

- EDUCATION**
- Boğaziçi University**, Istanbul, Turkey
Ph.D. in Electrical and Electronics Engineering, 2009
Title: Statistical and Discriminative Language Modeling for Turkish Large Vocabulary Continuous Speech Recognition.
- Boğaziçi University**, Istanbul, Turkey
M.Sc. in Electrical and Electronics Engineering, 2004
Title: Turkish Dictation System for Radiology and Broadcast News Applications
- Boğaziçi University**, Istanbul, Turkey
B.Sc. in Electrical and Electronics Engineering, 2002
- RESEARCH INTERESTS** Speech and Language Processing, Automatic Speech Recognition (ASR), Language Modeling.
- EXPERIENCE**
- Assistant Professor** *December 2014 – present*
Department of Electrical and Electronics Engineering **MEF University**
Teaching undergraduate level courses: Circuit Analysis, Signals and Systems, Numerical Methods for EE, Introduction to Speech and Language Processing.
Served as the department chair (2014 - 2017)
- Principal Investigator** *March 2018 – present*
TUBITAK ARBEB Career Project **MEF University**
Spoken Lecture Processing for Personalized and Adaptive Learning
- Collecting and annotating lecture data for ASR and spoken Question Answering (QA).
 - Building Turkish and English ASR and retrieval systems using Kaldi for video lectures.
 - Building end-to-end spoken QA systems.
- Principal Investigator** *March 2015 – March 2017*
TUBITAK BIDEB-2232 Reintegration Project **MEF University**
Automatic Turkish Lecture Transcription
- Built a state-of-the-art ASR system using Kaldi for Turkish lecture videos.
 - Investigated Neural Network Language Models (NNLMs) for Turkish.
- IT Specialist** *December 2013 – December 2014*
IBM Software Group **IBM Turkey**
Worked on Language Modeling for Voice Search Applications in a project at IBM T.J. Watson Research Center.
- Investigated bidirectional LSTM language models for ASR.
- Post-doctoral Researcher** *September 2010 – August 2013*
Speech Technologies for Media and ACCES Department **IBM T.J. Watson Research Center**
Language Modeling for Voice Search and Mobile Dictation Applications
- Investigated neural network language models in first-pass decoding.
 - Investigated deep neural networks in language modeling.
 - Explored feed-forward and recurrent NNLMs for voice search and mobile dictation applications.
 - Explored large scale hierarchical NNLMs for voice search and mobile dictation applications.
 - Investigated supervised and unsupervised discriminative language models (DLMs) for voice search and Arabic speech recognition.

Researcher *June 2009 – June 2010*
Telematics and Informatics Research Center (TAM) **Boğaziçi University**
Turkish Large Vocabulary Continuous Speech Recognition

- Worked on DLMS for Turkish.

Visiting Ph.D. Student *December 2007 – June 2008*
Beckman Institute **University of Illinois at Urbana-Champaign**
Automatic Learning of Semantic and Syntactic Dependencies Supervisor: R. Sproat

- Worked on automatic learning of semantic and syntactic dependencies in a sentence.

Visiting Ph.D. Student *March 2007 – December 2007*
Center for Spoken Language Understanding **Oregon Graduate Institute**
Discriminative Language Modeling Supervisors: B. Roark and I. Shafran

- Implemented perceptron algorithm for DLMS. Syntactic and morphological discriminative features were investigated using this algorithm.
- Generated DLM training data for Turkish. The effect of over-trained language and acoustic models on DLM performance were explored with varying size training data.
- Built an Automatic Speech Recognition (ASR) system using IBM Attila for DLM research.

Researcher *June 2007 – June 2010*
Boğaziçi University Research Fund Project **Boğaziçi University**
Feature Selection for Discriminative Language Modeling of Turkish PI: M. Saraçlar

- Exploring feature selection techniques for Turkish DLM features.
- Sub-lexical features were investigated on Turkish DLM data with the perceptron algorithm.
- Wrote the project proposal with PI.
- Some parts of this project were done at Oregon Graduate Institute.

