# Supplementary materials for 'Semi-supervised Unmixing of Hyperspectral data via Spectral-Spatial Factorization'

October 6, 2021

---

## More experiments using Urban dataset

In order to conduct similar unmixing experiment as the Cuprite dataset, we employed an image-based library construction method described in [Somers12] to extract $\boldsymbol{A}$ directly from the Urban dataset. Specifically, we first constructed a preliminary library $\boldsymbol{A}$ by manually extracting pure pixels from the observed images. Afterwards, the libraries for each material were pruned in order to limit the amount of signatures for each material, leading to libraries of size images $n = 651$ for the Urban HI. These signatures were roughly divided into 6 materials, please see Figure 1 for more details.
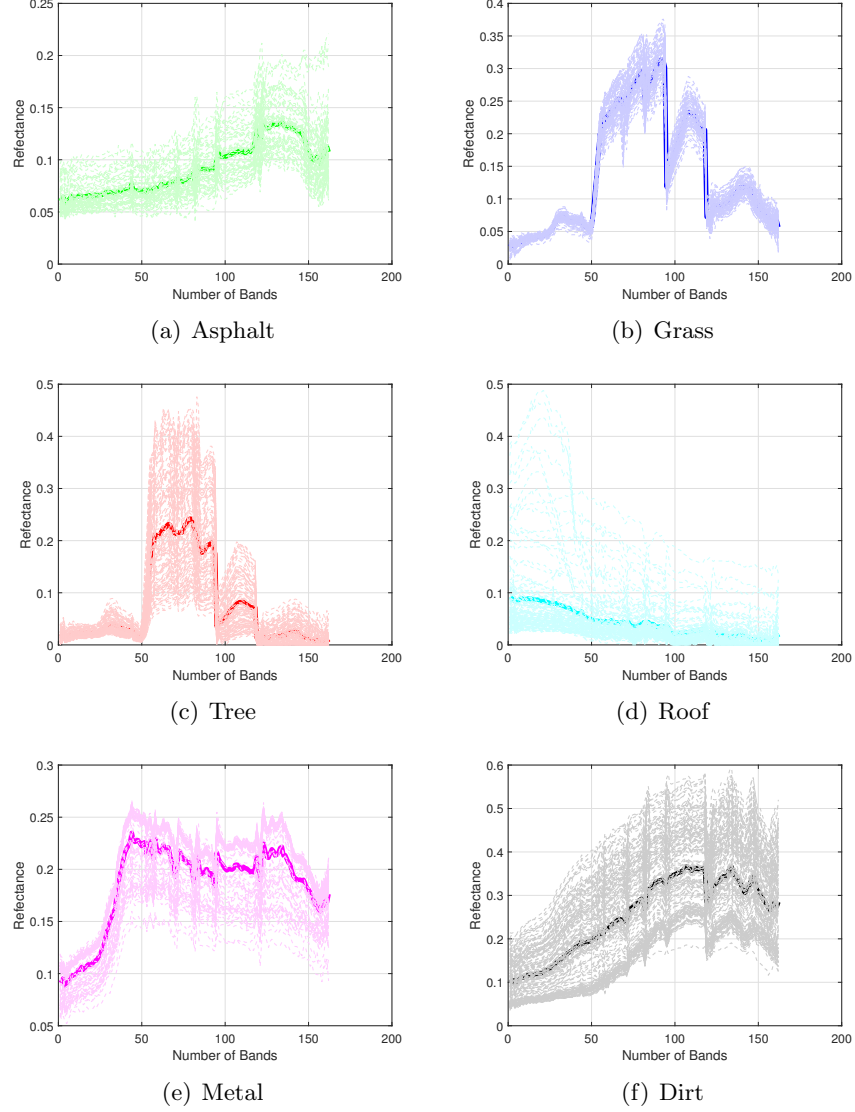
Figure 1: The extracted spectral library of different materials, the thicker line is the mean of all spectral signatures belong to the same material.

