

HAKAN ERDOGAN

Address: Sabanci University, Orhanli Tuzla 34956 Istanbul

Tel: +90 216 4839607

Email: haerdogan@sabanciuniv.edu

URL: <http://people.sabanciuniv.edu/haerdogan>

WORK EXPERIENCE

Assistant Professor

September 2002 – present

Sabanci University, Istanbul, Turkey

- Taught or teaching the following courses:
 - Signals (ENS 211), sophomore level introductory signal processing class
 - Discrete-time Signal Processing (TE 302), junior level EE program class
 - Speech Processing (TE 405 / EE 562), senior/graduate level class
 - Introduction to Scientific Computing (CS 409), senior level class
 - Advanced DSP (EE 560), graduate level class
 - Advanced Speech Recognition (EE 662), graduate level class
- Research interests: Statistical machine learning, audio-visual signal processing, speech recognition, multimodal biometrics and classifier combination methods, sensor signal processing and decision making, multimedia information extraction, statistical methods for bioinformatics.
- Projects:
 - "Novel approaches in audio-visual speech recognition," supported by TUBITAK, Dates: Oct. 2007 - Sep. 2010, Budget: 221945 YTL, Role: PI.
 - "Speaker recognition using support vector machines," supported by TUBITAK UEKAE, Dates: May 2008 - May 2009, Role: PI.
 - "Driving behavior analysis," supported by NEDO, Japan, Dates: 2006-2009, Budget (for Sabanci only): 11.7 million JPY (100K USD), Role: PI for Sabanci University part of the project since Winter 2007.
 - "Drive-safe," supported by DPT, Turkey, Dates: 2006-2009, Budget (total) approximately 1800000 YTL, Role: researcher.
 - "Language modeling for morphologically rich languages," with IBM TJ Watson Research Center, NY, USA, not funded, 2007-now.
 - Protein secondary structure prediction, jointly with Yucel Altunbasak, Zafer Aydin of Georgia Tech, USA, not funded, Dates: 2005-2008.
 - Turkish speech recognition research supported by European Union Cost 278 scheme (with Engin Erzin, Kemal Oflazer, Enis Cetin), Dates: 2003-2005.

Researcher

September 1999 – August 2002

IBM TJ Watson Research Center, Human Language Technologies Department

- Played key role in research and development for IBM ViaVoice dictation product
- Built HMM models for ViaVoice dictation using new spontaneous speech training data collected from about 200 speakers
- Developed new rapid speaker adaptation methods and algorithms based on penalized likelihood criterion
- Improved name dialer performance by using speaker clustering and novel adaptation methods
- Involved in designing a new discriminative feature extraction method called WLDA for speech recognition
- Played key role in IBM DARPA communicator telephony air travel reservation demo system
- Improved the performance of the speech recognition module for DARPA Communicator (an air travel reservation system) by developing and tuning a compound word and class based

language model, this IBM system achieved first place in DARPA evaluation in 2001 for task completion

- Designed language models that use embedded grammars and dialog state feedback for DARPA Communicator
- Developed maximum entropy language modeling methods that uses semantic parser features for improved language modeling in speech recognition
- Working on statistical machine translation algorithms for inter-lingua based, limited domain speech to speech translation

Graduate Student Research Assistant

January 1996 - August 1999

The University of Michigan, Image Computing Laboratory

- Attacked the problem of post-injection transmission scans in PET
- Developed statistical reconstruction procedures for post-injection problem
- Developed a fast and monotonic algorithm for penalized likelihood image reconstruction in transmission tomography applicable to PET, SPECT and CT
- Analyzed variance and bias propagation from transmission scans to emission images
- Developed formulas for optimal scan times for emission and transmission scans to achieve minimum variance in a specific region
- Developed an ordered subsets algorithm for transmission tomography
- Implemented new algorithms in UNIX environment in C language as a part of the ASPIRE library

Programmer

September 1995 - August 1997

The University of Michigan, Computer Aided Engineering Network (CAEN)

- Developed scripts for nameservice and AFS (Andrew File System) support services of the CAEN computer environment
- Made extensive use of unix environment and scripting languages perl, bsh, csh and unix utilities grep, sed, awk, acquired some unix system administration skills
- reference: Steve Mattson, email: hobbes@engin.umich.edu

Graduate Student

Winter 1994 - Fall 1995

The University of Michigan, Biomedical Ultrasonics Laboratory

- Advisor: Emad Ebbini, worked on coded excitation ultrasound imaging, worked with singular value decomposition and linear inverse problems
- Developed total least squares solution to coded excitation imaging problem robust to both noise in the system and model mismatches in the system matrix

