

# Kai-min Kevin Chang

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## CONTACT INFORMATION

Language Technologies Institute     *Phone:* +1 (412) 268-1810  
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USA

## RESEARCH INTERESTS

Machine learning, cognitive modeling, brain imaging, artificial intelligence, human-computer interaction, brain-computer interface, intelligent tutoring system, speech recognition.

## EDUCATION

**Carnegie Mellon University**, Pittsburgh, PA, USA

*School of Computer Science*

Ph.D., Language Technologies Institute, August 2011

- Advisors: Dr. Marcel Just and Dr. Tom Mitchell.
- Thesis Topic: Quantitative modeling of the neural representation of nouns and phrases.
- GPA: 3.93/4.00.

M.S., Language Technologies Institute, June 2006

- Advisors: Dr. Jack Mostow and Dr. Joseph Beck.
- GPA: 3.94/4.00.

**University of Waterloo**, Waterloo, ON, Canada

*Faculty of Mathematics*

B.Math., Computer Science and Psychology, June 2003

- Advisor: Dr. Derek Besner.
- Thesis Topic: Evolution of the dual route cascaded model of reading aloud.
- GPA: 81.93/100 (Graduated With Distinction).

## ACADEMIC EXPERIENCE

**Carnegie Mellon University**, Pittsburgh, PA, USA

*Research Associate, Language Technologies Institute*

**September, 2011 - present**

Work includes 1) using EEG to identify students' mental states and decide accordingly what and how to teach in a Reading Tutor, 2) investigating and contributing to computational neurolinguistics.

*Research Assistant, Center for Cognitive Brain Imaging*

**November, 2006 - August, 2011**

Supervised by Dr. Marcel Just and Dr. Tom Mitchell. Work included applying brain imaging and machine learning methods to model the semantic representation of object knowledge and multi-word expressions, such as adjective-noun phrases and noun-noun concept combinations.

*Research Assistant, Project LISTEN*

**September, 2004 - October, 2006**

Supervised by Dr. Jack Mostow and Dr. Joseph Beck. Work included applying Knowledge Tracing and Bayes nets to develop a student model that describes the learner's competencies in a Reading Tutor.

*Research Assistant*

**September, 2005 - June, 2006**

Supervised by Dr. David Plaut. Work included 1) learning static representations of variable-length strings, and 2) generating continuous articulatory trajectories as output in a parallel distributed processing model of reading.

**University of Waterloo**, Waterloo, ON, Canada

*Research Assistant*

**May, 2002 - June, 2003**

Supervised by Dr. Derek Besner. Work included implementing and modifying the Dual Route

Cascaded model, a connectionist model of visual word recognition and reading aloud. Wrote undergraduate thesis.

*Research Assistant, PAMI Lab*

**September - December, 2002**

Supervised by Dr. Mohamed Kamel. Work included application of neural network in RoboCup platform.

*Research Assistant*

**May - September, 2002**

Supervised by Dr. Mu Zhu. Work included application of genetic algorithm to an optimization and data segmentation problem.

#### HONORS AND AWARDS

- Nominated for Best Paper Award at the 15th International Conference on Artificial Intelligence in Education, Auckland, New Zealand, 2011.
- Computing Innovation Fellowship Finalists, 2010.
- Training grant from UCLA Advanced Neuroimaging Summer Program, 2010.
- Google 2010 Grad CS Forum Fellowship, 2010.
- Travel grant from the Joint conference of the 47th Annual Meeting of the Association for Computational Linguistics and the 4th International Joint Conference on Natural Language Processing of the Asian Federation of Natural Language Processing, Suntec, Singapore, 2009.
- Best Paper Award at the 9th International Conference on Intelligent Tutoring Systems, Montreal, Canada, 2008.
- Best Presentation Award at Language Technologies Institute Student Research Symposium, 2008.
- Training grant from Institute for Pure and Applied Mathematics Graduate Summer School on Probabilistic Models of Cognition, 2007.
- Training grant from Okinawa Institute of Science and Technology Workshop on Cognitive Neurobiology, Okinawa, Japan, 2006.
- Language Technologies Institute Graduate Research Fellowship, 2004 - present.
- Taiwan Digital Technology of the Year, 2003 (Automatic Speech Analysis System with Language Labs Inc.).
- Taiwan itMonthAward, 2003 (Automatic Speech Analysis System with Language Labs Inc.).
- Shad Valley Scholarship, McMaster University campus, 1998.
- Certificate of Distinction for various Mathematics contests such as Descartes, Euclid, Canadian Open, American High School Mathematics Examination, etc., 1997 - 1999.