Then, semi-supervised umixing algorithms were conducted using different algorithms. Afterwards, we have summed the abundance contributions of all signatures of the same material and normalized the result. This allowed us to compare these abundance maps obtained from different materials, please see Figure 2-Figure 7.
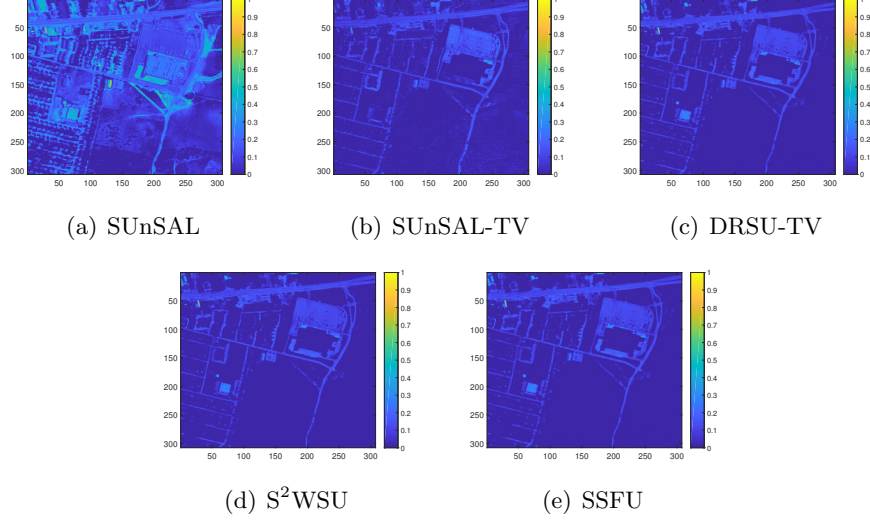
Figure 2: Abundance maps of Asphalt estimated by SUnSAL, SUnSAL-TV, DRSU-TV, S$^2$WSU and SSFU algorithm for the Urban dataset.
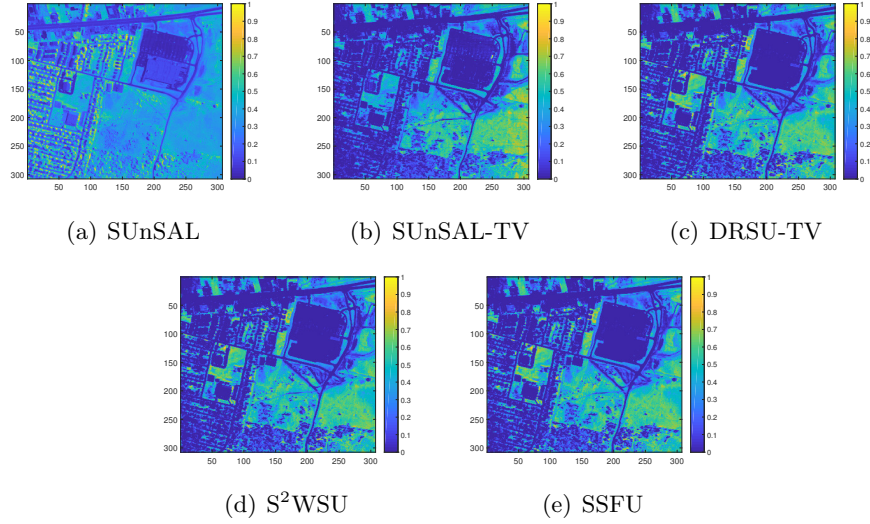


Figure 3: Abundance maps of Grass estimated by SUnSAL, SUnSAL-TV, DRSU-TV, S$^2$WSU and SSFU algorithm for the Urban dataset.
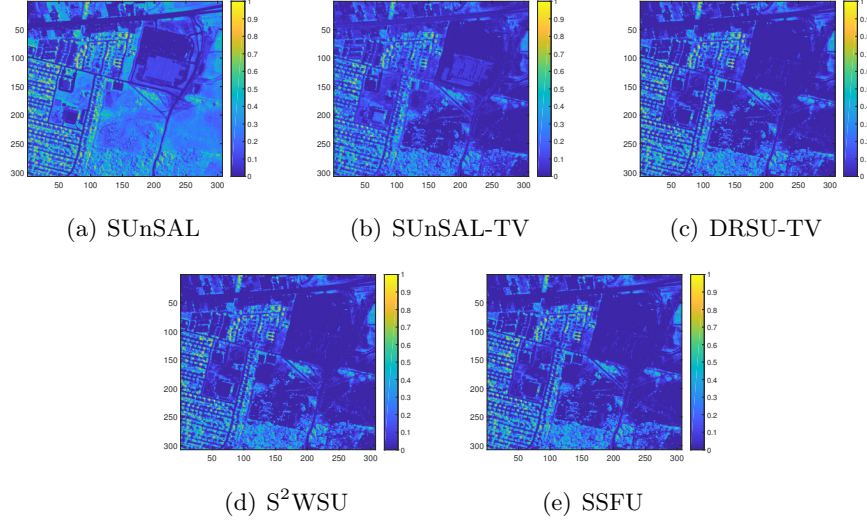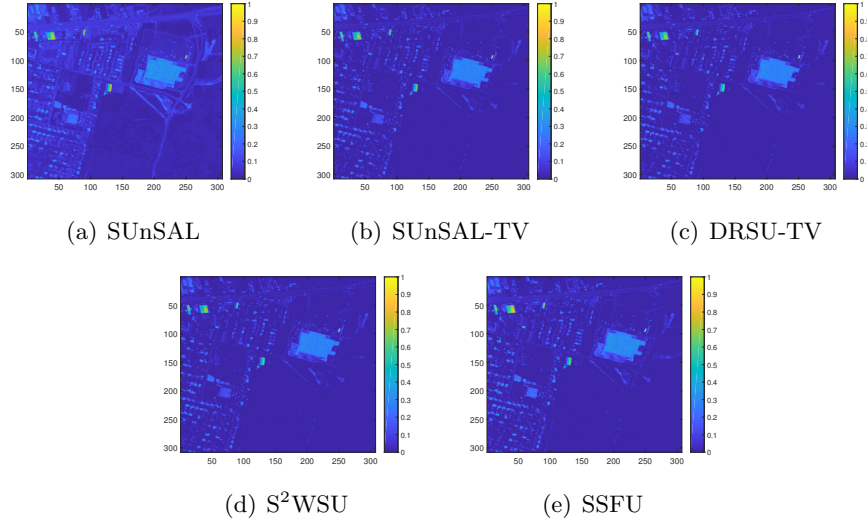
(a) SUnSAL      (b) SUnSAL-TV      (c) DRSU-TV

