Hsueh-Cheng (Nick) Wang

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Research Interests:

My work focuses on machine perception by developing algorithms and body-worn devices that assist human in everyday tasks. Specifically, I am interested in effective and efficient text detection/ recognition and scene understanding, as well as computational models mimicking human attentional capture and language processing. My broad knowledge of interdisciplinary approaches provides innovative opportunities to build intelligent systems in the fields of assistive technology, robotics, cyber-physical system, augmented reality, and human-centered computing.

Technical Skills:

- **Programming:** C/C++, Matlab, Python, Java
- **Robotics:** simultaneous localization and mapping (SLAM), Robotic Operating System (ROS), point cloud library (PCL), OpenGL, lightweight communication and marshalling (LCM), sensor fusion
- **Computer Vision and Machine Learning**: feature analysis, object detection, OpenCV, Hough forest, support vector machine, neural network
- **Sensors:** laser range scanners (LIDARs), depth sensors (Kinect and stereo cameras), pan/tilt/zoom cameras, eye tracker (EyeLink systems)

Professional Experiences:

- **Postdoctoral Associate**, Feb. 2013-Present
  Robotics, Vision, and Sensor Networks Group,
  Computer Science and Artificial Intelligence Laboratory,
  Massachusetts Institute of Technology (MIT), MA, USA.
- **Summer Intern**, Summer 2011
  Department of Computer Vision and Image Understanding,
  Institute for Infocomm Research, Singapore.
- **Visiting Ph.D. Student**, Rayner Eyetracking Lab, 2010-2011
  University of California, San Diego, USA.
- **Research Assistant**, 2004-2007
  Graduate Institute of Learning and Instruction,
  National Central University, Taiwan.
- **Research Assistant**, 2003-2004
  Software Research Center, National Central University, Taiwan.

Education:

- **Ph.D.** in Computer Science, University of Massachusetts at Boston. 2012
- **M.A.** in Computer-Aided Engineering,
  Department of Civil Engineering, National Taiwan University, Taiwan. 2003
- **B.S.** in Civil Engineering, National Taiwan University, Taiwan. 2001. 2001

Awards and Funding:

- **Postdoctoral Associate Fellowship**, Feb.2013-Present
  Computer Science and Artificial Intelligence Laboratory,
  Massachusetts Institute of Technology
- **Young Professional Travel Grant,** National Science Foundation 2014
- **Student Travel Award,** Cognitive Science Society (Top 3%) 2012
- **Student Travel Grant,** Asia-Pacific Conference on Vision (Top 3%) 2011
- **Research Excellence Award**, Graduate Research Symposium, 2011
  Department of Computer Science, University of Massachusetts at Boston
- **Graduate Research Fellowship**, 2008-2012
  Department of Computer Science, University of Massachusetts at Boston

Press Release and News Articles:

MIT News, Italian tenor Andrea Bocelli visits MIT in support of assistive technology and global poverty reduction, Dec. 9, 2013.

WBUR - Boston Radio, Blind Opera Superstar Andrea Bocelli Seeks High-Tech Vision At MIT, Dec. 6, 2013.

Italy Magazine, Andrea Bocelli Visits MIT in Support of Research for the Blind, Dec. 13, 2013.

The China Post (Taiwan), Bocelli visits MIT for adaptive tech workshop, Dec. 8, 2013.

Publications: (9 Journal Papers (5 SCI/ SSCI); Total IF: 11.61)

- **Text Detection and Recognition:**

Journal Papers:

Wang, H. C. & Pomplun, M. (2012). The Attraction of Visual Attention to Texts in Real-World Scenes, *Journal of Vision*, 12(6):26, 1–17. (SCI, **IF: 3.38**; Ranking 22/ 97)

Wang, H. C., Schotter, E., Angele, B., Yang, J. M., Simovici, D., Pomplun, M., & Rayner, K. (2013). Using Singular Value Decomposition to Investigate Degraded Chinese Character Recognition: Evidence from Eye Movements During Reading. *Journal of Research in Reading*, 36, S35-S50. (SSCI, **IF: 1.25**; Ranking: 119/ 359)

Peer-reviewed Conference Proceeding Papers:

Wang, H. C., Landa, Y., Fallon, M., & Teller, S. (2013). Spatially Prioritized and Persistent Text Detection and Decoding. Fifth International Workshop on Camera-Based Document Analysis and Recognition (CBDAR), Washington D. C., USA.