Researcher *June 2006 – June 2010*
TUBITAK Career Project **Boğaziçi University**
Turkish Broadcast News Transcription and Retrieval PI: M. Saraçlar

- Experimented with sub-lexical language modeling units like statistical morphs, grammatical morphemes and stem+endings. Stem+ending models were modified to take the characteristics of Turkish into account.
- Built a Broadcast News Transcription system for Turkish using AT&T FSM Library to be used in language modeling and retrieval research.
- Coordinated the Turkish Broadcast News Data Collection.

Visiting Ph.D. Student *July 2005 – September 2005*
Adaptive Informatics Research Centre **Helsinki University of Technology**
Unlimited Vocabulary Speech Recognition for Turkish Supervisor: M. Kurimo

- Applied statistical sub-lexical units obtained with the Morfessor algorithm to Turkish for unlimited vocabulary speech recognition.
- Evaluated Turkish speech recognition experiments in Morpho Challenge 2005.

Researcher *2004 – 2007*
EU IST Project SIMILAR NoE **Boğaziçi University**
Turkish Newspaper Content Transcription and Radiological Dictation

- Worked on dynamic vocabulary adaptation and lattice extension approaches to alleviate out-of-vocabulary problem in agglutinative languages.
- Built a newspaper content transcription system using AT&T FSM Library.
- Built a dictation system for radiologists using HTK Toolkit.

Teaching Assistant

September 2002 – March 2005

Electrical and Electronics Engineering Department

Boğaziçi University

Assisted following courses (first one is at graduate and others are at undergraduate levels):

Statistical Signal Analysis; Introduction to Digital Signal Processing; Communications Laboratory; Mobile Communications; Electromechanical Energy Conversion.

PUBLICATIONS

Journal Articles

E. Arısoy, S.F. Chen, B. Ramabhadran and A. Sethy.

Converting Neural Network Language Models Into Back-Off Language Models For Efficient Decoding In Automatic Speech Recognition.

ACM/IEEE Transactions on Audio, Speech and Language Processing, 22(1):184-192, January 2014.

E. Arısoy, M. Saraçlar, B. Roark and I. Shafran.

Discriminative Language Modeling with Linguistic and Statistically Derived Features.

IEEE Transactions on Audio, Speech and Language Processing, 20(2):540-550, February 2012.

E. Arısoy, D. Can, S. Parlak, H. Sak, M. Saraçlar.

Turkish Broadcast News Transcription and Retrieval.

IEEE Transactions on Audio, Speech and Language Processing, 17(5):874-883, July 2009.

E. Arısoy and M. Saraçlar.

Lattice Extension and Vocabulary Adaptation for Turkish LVCSR.

IEEE Transactions on Audio, Speech and Language Processing, 17(1):163-173, January 2009.

M. Creutz, T. Hirsimäki, M. Kurimo, A. Puurula, J. Pylkkönen, V. Siivola, M. Varjokallio, **E. Arısoy**, M. Saraçlar, and A. Stolcke.

Morph-Based Speech Recognition and Modeling of Out-of-Vocabulary Words Across Languages.

ACM Transactions on Speech and Language Processing, 5.1 Article 3, December 2007.

E. Arısoy, H. Dutagaci and L. M. Arslan.

A Unified Language Model for Large Vocabulary Continuous Speech Recognition of Turkish.

Signal Processing, 86 (10):2844-2862, January 2006.

PUBLICATIONS

Book Chapter

E. Arısoy, M. Saraçlar

Language Modeling for Turkish Text and Speech Processing.

Turkish Natural Language Processing.

Book edited by: K. Oflazer and M. Saraçlar.

ISBN 9783319901633, pp. 69-92, August 2018, Springer International Publishing AG.

E. Arısoy, M. Saraçlar

Turkish Speech Recognition.

Turkish Natural Language Processing.

Book edited by: K. Oflazer and M. Saraçlar.

ISBN 9783319901633, pp. 93-114, August 2018, Springer International Publishing AG.

E. Arısoy, M. Kurimo, M. Saraçlar, T. Hirsimäki, J. Pylkkönen, T. Alumäe, H. Sak.

Statistical Language Modeling for Automatic Speech Recognition of Agglutinative Languages.

