

**Title :** Review of estimation algorithms for HMM/HSMM with mixed effects.

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**Abstract :** Several articles in the literature consider HMM or HSMM with mixed effects in the law of the observed process and of the hidden process. The covariates are introduced via the composition of a potentially non-linear link function and a linear expression with fixed and random effects, in the image of Generalised Linear Mixed Models (GLMM). The presentation will consist of a review of these models, in particular their modelling and estimation methods.

Unlike an HMM or HSMM without covariates, the Expectation-Maximisation (EM) algorithm cannot be realised exactly. The maximisation step M generally no longer has an analytical solution, and the presence of random effects prevents the exact calculation of the E step. Numerical approximations must be considered to overcome this additional difficulty. It is also possible to bypass the EM algorithm by directly maximising the log-likelihood after approximating it numerically. Bayesian approaches have also been considered, which rely on computational methods. We will review how these different approaches have been mobilized for H(S)MM with mixed effects.