Summer Intern and Senior Project

Summer 1992 - Winter 1993

TUBITAK Software R&D Center, Ankara, Turkey

- Implemented C programs for verification of Discrete Event Systems

EDUCATION

Ph.D. in Electrical Engineering , December 1999

THE UNIVERSITY OF MICHIGAN, Ann Arbor, MI

Advisor: Jeffrey A. Fessler

Dissertation: Statistical Image Reconstruction Algorithms using Paraboloidal Surrogates in PET Transmission Scans

Master of Science in Electrical Engineering, April 1995

The University of Michigan, Ann Arbor, MI

Bachelor of Science in Electrical Engineering, June 1993

Middle East Technical University, Ankara, Turkey

Bachelor of Science in Mathematics (double major), June 1993
Middle East Technical University, Ankara, Turkey

TEACHING EXPERIENCE

Assistant Professor September 2002 - present
Sabanci University, Faculty of Engineering and Natural Sciences

- Digital Speech Processing, Digital Signal Processing, Advanced Speech Recognition, Advanced DSP, Numerical Linear Algebra

Graduate Student Instructor September 1995 - December 1995
University of Michigan, Electrical Engineering and Computer Science Department

- Course: Digital Signal Processing, senior level, about 50 students
- Assumed major responsibility on computer lab assignments
- Assisted students with their MATLAB skills and instructed two recitation sessions

Graduate Student Instructor September 1994 - April 1995
University of Michigan, Electrical Engineering and Computer Science Department

- Course: Introduction to Circuits Laboratory
- Instructed two laboratory sessions for two semesters

HONORS AND AWARDS

- TUBITAK NATO Science Fellowship for doctoral studies, June 1993
- First place in TUBITAK national mathematics competition in senior high school, 1989

SERVICE AND MEMBERSHIP

- Finance chair of ICPR 2010 (upcoming)
- Technical co-chair of IEEE SIU 2006 conference
- Technical co-chair of DSP-in-cars 2007 workshop
- Program committee (PC) member of LREC 2005-2008
- PC member of IEEE ISCIS 2006-2009
- PC member of IEEE SIU 2006-2009
- PC member of IEEE ICPS 2007
- PC member of DSP-in-cars 2009.
- Member of IEEE since 1992, planning to be senior member in 2009 or 2010.
- Member of ISCA since 2003
- Speech to speech translation workshop organizer - ACL-02 conference

RESEARCH INTERESTS

- Audio-visual signal processing
- Statistical modeling for signal and image processing problems, discriminative transforms for acoustic features, front-end signal processing for speech recognition, speaker adaptation algorithms, maximum entropy methods for acoustic and language modeling
- Statistical methods for natural language processing and machine translation
- Image reconstruction and restoration using statistical methods, image compression, optimization methods, vector space methods, algorithm development
- Biometrics including voice and face, fusion of multiple biometrics
- Bioinformatics, protein secondary structure estimation from amino-acid sequences.
- Multimedia information processing and extraction

PUBLICATIONS

JOURNALS

1. Aydin, Z., Altunbasak, Y., Erdogan, H., "Bayesian models and algorithms for protein beta-sheet prediction," *IEEE/ACM Transactions on Computational Biology and Bioinformatics*, to appear, 2009.
2. Sarikaya, R., Afify, M., Deng, Y., Erdogan, H., Gao, Y., "Joint morphological-lexical language modeling for processing morphologically rich languages with application to dialectal Arabic," *IEEE Transactions on Audio Speech and Language Processing*, vol. 16, no. 7, pp. 1330-40, Sep. 2008.
3. Aydin, Z., Altunbasak, Y., Erdogan, H., "Bayesian protein secondary structure prediction with near-optimal segmentations," *IEEE Transactions on Signal Processing*, vol. 55, no. 7, part 1, pp. 3512-3525, Jul. 2007.
4. Erzin, E., Yemez, Y., Tekalp, A. M., Ercil, A., Erdogan, H., Abut, H., "Multimodal person recognition for human-vehicle interaction," *IEEE MultiMedia*, vol. 13, no. 2, pp. 18-31, Apr-Jun. 2006.
5. Erdogan, H., Ercil, A., Ekenel, H. K., Bilgin, S. Y., Eden, I., Kirisci, M., Abut, H., "Multi-modal person recognition for vehicular applications," *N.C. Oza et al. (Eds.): MCS 2005, LNCS 3541*, pp. 366 – 375, Monterey CA, 2005.
6. Erdogan, H., Sarikaya, R., Chen, S. F., Gao, Y., Picheny, M., "Using semantic analysis to improve speech recognition performance," *Computer Speech and Language*, vol.19, no. 3, pp. 321-343, Jul. 2005.
7. Sarikaya, R., Gao, Y., Picheny, M., Erdogan, H., "Semantic confidence measurement for spoken dialog systems," *IEEE Transactions on Speech and Audio Processing*, vol. 13, no. 4, pp. 534-545, Jul. 2005.
8. Fessler, J. A., Erdogan, H., Wu, W. B., "Exact distribution of edge-preserving MAP estimators for linear signal models with Gaussian measurement noise," *IEEE Transactions on Image Processing*, vol. 9, no. 6, pp. 1049-56, Jun. 2000.
9. Erdogan, H., Fessler, J. A., "Ordered subsets algorithms for transmission tomography," *Physics in Medicine and Biology*, vol. 44, no. 11, pp. 2835-51, Nov. 1999.
10. Erdogan, H., Fessler, J. A., "Monotonic algorithms for transmission tomography," *IEEE Transactions on Medical Imaging*, vol. 18, no. 9, pp. 801-14, Sep. 1999.

