

# Junpei Zhong

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## Address

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## Education

### Dr.rer.nat.

June 2010 - April 2015

Department of Computer Science, Uni. of Hamburg, DE.

- Title: Artificial Neural Models for Feedback Pathways for Sensorimotor Integration
- Grade: "magna cum laude" (with great honor)

The topic of my PhD thesis is to investigate the neural prediction mechanism in the sensorimotor loop (mainly at the system and cognitive level). A hierarchical recurrent architecture is proposed to present different perspectives of the predictive mechanisms in the sensorimotor system.

### M.Phil

Oct 2007 - Oct 2009

Department of Electrical Engineering, The Hong Kong Polytechnic Uni., HK.

- Title: Utilization and optimization for particle filtering multi-robot SLAM

### B.Eng

Sep 2002 - Sep 2006

Double degrees in Control Science and Computer Science, South China Uni. of Tech., CN.

- Major in Control Science, minor in Computer Science
- Overall ranking 9%

## Experience

### Marie Curie Early Stage Researcher, University of Hamburg

2010 - 2013

- With acquisition of doctoral degree;
- Supervisor: Prof. Stefan Wermter

**Visiting Researcher**, Computing and mathematics, Uni. of Plymouth 2011 - 2013, 2016-present

- Study of pre-symbolic representation in visual system with interaction;
- Supervisor: Prof. Angelo Cangelosi.

**Research Fellow**, School of Computer Science, Uni. of Hertfordshire

2014

- Learning of non-verbal expression for humanoid robots;
- Funded by ALIZ-E project ([www.aliz-e.org](http://www.aliz-e.org));
- Work with robot and software: NAO, Xsens (for Motion Tracking).
- Supervisor: Dr. Lola Canamero

**Postdoc Researcher**, Computing and mathematics, Uni. of Plymouth

2015

- Development of a bio-inspired action-language-learning architecture;
- Funded by POETICON++ project ([www.poeticon.eu](http://www.poeticon.eu));
- Work with robot: iCub;
- Supervisor: Prof. Angelo Cangelosi

**Junior Researcher (Assistant Professor)**, Lab for Intelligent Dynamics and Representations, Waseda University, Japan  
2016

Apr - Sep

- Development and implementation of a deep learning architecture for robot language learning;
- Funded by Waseda SGU Informatics Program;
- Supervisor: Prof. Tetsuya Ogata.

**Advisor Editor (PT)**, Synced Ltd, Canada since Feb 2017

- Managing technical analysts in the group of industrial trends from technical perspective;
- Editing and managing reviews and discussions in industrial trends of AI;
- Consultant for technical development in AI and Robotics;

**Research Scientist**, National Institute of Advanced Industrial Science and Technology (AIST), Japan since Oct 2016

- Independent research on robot language learning from embodied interaction;
- Based on deep recurrent neural architectures;
- Robotic applications based on Nexstage, Pepper;

**Languages** English (Proficient, TOEFL (2006): 630/670), Cantonese (Mother Tongue), Chinese (Bilingual), German (Fair, European language levels A2)

**Technical Skills**

<u>Languages:</u>	Python, Matlab, C++, C;
<u>Robotic Software:</u>	ROS, OpenCV, Webots, Yarp;
<u>Machine Learning Software:</u>	Theano, TensorFlow, CUDA;
<u>Robots:</u>	NAO, iCub, PR2, Pepper, Nextstage.

**Awards** **Doctoral thesis,** 2015

- Magna cum laude (with great distinction)

**Marie Curie Early Stage Fellowship,** 2010 - 2013

- A competitive 3-year fellowship funding from the Marie Curie Actions program of the FP7 European research program.

**Hong Kong Polytechnic University Scholarship,** 2007-2009

- Study scholarship funding from the Research Grant Council, 2-year scholarship.

**Research Interests** My research interests center around machine learning methods and its embodiment for a cognitive robotics system. These learning models are mostly inspired by cognitive science, neuroscience, or other natural sciences and be built by connectionist, statistical or hybrid learning methods.

My current research interests include

1. Deep learning applications for multi-modal data understanding and prediction for assistive robotics;
2. Novel machine learning models, with special emphases on properties of predictive memory and one-shot learning;
3. Psychology, cognitive science and their contributions to machine learning.

**Other Professional Activities** **Guest Editor,** Complexity: Neural Network for Complex Systems: Theory and Applications  
**Local Chair,** Postgraduate Conference on Robotics and Development of Cognition 2012, Lausanne,

CH.

**Program Committee,**

The 5th International Conference on Emerging Internetworking, Data and Web Technologies, 2016 Kazan, RU

The International Conference on Social Robotics 2015, Paris, FR.

The International Conference on Artificial Neural Networks 2014, Hamburg, DE.

Workshop on Attention for Social Intelligence, ICSR 2014, Sydney, AUS.

**Ad-hoc Reviewer,**

IET Control Theory and Applications

International Conference on Artificial Neural Networks

The International Conference on Social Robotics

International Journal of Control, Automation and Systems

Optics Communications

Applied Mathematics and Computation

**Invited Talks,**

Northwest Polytechnic University, China, 2016

Shenzhen University, China, 2016

Tokyo University, Consciousness Club, Japan, 2016

Shenzhen Young Scholar Forum of Sun Yet-sen University, China, 2016

Interdisciplinary Forum, Wuhan, China, 2017

**Publications**

• Multi-modal Understanding for Service Robotic

- 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 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, 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, 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
- 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 (submitted). *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
- Predictive Neural Learning
  - 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 (ICCNS 2012)*, Boston, MA, USA, May 2012
  - 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, 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, A. Cangelosi, and T. Ogata. Sentence embeddings with sensorimotor embodiment. In *The 34th Annual Conference of the Robotics Society of Japan*, 2016
  - 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 (2nd review). *Autonomous Robots*, 2016
  - 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
- Statistical Machine Learning and SLAM
  - 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
  - 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
  - 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 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
  - 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

- Unpublished Articles

- J. Zhong, J. Tani, T. Ogata, and A. Cangelosi. The motor-action modulation role within hierarchical predictive coding: a neurobotic experiment (in preparation). *Frontiers in Robotics and AI*, 2017
- X. Zhang, J. Zhang, and J. Zhong. Bio-mimetic perception-action integration toward intelligent behaviors for an autonomous robot: A view from hierarchical temporal memory (submitted). *IEEE Transactions on Cognitive and Developmental Systems*, 2016
- J. Zhong and L. Canamero. A personalized emotion recognition method for assistive humanoid robot systems (in preparation). *IEEE Transactions on Affective Computing*
- Y. Xu, C. Yang, J. Zhong, H. Ma, and L. Zhao. Robot teaching by teleoperation based on visual interaction and extreme learning machine. *Neurocomputing (Submitted)*, 2017

## References

### Angelo Cangelosi

- Address: School of Computing and Mathematics, University of Plymouth, Portland Square A316, Plymouth, PL4 8AA, UK
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- Email: [acangelosi@plymouth.ac.uk](mailto:acangelosi@plymouth.ac.uk)
- URL: <http://www.tech.plym.ac.uk/soc/staff/angelo/>

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### Tetsuya Ogata

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### Stefan Wermter

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