Robust Latent Factor Analysis for Precise Representation of High-dimensional and Sparse Data Supplementary File

Di Wu, *Member, IEEE* and Xin Luo, *Senior Member, IEEE*

I. Introduction

This is the supplementary file for the paper entitled "Robust Latent Factor Analysis for Precise Representation of High-dimensional and Sparse Data" published in IEEE/CAA Journal of Automatica Sinica in January 2021. We have put some contents that are used to support the paper here, including:

(i) The experimental results of the proposed SL-LF model with different latent factor (LF) space dimensions f on datasets D1–D8. They are recorded in Figs. S1–S4 and used to support the Section IV.B.1) of the paper.

(ii) The experimental results of the proposed SL-LF model with respect to regularization parameter λ and learning rate η on datasets D1–D8. They are recorded in Figs. S5–S8 and used to support the Section IV.B.2) of the paper.

(iii) The outlier data sensitivity test results on datasets D1–D8. They are recorded in Figs. S9–S10 and used to support the Section IV.C of the paper.

III. Supplementary Figures

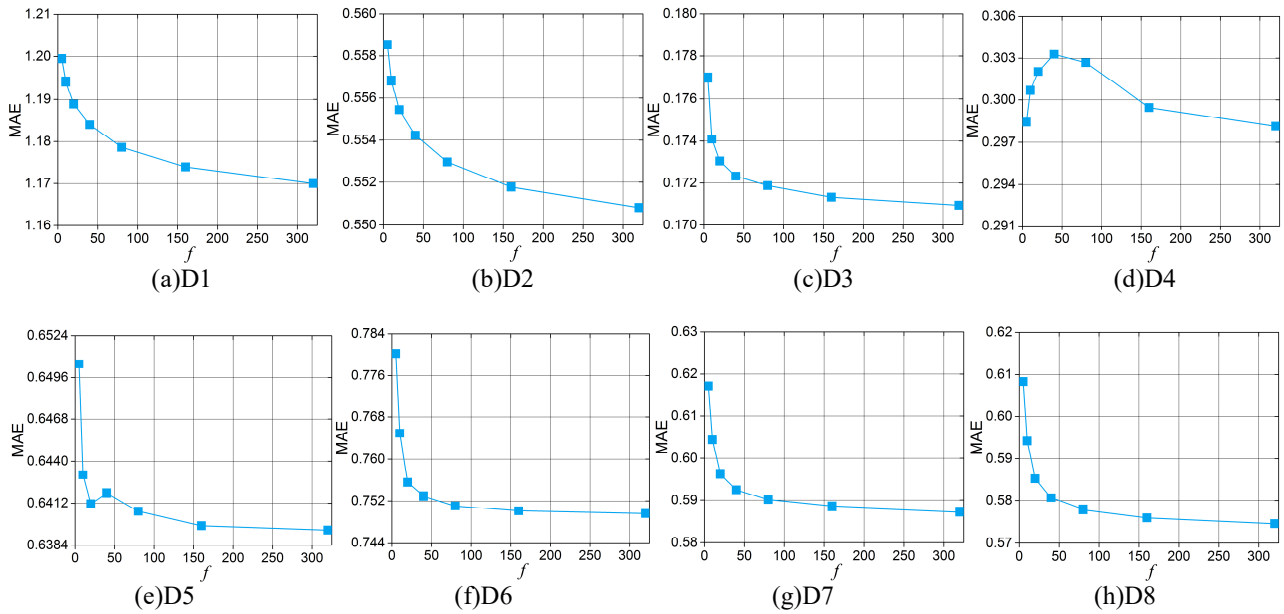


Fig. S1. The MAE of SL-LF$_{\bar{b}}$ (without linear biases) with different LF space dimensions f on different datasets, where regularization parameter λ=0.01 and learning rate η=0.001. We observe that the larger f makes SL-LF$_{\bar{b}}$ achieve lower MAE on all the datasets.