EDITED BOOKS

1. Takeda, K., Erdogan, H., Hansen, J.H.L., Abut, H. (Eds.), *In-Vehicle Corpus and Signal Processing for Driver Behavior*, New York: Springer, 2009, ISBN: 978-0-387-79581-2.

CHAPTERS IN BOOKS

1. Abut, H., Erdogan, H., Ercil, A., et.al., "Real-world data collection with "Uyanik," in *In-vehicle corpus and signal processing for driver behavior*, Takeda, K., Erdogan, H., Hansen, J. H. L., Abut, H., Eds., Springer, 2009, pp. 23-43.
2. Erdogan, H., Ercil, A., and Abut, H., "Experiments on decision fusion for driver recognition," in *Advances for In-Vehicle and Mobile Systems: Challenges for International Standards*, Abut, H., Hansen, J. H. L., Takeda, K., Eds., Springer, 2007, pp. 1-10.

CONFERENCES

1. Topcu, B., and Erdogan, H., "Improved feature extraction for local-appearance based face recognition," submitted to *IEEE ICIP 2009*.

2. Yılmaz, B., Erdogan, H., Unel, M., "Probabilistic facial feature extraction using joint distribution of location and texture information," submitted to IEEE ICIP 2009.
3. Karabat, C., and Erdogan, H., "Secure and cancellable face image hashing," submitted to IEEE ICIP 2009.
4. Ozgur, E., Yilmaz B., Karabalkan, H., Erdogan, H., Unel, M., "Lip segmentation using adaptive color space training," International Conference on Auditory-Visual Speech Processing 2008, Moreton Island, Australia, Sep. 2008.
5. Ozgur, E., Unel, M., Erdogan, H., Ercil, A., "Evolving Implicit Polynomial Interfaces," BMVC 2008, Leeds, UK, Sep. 2008.
6. Topcu, B., and Erdogan, H., "Using local temporal features of bounding boxes for walking/running classification," IEEE ICASSP 2008, Las Vegas, NV, Apr. 2008.
7. Turdu, D., and Erdogan, H., "Improved post-processing for GMM based adaptive background modeling," IEEE ISCIS 2007, Ankara, Turkey, Nov. 2007.
8. Aydin, Z., Altunbasak, Y., Pakatci, I. K., and Erdogan, H., "Training set reduction methods for protein secondary structure prediction in single sequence condition," EMBC 2007, Lyon, France, Aug. 2007.
9. Abut, H., Erdogan, H., et.al., "Data collection with "Uyanik": Too much pain; but gains are coming," Biennial on DSP for in-Vehicle and Mobile Systems, Istanbul, Turkey, Jun. 2007.
10. Karabalkan, H., Erdogan, H., "Audio-visual speech recognition in vehicular noise using a multi-classifier approach," Biennial on DSP for in-Vehicle and Mobile Systems, Istanbul, Turkey, Jun. 2007.
11. Stallkamp, J., Ekenel, H. K., Erdogan, H., Stiefelbogen, R. and Ercil, A., "Video-based driver identification using local appearance face recognition," Biennial on DSP for in-Vehicle and Mobile Systems, Istanbul, Turkey, Jun. 2007.
12. Aydin, Z., Erdogan, H., Altunbasak, Y., "Protein fold recognition using residue-based alignments of sequence and secondary structure," ICASSP 2007, Honolulu, Hawaii, Apr. 2007.
13. Erdogan, H., Buyuk, O., Oflazer, K., "Incorporating language constraints in sub-word based speech recognition," *IEEE Automatic Speech Recognition and Understanding Workshop*, Cancun Mexico, Dec. 2005.
14. Tuzcu, V., Nas, S., Erdogan, H., Zhang, L., Vincent, M., Woodward Benson, D., "Identification of Genotype-Specific Repolarization Patterns in Congenital Long-QT Syndrome Using Dynamic Time Warping Analysis," American Heart Association Scientific Session, Dallas, Texas, Nov. 2005.
