Shanqing Cai, Ph.D.

Work: 677 Beacon Street, Room 102, Boston, MA 02215
scai@bu.edu • http://people.bu.edu/scai/

Current Positions

Post-doctoral Associate Feb 2012 – Present
CNS Speech Laboratory
Center for Computational Neuroscience and Neural Technology (CompNet)
and Department of Speech, Language and Hearing Sciences
Sargent College, Boston University, Boston, MA

Research Consultant May 2012 – Present
Communication Analysis and Design Laboratory (CadLab)
Northeastern University, Boston, MA

Education

Massachusetts Institute of Technology, Cambridge, MA, USA Sept 2007 – Feb 2012
Ph.D. in Speech and Hearing Bioscience and Technology
(Harvard-MIT Division of Health Science and Technology)
Dissertation: "Online Control of Articulation Based on Auditory Feedback in Normal Speech and Stuttering: Behavioral and Modeling Studies."
Dissertation Committee: Frank Guenther, Joseph Perkell and Michael Fee

Master of Science (S.M.) in Electrical Engineering and Computer Science (EECS)
Thesis: "Adaptive auditory-motor control of the time-varying formant trajectories in vowels and its patterns of generalization."
Thesis advisor: Joseph Perkell

The Johns Hopkins University, Baltimore, MD, USA Sept 2005 – July 2007
Master of Science in Engineering (M.S.E.) in Biomedical Engineering
Thesis: "Intensity encoding of ventral cochlear nucleus neurons in normal and deafened cats and correlates of loudness recruitment."
Thesis advisor: Eric Young

Tsinghua University, Beijing, China Sept 2001 – July 2005
Bachelor of Engineering (B.E.) in Biomedical Engineering (with highest honors)

Research Experience

Speech Laboratory, Boston U. *(Postdoc. associate)* Feb 2012 – Present
- Neuro-computational modeling of the mechanisms of multisyllabic speech articulation in normal speech and developmental stuttering.
- Neuroimaging (MRI) studies of the neural bases of developmental stuttering and spasmodic dysphonia.
- Assistive technologies based on speech signal processing for fluency enhancement and speech training.

Communication Analysis and Design Lab (CadLab), Northeastern U. May 2012 – Present
(Research consultant)
- Using statistical parametric synthesis to improve personalized text-to-speech systems for users with severe communication disorders.

Speech Communication Group, RLE, MIT *(Ph.D. student)* Sept 2007 – Feb 2012
- Real-time dynamic perturbation of auditory feedback and functional MRI (fMRI) for studying the sensorimotor control of time-varying and multisyllabic speech production.
- Differences in the sensorimotor properties of the speech motor system between normal speakers and speakers with persistent developmental stuttering.
- Using diffusion-tensor imaging (DTI) to study the relation between structural abnormalities of the brain and abnormal speech motor functions in persistent developmental stuttering.

Neural Encoding Lab, JHU *(Master's student)* Sept 2005 – Jul 2007
- Effects of acoustic trauma on neuronal encoding of sound by ventral cochlear nucleus neurons.

Biomedical Signal Processing Laboratory, Tsinghua University Feb 2002 – July 2005
(Undergraduate research assistant)
- Psychophysics and image processing studies of the electronic visual prosthesis. (Research advisors: Prof. Guangshu Hu and Hui Zhang)

Honors and Awards

Research Funding
- National Science Foundation: "Doctoral Dissertation Research: Online Control of Multisyllabic Speech Articulation Based on Auditory Feedback" (ID: 1051566) (Ph.D. student co-PI) 2011

National
- Raymond H. Stetson Fellowship in Phonetics and Speech Production, Acoustical Society of America 2011
- National Scholarship (First-class), Tsinghua University, Beijing 2003

Institutional and Municipal

- Helen C. Peake Research Award, Research Laboratory of Electronics, MIT 2011
- Advanced Multimodal Neuroimaging Training Fellowship, A.A. Martinos Center for Biomedical Imaging, Massachusetts General Hospital, Harvard Medical School 2009
- Chyn Duog Shiah Memorial Fellowship, MIT 2008
- Edward Austin Endowed Fellowship, MIT 2007
- Outstanding Undergraduate Thesis Award, Tsinghua University 2007
- Award for Contribution to Student Laboratory Development, Tsinghua University 2007
- Excellent Graduate Award, Tsinghua University (Awarded to 55 out of 3801 bachelor degree recipients in the year 2005) 2005
- OOCL Scholarship, Tsinghua University 2004
- Second Prize in Mathematical Modeling Contest of Beijing Universities 2004
- Excellence in Cultural and Artistic Activities Award, Tsinghua University 2003
- Wei-Lun Foundation Scholarship, Tsinghua University 2002

