

NEWSLETTER

HEARING SYSTEMS IN PROFILE

February 2020



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News, awards and prizes



Niels Viggo Lynghøj, Mayor of Struer (A), together with Prof. Torsten Dau.
Photo: Lömmel Design & Branding

Danish Sound Award 2019 presented to Professor Torsten Dau

At the Danish Sound Day 2019 on October 9th, Professor Torsten Dau received the Danish Sound Award (Dansk Lydpris). Torsten Dau's research specializations are auditory signal processing and perception in humans, functional models of auditory processing, speech perception, computational scene analysis, auditory evoked potentials, hearing instrument signal processing and aided psychophysics. The Danish Sound Day is an initiative of Struer "Lydens By" and the Danish Sound Network. Read more about the award on our webpage at www.hea.healthtech.dk.



Naim Mansour, second from right, was awarded at the International Congress on Acoustics in Aachen. Photo: Gottfried Behler.

European Acoustics Association Best Paper Award for young researcher

At the International Congress on Acoustics (ICA) in September 2019 in Aachen, Naim Mansour, an industrial PhD student at Hearing Systems and Widex, was honored with the Best Paper and Presentation Award. The prize comes with an award of € 500. Read more about the European Acoustics Association Best Paper Award at euracoustics.org. The topic of Naim's presentation was "Speech intelligibility in a realistic virtual sound environment". Read the paper at <http://pub.dega-akustik.de/ICA2019/data/articles/000667.pdf>

News, awards and prizes



Photo: Eva Helena Andersen

Hearing Systems Presentation Day

On November 1st, Hearing Systems invited collaboration partners, colleagues and alumni to the annual "Presentation Day". The event took place at the laboratory building and attracted 70 guests during the afternoon.

Torsten Dau, Head of Hearing Systems, presented an overview of all the current projects and activities of the group.

"We used to be a group in DTU Elektro but are now a section in the new Department of Health Technology," he explained.

DTU Health Tech started January 2019 and is organized into three academic divisions with about 450 employees: Digital Health and Biological Modelling, which Hearing Systems is a part of, Biopharma, and Imaging & Sensors. At the moment, Hearing Systems consists of approximately 40 academic staff members including 20 PhD students and 9 postdocs. Torsten Dau introduced this year's new PhD students and those who recently received their PhD degree.

"We focus on both technological aspects and on more fundamental aspects, such as computational modelling, electrophysiology and imaging, within the hearing and speech sciences. As you can see from the various talks and posters today, we are involved in projects in many different areas. We try to understand how normal-hearing people are able to communicate almost effortlessly in demanding acoustic conditions. As well, we

investigate and characterize the consequences of individual hearing loss so that we can find the best compensation strategies for the individual, for example through hearing-aid and cochlear-implant technology," he said. The PhD students and Postdocs presented their current activities and research projects through nine talks and 14 posters. The talks were grouped into three sessions: "Rehabilitative audiology", "Human and Machine Processing of Speech" and "Exploring More Realistic Scenarios".

Søren Westermann has been named DTU Honorary Alumnus 2020 in recognition of his unique support for hearing research at DTU. Søren Westermann was Director of Research, IP and IT and later Vice Chairman of the company board until Widex merged with Sivantos last year and formed the new company WS Audiology.



Today, he is Co-owner of WS Audiology and Chairman of the board of T&W Holding. He was among the initiators of the Centre for Applied Hearing Research (CAHR), which started in 2003, and involved in the establishment of the Centre for Acoustic-Mechanical Micro Systems (CMM).

News, awards and prizes



Poster session at ISAAR
 Photo: Miguel Angel Aranda, GN Hearing.

ISAAR 2019 “Auditory Learning in Biological and Artificial Systems”

On August 21-23 2019, the 7th ‘International Symposium on Auditory and Audiological Research’ (ISAAR) took place at Nyborg Strand, DK. 180 researchers from 17 countries participated in the symposium. At the event, also the 50-years anniversary of the series of symposia, supported by GN Hearing, was celebrated, which started as the Danavox Symposium in 1969. The concept has remained the same, with an emphasis on scientific discussions at a high level, a mixture of fundamental and applied research contributions, and collegial networking. Each symposium has a main topic but also welcomes contributions from any topic within auditory and audiological research. This year’s theme was “Auditory Learning in Biological and Artificial Systems”. The symposium was divided into four sessions with overall 25 talks related to: “Auditory precision medicine”, “Learning from natural sounds”, “Machine learning and intelligent auditory signal processing” and “Novel directions in hearing-instrument technology”. Furthermore, over 80 posters were presented on various topics with audiological research. Following the ISAAR tradition, hearing loss and auditory disorders represented cen-

tral topics throughout the different symposium sessions.