15. H Erdogan, A N Ozyagci, T Eskil, M Rodoper, A Ercil, H Abut, "Experiments on decision fusion for driver recognition", *Biennial on DSP for in-vehicle and mobile systems*, Sesimbra Portugal, Sep. 2005.
16. H Erdogan, "Regularizing linear discriminant analysis for speech recognition," *Interspeech 2005 - Eurospeech*, Lisbon Portugal, Sep. 2005.
17. E Vural, H Erdogan, K Oflazer, B Yanikoglu, "An Online Handwriting recognition system for Turkish," *SPIE Electronic Imaging Symposium*, San Jose CA, Jan. 2005. H Erdogan , "Subspace kernel discriminant analysis for speech recognition," *Robust 2004 Workshop*, Norwich UK, Sep. 2004.
18. A Akyol, H Erdogan, "Filler model based confidence measures for spoken dialogue systems: a case study for Turkish," *ICASSP 2004*, Montreal Canada, May. 2004.
19. HK Ekenel, SY Bilgin, I Eden, M Kirisci, H Erdogan, A Ercil, "Multimodal person verification from video sequences," *Proceedings of SWIM*, Maui Hawaii, Jan. 2004.
20. H Erdogan, R Sarikaya, Y Gao, M Picheny, "Semantic Structured language models," *ICSLP 2002*.
21. Y Li, H Erdogan, Y Gao, E Marcheret, "Incremental Online feature space MLLR adaptation for telephony speech recognition," *ICSLP 2002*.
22. R Sarikaya, Y Gao, H Erdogan, M Picheny, "Turn-Based Language Modeling for Spoken Dialog Systems," *ICASSP 2002*.
23. Y Gao, H Erdogan, Y Li, V Goel, M Picheny, "Recent Advances in Speech Recognition for IBM DARPA Communicator," *Eurospeech 2001*.
24. H Erdogan, "Speech Recognition for a Travel Reservation System," *IC-AI 2001*.

25. H Erdogan, Y Gao, and M Picheny, "Rapid adaptation using penalized-likelihood methods," *ICASSP 2001*.
26. Y Gao, B Ramabhadran, J Chen, H Erdogan and M Picheny, "Innovative Approaches for Large Vocabulary Name Recognition," *ICASSP 2001*.
27. Y Li, Y Gao and H Erdogan, "Weighted Pairwise Scatter to Improve Linear Discriminant Analysis," *ICSLP 2000*.
28. H Erdogan, JA Fessler, "Algorithms for joint estimation of attenuation and emission images in PET," *Proc. IEEE Conf. Acoust. Speech Sig. Proc.*, vol. 6, pp. 3783-6, 2000.
29. H Erdogan, JA Fessler, "Joint estimation of attenuation and emission images from PET scans," *Proc. IEEE Nuc. Sci. Symp. Med. Im. Conf.*, vol. 3, pp. 1672-5, 1999.
30. H Erdogan, G Gualtieri, and JA Fessler, "An ordered subsets algorithms for transmission tomography," *Proc. IEEE Nuc. Sci. Symp. Med. Im. Conf.*, 1998.
31. H Erdogan and JA Fessler, "Scan time optimization for post-injection PET scans," *Proc. IEEE Nuc. Sci. Symp. Med. Im. Conf.*, 1998.
32. JA Fessler and H Erdogan, "Paraboloidal surrogates algorithm for convergent penalized-likelihood emission image reconstruction," *In Proc. IEEE Nuc. Sci. Symp. Med. Im. Conf.*, 1998.
33. H Erdogan and J A Fessler, "Accelerated monotonic algorithms for transmission tomography," *In Proc. IEEE Intl. Conf. On Image Processing*, vol. 2, pp. 680-684, 1998.
34. H Erdogan and J A Fessler, "Statistical image reconstruction methods for simultaneous emission/transmission PET scans," *In Proc. IEEE Nuc. Sci. Symp. Med. Im. Conf.*, vol. 3, pp. 1579-83, 1996.
35. J Shen, H Erdogan and E S Ebbini, "Optimal image operator design technique for coded excitation ultrasound imaging system," *In Proc. IEEE Ultrasonics Symposium*, vol. 3, pp 1777- 1781, 1994.