#### ACADEMIC ACTIVITIES

- Co-author and Co-PI, NSF 10-620 Cyberlearning: Transforming Education grant (Design and Implementation Projects: Exploiting Longitudinal EEG Input in a Reading Tutor), 2011-2014.
- Co-organizing Neural Information Processing Systems 2011 Workshop on Machine Learning and Interpretation in Neuroimaging, Granada, Spain, 2011 - 2012.
- Invited talk on "A Latent Feature Analysis of the Neural Representation of Object Knowledge" at Brain Informatics, Special Session on Computational Neurolinguistics, Toronto, Canada, 2010.
- Co-organized North American Chapter of the Association for Computational Linguistics - Human Language Technologies 2010 Workshop on Computational Neurolinguistics, Los Angeles, California, 2009 - 2010.
- Distributed the CMU 60 Word-Pic fMRI data set, 2009 - present.
- Maintained the 4CAPS Cognitive Neuroarchitecture, 2006 - present.
- Developed the Bayes Net Toolbox for Student Modeling, 2004 - present.

#### JOURNAL PUBLICATIONS

**Chang, K.M.**, Mitchell, T.M., & Just, M.A. (2010). Quantitative modeling of the neural representation of objects: How semantic feature norms can account for fMRI activation. *NeuroImage: Special Issue on Multivariate Decoding and Brain Reading*, 56, 716-727.

Kemp, C., **Chang, K.M.**, & Lombardi, L. (2010). Category and feature identification. *Acta Psychologica*, 133, 216-233.

Mitchell, T.M., Shinkareva, S.V., Carlson, A., **Chang, K.M.**, Malave, V.L., Mason, R.A., & Just, M.A. (2008). Predicting human brain activity associated with noun meanings. *Science*, 320, 1191-1195.

PEER-REVIEWED  
CONFERENCE  
PROCEEDINGS

Mostow, J., **Chang, K.M.**, & Nelson, J. (2011). Toward exploiting EEG input in a Reading Tutor. Proceedings of the 15th International Conference on Artificial Intelligence in Education, Auckland, New Zealand, 230-237. [Best Paper Nominee]

**Chang, K.M.**, Cherkassky, V.L., Mitchell, T.M., & Just, M.A. (2009). Quantitative modeling of the neural representation of phrases: How vector-based models of semantic composition can account for fMRI activation. *Proceedings of the 47th Annual Meeting of the ACL and the 4th IJCNLP of the AFNLP*, Suntec, Singapore, 638-646.

Jern, A., **Chang, K.M.**, & Kemp, C. (2009). Bayesian belief polarization. *Advances in Neural Information Processing Systems*, Vancouver, Canada, 22.

Beck, J.E., **Chang, K.M.**, Mostow, J., & Corbett, A. (2008). Does help Help? Introducing the Bayesian evaluation and assessment methodology. *Proceedings of the 9th International Conference on Intelligent Tutoring Systems*, Montreal, Canada, 383-394. [Best Paper Nominee]

Beck, J.E., & **Chang, K.M.** (2007). Identifiability: A fundamental problem of student modeling. *Proceedings of the 11th International Conference on User Modeling*, Corfu, Greece, 137-146.

**Chang, K.M.**, Beck, J.E., Mostow, J., & Corbett, A. (2006). A Bayes net toolkit for student modeling in intelligent tutoring systems. *Proceedings of the 8th International Conference on Intelligent Tutoring Systems*, Jhongli, Taiwan, 104-113.

**Chang, K.M.**, Beck, J.E., Mostow, J., & Corbett, A. (2006). Does help help? A Bayes net approach to modeling tutor interventions. *Proceedings of the 21st National Conference on Artificial Intelligence Workshop on Educational Data Mining*, Boston, MA, 41-46.

**Chang, K.M.**, Beck, J.E., Mostow, J., & Corbett, A. (2005). Using speech recognition to evaluate two student models for a Reading Tutor. *Proceedings of the 12th International Conference on Artificial Intelligence in Education Workshop on Student Modeling for Language Tutors*, Amsterdam, Netherlands, 12-21.

