

## RESEARCH INTERESTS

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- Automatic speech and speaker recognition: normalization of noise, channel, and speech variation mismatch; robust front-ends; online feature equalization; acoustic models for varying environments; limited resource speech recognition.
- Speech analysis: cognitive load/emotion/talking style assessment; speaker and dialect identification; longitudinal characteristics of speech production; statistical modeling of prosody.

## EDUCATION

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- JULY 2008 Ph.D. in ELECTRICAL ENGINEERING AND INFORMATION TECHNOLOGY  
**Czech Technical University**, Prague  
 Dissertation: “Robust Speech Recognition: Analysis and Equalization of Lombard Effect in Czech Corpora”
- MARCH 2003 M.S. in ELECTRICAL ENGINEERING (Includes B.S.)  
 SEPTEMBER 1997 **Czech Technical University**, Prague  
 Master’s Thesis: “Guitar MIDI Converter”

## RESEARCH & WORK EXPERIENCE

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| <i>Current</i><br>AUG 2007 | RESEARCH ASSOCIATE<br>Center for Robust Speech Systems<br>Erik Jonsson School of Engineering and Computer Science<br><b>The University of Texas at Dallas</b>              |
| AUG 2007<br>MARCH 2003     | GRADUATE RESEARCH ASSISTANT<br>Speech Processing Group<br>Department of Circuit Theory<br>Faculty of Electrical Engineering<br><b>Czech Technical University in Prague</b> |

## AWARDS

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- 2010–2012 CO-PI, “Non-Native Speaker Systems: Analysis and Development of Automatic Recognition for Non-Native Speakers”, Li Creative Technologies (Florham Park, NJ)/US Army, (\$100,000)
- JAN–SEPT 2006 PRINCIPAL INVESTIGATOR (PI), “Normalization of Lombard Effect”, Siemens Corporate Technology (Munich, Germany), (€10,000)
- 2006 POSTER’06 – 10<sup>th</sup> International Student Conference on Electrical Engineering, Prague – Paper Award
- 2005 INTERSPEECH’05 Student Travel Grant (ISCA)
- 2005 COMPREHENSIVE DOCTORAL EXAMINATION – Passed with Honors
- 2003–2007 RESEARCH ASSISTANTSHIP at Department of Circuit Theory, CTU in Prague

## PROFESSIONAL SERVICE

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**External Reviewer** of 54 books, journal articles, a conference and workshop papers:

JOURNAL OF THE ACOUSTICAL SOCIETY OF AMERICA (JASA)

IEEE TRANSACTIONS ON AUDIO, SPEECH AND LANGUAGE PROCESSING (TASLP)

SPEECH COMMUNICATION (ELSEVIER JOURNAL)

EURASIP JOURNAL ON AUDIO, SPEECH, AND MUSIC PROCESSING

INTERNATIONAL JOURNAL OF TOMOGRAPHY & STATISTICS

IEEE INTERNATIONAL CONFERENCE ON ACOUSTICS, SPEECH, AND SIGNAL PROCESSING (ICASSP)

IEEE INTERNATIONAL CONFERENCE ON SIGNAL PROCESSING AND COMMUNICATIONS (SPCOM)

IEEE WORKSHOP ON AUTOMATIC SPEECH RECOGNITION AND UNDERSTANDING (ASRU)

IEEE WORKSHOP ON SIGNAL PROCESSING SYSTEMS (SIPS)

ISCA INTERSPEECH CONFERENCE

### Book Reviews for Publishers

Machač, P. & Skarnitzl, R. (2009), Principles of Phonetic Segmentation, Epoque Publishing, Prague

### Independent Expert

Independent Expert in a Patent Infringement Case and Two Patent Validity Reexamination Cases in the Field of Automatic Speech Recognition

### Service on Committees

EDITORIAL ADVISORY BOARD: (Book) Technologies for Inclusive Education: Beyond Traditional Integration Approaches (Eds. D. Griol, Z. Callejas, R. L. Cozar), IGI Global, 2012

