

NEWSLETTER

HEARING SYSTEMS IN PROFILE

August 2016



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News, awards and prizes



Talented students get the Danish Sound Young Researcher Award

On the Danish Sound Day, held at the Royal Danish Academy of Music on Thursday March 12th, Anna Josefine Sørensen, Master student at DTU Elektro, won the 'Young Researcher Pitch Battle' and was awarded the Young Researcher Award 2016 together with Lærke Cecilie Bjerre and Thea Mathilde Larsen from DTU Civil Engineering. The project 'On-site and laboratory soundscape evaluations of recreational urban spaces' is from a course in environmental acoustics supervised by Sébastien Santurette (Hearing Systems) and Cheol-Ho Jeong (Acoustic Technology). The award comes with a travel grant worth DKK 8.000 for scientific research or educational purposes. The three women will use the grant for travel expenses for a conference.

Read more on our webpage www.he.elektro.dtu.dk (News and Education).



Grant from HC Ørsted's Foundation for new audiological equipment

Associate Professor Bastian Epp has received a DKK 160.000 grant from the H.C Ørsted's Foundation for a low-noise acoustical probe system for the development of sensitive audiological screening methods. This method, recently developed in the Hearing Systems group, utilizes a combination of non-invasive acoustical- and electrophysiological techniques to examine the state of the inner ear. The method allows the simultaneous collection of electrophysiological and acoustical data from both ears, reducing measurement time and expenses. The system provides built-in calibration routines and a high accessibility of the signals which make it perfectly suitable for research-based teaching activities. Photo by Joachim Rode



IHCON scholarship

Borys Kowalewski, a 2nd year PhD student in the Hearing Systems Group, received a scholarship from the organizers of the International Hearing Aid Research Conference (IHCON) which will take place August 10-14 2016 in Lake Tahoe, California. The scholarship covers the conference fee, accommodation and travel costs. At IHCON, Borys will give a poster presentation titled 'Model-based fitting of compression settings using narrowband stimuli'.

"I am looking forward to presenting the work that is a big part of my PhD project. IHCON encourages presenting work in progress and is a great opportunity to meet experts from academia and industry and exchange ideas," says Borys.

MSc Jonas Lochner, who just successfully defended his Master thesis titled 'Effect of low-frequency gain on speech intelligibility in hearing-impaired listeners', also received the grant and will present his work at the conference.



Visiting PhD student from Oldenburg

As a part of her project Jana Müller, a PhD student from the University of Oldenburg, Germany, spent two months at the Hearing Systems' research group.

Her project deals with different aspects of speech processing and focuses on processing duration, auditory attention and listening effort. Jana collected pilot data and set up experiments at DTU and will continue to work in Oldenburg where they have similar equipment setup:

"So I can continue my work based on the pilot measurements from here and will do the next measurements back in Oldenburg. I can use the same set up as the researchers here have used in one of their latest studies with the same experimental design for another research question," she says.

Better Hearing Rehabilitation

A new, large collaborative project between the University of Southern Denmark, Aalborg University, the Technical University of Denmark (Hearing Systems, Elektro) independent tech company DELTA, Danish hearing aid manufacturers Oticon, Widex and GN Resound and the university hospitals in Odense and Aalborg will improve quality so that people with hearing loss can get more out of hearing aids. The project BEAR (Better Hearing Rehabilitation) has a budget of DKK 50 million (6.7 million euros); of that, the industry is contributing DKK DKK 15 million while Innovation Fund Denmark is investing just under DKK 29 million in the project.



News from abroad

PhD student Gerard Encina Llamas (left) in collaboration with the Interacoustics Research Unit (IRU) has received funding from the the Erasmus Mundus (ACN) for a stay at the Auditory Neuroscience Laboratory in Boston. Gerard Encina Llamas' PhD project focuses on hidden hearing loss and developing methods methods for investigating this are inspired by recent results from invasive animal studies as well as human psychoacoustical studies. The Auditory Neuroscience Laboratory provides excellent possibilities for this kind of studies.

