Inrobin
Gareth W. Peters
Dorota Toczydłowska
Marta Campi

Experiment two speech signals

Frequency bands location

Set the notation of this experiment as follows:
Ω is the set of M_{true} vectors of parameters where each vector is J dimensional
$\Omega = \left\{\Psi^1, \ldots, \Psi^{M_{true}}\right\}$
Let $\Psi^j = [\Psi_1^j, \ldots, \Psi_J^j]$ which is the jth element of Ω set
Ψ_h^j is hth element of Ψ^j
$k(\cdot, \cdot; \Psi)$ a kernel function from parameterized by the parameter Ψ, $k : \mathcal{R} \times \mathcal{R} \to \mathcal{R}$
Let $\mathbf{t}$ be a $1 \times N$ vector of real numbers
$\mathbf{K} = k(\mathbf{t}, \mathbf{t}; \Psi = \Psi)$
$j \in \left\{1, \cdots, M_{true}\right\}$, $m \in \left\{1, \cdots, M\right\}$, $h \in \left\{1, \ldots, J\right\}$
$n_{j,m}$ number of IMFs

Algorithm 1: Algorithm

Input: Discrete speech signals

1. Fit a spline through each $\mathbf{x}_j^{(m)}$ denoted as $\hat{\mathbf{x}}_j^{(m)}$.
2. Apply the EMD to $\hat{\mathbf{x}}_j^{(m)}$ to get the IMFs decomposition and collect all the IMFs generated up to the stopping criterion chosen denoted as $\boldsymbol{\gamma}_{j,1}^{(m)}, \boldsymbol{\gamma}_{j,2}^{(m)}, \ldots, \boldsymbol{\gamma}_{j,v_{j,m}}^{(m)}$. For each j and for each m we might have different number of IMFs denote by $v_{j,m}$.
3. Compute the Instantaneous Frequency of each IMF denoted as $\boldsymbol{f}_{j,1}^{(m)}, \boldsymbol{f}_{j,2}^{(m)}, \ldots, \boldsymbol{f}_{j,v_{j,m}}^{(m)}$.
4. Compare the frequencies with Spectral Component of the kernels

