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An Overview of Bayesian Computational methods for audio signal processing

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In this talk we describe Bayesian computational models and methods for inference about noisy audio signals, with the aim of performing tasks such as musical transcription, source separation, automated annotation with content descriptors, noise reduction and object-based coding. The models are structured models of non-stationary sparsity in audio sources, usually expressed in the time-frequency plane. The computational inference methods are based around Monte Carlo techniques including the particle filter for rapid on-line inference and Markov chain Monte Carlo for batch problems of higher complexity. Examples will be given from the spheres of source separation, multiresolution noise reduction, denoising and interpolation of missing batches from audio. We will also describe their use for acoustical analysis of the properties of a musical instrument, focusing on the parameters of inharmonicity in struck or plucked strings.