Illustration: Helene Ingerslev

More information about the conference can be found on our webpage www.hearhealthtech.dtu.dk and on www.isaar.eu.

Staff news



Photo: Jesper Scheel DTU Health Tech

Head of Department of Health Technology Professor Thomas Andresen

The Head of Department at DTU Health Tech, Prof. Thomas L. Andresen, has a background in chemistry and is a renowned scientist within the area of drug delivery. In his research career, Thomas Andresen has focused on developing systems for delivering immunostimulatory molecules to cancer patients' own immune cells and programming them to recognize cancer cells. He has also a strong track record in founding startup companies, and values the creation of results that make a difference whether it is society, patients or industry.

"I have joined DTU Health Tech as Head of Department with a vision of making a world leading department within technology research and development for the benefit of patients. I believe in close collaboration with industry and the public health sector, I believe in the collaboration between people and I believe in unique individuals. I want to make this department the most exciting place to work in Denmark because of the results we generate and the culture we have. I want this to be a journey we make together with the world around us and our students," says Thomas Andresen.



News from Abroad

As part of his external research stay, PhD student Naim Mansour currently spends six months at Macquarie University in Sydney, Australia. He investigates the link between hearing-aid users' ecological experience of the world around them and their corresponding assessment in a virtual sound environment. This research during this external stay is carried out under the supervision of Dr. Jörg Buchholz, Associate Professor at the Department of Linguistics.



New postdoc position at SDU and DTU

Michal Fereczkowski

Michal Fereczkowski has started a postdoc position at the Institute of Clinical Research at the University of Southern Denmark (SDU) in Odense. His research is part of the BEAR project (Better Hearing Rehabilitation). Michal focuses on hearing-aid users who experience low benefit from their current hearing solution, as reflected by, e.g., poor speech perception in quiet surroundings as evidenced by a low "maximum Discrimination Score". Michal still has an affiliation as a guest researcher at DTU where he spends part of his time.



New Research
 Leader position at
 Facebook Reality
 Laboratories

Thomas Lunner

Thomas Lunner, who has been Adjunct Professor at Hearing Systems in a joint position with Linköping University and Eriksholm Research Centre, has started a new position as a Research Leader at Facebook Reality Laboratories, Seattle, USA.



New Postdoc position
 at Eriksholm Research
 Centre

Johannes Zaar

In October 2019, Johannes Zaar started a 2,5 year postdoc position at Eriksholm Research Centre where he is part of the Cognitive Hearing Science group. Johannes will keep a connection to DTU as a guest researcher. The new research project takes place in collaboration with the University of Linköping in Sweden and is related to the evaluation of aided hearing using electrophysiological measures like EEG.



Project controller

Christina Winther

Christina Winther has started as project controller in the Hearing Systems Section.

PhD defences



Wiebke Lamping

Photo: Jesper Schell DTU Health Tech.

On November 5 2019, Wiebke Lamping successfully defended her PhD project "Improving cochlear implant performance through psychophysical measures". The external examiners at her defence were Associated Professor David Landsberger, New York University, USA, and Dr. Dan Gnansia, Oticon Medical Nice Area, France. Wiebke Lamping has started a postdoctoral position at the Department of Clinical Neuroscience at the University of Cambridge, UK.



Antoine Favre-Félix

Photo: Eva Helena Andersen

On February 25, Antoine Favre-Félix successfully defended his PhD project "Controlling a hearing aid by electrically assessed eye-gaze". The external examiners at his defence were Professor Jürgen Tchorz, University of Applied Sciences, Lübeck, Germany and Senior Director Graham Naylor, University of Nottingham, UK. Antoine carried out his project at Eriksholm Research Centre (part of Oticon). He is still employed at Eriksholm.