Publications

Peer-reviewed Journal Articles

- **Cai S**, Tourville JA, Beal DS, Perkell JS, Guenther FH, Ghosh SS. (2014). "Diffusion Imaging of Cerebral White Matter in Persons Who Stutter: Evidence for Network-Level Anomalies." *Front. Hum. Neurosci.* 8:54.
- **Cai S,** Beal DS, Ghosh SS, Guenther FH, Perkell JS. (2014). "Impaired timing adjustments in response to time-varying auditory perturbation during connected speech production in persons who stutter." *Brain Lang.* 129:24-29.
- **Cai S**, Beal DS, Ghosh SS, Tiede MK, Guenther FH, Perkell JS. (2012). "Weak responses to auditory feedback perturbation during articulation in persons who stutter: Evidence for abnormal auditory-motor transformation." *PLoS ONE*. 7(7):e41830.
- **Cai S**, Ghosh SS, Guenther FH, Perkell JS. (2011). "Focal manipulations of formant trajectories reveal a role of auditory feedback in the online control of both within-syllable and between-syllable speech timing." *J. Neurosci.* 31(45):16483-16490.
- **Cai S**, Ghosh SS, Guenther FH, Perkell JS. (2010). "Adaptive auditory feedback control of the production of the formant trajectories in the Mandarin triphthong /iau/ and its patterns of generalization." *J. Acoust. Soc. Am.* 128(4):2033-2048.
- **Cai S**, Ma W-LD, and Young ED. (2009). "Encoding intensity in ventral cochlear nucleus following acoustic trauma: implications for loudness recruitment." *J. Assoc. Res. Otolaryngol.* 10(1): 5-22. Commented in Joris, P. X. (2009). "Recruitment of neurons and loudness." *J. Assoc. Res. Otolaryngol.* 10(1):1-4.
- Fu L, **Cai S**, Zhang H, Hu G, Zhang X. (2006). "Psychophysics of reading with a limited number of pixels : towrads the rehabilitation of reading ability with visual prosthesis." *Vision Res.* 46: 1292-1301.
- Fu L, Zhang H, **Cai S**, Hu G. (2006). "Chinese printed text reading performance with pixelized prosthetic vision system." [In Chinese]. *J. Tsinghua Univ. (Sci. & Tech.).* 46(6): 858-860, 871.

Peer-reviewed Articles in Conference Proceedings

- **Cai S**, Bunnell HT, Patel R. (2013). Unsupervised vocal-tract length estimation through model-based acoustic-to-articulatory inversion. *14th Annual Conference of the International Speech Communication Association (InterSpeech 2013)*, Lyon, France, Aug. 25-29, 2013.
- **Cai S**, Boucek M, Ghosh SS, Guenther FH, and Perkell JS. (2008). "Sensorimotor adaptation to dynamic feedback perturbation of diphthong acoustics and results from perturbation of the Mandarin triphthong /iau/." In *Proceedings of the 8th Int. Seminar on Speech Production*, Strasbourg, France, Dec. 8–12, 2008. pp. 65-68.
- **Cai S**, Fu, L., Zhang, H., Hu, G., & Liang, Z. (2005). "Prosthetic visual acuity in irregular phosphene arrays under two down-sampling schemes: a simulation study." In *Proceedings of the 2005 IEEE EMBS 27th Annual Conference*, Shanghai, China, September 1-4, 2005. Vol. 5.

Non peer-reviewed Articles in Conference Proceedings

- Tourville JA, **Cai S**, Guenther FH (in press). "Exploring auditory-motor interactions in normal and disordered speech." *Proceedings of Meeting on Acoustics* 9:060180. *165th Meeting of the Acoustical Society of America*, Montreal, Quebec, Canada, June 2 – June 7, 2013.

