FACULTY OF ENGINEERING AND ARCHITECTURE

DEPARTMENT OF INFORMATION TECHNOLOGY - WAVES RESEARCH GROUP

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HEARING RESEARCH

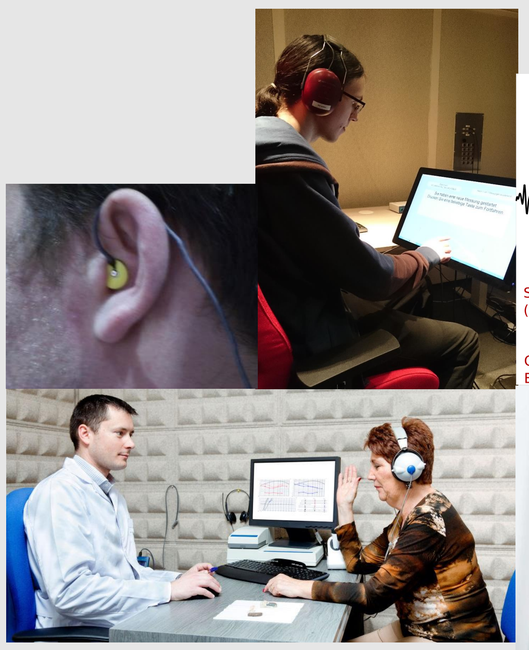
Methods

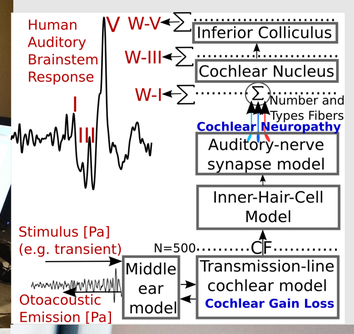
Psychoacoustics: Measured over headphones in sound attenuated rooms to test perception of sound

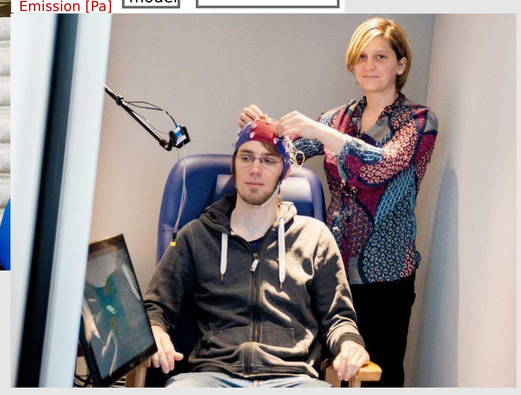
Multi-channel EEG: To test the physiological and cortical response to sound

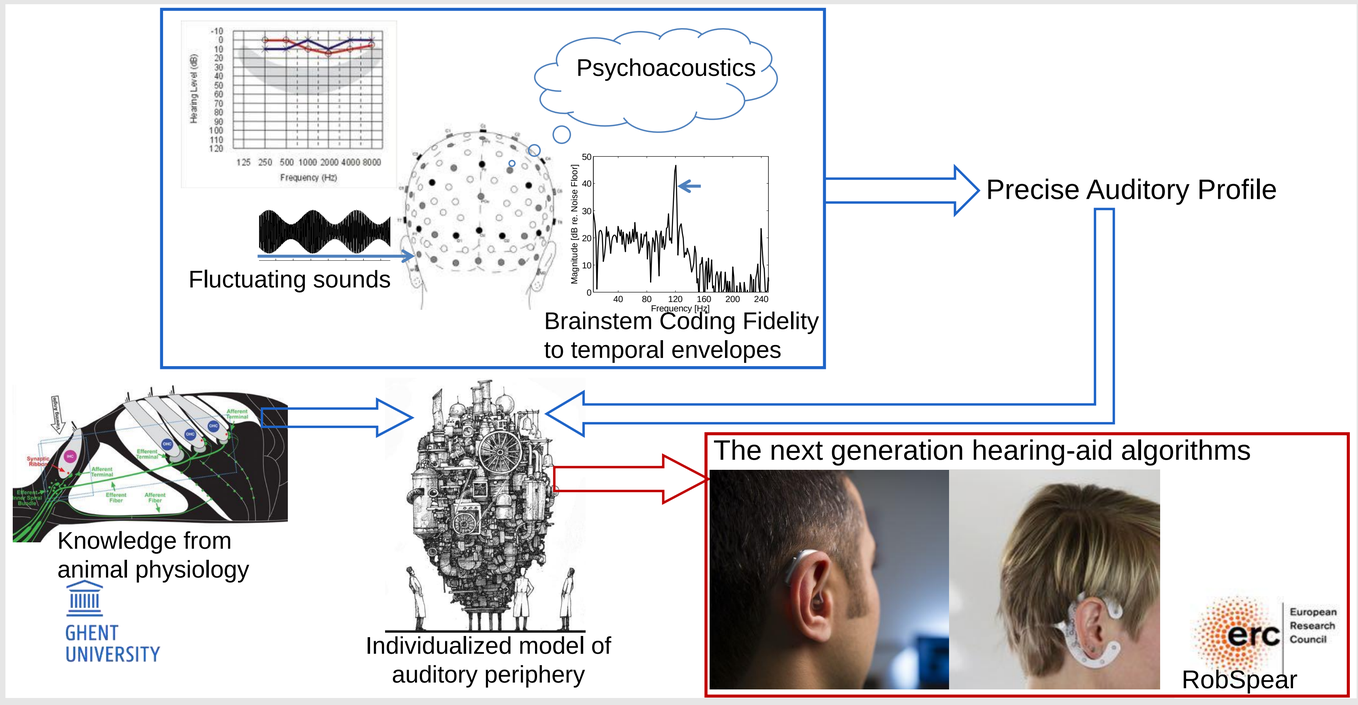
Otoacoustic Emissions: Using a microphone in the ear-canal, the outer-hair-cell response to sound in the cochlea is tested.