Wang, H. C., Lu, S. J., Lim, J. H., & Pomplun, M. (2012). Visual Attention is Attracted by Text Features Even in Scenes without Text. In Proceedings of *Annual Meeting of the Cognitive Science Society (CogSci 2012)*, Sapporo, Japan.

Wang H. C. & Pomplun, M. (2011). The Attraction of Visual Attention to Texts in Real-World Scenes. In Proceedings of *Annual Meeting of the Cognitive Science Society (CogSci2011)*, Boston, USA. (Oral presentation, 32%)

Conference Presentations:

Wang, H. C., Namdev, R., Finn, C., & Teller, S. (2014). Text Spotting for the Blind and Visually Impaired. NSF Young Professional Workshop on Exploring New Frontiers in Cyber-Physical Systems, Washington D. C., USA. (Oral Presentation with **Travel Grant**)

Wang, H. C., Finn, C., Mattinson, B., Namdev, R., & Teller, S. (2013). Exhibition in Second Andrea Bocelli Foundation Challenges Workshop, MIT, Cambridge, MA, USA.

Wang, H. C., Schotter, E., Angele, B., Yang, J. M., Simovici, D., Pomplun, M., & Rayner, K. (2012). Using Singular Value Decomposition to Investigate Degraded Chinese Character Recognition: Evidence from Eye Movements During Reading. China International Conference of Eye Movements (CICEM), Dalian, China. (**Invited Guest Speaker**)

Wang, H. C. & Pomplun, M. (2011). The Attraction of Visual Attention to Texts in Real-World Scenes. *Asia-Pacific Conference on Vision (APCV)*, Hong Kong.

Wang, H. C., Angele, B., Schotter, E., Yang, J. M., Simovici, D., Pomplun, M., & Rayner, K. (2011). Singular Value Decomposition is a Valid Predictor of Stroke Importance in Reading, *16th European Conference on Eye Movements (ECEM)*, Marseille, France.

Wang, H. C. & Pomplun, M. (2011). How Does Text in Real-World Scenes Attract Attention? *Scene Understanding Symposium (SUnS)*, Boston, USA.

Wang, H. C. & Pomplun, M. (2010). How Text Attracts Attention in Real-World Scenes. *European Conference on Visual Perception (ECVP)*, Lausanne, Switzerland.

- **Scene Understanding:**

Journal Papers:

Hwang, A. D., Wang, H. C., and Pomplun, M. (2011). Semantic Guidance of Eye Movements in Real-world Scenes, *Vision Research*, 51, 1192-1205. (SCI, **IF: 2.51;** Ranking: 15/ 97)

Wang, H.-C., Hwang, A. D. & Pomplun, M. (2010). Object Frequency and Predictability Effects on Eye Fixation Durations in Real-World Scene Viewing. *Journal of Eye Movement Research*, 3(3):3, 1-10. (#Google Scholar citations= 8)

Peer-reviewed Conference Proceeding Papers:

Wu, C. C., Wang, H. C., Pomplun, M. (2013). The Role of Scene Gist and Spatial Dependency among Objects in the Semantic Guidance of Attention. *Annual Meeting of the Cognitive Science Society (CogSci 2013)*, Berlin, Germany. (Accepted as oral presentation, 28%)

Hwang, A. D., Wang, H. C., & Pomplun, M. (2009). Semantic guidance of eye movements during real-world scene inspection. In Proceedings of *Annual Meeting of the Cognitive Science Society (CogSci 2009)*, Amsterdam, Netherlands. (Oral presentation, 32%)

Conference Presentations:

Wang, H. C., Hwang, A. D., Pomplun, M. (2009). Object Frequency and Predictability Effects on Eye Fixation Durations in Real-world Scene Viewing. *15th European Conference on Eye Movements (ECEM)*, Southampton, UK.

