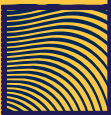




AALBORG UNIVERSITET
AALBORG ESBJERG KØBENHAVN

SIGNAL PROCESSING FOR HEARING ASSISTIVE DEVICES 2024

COURSE



**KNOWLEDGE
COMPETENCES
NETWORK**

5 DAY SIGNAL PROCESSING COURSE FOR EXPERTS AND RESEARCHERS

Network with other participants and experts in sound, signal processing, and machine learning.

Hearing assistive devices (HADs) are ubiquitous. They include, for example, devices such as headsets for speech communication in noisy environments (airplane crews, emergency/rescue teams, combat soldiers, police forces, etc.), headsets for office use, gaming, etc., and hearing care systems, e.g., hearing aids and cochlear implants.

The course consists of lectures and hands-on exercises, allowing the participants to understand in-depth the technical problems related to HADs and their potential solutions. The multi-disciplinary course focuses on applying theoretical results to real-world problems and practical do's and don'ts.

The three days will cover teaching, presentations, hands-on practical training, and networking. A diploma will be issued on successful completion of the 3-day program.

As an inspiration and for your further development, CASPR provides a "Research talks on emerging technologies" event the following two days after the course, where participation is optional. University researchers will give the talks - furthermore, you will have the opportunity to network with other participants and experts in sound, signal processing, and machine learning.

BRIEF COURSE OUTLINE

The first part of the course is a short introductory part, which lays the foundation for the rest of the course, covering fundamental topics such as auditory perception (normal and impaired hearing) and a discussion of the basic principles of HADs.

The second part provides an overview of fundamental signal processing problems encountered in HADs, and an in-depth treatment of state-of-the-art solutions. These include beamforming and noise reduction methods, direction-of-arrival estimation, voice activity detection, feedback control, hearing loss compensation, etc. Furthermore, an overview is given of important methodologies for evaluating HADs related to speech intelligibility and listening effort.

The last two – optional – days are devoted to lectures on emerging technologies for hearing assistive devices. These include deep learning based methods for multi-modal HAD processing, including EEG and sound, methods for listening effort and attention decoding, generative speech enhancement methods, hearing loss compensation methods, self-supervised deep learning methods, HADs involving microphones outside the ear of the user, and methods for low-latency enhancement and communication.

While the course focuses on applications, many of the discussed techniques are general and find use in the much broader field of general sound processing.

PREREQUISITE FOR PARTICIPATION

The course requires a background in signal processing and statistics. It is expected that you have qualifications corresponding to a M.Sc. in e.g., signal processing. We expect the participants in the course to consist of R&D engineers from industry together with PhD students from universities.

PREPARATION

Before the course starts, you will receive a link to the literature. It is not mandatory to prepare before the course. The course will primarily be in English.

LECTURERS

- Prof. Steven van de Par, Oldenburg University
- Prof. Jesper Jensen, Aalborg University and Oticon
- Prof. Zheng-Hua Tan, Aalborg University
- Dr. Meng Guo, Oticon.
- Dr. Robert Rehr, Oticon.
- Dr. Michael Syskind Pedersen, Oticon.
- Dr. Dorothea Wendt, Eriksholm Research Center.
- Postdoc Payam Shahsavari, Aalborg University
- PhD student Vasudha Sathyapriyan, Aalborg University and Oticon
- PhD student Andreas Fuglsig, Aalborg University
- PhD student Peter Leer Bysted, Aalborg University
- PhD student Philippe Gonzalez , Technical University of Denmark
- PhD student Asjid Tanveer, Aalborg University
- PhD student Sangeeth G. Jayaprakash, Aalborg University
- PhD student Holger S. Bovbjerg, Aalborg University
- PhD student Mohammad Bokaei, Aalborg University

ORGANIZERS

- Prof. Jesper Jensen, Aalborg University and Oticon
- Prof. Jan Østergaard, Aalborg University.
- Prof. Zheng-Hua Tan, Aalborg University.
- CASPR - Centre for Acoustic Signal Processing Research at Aalborg University

