strategic Project Fund</b> , (PI) January - December 2020
	<b>PolyU Start-up Fund</b> , (PI) Social assistive robots used for elderly mental care and its neural responses, Feb 2021 - Nov 2022
	<b>PolyU Internal Research Fund</b> (Co-I) Relations of Physical and Cognitive Functions of Older Adults with Mild Cognitive Impairment: Cross-Sectional and Intervention Studies,

Feb 2021 - Dec 2022

**PolyU Internal Research Fund (Co-I)** Unveiling the therapeutic mechanisms of non-invasive brain stimulation for cognitive rehabilitation, Dec 2021 - Jan 2024

**PolyU Mental Health Research Center Research Fund (Co-I)** Dissecting Linkage between Sarcopenia and Depression from Molecular Mechanisms to Prediction, Prevention and Rehabilitation: A Novel Role of Myokine Apelin in Muscle-brain Crosstalk Mar 2022 - Feb 2024

## Teaching Experience

### Courses Taught,

- Optimal control applications and methods (HKPU 2008)
- Bio-inspired artificial intelligence (Hamburg 2011)
- Knowledge processing and neural networks (Hamburg 2011)
- Robotics and Cybernetics (NTU 2019)
- Introduction to Computer System and Programming (SCUT 2020)
- Big Data in Manufacturing (SCUT 2020)
- Machine Vision (SCUT 2020)
- Current Development in Neurological Rehabilitation (PolyU 2022)
- Neuroscience Investigation (PolyU 2022)
- Enabling Occupation: Environmental Issues and Assistive Technology (PolyU 2022)

### Graduate Students Supervised,

- Supervised: C. Ling (SCUT, M.Eng, 2020-), J. Ye (SCUT, M.Eng, 2020-)
- Co-supervised: J. Li (SCUT, PhD, 2018-), S. Huang (SZU, M.Eng, 2016-2018), A. Naser (NTU, PhD, 2019-)

## Other Professional Activities

### Associate Editors

International Journal of Advanced Robotic Systems

### Chair,

Task Force on Action and Perception, IEEE CIS Technical Committee on Cognitive and Developmental Systems

### Guest Editors

Complexity: Neural Network for Complex Systems: Theory and Applications (2017)

Interaction Studies: Human-robot Collaborative Intelligence (2017)

Complexity: Control Design for Systems Operating in Complex Environments (2018)

IEEE Transaction on Cognitive and Developmental Systems: Unsupervised Continuous Learning (2018, 2022)

Journal of Ambient Intelligence and Humanized Computing: Human Behaviour Monitoring, Interpretation and Understanding (2019)

Neural Computing and Applications: Human-in-the-loop Learning and Applications (2021)

Security and Communication Networks (2021)

### Organised Events,

Conference on Robotics and Development of Cognition 2012, Lausanne, CH.

Workshop in Human Robot Collaborative Intelligence (at ICARM 2018), SG.

IEEE Symposium on Domestic Robotics 2019, Xiamen, CN.

Special Session of Human-in-the-loop Learning (at IEEE SMC 2020), Toronto, CA.  
Workshop in Sensorimotor Interaction, Language and Embodiment of Symbols (at IEEE ICDL/EpiRob 2020), Valparaiso, CL.  
Special Session of Human-in-the-loop Learning System and its User-centric Methods (at IEEE SMC 2021), Melbourne, AU.  
The 15th International Convention on Rehabilitation Engineering and Assistive Technology (i-CREATE 2022), Hong Kong

#### **Ad-hoc Reviewer,**

IEEE Transaction on Cognitive and Developmental Systems  
IET Control Theory and Applications  
Frontiers on AI and robotics  
International Journal of Advanced Robotic Systems  
ISA Transactions  
Optics Communications  
Applied Mathematics and Computation  
IEEE Access, etc

#### **Invited Talks,**

Northwest Polytechnic University, China, 2016  
Tokyo University, Tokyo, Japan, 2016  
Sun Yet-sen University, Shenzhen, China, 2016  
Interdisciplinary Forum, Wuhan, China, 2017  
Workshop on Industry 4.0 and Intelligent Machines, Fujian, China, 2017  
Re.Work Machine Intelligence Summit, Hong Kong, 2018  
AI Summit, Hong Kong, 2018  
Machine Learning Summit, Shanghai, 2018

