Prior information in Bayesian identification of a linear regression model: inference and examples

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Abstract: Bayesian methodology is a widely-applicable tool for probabilistic modelling and decision making. Its strength is based on a consistent way of merging information including a subjective knowledge and ideas about functioning of the uncertain modelled system. As a result, it can describe, reduce and quantify uncertainty of unknown quantities.

A linear regression model with normal noise is well elaborated from this point of view. Both theoretical and stable algorithmic solutions are available [1]. To take the full advantage of the technology, ways of building prior information and proper choice of initial information matrix representing suitable fictitious data will be discussed. The topic will be illustrated by two examples.

In the first example, model of accummulation function will be shown. Its parameters are hard bounded by physical requirements. Because of few noisy data, any available information is useful. Construction and influence of the prior will be demonstrated including a wrong choice.

In the second example, Bayesian testing of hypotheses on distribution of a random quantity will be presented. The random quantity considered is integral of the function from the first example with random-sampled parameters.

The examples are taken from a real application of activity prediction and dose estimation in nuclear medicine.

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References

[1] M. Kárný, J. Böhm, T. Guy, L. Jirsa, I. Nagy, P. Nedoma, and L. Tesař, *Optimized Bayesian Dynamic Advising: Theory and Algorithms*, Springer, London, 2005, To appear.