Speech Recognition, Technologies and Applications.

Book edited by: France Mihelič and Janez Žibert.

ISBN 978-953-7619-29-9, pp. 550, November 2008, I-Tech, Vienna, Austria.

PATENTS

E. Arısoy, B. Ramabhadran, A. Sethy, S. Chen.

Conversion of non-back-off language models for efficient speech decoding.

(US Patent 9934778, issued April 3, 2018)

- PUBLICATIONS M. Ünlü, **E. Arısoy**, and M. Saraclar.
Peer-Reviewed International Conference Papers Question Answering for Spoken Lecture Processing.
In *Proceedings of the IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, Brighton, UK, 2019.
- E. Arısoy**, and M. Saraclar.
Compositional Neural Network Language Models for Agglutinative Languages.
In *Proceedings of Interspeech*, San Francisco, CA, USA, 2016.
- M. Saraclar, E. Dikici and **E. Arısoy**.
A Decade of Discriminative Language Modeling for Automatic Speech Recognition.
In *Proceedings of SPECOM*, Athens, Greece, September 2015.
- E. Arısoy**, and M. Saraclar.
Multi-Stream Long Short-Term Memory Neural Network Language Model.
In *Proceedings of Interspeech*, Dresden, Germany, 2015.
- E. Arısoy**, A. Sethy, B. Ramabhadran, S. Chen.
Bidirectional Recurrent Neural Network Language Models for Automatic Speech Recognition.
In *Proceedings of the IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, Brisbane, Australia, 2015.
- A. Sethy, S. Chen, **E. Arısoy**, B. Ramabhadran, K. Audkhasi, S. Narayanan and P. Vozila.
Joint Training of Interpolated Exponential N-Gram Models.
In *Proceedings of IEEE ASRU Workshop*, Olomouc, Czech Republic, 2013.
- T. N. Sainath, B. Kingsbury, V. Sindhvani, **E. Arısoy** and B. Ramabhadran.
Low-Rank Matrix Factorization For Deep Neural Network Training With High-Dimensional Output Targets.
In *Proceedings of the IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, Vancouver, Canada, 2013.
- E. Arısoy**, S. Chen, B. Ramabhadran, and A. Sethy.
Converting Neural Network Language Models into Back-off Language Models for Efficient Decoding in Automatic Speech Recognition.
In *Proceedings of the IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, Vancouver, Canada, 2013.
- H-K. J. Kuo, **E. Arısoy**, A. Emami and P. Vozila.
Large Scale Hierarchical Neural Network Language Models.
In *Proceedings of Interspeech*, Portland, OR, USA, 2012.
- E. Arısoy**, T. Sainath, B. Kingsbury and B. Ramabhadran.
Deep Neural Network Language Models.
In *Proceedings of NAACL-HLT Workshop: Will We Ever Really Replace the N-gram Model? On the Future of Language Modeling for HLT*, Montreal, Canada, 2012.
- H-K. J. Kuo, **E. Arısoy**, L. Mangu and G. Saon.
Minimum Bayes Risk Discriminative Language Models for Arabic Speech Recognition.
In *Proceedings of IEEE ASRU Workshop*, Hawaii, HI, USA, 2011.
- E. Arısoy**, B. Ramabhadran and H-K. J. Kuo.
Feature Combination Approaches for Discriminative Language Models.
In *Proceedings of Interspeech*, Florence, Italy, 2011.