TECHNICAL COMMITTEE: LISTA Workshop on Natural and Synthetic Modification of Speech in Response to Listening Conditions, Edinburgh, UK, May 2–3, 2012

## PROFESSIONAL AFFILIATIONS (CURRENT/PAST)

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INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE) – current

INTERNATIONAL SPEECH COMMUNICATION ASSOCIATION (ISCA) – current

EUROPEAN ASSOCIATION FOR SIGNAL PROCESSING (EURASIP) – 2004–2005

EUROPEAN CENTER OF EXCELLENCE IN SPEECH SYNTHESIS (ECESS) – 2006

## TEACHING/ACADEMIC EXPERIENCE

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2008–2011 | COURSE SUPPORT  
Erik Jonsson School of Engineering and Computer Science  
**The University of Texas at Dallas**  
Course: EE6366 Speech and Speaker Recognition

2005–2007 | COURSE DEVELOPMENT/INSTRUCTOR  
Institute of Phonetics  
**Charles University in Prague**  
Course: Matlab Fundamentals

2003–2007 | INSTRUCTOR  
Faculty of Electrical Engineering  
**Czech Technical University in Prague**  
Courses: Circuit Theory I, Circuit Theory II, Electrical Circuits, Fundamentals of Electronic Circuits, Electrical Engineering for Informatics, Electrical Circuits in Communications

| THESIS REVIEWS  
Service on Thesis Review Committees for 6 M.S. and B.S. Theses

# PUBLICATIONS

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## JOURNAL ARTICLES

1. T. Hasan, **H. Bořil**, A. Sangwan, J. H. L. Hansen, “Multi-modal highlight generation for sports videos using an information-theoretic excitability measure,” *submitted to IEEE Transactions on Multimedia*, 2012.
2. J. H. L. Hansen, E. Ruzanski, **H. Bořil**, J. Meyerhoff, “TEO-based speaker stress assessment using hybrid classification and tracking schemes,” *submitted to International Journal of Speech Technology*, Springer, 2012.
3. **H. Bořil** and J. H. L. Hansen, “Unsupervised equalization of Lombard effect for speech recognition in noisy adverse environments,” *IEEE Transactions on Audio, Speech, and Language Processing*, 18(6), August 2010, pp. 1379–1393.
4. **H. Bořil** and P. Fousek, “Influence of different speech representations and HMM training strategies on ASR performance,” *Acta Polytechnica, Journal on Advanced Engineering*, 46(6), 2006, pp. 32–35.

## BOOKS

5. J. H. L. Hansen and **H. Bořil**, *in preparation, Hidden Cues in Voice: Stress, Emotion, and Lombard Effect; A Survey on Speech Production Variability and its Impact on Speech Systems*, Springer, New York, 2012.

## BOOK CHAPTERS

6. **H. Bořil**, P. Boyraz, J. H. L. Hansen, *Digital Signal Processing for In-Vehicle Systems and Safety*, chapter “Towards Multi-modal Driver’s Stress Detection,” J. H. L. Hansen, P. Boyraz, K. Takeda, H. Abut (Eds.), Springer, New York, 2012, pp. 3–19.

## ABSTRACTS AND BOOK REVIEWS IN JOURNALS

7. **H. Bořil**, “Pavel Machač and Radek Skarnitzl (2009). Fonetická segmentace hlásek. Prague: Epocha Publishing House” *Book review, in press, Naše Řeč (Our Speech)*, The Institute of Czech Language, Academy of Sciences of the Czech Republic, in Czech, Prague, 2012.
8. **H. Bořil**, “Pavel Machač and Radek Skarnitzl (2009). Principles of Phonetic Segmentation. Prague: Epocha Publishing House,” *Book review, Acta Universitatis Carolinae (AUC) Philologica 1/2009, Phonetica Pragensia XII*, Karolinum Publishing House, Prague, 2010, pp. 63–64.
9. **H. Bořil**, T. Kleinschmidt, P. Boyraz, and J. H. L. Hansen, “Impact of cognitive load and frustration on drivers,” *Abstract, Journal of the Acoustical Society of America*, vol. 127, no. 3, pp. 1996–1996, March 2010.

