Linear Multi-task Learning for Predicting Soil Properties Using Field Spectroscopy

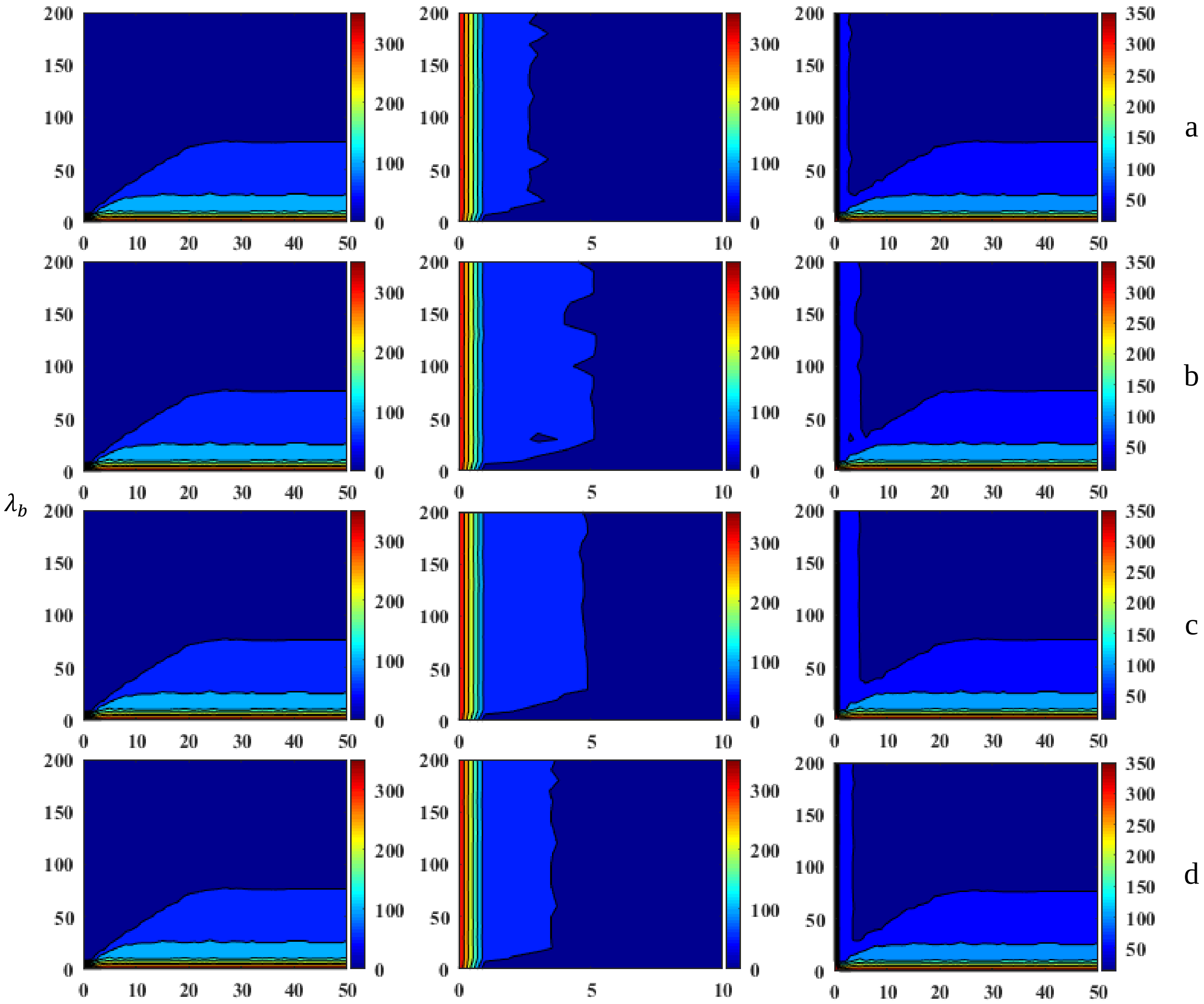
Haijun Qi [1,3], Tarin Paz-Kagan[2], Arnon Karnieli[3,*], and Shaowen Li[1,*]

[1.] School of Information and Computer Science, Anhui Agricultural University, Hefei 230036, China; E-mail:haijun.qi0418@qq.com (H.Q.);

