Abstract: We present an innovative Bayesian method for estimation of
statistical parameters of time series data. This method works
by comparing coefficients of Karhunen-Lo\`{e}ve expansion of
observed and synthetic data with known parameters.
We show one new method for generating synthetic data with prescribed
properties and we demonstrate on a numerical example how this method
can be used for estimation of physically interesting features
in power spectra calculated from observed light curves of some X-ray sources.