"The topic of hidden hearing loss was discovered in a laboratory in Boston by Professor Charles Liberman. The group of Barbara Shinn-Cunningham at the Auditory Neuroscience Laboratory has various connections to Liberman's work. Bringing the work from animals to human beings is very similar to what I'm doing here at Hearing Systems. It is the perfect environment to push forward my project and transfer ideas between the different groups," he says and adds:

"I come from Barcelona in Southern Europe. Now I have been living here in Denmark in Northern Europe for more than four years, and I know the culture. I also want to experience how people live and work in Northern America, which has a different culture and society from the Mediterranean or the Danish



one, so I can keep expanding my knowledge," he says. Gerard Encina Llamas started his studies at Boston University in March for a period of half a year. Overall he recieved 11.000 Euros to support his external stay.

Another PhD student in the group Suyash Joshi (right) recently returned from a three months external research stay, visiting two excellent research laboratories in the USA. For the first two months, he visited the Auditory Neurophysiology and Modeling laboratory headed by Professor Michael Heinz at Purdue University. Their laboratory specializes in neurophysiological experiments in the auditory nerve and brainstem in animals and modelling of the neural responses in normal and impaired listeners. Afterwards, Suyash visited the Cochlear Implant and Psychophysics Laboratory at the University of Washington in Seattle. Headed by Professor Julie Bierer, the laboratory aims to identify the limiting factors in listeners with Cochlear Implants and their effect on performance of the listeners with cochlear implants in psychophysical tasks. The collaborations with Professor Heinz and Professor Bierer will continue in the future and have provided Suyash with valuable experience and insights for his PhD research, which focuses on modelling of the auditory nerve fiber responses to electrical stimulation with cochlear implants.

Photos by Eva Helena Andersen



Researchers getting together at Eriksholm Research Centre

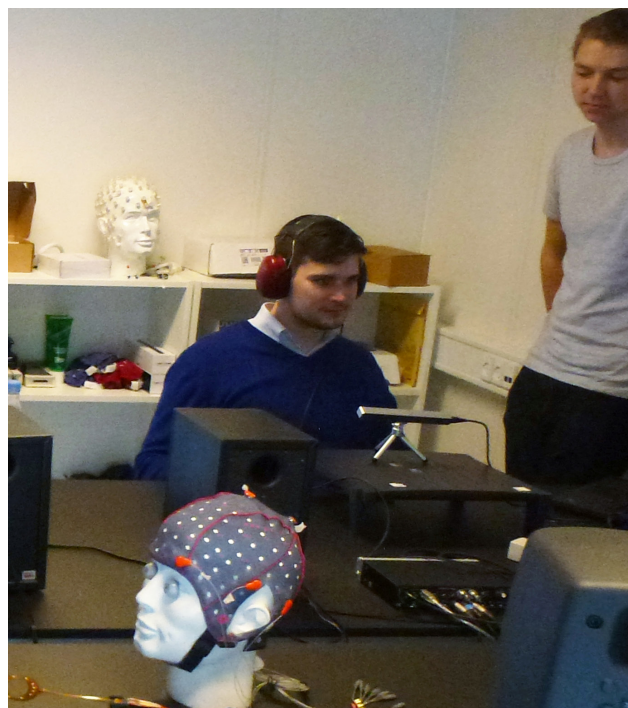
In April, Hearing Systems' researchers participated in a workshop initiated by Eriksholm Research Centre to meet with the researchers from the centre. The purpose was to exchange ideas from different projects in an informal way and to form possibilities for networking. The Head of the Advanced Algorithm Group at Eriksholm, Niels Henrik Pontoppidan, presented the different focus areas at Eriksholm.

There were three poster sessions which inspired lively discussions about different projects.

