Data-driven approach for auditory profiling

Nowadays, the pure-tone audiogram is the main tool used to characterize hearing loss and to fit hearing aids. However, the perceptual consequences of hearing loss are typically not only associated with a loss of sensitivity, but also with a clarity loss that is not captured by the audiogram. A detailed characterization of hearing loss has to be simplified to efficiently explore the specific compensation needs of the individual listener. We hypothesized that any listener’s hearing can be characterized along two dimensions of distortion: type I and type II. While type I can be linked to factors affecting audibility, type II reflects non-audibility-related distortions. To test our hypothesis, the individual performance data from two previous studies were re-analyzed using an archetypal analysis. Unsupervised learning was used to identify extreme patterns in the data which form the basis for different auditory profiles. Next, a decision tree was determined to classify the listeners into one of the profiles. The new analysis provides evidence for the existence of four profiles in the data. The most significant predictors for profile identification were related to binaural processing, auditory non-linearity and speech-in-noise perception. The current approach is promising for analyzing other existing data sets in order to select the most relevant tests for auditory profiling.