## **Publications**

### • Journal Papers

- Abdallah Naser, Ahmad Lotfi, and Junpei Zhong. Calibration of low-resolution thermal imaging for human monitoring applications. *IEEE Sensors Letters*, 6(3):1–4, 2022
- Abdallah Naser, Ahmad Lotfi, and Junpei Zhong. Multiple thermal sensor array fusion towards enabling privacy-preserving human monitoring applications. *IEEE Internet of Things Journal*, 2022
- Bixiao Wu, Junpei Zhong, and Chenguang Yang. A visual-based gesture prediction framework applied in social robots. *IEEE/CAA Journal of Automatica Sinica*, 9(3):510–519, 2021
- Bi-Xiao Wu, Chen-Guang Yang, and Jun-Pei Zhong. Research on transfer learning of vision-based gesture recognition. *International Journal of Automation and Computing*, 18(3):422–431, 2021
- Xing Li, Junpei Zhong, and MM Kamruzzaman. Complicated robot activity recognition by quality-aware deep reinforcement learning. *Future Generation Computer Systems*, 117:480–485, 2021
- Abdallah Naser, Ahmad Lotfi, and Joni Zhong. Towards human distance estimation using a thermal sensor array. *Neural Computing and Applications*, pages 1–11, 2021
- Junpei Zhong, Chaofan Ling, Angelo Cangelosi, Ahmad Lotfi, and Xiaofeng Liu. On the gap between domestic robotic applications and computational intelligence. *Electronics*, 10(7):793, 2021

- Jie Li, Junpei Zhong, and Min Wang. Unsupervised recurrent neural network with parametric bias framework for human emotion recognition with multi-modal sensor data fusion. *Sensors and Materials*, 31(4):1261–1277, 2020
- Jie Li, Junpei Zhong, Jingfeng Yang, and Chenguang Yang. An incremental learning framework to enhance teaching by demonstration based on multimodal sensor fusion. *Frontiers in Neurorobotics*, 14, 2020
- Xing Li and Junpei Zhong. Upper limb rehabilitation robot system based on internet of things remote control. *IEEE Access*, 8:154461–154470, 2020
- Abdallah Naser, Ahmad Lotfi, and Junpei Zhong. Adaptive thermal sensor array placement for human segmentation and occupancy estimation. *IEEE Sensors Journal*, 21(2):1993–2002, 2020
- Junpei Zhong, Tetsuya Ogata, Angelo Cangelosi, and Chenguang Yang. The emerge of disentanglement in the conceptual space during sensorimotor interaction. *Cognitive Computation and Systems*, 2019
- Yanan Li, Xiaodong Zhou, Junpei Zhong, and Xuefang Li. Robotic impedance learning for robot-assisted physical training. *Frontiers in Robotics and AI*, 6:78, 2019
- Chao Zeng, Chenguang Yang, Junpei Zhong, and Jianwei Zhang. Encoding multiple sensor data for robotic learning skills from multimodal demonstration. *IEEE Access*, 2019
- Chenguang Yang, Xiaofeng Liu, Junpei Zhong, and Angelo Cangelosi. Human robot collaborative intelligence. *Interaction Studies*, 20(1):1–3, 2019
- J. Zhong, A. Cangelosi, T. Ogata, and Zhang X. Encoding longer-term contextual information with predictive coding and ego-motion. *Complexity*, 2018
- J. Zhong, M. Peniak, J. Tani, T. Ogata, and A. Cangelosi. Sensorimotor input as a language generalisation tool: A connectionist model for generation and generalisation of noun-verb combinations with sensorimotor inputs. *Autonomous Robots*, 2018
- X. Zhang, J. Zhang, and J. Zhong. Towards navigation ability for autonomous mobile robots with learning from demonstration paradigm: A view of hierarchical temporal memory (accepted). *International Journal of Advanced Robotic Systems*, 2018
- Y. Xu, C. Yang, J. Zhong, H. Ma, and L. Zhao. Robot teaching by teleoperation based on visual interaction and extreme learning machine (accepted). *Neurocomputing*, 2017
- Y. Jiang, C. Yang, J. Na, G. Li, Y. Li, and J. Zhong. A brief review of neural networks based learning and control and their applications for robots. *Complexity*, 2017
- X. Zhang, J. Zhang, and J. Zhong. Skill learning for intelligent robot by perception-action integration: A view from hierarchical temporal memory. *Complexity*, 2017
- J. Zhong, A. Cangelosi, and S. Wermter. Towards a self-organizing pre-symbolic neural model representing sensorimotor primitives. *Frontiers in Behavioral Neuroscience*, 8:22, 2014
- J. Zhong, C. Weber, and S. Wermter. A predictive network architecture for a robust and smooth robot docking behavior. *Paladyn. Journal of Behavioral Robotics*, 3(4):172–180, 2012
- J. Zhong and Y. Fung. Case study and proofs of ant colony optimisation improved particle filter algorithm. *Control Theory Applications, IET*, 6(5):689–697, 15 2012