(d) S$^2$WSU      (e) SSFU

Figure 4: Abundance maps of Tree estimated by SUnSAL, SUnSAL-TV, DRSU-TV, S$^2$WSU and SSFU algorithm for the Urban dataset.



(a) SUnSAL      (b) SUnSAL-TV      (c) DRSU-TV

(d) S$^2$WSU      (e) SSFU

Figure 5: Abundance maps of Roof estimated by SUnSAL, SUnSAL-TV, DRSU-TV, S$^2$WSU and SSFU algorithm for the Urban dataset.

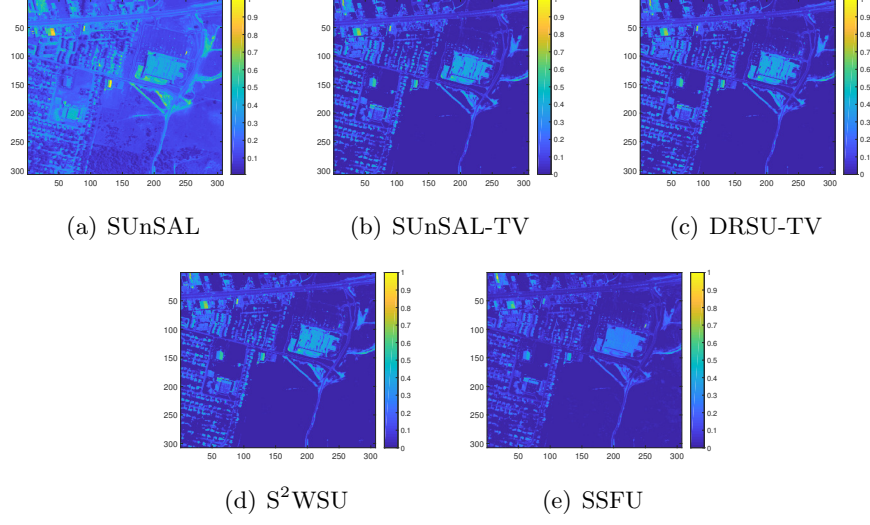(a) SUnSAL     (b) SUnSAL-TV     (c) DRSU-TV



(d) S$^2$WSU     (e) SSFU

Figure 6: Abundance maps of Metal estimated by SUnSAL, SUnSAL-TV, DRSU-TV, S$^2$WSU and SSFU algorithm for the Urban dataset.



(a) SUnSAL     (b) SUnSAL-TV     (c) DRSU-TV
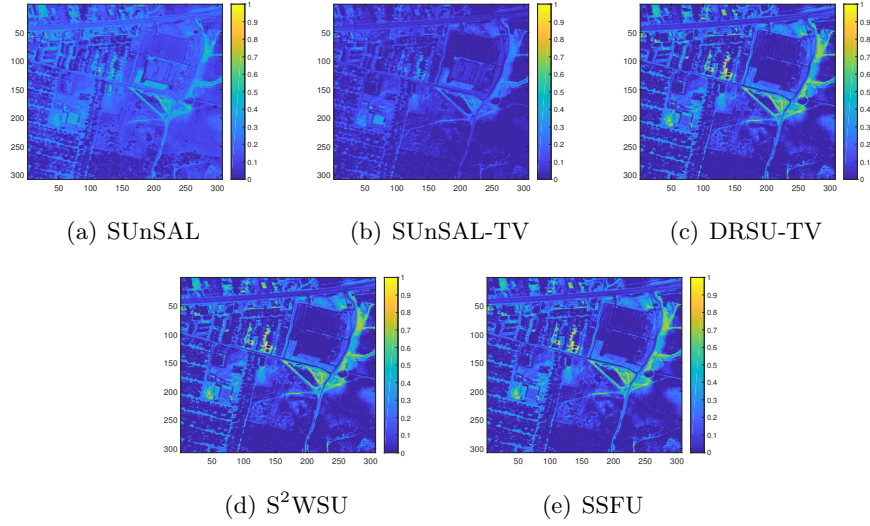


(d) S$^2$WSU     (e) SSFU

Figure 7: Abundance maps of Dirt estimated by SUnSAL, SUnSAL-TV, DRSU-TV, S$^2$WSU and SSFU algorithm for the Urban dataset.

From Figure 2-Figure 7, we can see that the performance of spatial-spectral semi-supervised unmixing algorithms are very close to each other

regarding all these 6 materials.