New PhD projects



Evaluation of pupillometry as a diagnostic tool for hearing-aid fitting

Mihaela Beatrice Neagu

Several studies gathered evidence and demonstrated the relevance of pupillometry as a measure of listening effort. So far, this measure has only been evaluated on a group level and no attempts have been made to evaluate the method in individual listeners. This PhD project examines whether pupillometry can be a suitable diagnostic tool for hearing-aid fitting and for testing the benefit of a hearing aid on an individual listener basis. The reliability of the pupillometry as an index of listening effort is explored by assessing the sensitivity and specificity of the method.

Electro-tactile hearing: Using tactile stimulation to improve music perception in cochlear implant users

Scott Aker



Developments in hearing research have found an increasing number of perceptual and neurological links between the auditory and haptic systems. It has recently been found that these links can be advantageous for cochlear implant users when supplementing speech with tactile vibrations to aid speech understanding. In a similar vein, this industrial PhD project, a collaboration between DTU and Oticon Medical, investigates the viability of using tactile vibration to enhance music perception and appreciation in cochlear implant users.



Measures and computational models of amplitude modulation processing and perception in hearing-impaired listeners

Jonathan Regev

On March 1, Jonathan Regev will start his PhD project. Over the last years, substantial efforts have been made to extend current model approaches for complex sound perception in normal-hearing listeners towards predictions of the consequences of hearing impairment. This project investigates the functional and perceptual consequences of central processing deficits on the perception of amplitude modulations. The results may provide the basis for a better understanding of the difficulties of hearing-impaired listeners with speech communication.

New postdoc project



Audiology and Hearing Rehabilitation

Maaïke Van Eeckhoutte

On January 6th, Maaïke Van Eeckhoutte started as a postdoc in a new joint position at Hearing Systems at DTU and at the Department of Otorhinolaryngology, Head and Neck Surgery & Audiology at Rigshospitalet. A major goal is to facilitate the translation of research between DTU and the clinic. After her time as a PhD student at KU Leuven in Belgium and a postdoc at the National Centre for Audiology in Canada, she will now focus on research within clinical audiology and will also be a part of the recently established Copenhagen Hearing and Balance Center (CHBC).

Other research projects



UHEAL: Uncovering Hidden Hearing Loss

Sam Watson, Research Assistant

Exposure to loud sounds has been shown to cause neuropathic damage which cannot be detected by standard audiometric testing and is thought to cause indefinite problems when listening in noisy situations. The consequences and extent of this unmonitored damage in the human population is unknown. The goal of the UHEAL project is to bring together expertise from the fields of audiology, physiology and MRI to evaluate the repercussions of these neuropathic damages and assess measures to diagnose cochlear neuropathy in humans. Sam will contribute with his work on electro-physiological and behavioral correlates of synaptopathy.

Master projects

Miguel Temboury Gutiérrez. Quantitative modeling of auditory brainstem responses in normal-hearing and hearing-impaired listeners. Supervisors: Torsten Dau (DTU), Gerard Encina-Llamas (DTU)

Sine Palm Gummesen. Evaluating the effects of hearing-aid processing on conversational dynamics. Supervisors: Ewen MacDonald (DTU), A. Josefine Munch Sørensen (DTU), Eline Borch Petersen (Widex)

Sascha Bilert. Decoding attention in real-world listening. Supervisors: Jens Hjortkjær (DTU), Johannes Zaar (DTU/Eriksholm Research Centre), Sergi Rotger Gritful (Eriksholm), Martha Shiell (Eriksholm)

Philippe Gonzalez. Binaural speech segregation in noisy and reverberant environments using deep neural networks. Supervisor: Tobias May (DTU)

Publications (since September 2019)

Journal papers

Steinmetzger K, Zaar J, Relanó-Iborra H, Rosen S, Dau T (2019) Predicting the effects of periodicity on the intelligibility of masked speech: An evaluation of different modelling approaches and their limitations. *Journal of the Acoustical Society of America*, 146, 4, P 2562-2576

Steinmetzger K, Relanó-Iborra H, Zaar J, Dau T (2019) A speech-based computational auditory signal processing and perception model. *Journal of the Acoustical Society of America* 146, 5 P 3306-331