- E. Arısoy**, M. Saraçlar, B. Roark and I. Shafran.
Syntactic and Sub-lexical Features for Turkish Discriminative Language Models.
In *Proceedings of the IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, Dallas, Texas, USA, 2010.
- E. Arısoy**, T. Pellegrini, M. Saraçlar and L. Lamel.
Enhanced Morfessor Algorithm with Phonetic Features: Application to Turkish.
In *Proceedings of the International Conference on Speech and Computer (SPECOM)*, St. Petersburg, Russia, 2009.
- E. Arısoy**, B. Roark, I. Shafran, M. Saraçlar.
Discriminative N-gram Language Modeling for Turkish.
In *Proceedings of Interspeech*, Brisbane, Australia, 2008.
- E. Arısoy**, H. Sak and M. Saraçlar.
Language Modeling for Automatic Turkish Broadcast News Transcription.
In *Proceedings of Interspeech – Eurospeech*, Antwerp, Belgium, 2007.
- M. Creutz, T. Hirsimäki, M. Kurimo, A. Puurula, J. Pykkönen, V. Siivola, M. Varjokallio, **E. Arısoy**, M. Saraçlar, and A. Stolcke.
Analysis of Morph-Based Speech Recognition and the Modeling of Out-of-Vocabulary Words Across Languages.
In *Proceedings of Human Language Technologies / The Annual Conference of the North American Chapter of the Association for Computational Linguistics (HLT-NAACL)*, Rochester, USA, 2007.
- E. Arısoy** and M. Saraçlar.
Lattice extension and rescoring based approaches for LVCSR of Turkish.
In *Proceedings of the International Conference on Spoken Language Processing (Interspeech 2006 - ICSLP)*, Pittsburgh, PA, USA, 2006.
- M. Kurimo, M. Creutz, M. Varjokallio, **E. Arısoy**, and M. Saraçlar.
Unsupervised segmentation of words into morphemes – Morpho Challenge 2005: Applications to automatic speech recognition.
In *Proceedings of the International Conference on Spoken Language Processing (Interspeech 2006 - ICSLP)*, Pittsburgh, PA, USA, 2006.
- M. Kurimo, M. Creutz, M. Varjokallio, **E. Arısoy** and M. Saraçlar.
Unsupervised segmentation of words into morphemes: An Introduction and Evaluation Report.
PASCAL Challenge Workshop on Unsupervised segmentation of words into morphemes, 2006.
- M. Kurimo, A. Puurula, **E. Arısoy**, V. Siivola, T. Hirsimäki, J. Pykkönen, T. Alumäe, and M. Saraçlar.
Unlimited vocabulary speech recognition for agglutinative languages.
In *Proceedings of the Human Language Technology Conference and the North American Chapter of the Association for Computational Linguistics Annual Meeting (HLT-NAACL)*, New York, 2006.
- E. Arısoy** and L. M. Arslan.
Turkish Dictation System for Broadcast News Applications.
In *Proceedings of European Signal Processing Conference (EUSIPCO)*, Antalya, Turkey, 2005.
- E. Arısoy** and L. M. Arslan.
Turkish Radiology Dictation System.
In *Proceedings of the International Conference on Speech and Computer (SPECOM)*, St. Petersburg, Russia, 2004.

E. Arısoy and L. M. Arslan.

A New Universal Language for Robust Speech Recognition Applications, In *Proceedings of the International Conference on Text Speech and Dialogue (TSD)*, Brno, Czech Republic, 2004.

E. Arısoy, L. M. Arslan, M. Demiralp, H. K. Ekenel, M. Keleşir, H. M. Meral, A. S. Özsoy, O. Sayli, O. Turk, B. C. Yolcu.

Duration of Turkish Vowels Revisited.

In *Proceedings of the International Conference on Turkish Language (ICTL)*, Izmir, Turkey, 2004.

PUBLICATIONS
*Peer-
Reviewed
National
Conference
Papers*

M. Ünlü, **E. Arısoy** and M. Saraçlar.

Türkçe Sözlü Ders Anlatımları için Soru Cevaplama Sistemi

In *Proceedings of the IEEE 27. Sinyal İşleme ve İletişim Uygulamaları Konferansı (SİU)*, Sivas, Turkey, 2019.

E. Arısoy and M. Saraçlar.

Türkçe Haber Programları için Konuşma Tanımının Tekrar Gözden Geçirilmesi.

In *Proceedings of the IEEE 26. Sinyal İşleme ve İletişim Uygulamaları Konferansı (SİU)*, Çeşme, İzmir, Turkey, 2018.