Beck, J.E., **Chang, K.M.**, Mostow, J., & Corbett, A. (2005). Using a student model to improve a computer tutor's speech recognition. *Proceedings of the 12th International Conference on Artificial Intelligence in Education Workshop on Student Modeling for Language Tutors*, Amsterdam, Netherlands, 2-11.

POSTER  
PRESENTATIONS

**Chang, K.M.**, Mitchell, T.M., & Just M.A. (2008). What functional brain imaging reveals about neuroarchitecture of object knowledge. *The 30th Annual Meeting of the Cognitive Science Society*, Washington, DC.

**Chang, K.M.**, Malave V., Shinkareva, S., Mitchell, T.M., & Just M.A. (2007). What functional brain imaging reveals about neuroarchitecture of object knowledge. *The 1st Okinawa Institute of Science and Technology Workshop on Cognitive Neurobiology*, Okinawa, Japan.

TEACHING  
EXPERIENCE

**Carnegie Mellon University**, Pittsburgh, PA, USA  
*Co-advisor, M.S. student*

**September - present, 2011**  
Supervised Language Technologies Institute M.S. student Vivian Chen on using EEG to help improve automatic speech recognition.

*Co-advisor, M.S. student* **September - present, 2011**  
Supervised Computer Science Department M.S. student Lucas Tan on improving temporal models of EEG mental state detection.

*Supervisor, PSLC Summer Internship Program* **April - August, 2011**  
Supervised Brigham Young University undergraduate Udip Pant on using EEG to detect comprehension.

*Guest Lecturer, Andrew's Leap Summer Program* **June, 2010**  
Lectured on mind reading.

*Teaching Assistant, 15-386/686 Neural Computation* **January - May, 2010**  
Assisted Dr. Tai Sing Lee.

*Guest Lecturer, Andrew's Leap Summer Program* **July, 2009**  
Lectured on mind reading.

*Teaching Assistant, 05-834 Machine Learning in Practice* **September - December, 2008**  
Assisted Dr. Carolyn Rose.

PROFESSIONAL  
EXPERIENCE

**The Language Labs Inc.**, Taipei, Taiwan  
*Software Engineer* **September, 2003 - August, 2004**  
Coordinated the intonation project in patented Automatic Speech Analysis System. Assisted the laboratory to win Taiwan's two national awards on technology advancement: 2003 Taiwan itMonthAward and 2003 Taiwan Digital Technology of the Year.

**Canadian Imperial Bank of Canada, PERC**, Toronto, ON, Canada  
*Software Developer* **September - December, 2000**  
Enhanced the functionality of a Java application used by all CIBC employees in the nation. Automated the monitoring process for error reports and improved efficiency by 80%.

**Mitra Imaging Inc.**, Waterloo, ON, Canada  
*Software Developer* **January - April, 2000**  
Managed a full software development cycle of a new security package system, which administered the external OEM access to MIS systems.

**QLT Phototherapeutics Inc.**, Vancouver, BC, Canada  
*Computer Technician* **August - September, 1998**  
Researched the Y2K problem and applied patches to all computers in the company.

**Eric Hamber Secondary School**, Vancouver, BC, Canada  
*Private Tutor* **1995-1999**  
Tutored Grade 10-12 Mathematics.

COMPUTER SKILLS

- *Certifications:* SCJP, SCJD, MCP, MCSE, MCDBA.
- *Research Tools:* Matlab, R, SPSS, SPM, FSL, Weka, Bayes Net Toolbox, PsychToolBox, LENS neural network toolkit, 4CAPS and ACT-R cognitive architecture, Sphinx and Janus speech recognition system.
- *Programming:* Java, C/C++, Perl, TCL/TK, Lisp, Visual C++, Visual Basic, UML, UIMA, SVN, CVS, ANT.
- *Networking:* HTML, XML, ASP, VBScript, JavaScript, MS Win2000 Server, MS IIS.
- *Database:* SQL, MySQL, SQL Server, Oracle, MS Access, ODBC, JDBC.
- *Design:* Adobe Photoshop, Illustrator, PageMaker, Imagine 3D, Macromedia Director, Amaya,

LaTeX, Adobe FDF Toolkit.

- *Platform:* GNU/Linux, UNIX, Cygwin, Windows, NT, DOS, Mac OS.

LANGUAGE  
PROFICIENCIES

- *English:* Fluent speaking, reading and writing.
- *Chinese:* Fluent speaking, reading and writing.

CITIZENSHIP

- Canada.