Dorothea Wendt, who holds a joint position at Eriksholm Research Centre and Hearing Systems, presented amongst others a poster about her project 'Analyzing sentence processing using the eyes'.

Besides the poster exchanges, PhD student Antoine Favre-Félix gave a demonstration of his project 'Controlling a hearing aid by electrically assessed eye-gaze'. The results of his project are expected to provide basis for advanced signal processing strategies in hearing instruments that enable hearing aid to transmit sound coming from the direction that the listener is looking at.

Photos by Eva Helena Andersen



Staff news



Henrik Hvidberg is making a model of a head where students can work on the electrodes on the circuit board and can observe how a cochlear implant (electrodes that stimulate the brain to capture audio) works.

New technician

In April, Henrik Hvidberg started a position as new technician at the Hearing Systems and the Acoustic Technology groups. The job ad said that the candidates should support the students with various technical and creative tasks and also should have some experience with building maintenance. These qualities match perfectly some of Henrik Hvidberg's previous experiences. With both experience as an operator and a Bachelor of Commerce in management, he has been working as workshop and production manager in several companies. After having worked at companies for several years, Henrik Hvidberg felt like doing something different where he still could use his skills. "It is exciting to work with engineers and provide input that the students can use. What I had expected is fulfilled. There's a very good atmosphere here and people are very dedicated to their projects. Everyone is friendly and accommodating," he says.

Photo by Eva Helena Andersen



On Friday 10 June, Federica Bianchi successfully defended her PhD thesis on "Complex-tone pitch representations in the human auditory system". Federica Bianchi will now pursue this work as a postdoc, in which she will also focus on potential clinical implications of her findings



On August 15, Gusztáv Lőcsei starts in Oticon as Development Engineer at the department of Audiology and Embedded Systems.



Postdoc Michał Feręczkowski is now also fulfilling the responsibilities of a lab manager in the new Hearing Systems facilities

New PhD projects



“Perceptual consequences of noise-induced neural degeneration in humans

Pernille Holtegaard

Supported by the Oticon Foundation

Research suggests that synaptic and neuronal damage from noise exposure precedes the hair cell damage that causes increased pure-tone thresholds. The neural synapses and fibres most sensitive to this type of noise-induced damage are responsible for the coding of mid- to high-intensity stimuli and seem to play a crucial role for our ability to perceive sound stimuli in background noise. This project is aimed at investigating noise-induced neural degeneration in human listeners; clarify the relation between people with a history of working in noise exposure and supra-threshold auditory impairments, despite no signs of elevated pure-tone thresholds in the audiogram.



“Aided performance of hearing-aid users in realistic listening situations”

Anja Kofoed

Supported by BEAR project

When persons with hearing impairment are fitted with hearing aids for the first time, it is crucial to follow up on the benefit the hearing rehabilitation provides. However, individual hearing-aid benefit in real-life situations is poorly known today, and there is a lack of relevant clinical tests and outcome measures to assess this benefit more systematically. The idea of this project is to improve the follow-up process and readjustment of hearing-aid parameters via a more systematic and objective evaluation of aided performance, based on what individual patients have difficulties with in real life.

New Postdoc project



“Clinical auditory profiling and hearing-aid fitting strategies”

Raul Sanchez Lopez

Supported by project BEAR (Better Hearing Rehabilitation)

In audiological clinics, the choice of a hearing aid and the adjustment of its amplification and processing parameters are today mostly based on the audiogram. However, it is well established that many hearing-impaired listeners still experience difficulty with understanding speech in more complex listening situations. Despite loss of audibility these hearing-impaired listeners present a supra-threshold deficit, which is still a challenge to compensate for in practice. The idea of the present project is to improve the hearing-aid fitting process and suggest parameter adjustment rationales based on a more complete evaluation of each patient's hearing profile.



