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# Tanel Alumäe

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## CONTACT INFORMATION

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- Laboratory of Language Technology  
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## CURRENT RESEARCH INTERESTS

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- Speech and language processing, particularly speech recognition
- Language modeling
- Unsupervised and semi-supervised methods for training deep neural networks
- Robust speech recognition

## EDUCATION

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|---|-----------|
| <b>Tallinn University of Technology</b>   | 2002-2006 |
| <b>PhD in Information Technology</b>  |           |
| • Thesis: <i>Methods for Estonian Large Vocabulary Speech Recognition</i>               |           |
| <b>Tallinn University of Technology</b>   | 1999-2002 |
| <b>M.S. in Information Technology</b>   |           |
| • Two semesters as part of the studies in the University of Erlangen-Nuremberg, Germany |           |
| <b>Tallinn University of Technology</b>   | 1994-1999 |
| <b>Engineering Diploma</b>  |           |

## HONORS AND AWARDS

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- Award *Keeletegu 2011* from Estonian Ministry of Education and Research, 2011
- Best paper award at the national contest for scientific works for doctoral students (technical sciences), 2007
- Support grant from Estonian Information Technology and Telecommunications Association, 2006
- One-year scholarship from German Academic Exchange Service (DAAD) for studying in the Computational Engineering program at the University of Erlangen-Nuremberg, 1999

## PROFESSIONAL EXPERIENCE

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|---|---------------------------------|
| <b>Tallinn University of Technology</b>   | 2003 - 2008, 2010 - 2015, 2016- |
| <b>Senior Researcher at Laboratory of Language Technology</b>                               |                                 |
| • Research and development of Estonian LVCSR  |                                 |
| • Robust and adaptable models for speech recognition  |                                 |
| • Speaker recognition   |                                 |
| • Language and dialect identification   |                                 |
| • Punctuation restoration in speech transcripts   |                                 |
| <b>Raytheon BBN Technologies, Boston, USA</b>   | August 2015 - September 2016    |
| <b>Research Scientist</b>   |                                 |
| • Research on agile and robust speech recognition technology within the IARPA Babel program |                                 |
| <b>Helsinki University of Technology</b>  | April 2009 - April 2010         |
| <b>Post-doc Researcher, Speech Recognition research group</b>                               |                                 |
| • Research on adaptation of maximum entropy language models                                 |                                 |

**CNRS/LIMSI Laboratory, Orsay/Paris**

March 2008 - March 2009

**Post-doc researcher, Spoken Language Processing group**

- Research on adaptation of  $N$ -gram language models
- Participation in the Quaero project
- Participation in the ESTER2 evaluation campaign of French broadcast news transcription

**Aqris Software AS, Tallinn, Estonia**

2000 - 2006

**Software Developer**

- Involvement in several software development projects, mainly in the area of telecommunications, business-critical server-side systems and software refactoring
- Included programming in Java, object-oriented design, agile software development

## **PUBLICATIONS**

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- Implementation of a radiology speech recognition system for Estonian using open source software. In *Interspeech*, 2017. Accepted for publication. Joint work with Andrus Paats, Ivo Fridolin and Einar Meister.
- Automatic speech recognition system for Lithuanian broadcast audio. In *Baltic HLT*, volume 289, page 39. IOS Press, 2016. Joint work with Ottokar Tilk.
- Bidirectional recurrent neural network with attention mechanism for punctuation restoration. *Interspeech 2016*, pages 3047–3051, 2016. Joint work with Ottokar Tilk.
- Improved multilingual training of stacked neural network acoustic models for low resource languages. *Interspeech 2016*, pages 3883–3887, 2016. Joint work with Stavros Tsakalidis and Richard Schwartz.
- Modeling under-resourced languages for speech recognition. *Language Resources and Evaluation*, pages 1–27, 2016. Joint work with Mikko Kurimo, Seppo Enarvi, Ottokar Tilk, Matti Varjokallio and André Mansikkaniemi.
- Sage: The new BBN speech processing platform. In *Interspeech*, 2016. Joint work with Roger Hsiao, Ralf Meermeier, Tim Ng, Zhongqiang Huang, Maxwell Jordan, Enoch Kan, Jan Silovsky, William Hartmann and Francis Keith.
- Evaluation of automatic speech recognition prototype for Estonian language in radiology domain: A pilot study. In *16th Nordic-Baltic Conference on Biomedical Engineering*, pages 96–99. Springer International Publishing, 2015. Joint work with Andrus Paats, Einar Meister and Ivo Fridolin.
- LSTM for punctuation restoration in speech transcripts. In *Interspeech*, pages 683–687, 2015. Joint work with Ottokar Tilk.
- Full-duplex speech-to-text system for Estonian. In *Baltic HLT*, pages 3–10, 2014.
- Multi-domain recurrent neural network language model for medical speech recognition. In *Baltic HLT*, pages 149–152, 2014. Joint work with Ottokar Tilk.
- Neural network phone duration model for speech recognition. In *Interspeech*, pages 1204–1208, 2014.
- Recent improvements in Estonian LVCSR. In *SLTU*, pages 118–123, 2014.
- Multi-domain neural network language model. In *Interspeech*, pages 2182–2186, 2013.
- Phone duration modeling using clustering of rich contexts. In *Interspeech*, pages 1801–1805, 2013. Joint work with Rena Nemoto.
- Controlled natural language in speech recognition based user interfaces. In *International Workshop on Controlled Natural Language*, pages 79–94. Springer Berlin Heidelberg, 2012. Joint work with Kaarel Kaljurand.