- J. Zhong, Y. Fung, and M. Dai. A biologically inspired improvement strategy for particle filter: Ant colony optimization assisted particle filter. *International Journal of Control, Automation and Systems*, 8:519–526, 2010
- Conference Papers
  - Jiancong Ye and Junpei Zhong. A review on data-driven methods for human activity recognition in smart homes. In *Cases on Virtual Reality Modeling in Healthcare*, pages 21–40. IGI Global, 2022
  - Ran Dong, Yangfei Lin, Qiong Chang, Junpei Zhong, Dongsheng Cai, and Soichiro Ikuno. Motion feature extraction and stylization for character animation using hilbert-huang transform. In *Proceedings of the 2021 ACM International Conference on Intelligent Computing and its Emerging Applications*, pages 16–21, 2021
  - Libo Zhao and Junpei Zhong. Recurrent neural network with adaptive gating timescales mechanisms for language and action learning. In *International Conference on Neural Information Processing*, pages 405–413. Springer, 2021
  - Kaibin Xu, Junpei Zhong, and Kristiina Jokinen. It is time to laugh: Discovering specific contexts for laughter with attention mechanism. In *2021 IEEE 4th International Conference on Information Systems and Computer Aided Education (ICISCAE)*, pages 211–215. IEEE, 2021
  - Abdallah Naser, Ahmad Lotfi, and Junpei Zhong. A novel privacy-preserving approach for physical distancing measurement using thermal sensor array. In *The 14th Pervasive Technologies Related to Assistive Environments Conference*, pages 81–85, 2021
  - J. Zhong and A. Lotfi. Sensor2vec: an embedding learning for heterogeneous sensors for activity classification. In *2020 International Symposium on Community-centric Systems (CcS)*, pages 1–6. IEEE, 2020
  - A Naser, A Lotfi, J Zhon, and J He. Heat-map based occupancy estimation using adaptive boosting. In *IEEE World Congress on Computational Intelligence 2020 (WCCI 2020)*, 2020
  - W Huang, J Zhong, and A. Cangelosi. Multiple timescale and gated mechanisms for action and language learning in robotics. In *IEEE World Congress on Computational Intelligence*, 2020
  - Kristiina Jokinen and Junpei Zhong. Learning co-occurrence of laughter and topics in conversational interactions. In *2020 IEEE International Conference on Systems, Man, and Cybernetics (SMC)*, pages 3845–3851. IEEE, 2020
  - Jingkang Xia, Deqing Huang, Yanan Li, and Junpei Zhong. Iterative learning control based on stretch and compression mapping for trajectory tracking in human-robot collaboration. In *2020 Chinese Automation Congress (CAC)*, pages 3905–3910. IEEE, 2020
  - Abdallah Naser, Ahmad Lotfi, Junpei Zhong, and Jun He. Human activity of daily living recognition in presence of an animal pet using thermal sensor array. In *Proceedings of the 13th ACM International Conference on Pervasive Technologies Related to Assistive Environments*, pages 1–6, 2020
  - Junpei Zhong and Chenguang Yang. A compositionality assembled model for learning and recognizing emotion from bodily expression (accepted). In *The IEEE International Conference on Advanced Robotics and Mechatronics*, 2019
  - Junpei Zhong and Yanan Li. Toward human-in-the-loop pid control based on cacla reinforcement learning. In *International Conference on Intelligent Robotics and Applications*, pages 605–613. Springer, 2019