“Objective measures of temporal coding in hearing-impaired listeners”

Federica Bianchi

Supported by BEAR project

During her postdoc, Federica Bianchi will investigate temporal coding in hearing-impaired listeners by means of objective methods. Understanding the neural representation of complex stimuli, as well as the individual abilities of hearing impaired listeners to use envelope and temporal fine structure cues is essential towards restoring accurate pitch perception, thus potentially improving sound source segregation and speech communication. Federica Bianchi will also be involved in the BEAR project, where a new test battery for auditory profiling and hearing-aid fitting strategies will be developed to improve the quality of service in audiological clinics.

Recent publications

Recent articles

Epp B, Wit H, van Dijk P (2016) Clustering of cochlear oscillations in frequency plateaus as a tool to investigate SOAE Generation
AIP Conference Proceedings Vol: 1703 DOI: 10.1063/1.4939423

Bouserhal RE, MacDonald E, Falk, Tiago H, Voix J (2016) Variations in voice level and fundamental frequency with changing background noise level and talker-to-listener distance while wearing hearing protectors: A pilot study, *International Journal of Audiology* (55)13-20

Ohlenforst B, Souza PE, MacDonald E (2016) Exploring the relationship between working memory, compressor speed, and background noise characteristics, *Ear and Hearing* 37 (2) 137-143

Wendt D, Dau T, Hjortkjær J (2016) Impact of background noise and sentence complexity on processing demands during sentence comprehension, *Frontiers in Psychology* (2) DOI 10.3389

Ioannidou C, Santurette S, Jeong C-H (2016) Effect of modulation depth, frequency, and intermittence on wind turbine noise annoyance
Journal of the Acoustical Society of America 139(3) 1241-1251

Paredes Gallardo A, Epp B, Dau T (2016) Can place-specific cochlear dispersion be represented by auditory steady-state responses?
Hearing Research 335, 76-82

Zaar J, Dau T (2016) Sources of variability in consonant perception and implications for speech perception modeling
Physiology, Psychoacoustics and Cognition in Normal and Impaired Hearing 437-446

Cubick J, Dau T (2016) Validation of a virtual sound environment system for testing hearing aids, *Acta Acustica united with Acustica* 102, 547-557

Kressner A, May T, Rozell C (2016) Outcome measures based on classification performance fail to predict the intelligibility of binary-masked speech, *Journal of the Acoustical Society of America* 139 (6) 3033–3036

Slater KD, Marozeau J (2016) 26 The effect of tactile cues on auditory stream segregation ability of musicians and nonmusicians
Psychomusicology (2) 162-166

Innes-Brown H, Tsongas R, Marozeau J, McKay C (2016) Towards objective measures of functional hearing abilities psychomusicology.
Part of: *Physiology, Psychoacoustics and Cognition in Normal and Impaired Hearing* 315-325

Hassager H, Gran F, Dau T (2016)
The role of spectral detail in the binaural transfer function on perceived externalization in a reverberant environment
Journal of the Acoustical Society of America 139 (5) 2992-3000

Book Production

Santurette S, Dau T, Dalsgaard JC, Traneberg L, Andersen T (2016) Individual hearing loss-characterization, modelling, compensation strategies, based on the 5th International Symposium on Auditory and Audiological Research ISAAR 2015, Nyborg DK

Conference Papers

Sanchez Lopez R, Epp B (2016) Simultaneous measurement of auditory-steady-state responses and otoacoustic emissions to estimate peripheral compression. Part of: Proceedings of ISAAR 2015, Nyborg DK

Bentsen T, May T, Kressner A, Dau T (2016) Comparing the influence of spectro-temporal integration in computational speech segregation. Presented at: Interspeech 2016, San Francisco USA

Chabot-Leclerc A, MacDonald E, Dau T (2016) Predicting masking release of lateralized speech
Part of: Proceedings of ISAAR 2015, Nyborg DK