Other Conference Publications and Abstracts

- Van Brenk F, Terband H, **Cai S**. (2014) "Auditory feedback perturbation in adults and children." To be presented at 2014 Motor Speech Conference, Sarasota, FL, Feb. 27 – March 2, 2014.
- Terband H, van Brenk F, van der Zee A, Nijssen M, **Cai S** (2014) "Auditory feedback perturbation in children with developmental speech sound disorders." To be presented at 2014 Motor Speech

Conference, Sarasota, FL, Feb. 27 – March 2, 2014.

- **Cai S**, Beal, DS, Guenther FH, Perkell JS, Ghosh SS (2012). FMRI resting state connectivity of the brain in stuttering. *Society for Neuroscience (SfN) Annual Meeting 2012*, New Orleans, LA, Oct. 13 – 17, 2012.
- Beal DS, Segawa J, Tourville JA, **Cai S**, Guenther FH (2012). Speech motor sequence learning difficulties in persistent developmental stuttering: An fMRI study. *Society for Neuroscience (SfN) Annual Meeting 2012*, New Orleans, LA, Oct. 13 – 17, 2012.
- Schaefer M, McAuliffe MCM, Liss JM, Katseff S, O'Beire GA, **Cai S** (2012). Responses to manipulations in auditory feedback: The effect of aging. *2012 Motor Speech Conference*, Santa Rosa, CA, USA. Feb. 29 – March 4, 2012.
- Beal DS, **Cai S**, Guenther FH, Ghosh SS, Tiede MK, Perkell JS (2012). The relations among stuttering severity, experiences, and kinematic variability measures. *2012 Motor Speech Conference*, Santa Rosa, CA, USA. Feb. 29 – March 4, 2012.
- Beal DS, **Cai S**, Ghosh SS, Tiede MK, Perkell JS (2011). The Relations Among Stuttering Severity, Experiences, & Kinematic Variability Measures. *American Speech, Language and Hearing Association (ASHA) Annual Convention*. San Diego, CA, Nov. 17-19, 2011.
- Beal DS, Tourville JA, **Cai S**, Segawa J, Guenther FH (2011). An fMRI Study of Speech-Sequence Learning in People Who Stutter. *American Speech, Language and Hearing Association (ASHA) Annual Convention*. San Diego, CA, Nov. 17-19, 2011.
- **Cai S**, Beal DS, Tiede MK, Perkell JS, Guenther FH, Ghosh SS (2011). "Relating the kinematic variability of speech to MRI-based structural integrity of brain white matter in people who stutter and people with fluent speech." *Society for Neuroscience Annual Meeting*, Washington, DC, Nov. 12 – 16, 2011.
- **Cai S**, Beal DS, Ghosh SS, Tiede MK, Guenther FH, Perkell JS (2011). Comparing auditory-motor interaction in static and time-varying articulation between stutterers and normal speakers. *The 3rd Neurobiology of Language Conference (NLC)*, Annapolis, MD, Nov. 10 – 11, 2011.
- Schaefer MCM, McAuliffe MJ, Liss JM, O'Beirne GA, **Cai S** (2011). "Responses of older individuals to manipulations in auditory feedback: Preliminary findings." *The 8th Asia Pacific Conference on Speech, Language and Hearing*, Christchurch, Canterbury, New Zealand, Jan. 11-14, 2011.
- **Cai S**, Ghosh SS, Guenther FH, Perkell JS (2010). "The role of auditory feedback in the online control of multisyllabic articulation." *International Summer School on Cognitive and Physical Models of Speech Production, Speech Perception and Production-Perception Interaction.* Berlin, Germany, Sept. 21 – Oct. 1, 2010.
- **Cai S**, Ghosh SS, Guenther FH, Perkell JS (2010). "Coordination of the first and second formants of the Mandarin triphthong /iau/ revealed by adaptation to auditory perturbations. (Abstract)" *J. Acoust. Soc. Am.* 127(3): p. 2018. *159th Meeting of the Acoustical Society of America*, Baltimore, MD, April 19-23, 2010.
- **Cai S**, Ghosh SS, Perkell JS, Guenther FH (2010). "The role of auditory feedback in the online control of articulatory trajectories and timing in a multi-syllabic utterance." *Motor Speech Conference*, Savannah, GA, March 4 – 7, 2010.
- **Cai S**, Ma WLD, Letham B, Young ED (2007). "Rate-intensity functions of ventral cochlear nucleus in normal and hearing-impaired cats and their possible relationships to loudness recruitment." *30th Midwinter Meeting of the Assoc. Res. Otolaryngol.*, Denver, Colorado, February 10-15, 2007.
- Letham B, Ma WLD, **Cai S**, Young ED (2007). "Acoustic trauma induces long-term temporal correlations in DCN." *30th Midwinter Meeting of the Assoc. Res. Otolaryngol.*, Denver, Colorado, February 10-15, 2007.