E. Arısoy and M. Saraçlar.

Türkçe Sözlü Ders Anlatımları için Otomatik Yazılandırma ve Geri Getirim Sistemi Geliştirilmesi.

In *Proceedings of the IEEE 25. Sinyal İşleme ve İletişim Uygulamaları Konferansı (SİU)*, Antalya, Turkey, 2017.

E. Arısoy and M. Saraçlar.

Türkçe GDSKT için Konuşma Tanıma Hatalarının Analizi.

In *Proceedings of the IEEE 17. Sinyal İşleme ve İletişim Uygulamaları Konferansı (SİU)*, Side, Antalya, Turkey, 2009.

E. Arısoy and M. Saraçlar.

Türkçe Haber Programları için Konuşma Tanıma.

In *Proceedings of the IEEE 15. Sinyal İşleme ve İletişim Uygulamaları Konferansı (SİU)*, Eskişehir, Turkey, 2007.

İ. Uzun, **E. Arısoy**, R. Edizkan and M. Saraçlar.

Dağıtık Yapıda Türkçe Sürekli Konuşma Tanıma Sisteminde Seyrek Paket Kayıplarının Analizi ve Telafisi.

In *Proceedings of the IEEE 15. Sinyal İşleme ve İletişim Uygulamaları Konferansı (SİU)*, Eskişehir, Turkey, 2007.

E. Arısoy and M. Saraçlar.

Geniş Dağarcıklı Konuşma Tanıma Sistemleri için Örünün Yeniden Değerlendirilmesi Tabanlı Dil Modellemesi Yaklaşımları.

In *Proceedings of the IEEE 14. Sinyal İşleme ve İletişim Uygulamaları Konferansı (SİU)*, Antalya, Turkey, 2006.

E. Arısoy and L. M. Arslan.

Türkçe Gazete Haberleri Dikte Sistemi.

In *Proceedings of the IEEE 13. Sinyal İşleme ve İletişim Uygulamaları Konferansı (SİU)*, Kayseri, Turkey, 2005.

E. Arısoy and L. M. Arslan.

Dayanıklı Konuşma Tanıma Uygulamaları için Evrensel bir İnsan-Makine Dilinin Geliştirilmesi.

In *Proceedings of 11 Sinyal İşleme ve İletişim Uygulamaları Konferansı (SİU)*, İstanbul, 2003.

- AWARDS** Boğaziçi University Research Fund (BAP) Ph.D. Thesis Award, 2010.
Serhat Özyar Young Scientist Honor Award, 2010.
TUBITAK grant to attend Interspeech conference to make an oral presentation, 2008.
ISCA grant to attend Interspeech conference to make an oral presentation, 2008.
ISCA grant to attend Interspeech-ICSLP conference to make an oral presentation, 2006.
TUBITAK BDP (Integrated Doctorate Program) Ph.D. Fellowship, 2004 – 2008.
Turkish Education Foundation (TEV) B.Sc. Fellowship, 1997 – 2002.
- PROFESSIONAL ACTIVITIES** **Elected Committee Members:** IEEE Signal Processing Society Speech and Language Technical Committee (2019 – present)
Organizing Committee Member: NAACL-HLT 2012 Future of Language Modeling Workshop
Speech Co-chair in ACL 2008 Student Research Workshop
Session Chair: Interspeech 2015, Interspeech 2016 – Neural Networks for Language Modeling
Board Member: International Speech Communication Association (ISCA) Student Advisory Committee (2006 – 2008)
Reviewer: IEEE Transactions on Audio, Speech and Language Processing (2008 – present)
Computer Speech and Language (2013 – present)
Speech Communication (2011 – present)
ICASSP (2011 – present)
Interspeech Conference (2011 – present)
ASRU Workshop (2011 – present)
SLT Workshop (2014 – present)
- SUPERVISORY** **Current MS Students:**
Enver Fakhani (co-advised), Bogazici University Electrical and Electronics Engineering Department.

Past MS Students:
Merve Unlu (co-advised), “Deep Learning for Question Answering”, Bogazici University Computer Engineering Department (2019)
- REFERENCES** Available upon request.