Santurette S, Bianchi F, Fereczkowski M, Zaar J, Dau T (2016) Effets d'une compression cochléaire et d'une sélectivité en fréquence réduites sur la discrimination de la hauteur de tons complexes. Presented at: Le 13e Congrès Français d'Acoustique, Le Mans FR p 805-810

Santurette S, Carvajal J, Cubick J, Dau T (2016) Extériorisation sonore avec des indices auditifs et visuels discordants
Presented at: Le 13e Congrès Français d'Acoustique, Le Mans FR p 2311-2312

Wiinberg A, Løve Jepsen M, Epp B, Dau T (2016) Effects of dynamic-range compression on temporal acuity
Part of: Proceedings of ISAAR 2015, Nyborg DK

Kowalewski B, MacDonald E, Strelcyk O, Dau T (2016) Auditory-model based assessment of the effects of hearing loss and hearing-aid compression on spectral and temporal resolution. Part of: Proceedings of ISAAR 2015, Nyborg DK

Zaar J, Dau T (2016) Auditory features in consonant perception - a modeling perspective
Part of: Proceedings of the 2016 SPIRE workshop, Groningen NL

Käsbach J, Hahmann M, May T, Dau T (2016). Assessing and modeling apparent source width perception
Part of: Proceedings of DAGA, Aachen D

Conference posters

Joshi S, Dau T, Epp B (2016) What affects envelope coding in the electrically stimulated auditory nerve?
Presented at: 39th midwinter meeting of Association of Research in Otolaryngology, San Diego USA

Carvajal J, Santurette S, Cubick J, Dau T (2016) The Influence of Visual Cues on Sound Externalization
Presented at: 39th midwinter meeting of Association of Research in Otolaryngology, San Diego USA

Cubick J, Dau T (2016) Objective and Perceptual Evaluation of a Virtual Sound Environment System. Presented at: DAGA, Aachen D

PhD thesis

Bianchi Federica (2016) Complex-tone pitch representations in the human auditory system

Master projects

Relating cortical speech envelope processing to working memory load. Jonathan Marcher-Rørsted

Supervisors: Jens Hjortkjær, Søren Fuglsang and Torsten Dau (DTU)

Spatial release from masking in complex acoustical scenes and the effect of hearing aid processing. Vera Löw.

Supervisors: Adam Westermann (Widex), Marton Marschall, Jens Cubick and Torsten Dau (DTU)

Effects of compression on signals with respect to reverberation. Ruksana Giurda

Supervisors: Henrik Hassager, Torsten Dau (DTU) and Eleftheria Georgianti (Phonak)

Effect of low-frequency gain on speech intelligibility in hearing-impaired listeners. Jonas Lochner

Effect of low-frequency gain on speech intelligibility in hearing-impaired listeners. Jonas Lochner

Supervisors: Sébastien Santurette, Ewen MacDonald (DTU), Lars Bramsløw (Eriksholm Research Centre)

This Master project is conducted in collaboration with Eriksholm Research Centre

Evaluation of acoustic comfort in restaurants. Nicolaj Østergaard Nielsen.

Supervisors: Sébastien Santurette, Cheol-Ho Jeong, Marton Marschall

Bachelor Projects

Acoustic scene classification for potential hearing aid applications. Alejandro Ariza Casabona

Supervisors: Tobias May, Ewen MacDonald (DTU)

Development of a microcontroller based filter-bank for the simulation of cochlear implant (CI) signal processing. Peter Mølgaard Sørensen.

Supervisor: Bastain Epp (DTU)

Development of an ANDROID based teaching platform for implementation of digital filters. Nikolaj Christiansen.

Supervisor: Bastain Epp (DTU)

Analysis of estimated binary mask errors. Kristine Juhl

Supervisors: Abigail Anne Kressner, Torsten Dau (DTU)

Analysis of estimated binary mask errors. Rasmus Høegh

Supervisors: Abigail Anne Kressner (DTU), Torsten Dau (DTU)