PRELIMINARY PROGRAM

	Mon 26/2-24	Tue27/2-24	Wed 28/2-24	Thu 29/2-24	Fri 1/3-24	
8:30	Registration					
9:00	Welcome and Intro: Hearing Assistive Devices (HADs) Jesper Jensen	Beamforming II Jesper Jensen *	Voice Activity Detection (VAD) Zheng-Hua Tan	EEG and Audile Quality Payam Shahbaziari	Self-supervised Learning for speech Helger S. Bockjerg	■ : Introductory ■ : Fundamental / State-of-the-art
10:00	Basic: Auditory Perception Steven van de Par	Exercise Beamforming	DNN Single-Microphone Noise Reduction Robert Rehr	Joint Far- and Near-end Speech and Listening Enhancement with Minimum Processing Andreas Fuglbig	Speech enhancement for HADs with a remote mic. Vasudha Sathyaipriyan	■ : Emerging
11:00	Basic: Auditory Perception Steven van de Par	Feedback Control Meng Guo	Speech Intelligibility Assessment I Michael Sjøland Pedersen	Deep Learning based Hearing Loss Compensation Peter Bysted	Target Identification using Turn-Taking Jesper Jensen	■ : Exercise
11:45	Lunch					■ : Hands-on
12:30	Hands-on Experience Aud Perc Steven van de Par	Feedback Control Meng Guo	Speech Intelligibility Assessment II Michael Sjøland Pedersen	Speech Enhancement Using Diffusion Based Generative Models Philippe Gonzalez	Low-latency speech enhancement and coding Mohammed Bialal	■ : Other
13:30	Hearing Loss Compensation Jesper Jensen	Hands-on Experience Feedback Meng Guo	Hands-on Experience Speech Intelligibility Michael Sjøland Pedersen	Inter- and Intra-Trial Deep Learning Based Auditory Attention Decoding M. Aujiz Tanveer	Exercise Beamforming	● : Lectures that support hands-on exercise
14:30	Intro to Exercise Vasudha Sathyaipriyan / Jesper Jensen *	Acoustic Transfer Function (DOA) Estimation I Jesper Jensen *	Listening Effort and impact of HAD signal proc. Dorothea Wendt	DNN - EEG and listening effort. Sangeeth G. Jayarajah	Exercise Beamforming - Last-Minute Questions	Each lecture is 45 min, followed by 15min break
15:30	Beamforming I Jesper Jensen *	Acoustic Transfer Function (DOA) Estimation II Jesper Jensen *	Exercise Beamforming	Exercise Beamforming	Wrap-up	
16:30	Exercise Beamforming (Optional)	Exercise Beamforming (Optional)	Exercise Beamforming (Optional)	Exercise Beamforming (Optional)		
17:30						

PRICE AND REGISTRATION

Registration fee: 13,748 DKK (approx. 1,845 EUR). The fee is exempt of VAT.

Catering (mandatory): 1,565 DKK incl. VAT

To register for the course: [click here \(events.aau.dk\)](https://events.aau.dk)

PRACTICAL INFORMATION

Dates for the mandatory course part (2024 CASPR Course on Signal Processing for Hearing Assistive Devices):

Monday 26th - Wednesday 28th, February 2024.

Dates for the additional optional part (Emerging Topics in Signal Processing for Hearing Assistive Devices):

Thursday 29th February - Friday 1st March 2024.

Place: Aalborg Universitet København, A. C. Meyers Vænge 15, 2450 KBH SV
Bygning A (ACM15), Stuen
Lokale CPH ACM15 (A) 0.091

Parking info: [click here \(campusservice.aau.dk\)](#)

CONTACT

For further information about the course, contact:

→ Jan Østergaard (jo@es.aau.dk).

→ Jesper Jensen (jje@es.aau.dk).

