Testing Performances of Sparse GPVB and Variational Approximation for Linear Mixed Model

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1 Performance: GPVB

The model was initially

$$y = \mathsf{E}\left[Z\right]\alpha + A\beta + \epsilon.$$

Since we are running mean-field variational approximation, we are updating variational parameters of the optimal distributions, thereby enabling the replacement of each parameter with its variational parameter. Therefore, the fitted model will be

$$\hat{y} = Z\mu_{q(\alpha)} + A\mu_{q(\beta)}.$$

However, we should keep in mind that there is λ inside Z so we must not forget to replace λ with $\mu_{q(\lambda)}$. With the data obtained from *J. T. Ormerod & M. P. Wand (2010) Explaining Variational Approximations, The American Statisticians*, we tested the implemented code. By using the *root MSE(RMSE)* defined as follows,

$$\text{RMSE} = \sqrt{\frac{1}{n}\sum_{i=1}^{n}\left(y_i - \hat{y}_i\right)^2},$$

we can test the performances of multiple codes.

- For GPVB, $\text{RMSE}_{\text{GPVB}} = 1.890758$.
- For ordinary VB, $\text{RMSE}_{\text{VB}} = 1.961782$.
- To test how much the two models differ, though we wish them to be fairly similar, we also consider computing the following measure(*root sum of squared differences*):

$$\text{RSSD} = \sqrt{\frac{1}{n}\sum_{i=1}^{n}\left(\hat{y}_{\text{GPVB}} - \hat{y}_{\text{VB}}\right)^2}.$$

- RSSD = 2.114151.

2 GP normal effect

We present a simple tutorial on simulation.

[*]Prof. Taeryon Choi

(a) A subfigure

(b) A subfigure

Figure 1: A figure with two subfigures

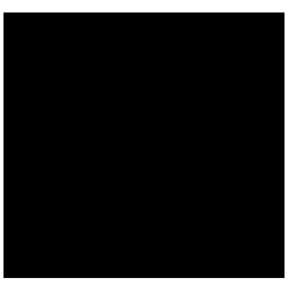

Figure 2: A figure

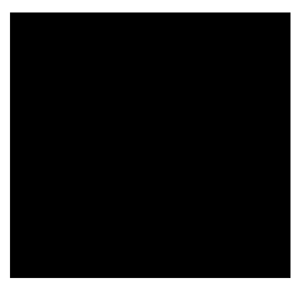

Figure 3: Another figure