Stephen H. Shum

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Citizen of U.S.A. |

Education

Massachusetts Institute of Technology — Cambridge, MA
Ph.D. in Electrical Engineering and Computer Science — **September 2011 - June 2016**
- Overcoming Resource Limitations in the Processing of Unlimited Speech: Applications to Speaker and Language Recognition

Massachusetts Institute of Technology — Cambridge, MA
S.M. in Electrical Engineering and Computer Science — **September 2009 - June 2011**
- Thesis: Unsupervised Methods for Speaker Diarization
- Recipient of the William A. Martin Thesis Award, May 2011
- GPA: 4.8/5.0

University of California, Berkeley — Berkeley, CA
B.S. in Electrical Engineering and Computer Science — **August 2005 - May 2009**
- GPA: 3.9/4.0

Research, Employment, and Workshops

MIT Computer Science and Artificial Intelligence Laboratory — Cambridge, MA
Graduate Student Researcher, Spoken Language Systems Group — **September 2009 - Present**
Advisors: Drs. James R. Glass and Najim Dehak
- Unsupervised acoustic unit discovery for language identification [IEEE 2016].
- Speaker diarization involving low-dimensional embeddings, iterative optimization, spectral clustering, and variational inference [Interspeech 2011, 2012; IEEE 2013].

Johns Hopkins Univ., Human Language Tech. Center of Excellence — Baltimore, MD
Researcher, Summer Camp for Advanced Language Exploration (SCALE) — **Summer 2013**
"Robust Speaker Recognition for Real Data," led by Drs. Alan McCree and Douglas Reynolds.
- Unsupervised clustering for robust domain adaptation in speaker recognition [Odyssey 2014].

Brno University of Technology, Speech Processing Group — Brno, Czech Republic
Participant, Speaker Recognition Research Workshop — **November 2012**
Collaborators: Drs. Pavel Matejka, Lukas Burget, et al.
- Low-dimensional stochastic neighbor embedding (t-SNE) for speaker diarization.

MIT Lincoln Laboratory — Lexington, MA
Research Intern, Group 52 – Human Language Technology — **Summer 2012**
Supervisors: Drs. William Campbell and Douglas Reynolds
- Graph-based methods for speaker clustering on large-scale speech corpora [ICASSP 2013].

Google, Inc. — Mountain View, CA
Software Engineering Intern, Machine Hearing Research Group — **Summer 2011**
Mentors: Drs. Tom Walters and Dick Lyon
- Audio fingerprinting for melody summarization and cover song detection.

UC Berkeley, Video and Image Processing Lab — Berkeley, CA
Undergraduate Research Assistant — **January – August 2009**
Advisor: Prof. Avideh Zakhor
- Indoor localization algorithms for a human-operated backpack system [3DPVT 2010].

Johns Hopkins University, Center for Language and Speech Processing — Baltimore, MD
Undergraduate Researcher, Summer Research Workshop — **Summer 2008**
"Vocal Aging Explained by Vocal Tract Modeling" Team, led by Prof. Elmar Noeth.

| **Publications and Talks** | S. Shum, N. Dehak, R. Dehak, and J. Glass, "On the Use of Acoustic Unit Discovery for Language Recognition," *IEEE Transactions on Audio, Speech, and Language Processing*, 2016. |

S. Shum, N. Dehak, and J. Glass, "Limited Labels for Unlimited Data: Active Learning for Speaker Recognition," in *Proc. Interspeech*, Singapore, September 2014.

S. Shum, D. Reynolds, D. Garcia-Romero, and A. McCree, "Unsupervised Clustering Approaches for Domain Adaptation in Speaker Recognition Systems," in *Proc. Odyssey*, Joensuu, Finland, June 2014. [**Best Student Paper**]

D. Garcia-Romero, A. McCree, S. Shum, N. Brummer, and C. Vaquero, "Unsupervised Domain Adaptation for i-vector Speaker Recognition," in *Proc. Odyssey*, Joensuu, Finland, June 2014.

S. Shum, "From Vectors Representing Speech to Graphs Representing Corpora: Reconciling how far we've come with how far we still have to go," seminar given at the Chinese University of Hong Kong, Hong Kong, November 26, 2013. [Host: Prof. Helen Meng]

S. Shum, N. Dehak, R. Dehak, and J. Glass, "Unsupervised Methods for Speaker Diarization: An Integrated and Iterative Approach," *IEEE Trans. Audio, Speech, Lang. Process.*, October 2013.

S. Shum, W. Campbell, and D. Reynolds, "Large-Scale Community Detection on Speaker Content Graphs," in *Proc. ICASSP*, Vancouver, British Columbia, Canada, May 2013.

S. Shum, "Unsupervised Methods for Speaker Diarization: An Integrated and Iterative Approach," colloquium given at Friedrich-Alexander Universitat Erlangen-Nuremberg, Germany, November 29, 2012. [Host: Prof. Elmar Noeth]

S. Shum, N. Dehak, and J. Glass, "On the Use of Spectral and Iterative Methods for Speaker Diarization," in *Proc. Interspeech*, Portland, Oregon, September 2012.

S. Shum, N. Dehak, E. Chuangsuwanich, D. Reynolds, and J. Glass, "Exploiting Intra-Conversation Variability for Speaker Diarization," in *Proc. Interspeech*, Florence, Italy, August 2011.

N. Dehak and S. Shum, "Low-Dimensional Speech Representation based on Factor Analysis and its Applications," tutorial given at *Interspeech*, Florence, Italy, August 27, 2011.

S. Shum, N. Dehak, R. Dehak, and J. Glass, "Unsupervised Speaker Adaptation Based on the Cosine Similarity for Text-Independent Speaker Verification," in *Proc. Odyssey*, Brno, CZ, June 2010.

G. Chen, J. Kua, S. Shum, N. Naikal, M. Carlberg, and A. Zakhor, "Indoor Localization Algorithms for a Human-Operated Backpack System," in the *Symposium on 3DPVT*, Paris, France, May 2010.

Coursework and Teaching

@MIT
- Algorithms for Inference (A), Discrete-Time Signal Processing (A), Speech Recognition (A)
- Signals and Systems (Teaching Assistant for Prof. Jae Lim, Spring 2012)
- Automatic Speech Recognition (TA for Dr. James Glass and Prof. Victor Zue, Spring 2013)

@UC Berkeley
- Multivariable Calculus (A+), Linear Algebra (A+), Numerical Analysis (A)
- Concepts of Probability (A+), Stochastic Processes (A), Statistical Learning Theory (A)

Awards, Honors, and Memberships

Journal of Emerging Investigators, Reviewer	August 2014
Cal Alumni Club of New England, Board Member	March 2014
MIT EECS Department, William A. Martin Thesis Award	May 2011
National Science Foundation, Graduate Research Fellowship – Honorable Mention	April 2011
Tau Beta Pi, Member	May 2008
Eta Kappa Nu, Member	May 2007

Hobbies, Interests, and Other Abilities

* MIT Road Cycling Team (*February 2012 – May 2014*)
    – Logistics Officer (*Spring 2014*)
* Marathon Running
    – *Comrades '14, Boston '14, Mount Desert Island '13, Bay State '12, Marine Corps '11, SF '11/'09, Chicago '10, NYC '09, Big Sur '09*
* Lindy Hop / Swing Dancing, Rubik's Cube, Spoken Cantonese