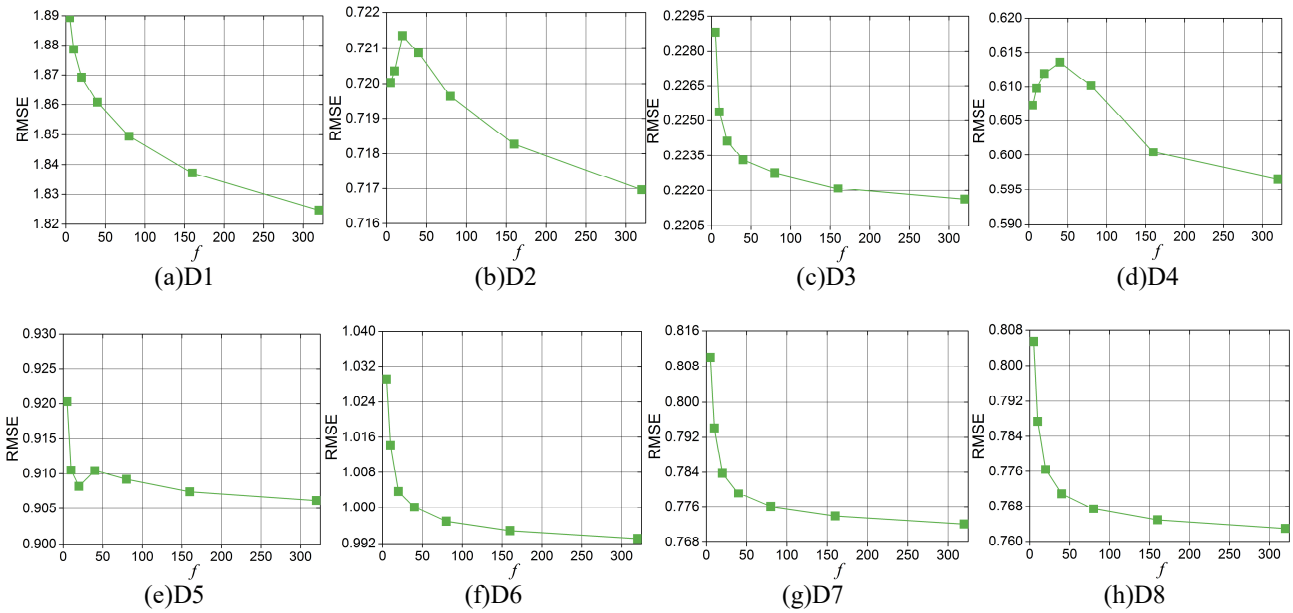


Fig. S2. The RMSE of SL-LF$_{\bar{b}}$ (without linear biases) with different LF space dimensions f on different datasets, where regularization parameter λ=0.01 and learning rate η=0.001. We observe that the larger f makes SL-LF$_{\bar{b}}$ achieve lower RMSE on all the datasets.