- **Langue Processing:**

Journal Papers:

Wang, H. C., Hsu, L. C., Tien, Y. M., & Pomplun, M. (2014). Predicting raters' transparency judgments of English and Chinese morphological constituents using latent semantic analysis. *Behavior Research Methods*, 46, 1, 284-306. (SSCI, **IF: 2.12**; Ranking: 50/ 359)

Wang, H. C., Pomplun, M., Ko, H. W., Chen M. L., & Rayner, K. (2010). Estimating the Effect of Word Predictability on Eye Movements in Chinese Reading using Latent Semantic Analysis and Transitional Probability. *Quarterly Journal of Experimental Psychology*, 64, 7, 1374-1386. (SCI, **IF: 2.35**; Ranking 32/ 134)

Chen, M. L., Wang, H. C., & Ko, H. W. (2009). The Construction and Validation of Chinese Semantic Space by Using Latent Semantic Analysis. *Chinese Journal of Psychology*, 51, 4, 415-435. (TSSCI, Ranking: 2/ 6; #Google Scholar citations= 6)

Peer-reviewed Conference Proceeding Papers:

Plummer, P., Wang, H. C., Tzeng, Y. T., Pomplun, M., & Rayner K. (2012). A Connectionist Model of Concept Activation during Reading using Latent Semantic Analysis and LandScape Model. In Proceedings of *Annual Meeting of the Cognitive Science Society (CogSci 2012)*, Sapporo, Japan. (**Student Travel Award, with 21 awards out of 798 contributions**, presented by Patrick Plummer)

Wang, H. C., Tien, Y. M., Hsu, L. C., & Pomplun, M. (2012). Estimating Semantic Transparency of Constituents of English Compounds and Two-Character Chinese Words using Latent Semantic Analysis. In Proceedings *of Annual Meeting of the Cognitive Science Society (CogSci 2012)*, Sapporo, Japan.

Conference Presentations:

Wang, H. C., Tien, Y. M., Hsu, L. C., & Pomplun, M. (2010). The Role of Semantic Transparency in Processing of Two-character Chinese words, *Asia-Pacific Conference on Vision (APCV)*, Taipei, Taiwan. (**Student Travel Grant, 5 out of approximately 200 contributions**)

Wang, H. C., Chen, M. L., Ko, H. W., & Kintsch, W. (2007). Estimating Word's Predictability on Lexical Processing using Latent Semantic Analysis – Verification from Eye Movement Data, *14th European Conference on Eye Movements (ECEM)*, Potsdam, Germany.

Wang, H. C., Chen, M. L., & Ko, H. W. (2007). Modeling and Simulation of Word Identification on Orthographically and Phonologically Similar Words in Context. *46th Annual Conference of the Taiwanese Psychology Association*, Tainan, Taiwan.

Wang, H. C. & Ko, H. W. (2007). Automatically Generated Lessons and Practices of the Knowledge of Chinese Characters and Words, *Proceeding of ED-Media 2007 (World Conference on Educational Multimedia, Hypermedia & Telecommunications)*, Vancouver BC, Canada.

Ko, H. W., Chen, M. L., & Wang, H. C. (2005). The Role of Word during Reading Expository Text: Evidence from Eye Movement. *13th European Conference on Eye Movements*, Bern, Switzerland.

- **Applications in Civil Engineering:**

Journal Papers:

Hsieh, S. H., Tseng, P. P., Wang, H. C. (2006). An Expert System for Preliminary Aseismic Capacity Estimation of Traditional School Classroom Buildings Using Case-Based Reasoning. *Journal of Chinese Civil and Hydraulic Engineering*. Vol. 18, No. 1, pp. 95-107.