Invited Talks

- **Cai S**, Guenther FH (2013) "Local time-warping in auditory feedback alters articulatory timing in connected multisyllabic speech containing vowels, fricatives and stops." Presented at Acoustical Soceity of America (ASA) Satellite Symposium: Neural Bases of Speech Production, San Francisco, CA, USA, December 1, 2013.
- "Auditory-motor interaction in normal speech production and stuttering." Department of Communication Science and Disorders, Michigan State University, East Lansing, MI. Aug. 15, 2012 (Host: Dr. Soo-Eun Chang)
- "Speech motor control in time-varying phonemes and multisyllabic utterances: Insights from auditory feedback perturbation." GIPSA-lab (Laboratoire de Recherché, Gipsa, Grenoble, Image, Parole, Signal, Automatique), Grenoble, France. Sept. 22, 2010 (Host: Dr. Marc Sato)
- "Speech motor control and auditory feedback: Exploring time-varying and multisyllabic articulation." New Zealand Institute of Language, Brain and Behavior (NZILBB), University of Canterbury, Christchurch, New Zealand. August 17th, 2010 (Host: Dr. Megan McAuliffe)
- "Neural correlates of speech motor learning: an fMRI study." Forum of the Havard-MIT Division of Health Science and Technology (HST). April 15th, 2010.
- "Sensorimotor control of dynamic formant trajectories in the Mandarin triphthong /iau/: preliminary results." Voice Center Research Forum, Massachusetts General Hospital. July 25th, 2008 (Host: Miriam Makhlouf).

Reviewer activities

- Review Editor for
  - Frontiers in Human Neuroscience (2012–)

- *Ad hoc* reviewer for
  - Neurobiology of Language Conference (2011–)
  - IEEE Engineering in Medicine and Biology Society Conference (EMBC) (2011–)
  - National Science Foundation (NSF): Division of Behavioral and Cognitive Sciences (2012)
  - Journal of Speech, Language and Hearing Research (2012–)
  - Chapter in edited book: Fuch S, Weirich M, Pape D, Perrier P. (Eds.) *Planning and Dynamics* (2012)
  - PLoS ONE (2012–)
  - Journal of Fluency Disorders (2012–)
  - Journal of Phonetics (2012–)
  - Journal of Communication Disorders (2011)
  - Journal of the Acoustical Society of America (2010–)
  - International Journal of Language and Communication Disorders (2012–)
  - Speech Communication (2013–)
  - Scientific Reports (Nature Publishing Group) (2013–)
  - Journal of Zhejiang University Science C (Computer & Electronics) (2013–)
  - Brain and Language (2013–)

Teaching Experience

Guest Lectures

Cai, S. "Feedback mechanisms in speech production", *Introduction to computational neuroscience of speech, language, and hearing (SAR HS 361 / CAS NE 360 / CAS CN 360; Course director: Jason Bohland)*, Boston University, Boston, MA, Nov. 20, 2012.

Teaching Assistantship

Systems Bioengineering II (Prof. Xiaoqin Wang), JHU	Spring 2007
Systems Bioengineering Lab I (Prof. Eileen Haase), JHU	Fall 2006
Physiol. Foundations of Biomed. Engineering Lab I (Prof. Eileen Haase), JHU	Fall 2005
Models and Simulations (Prof. Leslie Tung & Prof. Raymond Winslow), JHU	Spring 2006

Professional Memberships

- Society for Neuroscience (SfN)
- Student member of the Acoustical Society of America (ASA)
- Member of the National Student Speech Language Hearing Association (NSSLHA)
- Student Member of the Institute of Electrical and Electronics Engineers (IEEE)
- Student Member of Engineering in Medicine and Biology Society (EMBS)

Extracurricular Activities

Chief Tubist
Johns Hopkins University Wind Ensemble
Tsinghua University Symphonic Band

Tubist
Tsinghua University Symphonic Orchestra