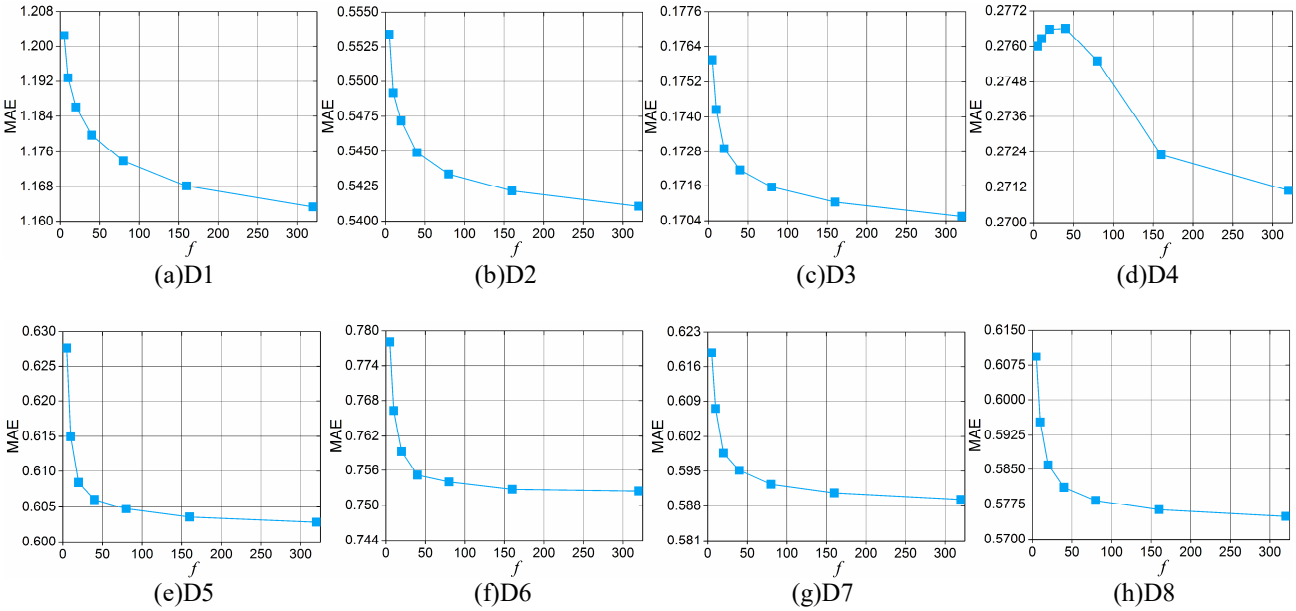


Fig. S3. The MAE of SL-LF$_{b}$ (with linear biases) with different LF space dimensions f on different datasets, where regularization parameter λ=0.01 and learning rate η=0.001. We observe that the larger f makes SL-LF$_{b}$ achieve lower MAE on all the datasets.

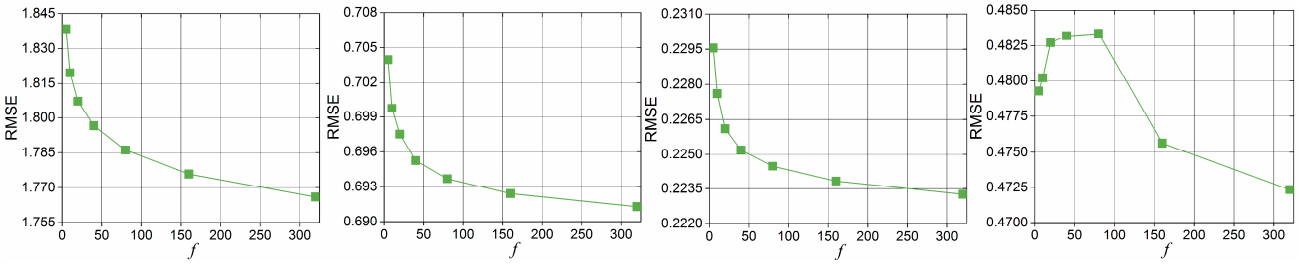


Fig. S4. The RMSE of SL-LF$_b$ (with linear biases) with different LF space dimensions f on different datasets, where regularization parameter λ=0.01 and learning rate η=0.001. We observe that the larger f makes SL-LF$_b$ achieve lower RMSE on all the datasets.

