

# Semiparametric mixtures of nonparametric regressions

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**Abstract** In this article, we propose and study a new class of semiparametric mixture of regression models, where the mixing proportions and variances are constants, but the component regression functions are smooth functions of a covariate. A one-step backfitting estimate and two EM-type algorithms have been proposed to achieve the optimal convergence rate for both the global parameters and the nonparametric regression functions. We derive the asymptotic property of the proposed estimates and show that both the proposed EM-type algorithms preserve the asymptotic ascent property. A generalized likelihood ratio test is proposed for semiparametric inferences. We prove that the test follows an asymptotic  $\chi^2$ -distribution under the null hypothesis, which is independent of the nuisance parameters. A simulation study and two real data examples have been conducted to demonstrate the finite sample performance of the proposed model.

**Keywords** EM algorithm · Kernel regression · Mixture of regression models · Semiparametric mixture models

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