Alain Dieterlen (IRIMAS, UHA)
Title : Time-Frequency at IRIMAS
Abstract : At the Universit de Haute-Alsace, the IRIMAS Institute brings together automaticians, computer scientists, mathematicians and specialists in signal and image processing. The IMTIS team develops instrumentation for optical microscopy, 3D image processing for microscopy and machine vision, and machine learning for temporal signal processing, with applications in energy and physiological measurement. After a brief overview of the team and the evolution of its projects, we will present the projects focused on time-frequency techniques. We focus on the practical value of optimizing TF methods to characterize and classify physiological signals (ECG, PCG, BCG and sEMG) and signals from electrical systems. We will also present the use of descriptors derived from the distribution of zeros of TF transforms for data protection.

Quentin Legros (polytech Orléans)
Title : Estimation of Multi-Component Signal Parameters in Challenging Scenarios Using an EM-Based Algorithm.
Abstract : This research presents a novel Bayesian observation model for estimating the instantaneous frequency (IF) and amplitude (IA) of modes within multi-component signals (MCS) based on their spectrograms. The model is designed to handle complex signal configurations, including noise and overlapping components. Our approach employs a stochastic variant of the Expectation-Maximization (EM) algorithm for efficient parameter estimation, avoiding the computationally demanding joint parameter estimation from the posterior distribution. Additionally, a post-processing step is proposed to address the challenges associated with estimating overlapping frequencies. By addressing these challenges, this research offers a robust and efficient solution for signal parameter estimation, underpinned by a Bayesian observation model and EM-based algorithm. The methodology's promising results are demonstrated in complex signal analysis scenarios.

Adrien Meynard (Laboratoire de Physique, ENS Lyon
Title :Time-scale synthesis of non-stationary signals
Abstract : We develop a time-scale synthesis-based probabilistic approach for the modeling of locally stationary signals. The model involves time-dependent vertical translations of the wavelet coefficients. We propose a maximum a posteriori estimator for the time-varying scale translation and the underlying power spectrum. We show that the model can handle signals with fast-varying frequency, and provide sharp time-scale representations.