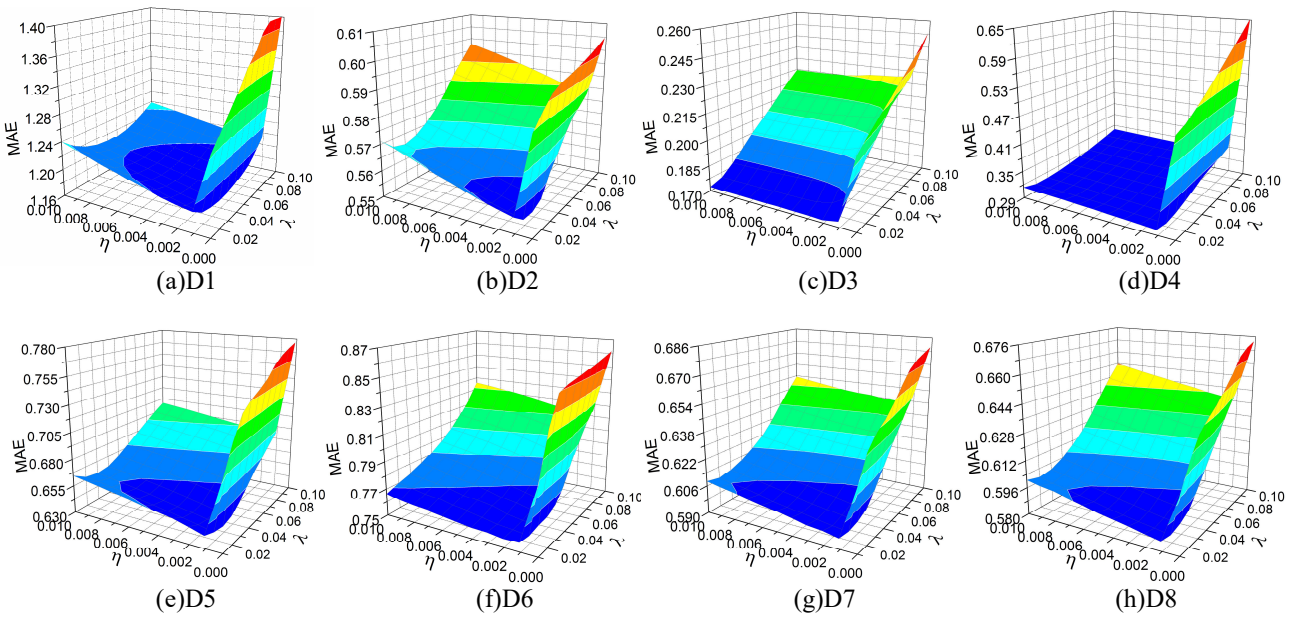
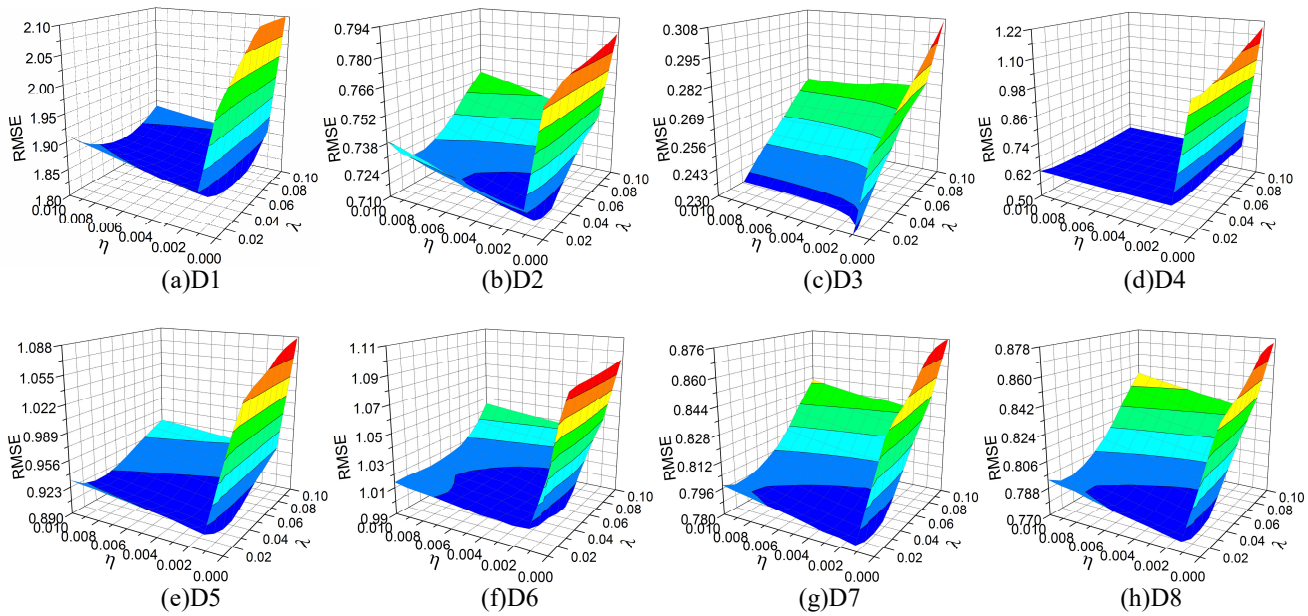