[2.] The Department of Sensing, Information and Mechanization Engineering, Institute of Agricultural Engineering, Agricultural Research Organization (ARO), Volcani Center, Israel. E-mail: tarin@volcani.agri.gov.il;

[3.] The Remote Sensing Laboratory, Jacob Blaustein Institutes for Desert Research, Ben-Gurion University of the Negev, Sede Boqer Campus 84990, Israel;

* Equal correspondence: karnieli@bgu.ac.il (A.K.); Tel.: +972-8-659-6855; shwli@ahau.edu.cn (S.L.); Tel.: +86-0551-65786146



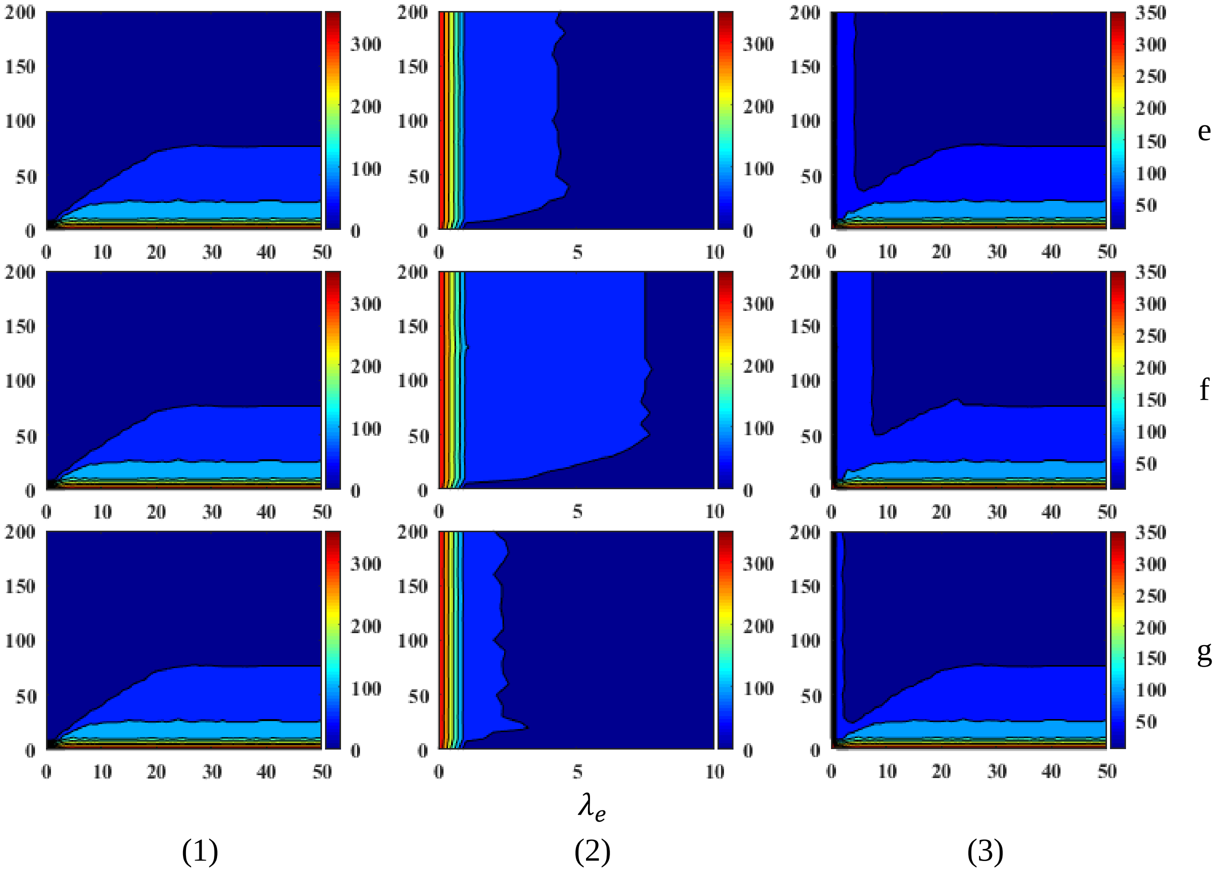


Figure S1. Sparsity (the number of non-zero elements) of the block-sparse matrix W_b (1), the elementwise sparse matrix W_e (2), and the combined regression coefficients matrix W (3) of the model generated from linear multi-task learning for predicting available nitrogen (a), available phosphorous (b), available potassium (c), water content (d), pH (e), electrical conductivity (f), and organic matter (g).