National Conferences (in Turkish)

36. Topcu, B., Erdogan, H., "Yerel görünüm tabanlı yüz tanıma için değişik boyut indirme ve normalizasyon yöntemlerinin incelenmesi," *IEEE SIU 2009, Side, 2009*.
37. Yılmaz, B., Erdogan, H., "Konum ve doku bilgisinin ortak dağılımını kullanarak yüz özniteliklerinin istatistiksel çıkarımı," *IEEE SIU 2009, Side, 2009*.
38. Karabat, C., Erdogan, H., "Güvenilir biyometrik kıyım yöntemi," *IEEE SIU 2009, Side, 2009*.
39. Aksoylar, C., Mutluergil, S.O., Erdogan, H., "Bir Türkçe konuşma tanıma sisteminin anatomisi," *IEEE SIU 2009, Side, 2009*.
40. Karabalkan, H., Erdogan, H., "Görsel-işitsel konuşma tanımda veri kaynaştırma teknikleri," *IEEE SIU 2009, Side, 2009*.
41. Tuysuzoglu, A., Pakatci, I.K., Erdogan, H., "Gözetim Videolarında Nesne ve Olay Tanımlama Başarım Analizi İçin Veritabanı Oluşturulması," *IEEE SIU 2008, Didim, 2008*.
42. Turdu, D., Erdogan, H., "Gauss karışım modeli tabanlı uyarlamalı arkaplan modelinin hizterezis eşikleme ile iyileştirilmesi," *IEEE SIU 2007, Eskisehir, 2007*.
43. Topcu, B., Erdogan, H., "Gözetim videolarında dinamik niteliklere dayalı yürüme/koşma sınıflandırma," *IEEE SIU 2007, Eskisehir, 2007*.
44. Pakatci, I. K., Aydin, Z., Erdogan, H., Altunbasak, Y., "Yetim proteinlerde ikincil yapı öngörüsü için eğitim kümesi indirgeme yöntemleri," *IEEE SIU 2007, Eskisehir, 2007*.
45. Camlikaya, E., Yanikoglu, B., Erdogan, H., "Saklı Markov modeli kullanarak ses ile metin bağımlı kimlik doğrulama," *IEEE SIU 2007, Eskisehir, 2007*.
46. Eskil, T., Erdogan, H., Ercil, A., Ozyagci, A. N., and Rodoper, M., "Araç içinde sürücü tanıma için karar tümleştirme yöntemleri," *IEEE SIU 2006, Antalya, 2006*.
47. O Buyuk, H Erdogan, K Oflazer, "Konuşma tanımda karma dil birimleri kullanımı ve dil kısıtlarının gerçekleşmesi," *IEEE SIU 2005, Kayseri, May 2005*.
48. H Erdogan, "Konuşma tanıma için heteroskedastik ayırtaç analizinin düzenlenmesi," *IEEE SIU 2005, Kayseri, May 2005*.
49. HK Ekenel, SY Bilgin, I Eden, M Kirisci, H Erdogan, A Ercil, "Video Dizilerinden Çoğul-Biyometrik Kimlik Doğrulama," *IEEE SIU 2004, Kuşadası, Jun. 2004*.

50. A Akyol, H Erdogan, "Sesli diyalog sistemlerinde dolgu modeli kullanarak güvenilirlik ölçümü," *IEEE SIU 2004*, Kuşadası, Jun. 2004.
51. E Vural, H Erdogan, K Oflazer, B Yanikoglu, "Türkçe için tablet PC ortamında çevrimiçi yazı tanıma sistemi", *IEEE SIU 2004*, Kuşadası, Jun. 2004.

PATENTS

- Ruhi Sarikaya, Hakan Erdogan, Yuqing Gao, Michael Picheny, Mark Epstein. Semantic language modeling and confidence measurement. Issued January 6, 2009, USPTO No: 7,475,015
- Yuqing Gao, Bhuvana Ramabhadran, Julian Chen, Hakan Erdogan, Michael Picheny. Method and apparatus for conversational name dialing systems. Issued August 2, 2005, USPTO No: 6,925,154
- Hakan Erdogan, Yuqing Gao and Yongxin Li, Weighted Pairwise Scatter to Improve Linear Discriminant Analysis. Issued May 20, 2003, USPTO No: 6,567,771

REFERENCES

Available upon request.