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# Polynomial regression with censored data based on preliminary nonparametric estimation

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**Abstract** Consider the polynomial regression model  $Y = \beta_0 + \beta_1 X + \dots + \beta_p X^p + \sigma(X)\varepsilon$ , where  $\sigma^2(X) = \text{Var}(Y|X)$  is unknown, and  $\varepsilon$  is independent of  $X$  and has zero mean. Suppose that  $Y$  is subject to random right censoring. A new estimation procedure for the parameters  $\beta_0, \dots, \beta_p$  is proposed, which extends the classical least squares procedure to censored data. The proposed method is inspired by the method of Buckley and James (1979, *Biometrika*, 66, 429–436), but is, unlike the latter method, a noniterative procedure due to nonparametric preliminary estimation of the conditional regression function. The asymptotic normality of the estimators is established. Simulations are carried out for both methods and they show that the proposed estimators have usually smaller variance and smaller mean squared error than the Buckley–James estimators. The two estimation procedures are also applied to a medical and an astronomical data set.

**Keywords** Bandwidth · Bootstrap · Kernel estimation · Least squares estimation · Linear regression · Nonparametric regression · Right censoring · Survival analysis