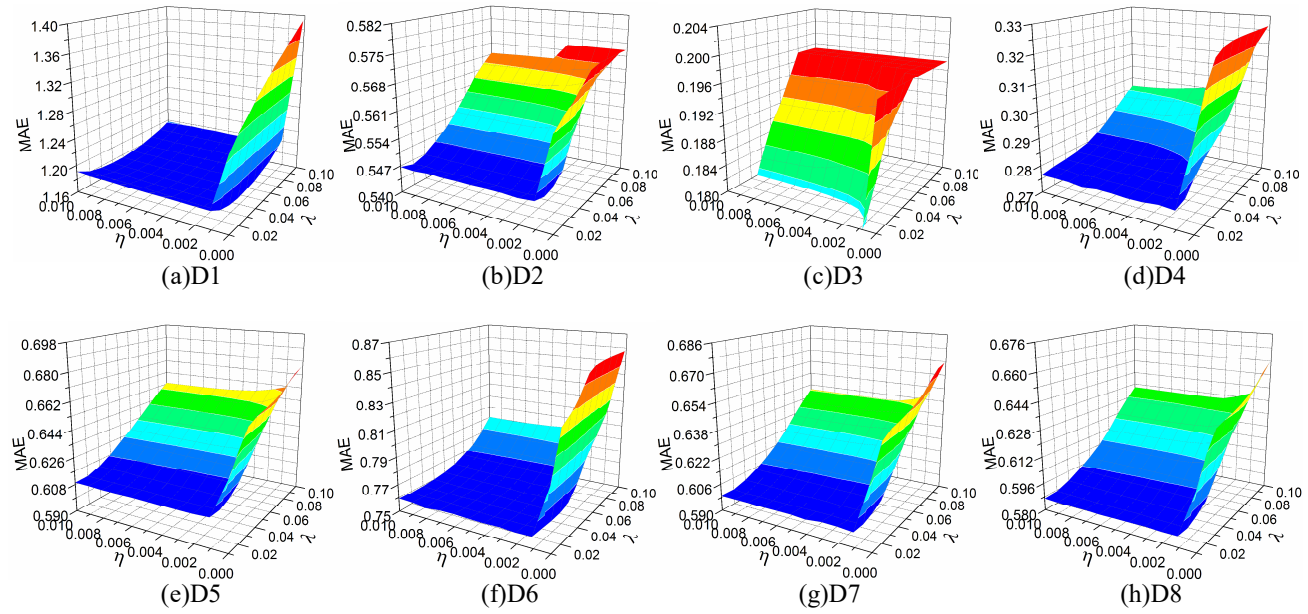
Fig. S5. The MAE of SL-LF$_{\bar{b}}$ (without linear biases) with respect to regularization parameter λ and learning rate η on different datasets, where LF space dimension f=20. We observe that both λ and η have a significant impact on MAE for SL-LF$_{\bar{b}}$ on all the datasets.



(a)D1 (b)D2 (c)D3 (d)D4

(e)D5 (f)D6 (g)D7 (h)D8

Fig. S6. The RMSE of SL-LF$_{\bar{b}}$ (without linear biases) with respect to regularization parameter λ and learning rate η on different datasets, where LF space dimension f=20. We observe that both λ and η have a significant impact on RMSE for SL-LF$_{\bar{b}}$ on all the datasets.



(a)D1 (b)D2 (c)D3 (d)D4

(e)D5 (f)D6 (g)D7 (h)D8

Fig. S7. The MAE of SL-LF$_{b}$ (with linear biases) with respect to regularization parameter λ and learning rate η on different datasets, where LF space dimension f=20. We observe that both λ and η have a significant impact on MAE for SL-LF$_{b}$ on all the datasets.