- Jie Li, Junpei Zhong, Fei Chen, and Chenguang Yang. An incremental learning framework for skeletal-based hand gesture recognition with leap motion. *The 9th IEEE International Conference on CYBER Technology in Automation, Control, and Intelligent Systems*, 2019
- Jie Li, Chenguang Yang, Junpei Zhong, and Shilu Dai. Emotion-aroused human behaviors perception using rnnpb. In *2018 10th International Conference on Modelling, Identification and Control (ICMIC)*, pages 1–6. IEEE, 2018
- Junpei Zhong, Tetsuya Ogata, and Angelo Cangelosi. Encoding longer-term contextual sensorimotor information in a predictive coding model. In *2018 IEEE Symposium Series on Computational Intelligence (SSCI)*, pages 160–167. IEEE, 2018
- J. Zhong, A. Cangelosi, X. Zhang, and T. Ogata. Afa-prednet: The action modulation within predictive coding. *International Joint Conference on Neural Networks (IJCNN)*, 2018
- J. Zhong, A. Cangelosi, and T. Ogata. Toward abstraction from multi-modal data: Empirical studies on multiple time-scale recurrent models. In *International Joint Conference on Neural Networks (IJCNN)*, 2017
- Xingjian Wang, Chenguang Yang, Junpei Zhong, and Rongxin Cui. Teleoperation control for bimanual robots based on rbfn and wave variable (accepted). In *Proceedings of the 9th International Conference on Modelling, Identification and Control*, 2017 (**Best Theory Paper**)
- Y. Xu, C. Yang, J. Zhong, H. Ma, and L. Zhao. Robot teaching by teleoperation based on visual interaction and neural network learning. In *Proceedings of the 9th International Conference on Modelling, Identification and Control*, 2017
- J. Zhong, A. Cangelosi, T. Ogata, and C Yang. Understanding natural language sentences with word embedding and multi-modal interaction. *Development and Learning and Epigenetic Robotics (ICDL-Epirob)*, 2017 *Joint IEEE International Conferences on*, 2017
- M. Dai, S. Huang, J. Zhong, C. Yang, and S. Yang. Influence of wording noise in text space on transfer learning; an empirical example in chinese sentiment classification. *Proceedings of the 13th International Conference on Natural Computation*, 2017
- J. Zhong, R. Novianto, M. Dai, X. Zhang, and A. Cangelosi. A hierarchical emotion regulated sensorimotor model: Case studies. In *The 5th International Conference on Data-Driven Control and Learning Systems*, 2016
- J. Zhong, A. Cangelosi, and T. Ogata. Sentence embeddings with sensorimotor embodiment. In *The 34th Annual Conference of the Robotics Society of Japan*, 2016
- J. Zhong and L. Canamero. From continuous affective space to continuous expression space: Non-verbal behaviour recognition and generation. In *Development and Learning and Epigenetic Robotics (ICDL-Epirob)*, 2014 *Joint IEEE International Conferences on*, pages 75–80. IEEE, 2014
- J. Zhong, C. Weber, and S. Wermter. Restricted boltzmann machine with transformation units in a mirror neuron system architecture. In *Proceedings of the IROS2011 Workshop on Cognitive Neuroscience Robotics (CNR)*, pages 23–28, San Francisco, CA, USA, Sep 2011
- J. Zhong, C. Weber, and S. Wermter. Learning features and predictive transformation encoding based on a horizontal product model. In *Artificial Neural Networks and Machine Learning–ICANN 2012*, pages 539–546. Springer, 2012

- J. Zhong, C. Weber, and S. Wermter. Learning features and transformation encoding based on a generative horizontal product model. In *Proceedings of the Sixteenth International Conference on Cognitive and Neural Systems (ICONS 2012)*, Boston, MA, USA, May 2012
- J. Zhong, C. Weber, and S. Wermter. Robot trajectory prediction and recognition based on a computational mirror neurons model. In T. Honkela, W. Duch, M. Girolami, and S. Kaski, editors, *Proceedings of the 21st International Conference on Artificial Neural Networks (ICANN 2011)*, volume 2, pages 333–340, Espoo, Finland, June 2011. Springer
- J. Zhong and Y. Fung. A detailed analysis of the ant colony optimization enhanced particle filters. In Min Zhu, editor, *Electrical Engineering and Control*, volume 98 of *Lecture Notes in Electrical Engineering*, pages 641–648. Springer Berlin Heidelberg, 2011
- S Ren, Y Fung, J Zhong, X Li, and J Bi. Freeway traffic estimation based on improved particle filter. *IEEE International Conference on Computer Science and Information Technology*, 5:312–317, 6 2011
- J. Zhong and Y. Fung. A biological inspired improvement strategy for particle filters. In *IEEE International Conference on Industrial Technology, 2009. ICIT 2009.*, pages 1 –6, feb. 2009

- Reviewed Abstracts

- J. Zhong and T. Ogata. A neurobotic experiment on multiple time-scales of predictive coding. In *The 22th Meeting of the Association for the Scientific Study of Consciousness*, 2018