Using degradation stochastic models, we study real time conditioning, which monitors complex machines. In engineering, a commonly used model is:

$$\begin{aligned} S(t_i) &= \theta t_i + \epsilon(t_i) \qquad \text{for } i = 1, \dots n \\ S(0) &= 0, \end{aligned}$$

where $S(t_i)$ is the observed signal from the system at a time t_i which runs from $[0, \infty)$, $\epsilon(t_i)$ is the error of the model at time t_i, and θ is the prior distribution. In the literature, the Bayesian approach is used to find the posterior distribution, assuming prior distribution is known. We remove the assumption that the prior distribution is known and use a Kernel density estimator to estimate the denstiy of θ using a convolution between the unknown prior distribution and the known distribution of the dependent error terms. We derive the rate of convergence of the MISE for this Kernel estimator.