## CONFERENCE/WORKSHOP PROCEEDINGS

10. **H. Bořil**, O. Sadjadi, J. H. L. Hansen, “A study on combined effects of reverberation and increased vocal effort on ASR,” *LISTA’12 Workshop*, Edinburgh, UK, May 2012, pp. 16–19.
11. T. Hasan, **H. Bořil**, A. Sangwan, J. H. L. Hansen, “A multi-modal highlight extraction scheme for sports videos using an information-theoretic excitability measure,” *IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP’12)*, Kyoto, Japan, March 2012, pp. 2381–2384.

12. O. Sadjadi, **H. Bořil**, J. H. L. Hansen, “A comparison of front-end compensation strategies for robust LVCSR under room reverberation and increased vocal effort,” *IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP'12)*, Kyoto, Japan, March 2012, pp. 4701-4704.
13. **H. Bořil**, F. Grézl, J. H. L. Hansen, “Front-end compensation methods for LVCSR under Lombard effect,” *Proc. of ISCA INTERSPEECH'11*, Florence, Italy, August 2011, pp. 1257–1260.
14. **H. Bořil**, O. Sadjadi, J. H. L. Hansen, “UTDrive: Emotion and cognitive load classification for in-vehicle scenarios,” *The 5th Biennial Workshop on Digital Signal Processing for In-Vehicle Systems*, September 4–7, 2011 (Kiel, Germany).
15. **H. Bořil**, J. H. L. Hansen, “UT-Scope: Towards LVCSR under Lombard effect induced by varying types and levels of noisy background,” *IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP'11)*, Prague, Czech Republic, May 2011, pp. 4472–4475.
16. **H. Bořil**, J. H. L. Hansen, D. Xu, G. Gilkerson, and J. Richards, “A longitudinal study of infant speech production parameters,” *LENA Users Conference*, Denver, Colorado, April 2011.
17. **H. Bořil**, A. Sangwan, T. Hasan, and J. H. L. Hansen, “Automatic excitement-level detection for sports highlights generation,” *Proc. of ISCA INTERSPEECH'10*, Makuhari, Chiba, Japan, September 2010, pp. 2202–2205.
18. **H. Bořil**, O. Sadjadi, T. Kleinschmidt, and J. H. L. Hansen, “Analysis and detection of cognitive load and frustration in drivers’ Speech,” *Proc. of ISCA INTERSPEECH'10*, Makuhari, Chiba, Japan, September 2010, pp. 502–505.
19. A. Sulyman, **H. Bořil**, A. Sangwan, and J. H. L. Hansen, “Limited resource speech recognition for Nigerian English,” in *Proc. of IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP'10)*, Dallas, TX, March 2010, pp. 5090–5093.
20. M. Mehrabani, **H. Bořil**, and J. H. L. Hansen, “Dialect distance assessment method based on comparison of pitch pattern statistical models,” in *Proc. of IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP'10)*, Dallas, TX, March 2010, pp. 5158–5161.
21. T. Kleinschmidt, P. Boyraz, **H. Bořil**, S. Sridharan, and J. H. L. Hansen, “Assessment of speech dialog systems using multi-modal cognitive load analysis and driving performance metrics,” in *Proc. of IEEE International Conference on Vehicular Electronics and Safety (ICVES'09)*, Pune, India, November 2009, pp. 162–167.
22. **H. Bořil** and J. H. L. Hansen, “Reduced complexity equalization of Lombard effect for speech recognition in noisy adverse environments,” in *Proc. of ISCA INTERSPEECH'09*, Brighton, UK, September 2009, pp. 1243–1246.
23. **H. Bořil**, P. Boyraz, and J. H. L. Hansen, “Towards multi-modal driver’s stress detection,” in *Proc. of 4<sup>th</sup> Biennial Workshop on Digital Signal Processing for In-Vehicle Systems and Safety*, Dallas, TX, 2009, 9 pages.
24. **H. Bořil**, N. Krishnamurthy, and J. H. L. Hansen, “Online noise and Lombard effect compensation for in-vehicle automatic speech recognition,” in *Proc. of 4<sup>th</sup> Biennial Workshop on Digital Signal Processing for In-Vehicle Systems and Safety*, Dallas, TX, 2009, 4 pages.
25. **H. Bořil** and J. H. L. Hansen, “Unsupervised equalization of Lombard effect for speech recognition in noisy adverse environment,” in *Proc. of IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP'09)*, Taipei, Taiwan, April 2009, pp. 3937–3940.
26. **H. Bořil**, P. Fousek, and H. Höge, “Two-stage system for robust neutral/Lombard speech recognition,” in *Proc. of ISCA INTERSPEECH'07*, Antwerp, Belgium, 2007, pp. 1074–1077.
27. **H. Bořil**, T. Bořil, and P. Pollák, “Methodology of Lombard speech database acquisition: Experiences with CLSD,” in *Proc. of 5<sup>th</sup> ELRA Conference on Language Resources and Evaluation (LREC 2006)*, Genova, Italy, 2006, pp. 1644–1647.