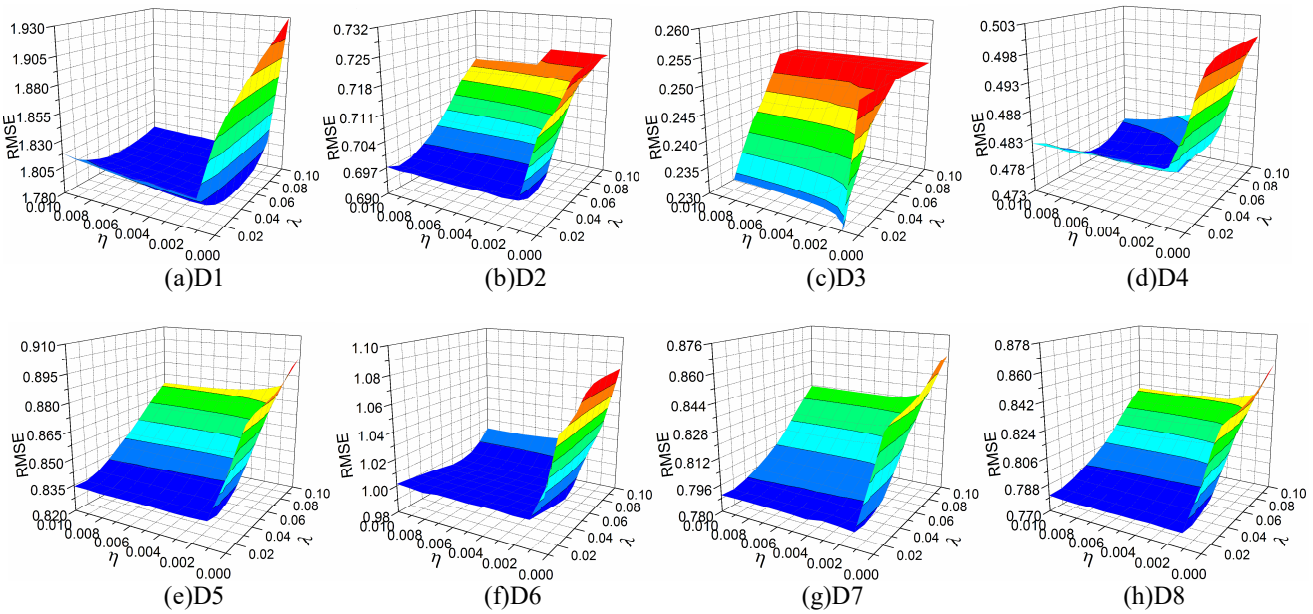


Fig. S8. The RMSE of SL-LF$_b$ (with linear biases) with respect to regularization parameter λ and learning rate η on different datasets, where LF space dimension f=20. We observe that both λ and η have a significant impact on RMSE for SL-LF$_b$ on all the datasets.