Computational Modeling: Using information from neuroscience, we build computational models of the auditory system that can be used to test how sound is encoded









Hearing Diagnostics and Sound Encoding

Multi-channel EEG, smartphone EEG and sound perception markers of hearing are integrated to develop novel and efficient hearing diagnostics tools that are much more precise than the current audiogram method.

Using an interdisciplinary approach, auditory processing is traced along the ascending auditory pathway to address key questions in auditory neuroscience, sound encoding, speech perception in challenging listening conditions.

Machine Listening - auditory attention models

What sounds do people hear in complex auditory scene?

Effect of sound on learning

Auditory object formation and sound recognition

Assessing bio-diversity in a natural environment

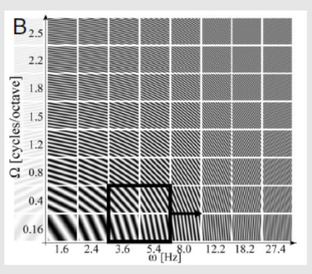
How to validate models with EEG measurement

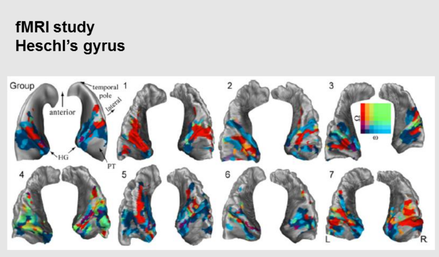
Gating deficit in Parkinson's desease etc.

The Next Generation Hearing Aids

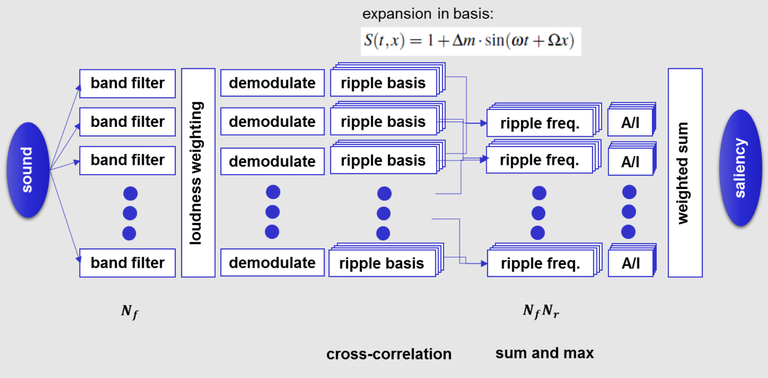
Using a combined experimental and computational modeling approach, individualized models of hearing impairment are constructued that model your individual hearing loss

Using these models, machine-learning methods can be used to reverse-engineer the system and design individualized hearing aid algorithms

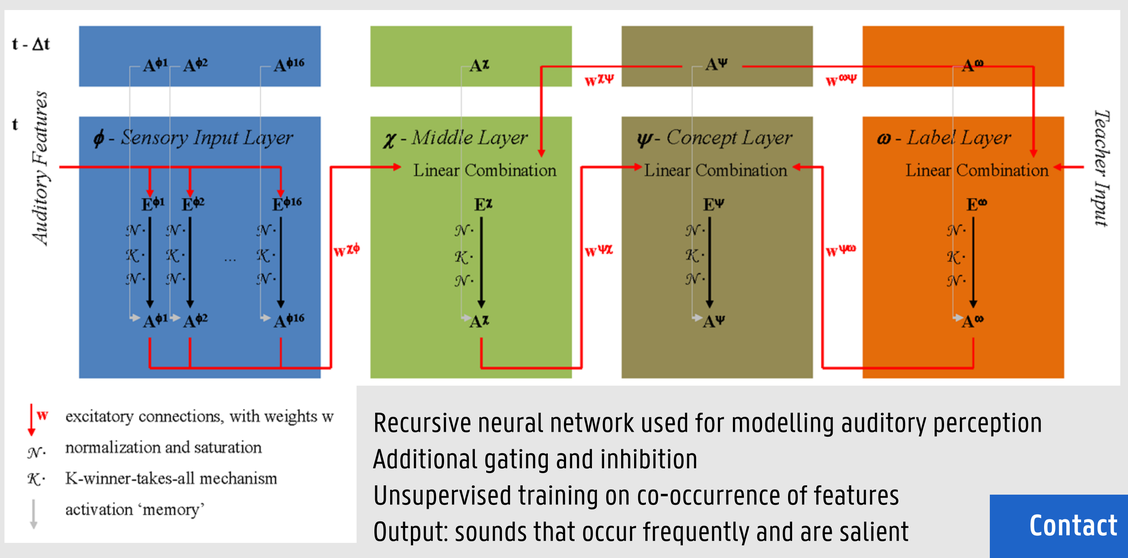




Schönwiesner, M., & Zatorre, R. J. (2009). Spectro-temporal modulation transfer function of single voxels in the human auditory cortex measured with high-resolution fMRI. *Proceedings of the National Academy of Sciences*, *106*(34), 14611-14616.



Model for saliency mimicking human auditory processing



Recursive neural network used for modelling auditory perception

Additional gating and inhibition

Unsupervised training on co-occurrence of features

Output: sounds that occur frequently and are salient

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