28. **H. Bořil**, “Design of speech feedback; comparison of features for Lombard speech recognition,” in *Proc. of Analysis and Processing of Speech and Biological Signals*, CTU Publishing House, in Czech, Prague, Czech Republic, 2006, pp. 24–30.
29. **H. Bořil**, P. Fousek, and P. Pollák, “Data-driven design of front-end filter bank for Lombard speech recognition,” in *Proc. of ISCA International Conference on Spoken Language Processing (ICSLP’06)*, Pittsburgh, Pennsylvania, 2006, pp. 381–384.
30. **H. Bořil**, P. Fousek, D. Sündermann, P. Červa, and J. Ždánský, “Lombard speech recognition: A comparative study,” in *Proc. of 16<sup>th</sup> Czech-German Workshop on Speech Processing*, Prague, Czech Republic, 2006, pp. 141–148.
31. **H. Bořil**, P. Fousek, “Influence of different speech representations and HMM training strategies on ASR performance,” in *Proc. of POSTER’06 – 10<sup>th</sup> International Student Conference on Electrical Engineering*, Prague, Czech Republic, 2006, 4 pages.
32. **H. Bořil**, “Automatic reconstruction of utterance boundaries time marks in speech database regrabbed from DAT recorder,” in *Proc. of International Workshop on Digital Technologies 2005*, Zilina, Slovakia, 2005, pp. 13–16.
33. **H. Bořil** and P. Pollák, “Comparison of three Czech speech databases from the standpoint of Lombard effect appearance,” in *Proc. of COST278 Final Workshop and ISCA Tutorial and Research Workshop on Applied Spoken Language Interaction in Distributed Environments (ASIDE) 2005*, Aalborg, Denmark, 2005, 4 pages.
34. **H. Bořil** and P. Pollák, “Design and collection of Czech Lombard Speech Database,” in *Proc. of ISCA INTERSPEECH’05*, Lisboa, Portugal, 2005, pp. 1577–1580.
35. **H. Bořil** and P. Pollák, “Analysis of Lombard effect in several Czech databases,” in *Proc. of Joint 16<sup>th</sup> Conference on Electronic Speech Signal Processing (ESSP 2005) and 15<sup>th</sup> Czech-German Workshop on Speech Processing*, Prague, Czech Republic, 2005, pp. 253–259.
36. **H. Bořil**, T. Bořil, and P. Pollák, “Design of Lombard effect speech database,” in *Proc. of Radioelektronika 2005*, Brno, Czech Republic, 2005, pp. 144–147.
37. **H. Bořil**, “Recognition of speech under Lombard effect,” in *Proc. of 14<sup>th</sup> Czech-German Workshop on Speech Processing*, Prague, Czech Republic, 2004, pp. 110–113.
38. **H. Bořil** and P. Pollák, “Direct time domain fundamental frequency estimation of speech in noisy conditions,” in *Proc. of EURASIP European Signal Processing Conference (EUSIPCO) 2004*, vol. 2, Vienna, Austria, 2004, pp. 1003–1006.
39. **H. Bořil**, “Speech feature variations and speech recognition under stress,” *Survey*, in *Proc. of Signal Analysis and Processing V*, CTU Publishing House, in Czech, Prague, Czech Republic, 2004, pp. 54–65.
40. **H. Bořil**, “Pitch detector for guitar MIDI converter,” in *Proc. of POSTER’03 – 7<sup>th</sup> International Student Conference on Electrical Engineering*, Prague, Czech Republic, 2003, pp. EI1 (2 pages).