Pedersen SS, Hjortkjær J, Marozeau J (2019) Perception of Musical Tension in Cochlear Implant Listeners. *Frontiers in Neuroscience* 13, 11 Article 987

Mansour N, Marschall M, May T, Westermann A, Dau T (2019) A Method for Conversational Signal-to-Noise Ratio Estimation in Real-World Sound Scenarios. *Acoustical Society of America* 145 P 1873

Mueller J, Wendt D, Kollmeier B, Debener S, Brand T (2019) Effect of Speech Rate on Neural Tracking of Speech. *Frontiers in Psychology* 10 P 449

Egger K, Dau T, Epp B (2019) Supra-threshold perception and neural representation of tones presented in noise in conditions of masking release. *PLOS ONE* 14, 10

Ahrens M, Marschall M, Dau T (2020) The effect of spatial energy spread on sound image size and speech intelligibility. *The Journal of the Acoustical Society of America*

May T, Kowalewski B, Dau T (2020) Scene-aware dynamic range compression in hearing aids. *The technology of binaural understanding* (Editors Blauert J, Braasch)

Fuglsang S, Märcher-Rørsted J, Dau T, Hjortkjær J (2020) Effects of sensorineural hearing loss on cortical synchronization to competing speech during selective attention, *Journal of Neuroscience*.

Kowaleski B, Fereczkowski M, Strelcyk O, MacDonald E, Dau T (2020) Assessing the effect of hearing-aid compression on auditory spectral and temporal resolution using an auditory modeling framework". *Acoustical Science and Technology* 41 P 214-222.

Navntoft C, Marozeau J, Barkat TR (2020) Ramped pulse shapes are more efficient for cochlear implant stimulation in an animal model. *Sci Rep* 10, 3288.

Conference papers

Ahrens A, Lund KD, Dau T (2019) Audio-visual scene analysis in reverberant multi-talker environments. Presented at the 23rd International Congress on Acoustics (ICA) Aachen, Germany P 3890-3896

Zaar J, Dau T, Carney LH (2019) Predicting speech intelligibility in normal-hearing and hearing-impaired listeners based on a physiologically inspired model of the auditory periphery. Presented at the 23rd International Congress on Acoustics (ICA) Aachen, Germany

Mansour N, Marschall M, Westermann A, May T, Dau T (2019) Speech Intelligibility in a Realistic Virtual Sound Environment. Presented at the 23rd International Congress on Acoustics (ICA) Aachen, Germany P 7658-7665

Wu M, Sanchez Lopez R, El-Haj-Ali M, Nielsen SG, Fereczkowski M, Dau T, Santurette S, Neher T (2019) Assessing the interaction between different auditory profiles and benefit from six hearing aid processing strategies: Insights from the BEAR project. Presented at the 23rd International Congress on Acoustics (ICA) Aachen, Germany P 3849-3856

Sanchez-Lopez R, Nielsen S, Cante O, Fereczkowski M, Wu M, Neher T, Dau T, Santurette S (2019) A clinical test battery for Better hEARing Rehabilitation (BEAR): Towards the prediction of individual auditory deficits and hearing-aid benefit. Presented at the 23rd International Congress on Acoustics (ICA) Aachen, Germany P3841-3848

Book Chapter

May T, Kowalewski B, Dau T (2020) Scene-aware dynamic range compression in hearing aids. The technology of binaural understanding (Editors Blauert J, Braasch)

Datasets

Lund, Kasper Duemose; Ahrens, Axel (2020) Recordings of Danish Monologues for Hearing Research. figshare. Media. <https://doi.org/10.11583/DTU.9746285.v1>

Sanchez-Lopez R, Nielsen S, El-Haj-Ali, M, Bianchi F, Fereczkowski M Cañete O, Oscar, Santurette S. (2019). Data from "Auditory tests for characterizing hearing deficits: The BEAR test battery" (Version v1.0) Zenodo. <http://doi.org/10.5281/zenodo.3459580>

PhD theses

Wiebke Lamping (2019) Improving cochlear implant performance through psychophysical measures

Antoine Favre-Félix (2010) Controlling a hearing aid by electrically assessed eye-gaze



Delegates and alumni from the Hearing Systems section at the ARO Midwinter Meeting Jan. 24-30 2020 in San Jose California, organized by the Association for Research in Otolaryngology.