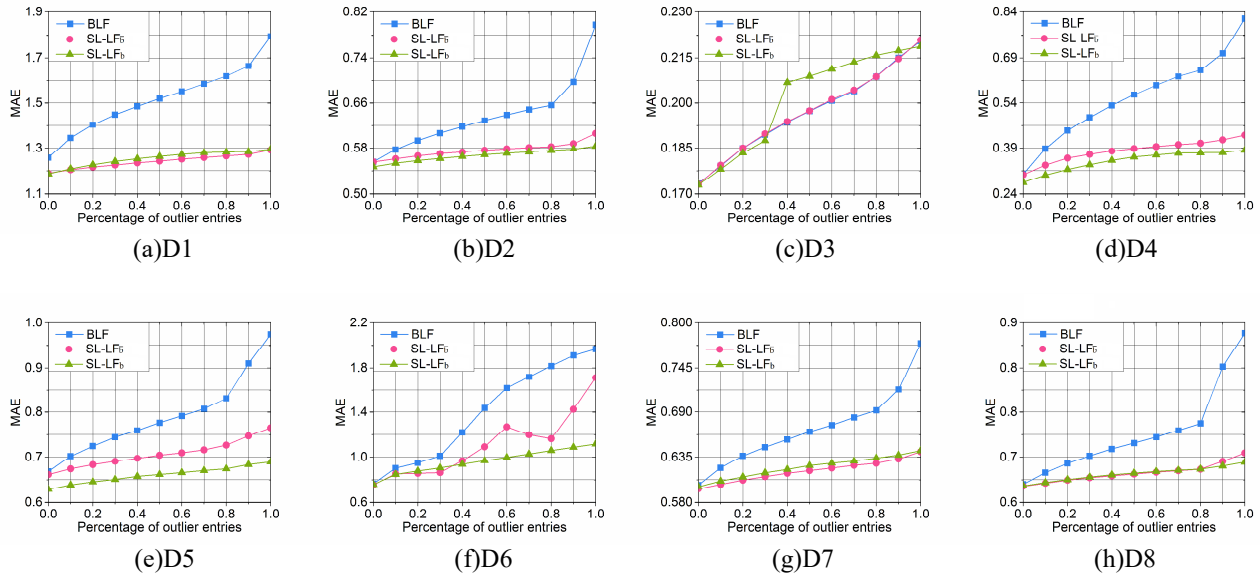
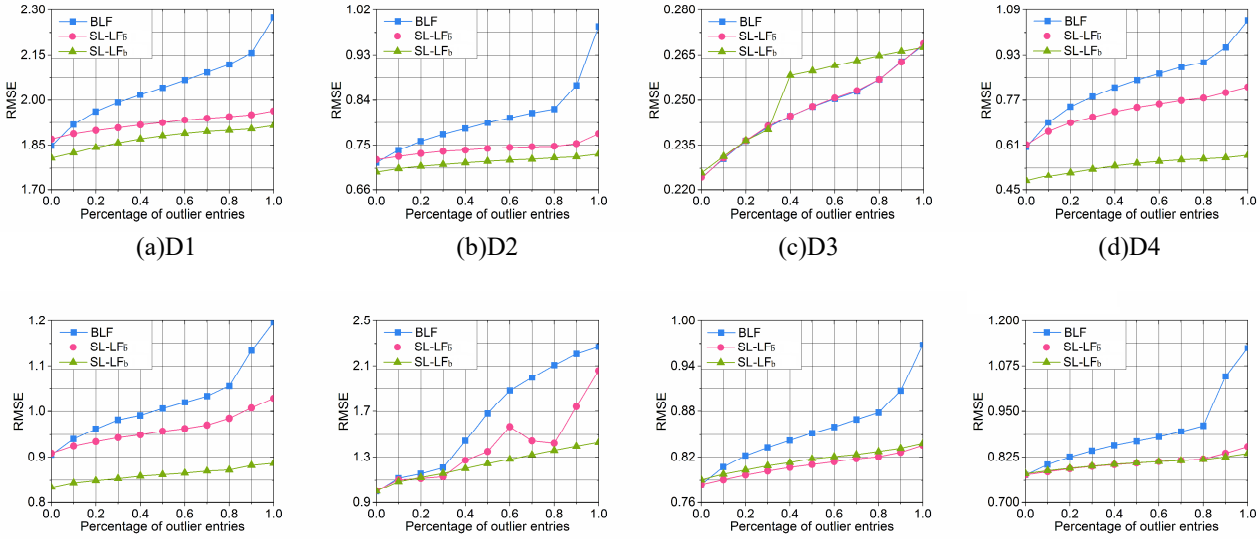


Fig. S9. The MAE of outlier data sensitivity tests results of BLF, SL-LF$_{\bar{b}}$ (without linear biases), and SL-LF$_b$ (with linear biases) on different datasets, where regularization parameter λ=0.01, learning rate η=0.001, and LF space dimension f=20. We observe that the MAEs for both SL-LF$_{\bar{b}}$ and SL-LF$_b$ become more and more robust than that of BLF as the percentage of outlier data increases on all the datasets.



(a)D1 (b)D2 (c)D3 (d)D4

(e)D5 (f)D6 (g)D7 (h)D8

Fig. S10. The RMSE of outlier data sensitivity tests results of BLF, SL-LF$_{\bar{b}}$ (without linear biases), and SL-LF$_b$ (with linear biases) on different datasets, where regularization parameter λ=0.01, learning rate η=0.001, and LF space dimension f=20. We observe that the RMSEs for both SL-LF$_{\bar{b}}$ and SL-LF$_b$ become more and more robust than that of BLF as the percentage of outlier data increases on all the datasets.