#### LECTURES/ABSTRACTS/REPORTS

41. J. H. L. Hansen, **H. Bořil**, A. Sathyanarayana, “Speech Communications–Driving Behavior–and Safety: Can they co-exist?” *Lecture, CREST Symposium on Human-Harmonized Information Technology*, Kyoto University, Kyoto, Japan, April 2, 2012.
42. G. Liu, S. O. Sadjadi, T. Hasan, J.-W. Suh, C. Zhang, M. Mehrabani, **H. Bořil**, A. Sangwan, and J. H. L. Hansen, “UTD-CRSS systems for NIST Language Recognition Evaluation 2011,” *Research Report, NIST 2011 Language Recognition Evaluation*, Atlanta, Georgia, USA, 3 pages, December 2011.

43. **H. Bořil**, A. Sangwan, T. Hasan, and J. H. L. Hansen, "Automatic excitement-level detection for sports highlights generation," *Poster Presentation, Wireless Long Term Evolution – The Connected World, UT Dallas Research and New Venture Showcase*, Dallas, Texas, October 2010.
44. **H. Bořil**, O. Sadjadi, T. Kleinschmidt, and J. H. L. Hansen, "Analysis and detection of cognitive load and frustration in drivers' Speech," *Poster Presentation, Wireless Long Term Evolution – The Connected World, UT Dallas Research and New Venture Showcase*, Dallas, Texas, October 2010.
45. Y. Lei, T. Hasan, J.-W. Suh, A. Sangwan, **H. Bořil**, L. Gang, K. Godin, C. Zhang, and J. H. L. Hansen, "The CRSS Systems for the 2010 NIST Speaker Recognition Evaluation," *Research Report, NIST 2010 Speaker Recognition Evaluation Workshop*, Brno, Czech Republic, 4 pages, 24–25 June 2010.
46. **H. Bořil**, T. Kleinschmidt, P. Boyraz, and J. H. L. Hansen, "Impact of cognitive load and frustration on drivers," *Invited Lecture, Joint 159<sup>th</sup> ASA Meeting and Noise-Con 2010*, Baltimore, Maryland, 19–23 April 2010.
47. **H. Bořil**, "Attributes and recognition of Lombard speech," *Invited Lecture, Sound to Sense (S2S) Workshop – Speech in Adverse Conditions* (Prague, Czech Republic), Sept. 2008.
48. **H. Bořil**, "Normalization of Lombard effect," CTU in Prague & Siemens Corporate Technology, Munich, Research Report No. R07-2, 52 pages, 2007.
49. **H. Bořil** and P. Pollák, "Czech Lombard Speech Database (CLSD'05)," CTU in Prague, Research Report No. R07-1, 24 pages, 2006.
50. **H. Bořil** and P. Pollák, "Pitch-marking based on the DFE algorithm," *Lecture, 6<sup>th</sup> Meeting of European Center of Excellence in Speech Synthesis (ECESS) and TC-STAR WP3* (Berlin, Germany), Jan. 2006.
51. **H. Bořil**, "Design and acquisition of Lombard speech database, first experiments," *Lecture*, Institute of Radio Engineering and Electronics, Czech Academy of Sciences, Prague, Czech Republic, Dec. 2004.