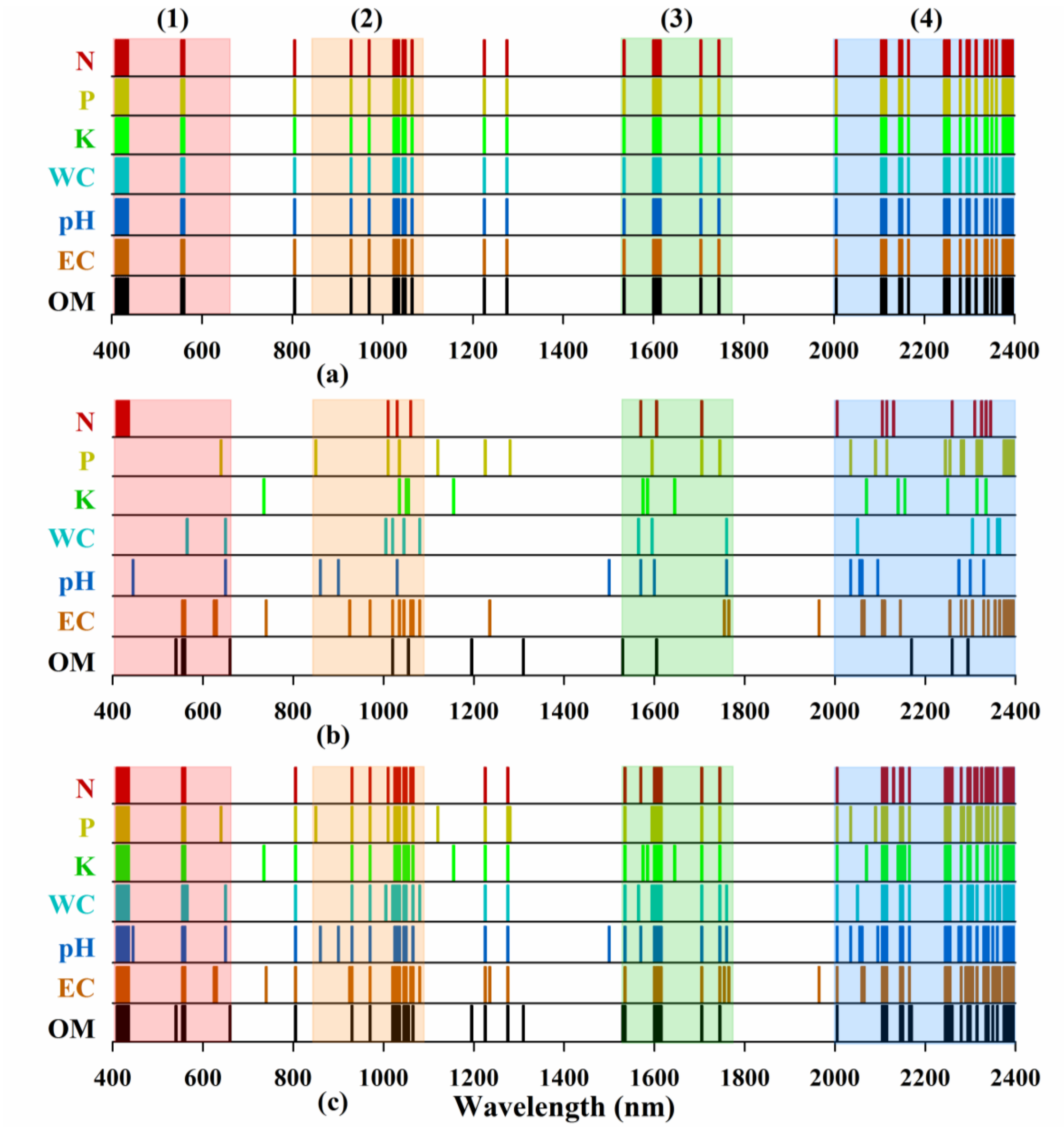


Figure S2. Used features (non-zero items in the transpose of the block-sparse matrix W_b (a), the elementwise sparse matrix W_e (b) and the combined regression coefficients matrix W (c)) of linear multi-task learning models with $\lambda_b = 40$ and $\lambda_e = 10$.