Wang, H. C. , Tu, W. H., Yu, W. H., Chen, C. S., & Hsieh, S. H. (2001). A Study on E-Teaching/E-Learning Standardization and Courseware Sharing. *Bulletin Of The College Of Engineering*, National Taiwan University, Vol. 85, pp. 59-68.

Conference Presentations:

Wang, H. C. and Hsieh, S. H. (2003). On Development of a Computer System for Preliminary Aseismic Estimation of School Classroom Building Using Case-Based Reasoning. *Proceedings of Asian Pacific Conference on Shell and Spatial Structures (IASS-APCS)*, Taipei, pp. 146~147.

Wang, H. C. and Hsieh, S. H. (2002), Preliminary Seismic Safety Assessment of School Building Using Case-based Reasoning Technique. *Proceedings of 15th KKCNN 2002 Symposium on Civil Engineering*, Singapore, pp. 280~284.

Service to the Profession:

- **Reviewer**

  IEEE on System, Man, and Cybernetics, Part A, Systems and Humans
  International Journal of Information and Communication Technology
  Ergonomics
  PloS One
  Journal of Vision
  Journal of Research in Reading
  Anatomical Sciences Education

- **Conference session moderator**

  NSF Young Professional Workshop on Exploring New Frontiers in Cyber-Physical Systems, Washington D. C., USA
  The Annual Meeting of the Cognitive Science Society (CogSci2011), Boston, USA.

Teaching Interests:

- **Teaching Experience:**

Instructor, CS 105 Computer Concepts. 2008-2011
Department of Computer Science, University of Massachusetts at Boston.

Guest Instructor, CS670 Artificial Intelligence. 2012
Department of Computer Science, University of Massachusetts at Boston.

Teaching Assistant, CS637 Database-Backed Web Sites & Web Services. 2008
Department of Computer Science, University of Massachusetts at Boston.

- **Advising Experience:**

During my post-doctoral training in MIT, I have the opportunities to advise and work with many talented students. I believe a good advising is to motivate students and develop their research skills, and also help them achieve a concrete goal. My advisees include:

Finn, C., senior in EECS. Admitted to Graduate Programs in MIT, CMU, & Stanford.
Mattinson, B., sophomore in EECS.
Gopalan, A., Lexington High School, MA. Admitted to EECS, MIT.

Joint publication or presentation:
Finn, C., Wang, H. C., & Teller S. Fast and Robust Text-detection for Real-time Text Spotting. Poster presentation in MIT EECS SuperUrop Program, Dec. 4th, 2013.

- **Courses:**

I have developed broad knowledge of computer science from my PhD and postdoctoral training and research experience, which covers most basic and advanced courses. I am qualified to teach courses on the following topics:

- Computer Concept
- Linear Algebra
- Object-oriented Programming
- Robotics
- Artificial Intelligence
- Computer Vision
- Neural Networks
- Assistive Technology
- Theory of Computation
- Probability and Statistics
- Software Engineering
- Human Computer Interface
- Image Processing
- Machine Learning
- Natural Language Processing
- Multimedia Information Processing

References:

Dr. Seth Teller
Department of Electrical Engineering & Computer Science
Massachusetts Institute of Technology (MIT), MA, USA
Phone: (617) 258-7885
E-mail: teller@csail.mit.edu

Dr. Marc Pomplun
Department of Computer Science
University of Massachusetts Boston, MA, USA
Phone: (617) 287-6443
E-mail: marc@cs.umb.edu

Dr. Joo-Hwee Lim
Department of Computer Vision and Image Understanding
Institute for Infocomm Research, Singapore
Phone: +65 64082533
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Dr. Keith Rayner
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University of California, San Diego, CA, USA
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E-mail: krayner@ucsd.edu

Dr. Matthew Schneps
Laboratory for Visual Learning
Harvard-Smithsonian Center for Astrophysics, MA, USA
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