- A hierarchical Dirichlet process model for joint part-of-speech and morphology induction. In *Proc. HLT-NAACL*, pages 407–416. Association for Computational Linguistics, 2012. Joint work with Kairit Siirts.
- Maximum entropy language model adaptation for mobile speech input. In *Interspeech*, 2012. Joint work with Kaarel Kaljurand.
- Open and extendable speech recognition application architecture for mobile environments. In *SLTU*, pages 15–18, 2012. Joint work with Kaarel Kaljurand.
- Transcription system for semi-spontaneous Estonian speech. In *Baltic HLT*, pages 10–17, 2012.
- TSAB - web interface for transcribed speech collections. In *Interspeech*, pages 3335–3336, 2011. Joint work with Ahti Kitsik.
- Domain adaptation of maximum entropy language models. In *ACL*, pages 301–306, 2010. Joint work with Mikko Kurimo.
- Efficient estimation of maximum entropy language models with n-gram features: an SRILM extension. In *INTER\_SPEECH*, pages 1820–1823, 2010. Joint work with Mikko Kurimo.
- Estonian large vocabulary speech recognition system for radiology. In *Baltic HLT*, pages 33–38, 2010. Joint work with Einar Meister.
- Using dependency grammar features in whole sentence maximum entropy language model for speech recognition. In *Baltic HLT*, pages 73–79, 2010. Joint work with Teemu Ruokolainen and Marcus Dobrinkat.
- Comparison of different modeling units for language model adaptation for inflected languages. In *International Conference on Intelligent Text Processing and Computational Linguistics*, pages 488–499. Springer Berlin Heidelberg, 2008.
- Automatic compound word reconstruction for speech recognition of compounding languages. 2007.
- Lemmatized latent semantic model for language model adaptation of highly inflected languages. In *Baltic HLT*, 2007. Joint work with Toomas Kirt.
- LSA-based language model adaptation for highly inflected languages. In *Interspeech*, pages 2357–2360, 2007. Joint work with Toomas Kirt.
- Methods for Estonian large vocabulary speech recognition. Master’s thesis, Tallinn University of Technology Press, 2006.
- A natural language interface to a theater information database. *Language*, 2:1, 2006. Joint work with Margus Treumuth and Einar Meister.
- Sentence-adapted factored language model for transcribing Estonian speech. In *ICASSP*, volume 1, 2006.
- Unlimited vocabulary speech recognition for agglutinative languages. In *Proc. HLT-NAACL*, pages 487–494. Association for Computational Linguistics, 2006. Joint work with Mikko Kurimo, Antti Puurula, Ebru Arisoy, Vesa Siivola, Teemu Hirsimäki, Janne Pylkkönen and Murat Saraclar.
- Phonological and morphological modeling in large vocabulary continuous Estonian speech recognition system. In *Baltic HLT*, pages 89–94, 2005.
- Large vocabulary continuous speech recognition for Estonian using morphemes and classes. In *International Conference on Text, Speech and Dialogue*, pages 245–252. Springer Berlin Heidelberg, 2004.
- Recent advances in Estonian spoken language technology. *Baltic IT&T Review*, (2):33, 2004. Joint work with Einar Meister.

## **WORKSHOPS AND SUMMER SCHOOLS**

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- **ELSNET Summer School on Advanced Dialogue Systems: Affectivity, Adaptability and Multimodality**, Belfast, July 2007.
- **Summer School on Variation In Speech Production and Speech Perception**, Palmse, Estonia, August 2005.
- **16th European Summer School in Logic, Language and Information**, Nancy, August 2004
- **Winter School on Speech Production Modelling at the Graduate School of Language Technology in Finland**, Helsinki, January 2004

## **ADMINISTRATIVE RESPONSIBILITIES**

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- Head of the steering committee of the National Programme for Estonian Language Technology (2011-2017)
- Member of the governmental advisory body Estonian Language Council (2012-2015)
- Reviewer for the following journals: *IEEE Transactions on Audio, Speech and Language Processing*, *Entropy*, *Digital Signal Processing*
- Reviewer for the following conferences: Interspeech, ACL, ICANN, LREC, COLING, SPECOM
- Member of the program committee of the SPECOM, NODALIDA, Baltic HLT conferences
- Member of the organizing committee of the Baltic HLT conference, 2005

## **SKILLS**

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### **Computer skills**

- Good understanding of object-oriented and reusable design concepts
- Proficient in Java, C/C++, Perl, Python, Linux/Unix, shell scripting
- Familiar with conducting large scale experiments on computer clusters
- Familiar with JavaScript, some Ruby, Prolog
- Regular expressions, SQL, HTML, XML skills
- Contributed to SRILM toolkit, Kaldi, CMU Sphinx

### **Language skills**

- Fluent English (spoken/written) and German (spoken/read), some Finnish and Russian, Estonian (mother tongue)