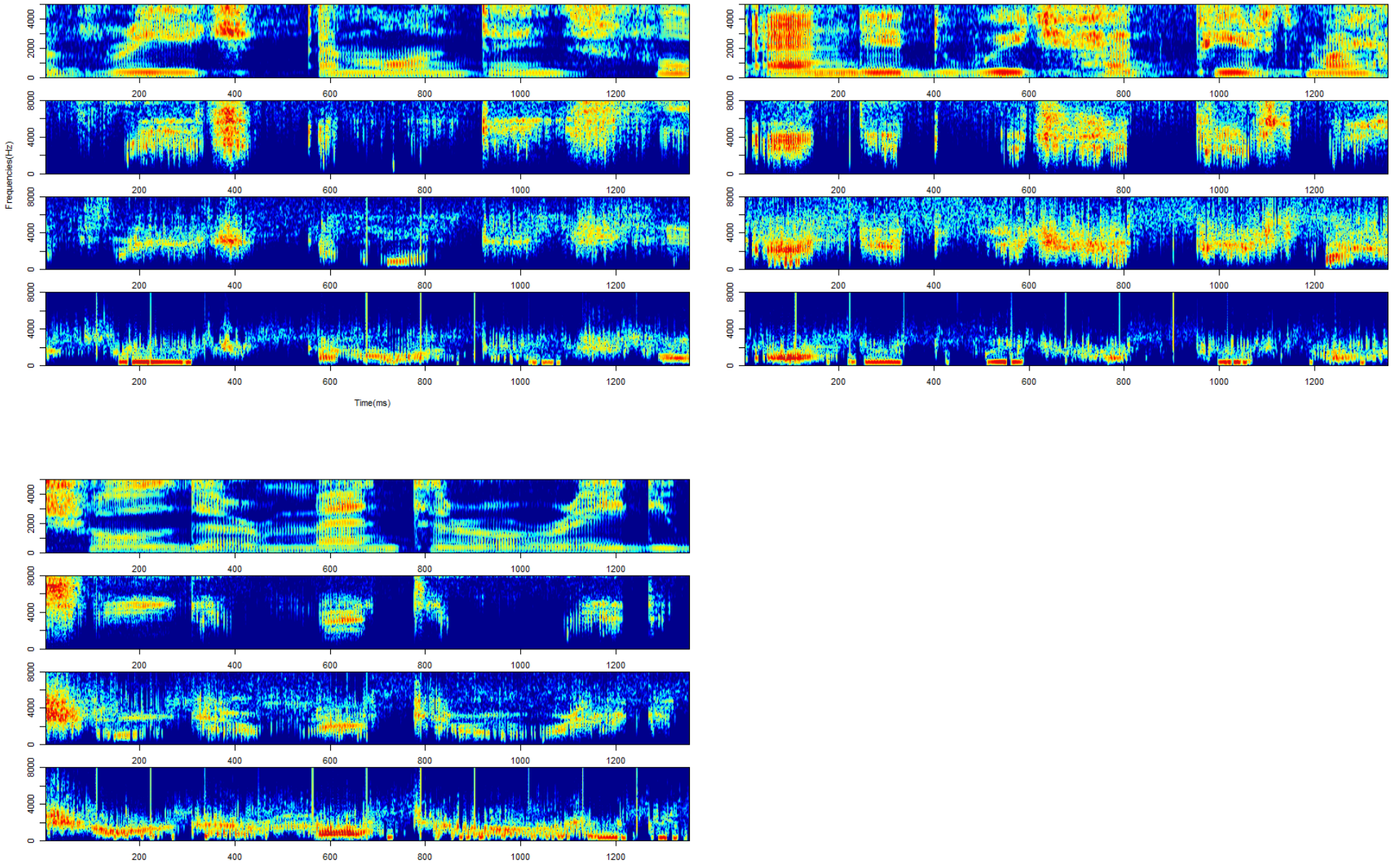

Figure 1: Spectrograms of three sentences for speaker 1 (female voice). From the top: the original signal, IMF1, IMF2 and IMF3 respectively.

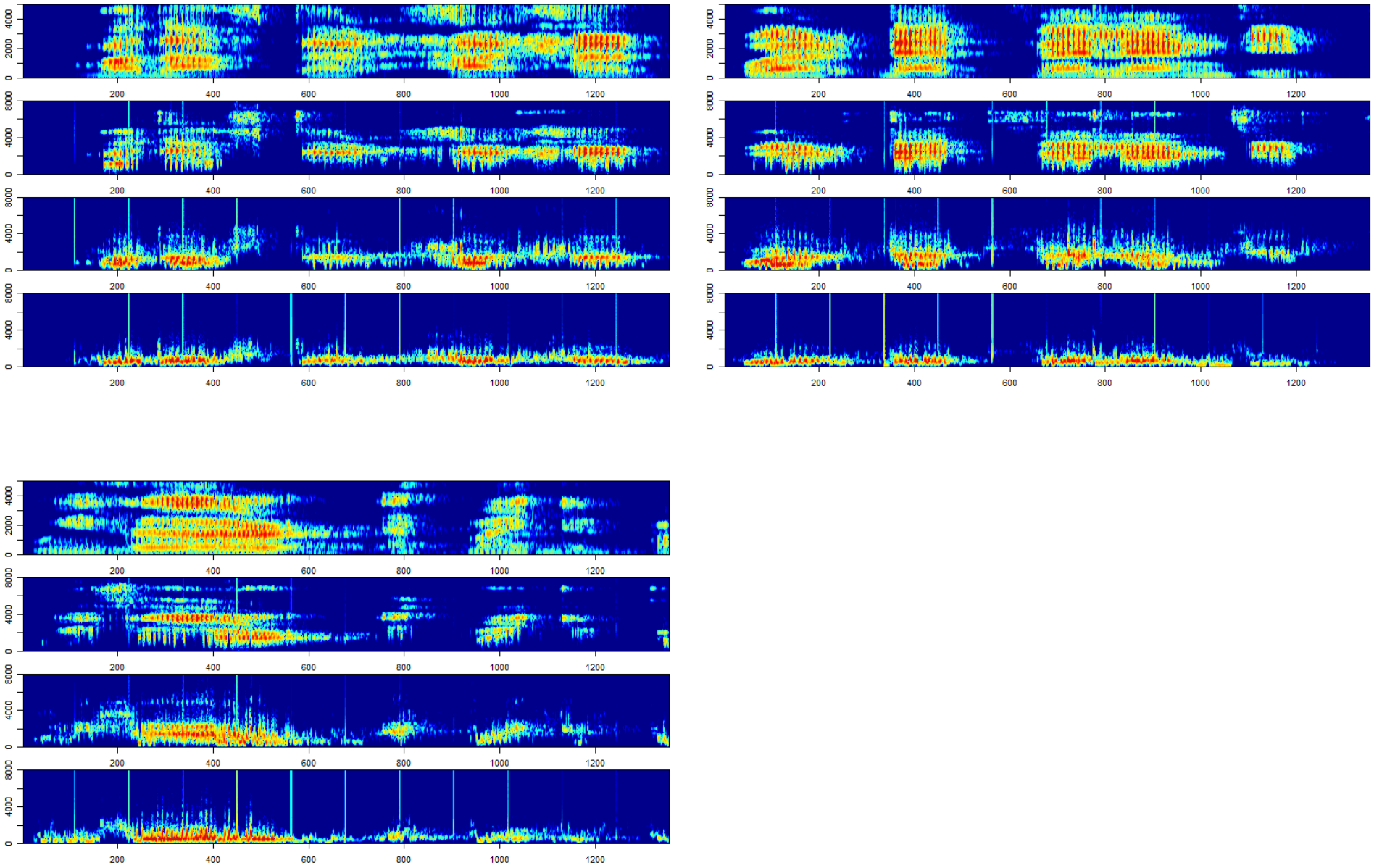

Figure 2: Spectrograms of three sentences for speaker 1 (male voice). From the top: the original signal, IMF1, IMF2 and IMF3 respectively.