Lecture: „Speech and audio signal processing” (2+1): Mondays 8:00 – 10:30 am, Room: S1|01 A2

Winter term 2024/25: (6 CP)

TECHNISCHE UNIVERSITÄT DARMSTADT

In case you are interested in Signal Processing topics you should have a look at the topic Audio Processing, e.g.:

- Speech signal processing: Beamforming and noise reduction
- Speech and hearing
- Speech and speaker recognition
- Music signal processing

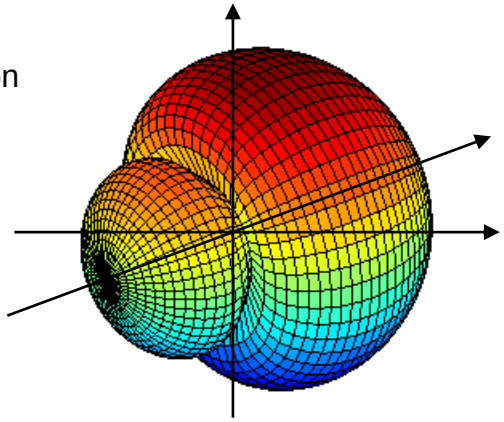

Fig.2: D3 beampattern

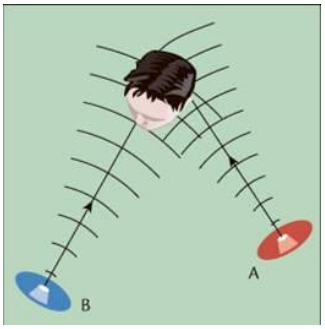

Fig.3: Binaural perception

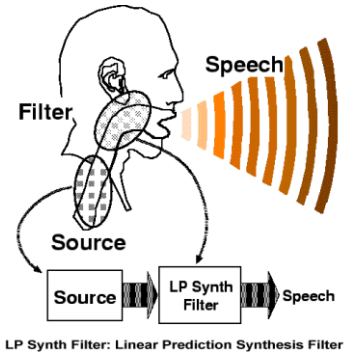

Fig.1: Speech models

Many applications based on audio processing:

- Mobile telephones, „automotive“ applications
- Surround systems, Dictation systems
- Music recognition (e.g., „Shazam“-App)

Theoretical background…

- Gaussian mixture models for pdf modeling
- Estimation of speech features: Fundamental frequency, formants
- Hidden-Markov Models
- DNNs for speech recognition, noise reduction, etc.

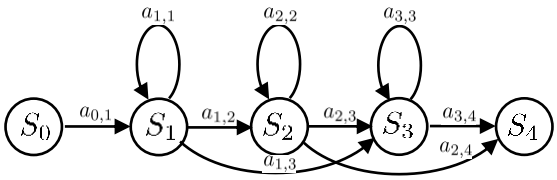

Fig.4: Hidden Markov Model

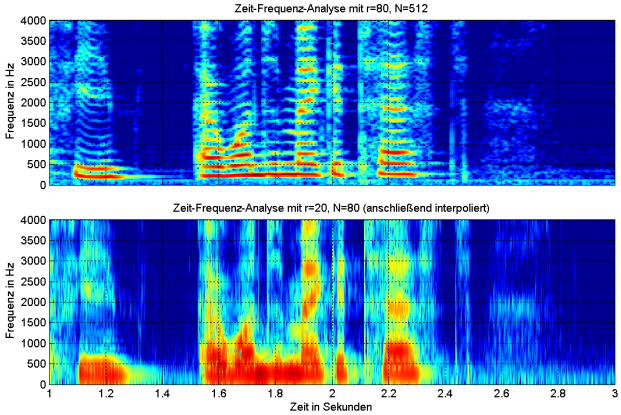

Fig.5: Speech analysis: Fundamental frequency and formants

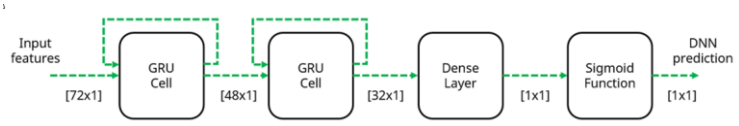

Fig.5: Deep Neural Network

… in a good balance with a lot practical examples based on industrial applications:

- Real-time realizations.
- Recognition of practical solutions.
- Deal with constraints, e.g., microphone noise.

- **Lecturer:**
  Prof. Dr.-Ing. Henning Puder (TU Darmstadt & Sivantos hearing aids)
  Slides in Englisch; Presentation language tbd.
- **Matlab exercises for a practical application of the lecture content**
- **Official Seminar part:** You give a talk about a selected topic of audio processing.
- **Exam: oral**