Supplementary materials for "Neuronal population reconstruction from ultra-scale optical microscopy images via progressive learning"

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Abstract

This supplementary materials document presents figures for neuronal population reconstruction performance of our method.

I. Supplementary Materials for Figure 9: VISoR-40 Dataset

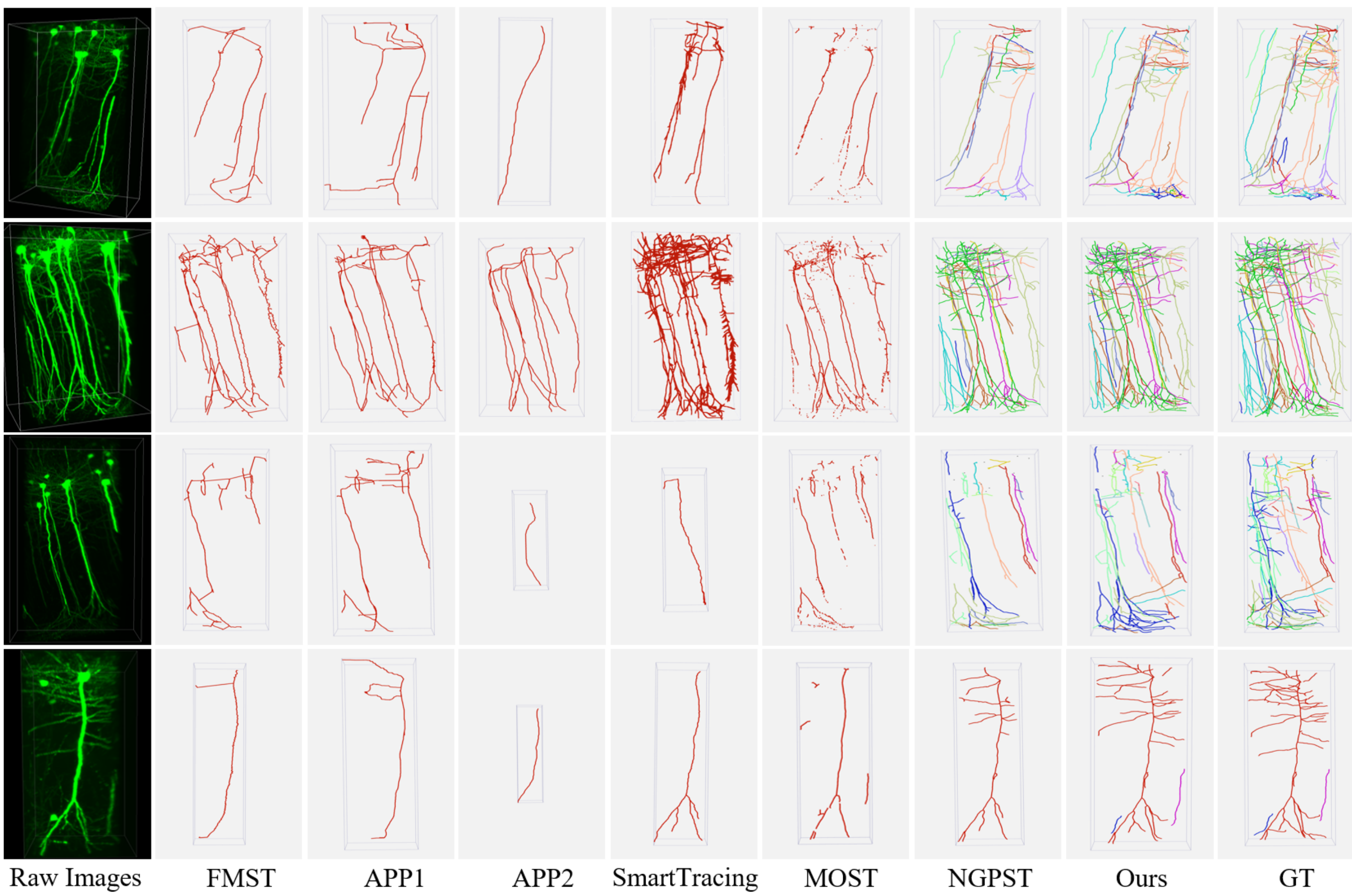


Fig. 1. Comparison of neuronal population reconstruction results generated by different methods for four test images in the VISoR-40 dataset. It can be seen that our method outperforms others in both sparse and dense neurites. FMST, APP1, APP2, SmartTracing (ST) and MOST tend to extract the main trunk of the neurites while a large portion of subtle neurites are missing. NGPST works better to identity dense neurites. However, subtle neuronal processes are still hard to extract by using hand-crafted features. In comparison, our method benefits from the progressively trained DSN, and reconstructs more complete and precise neurites for challenging OM images, even there are low contrast, noises, and blending of fluorescence in the images.

II. Supplementary Materials for Figure 6: VISoR-40 Dataset

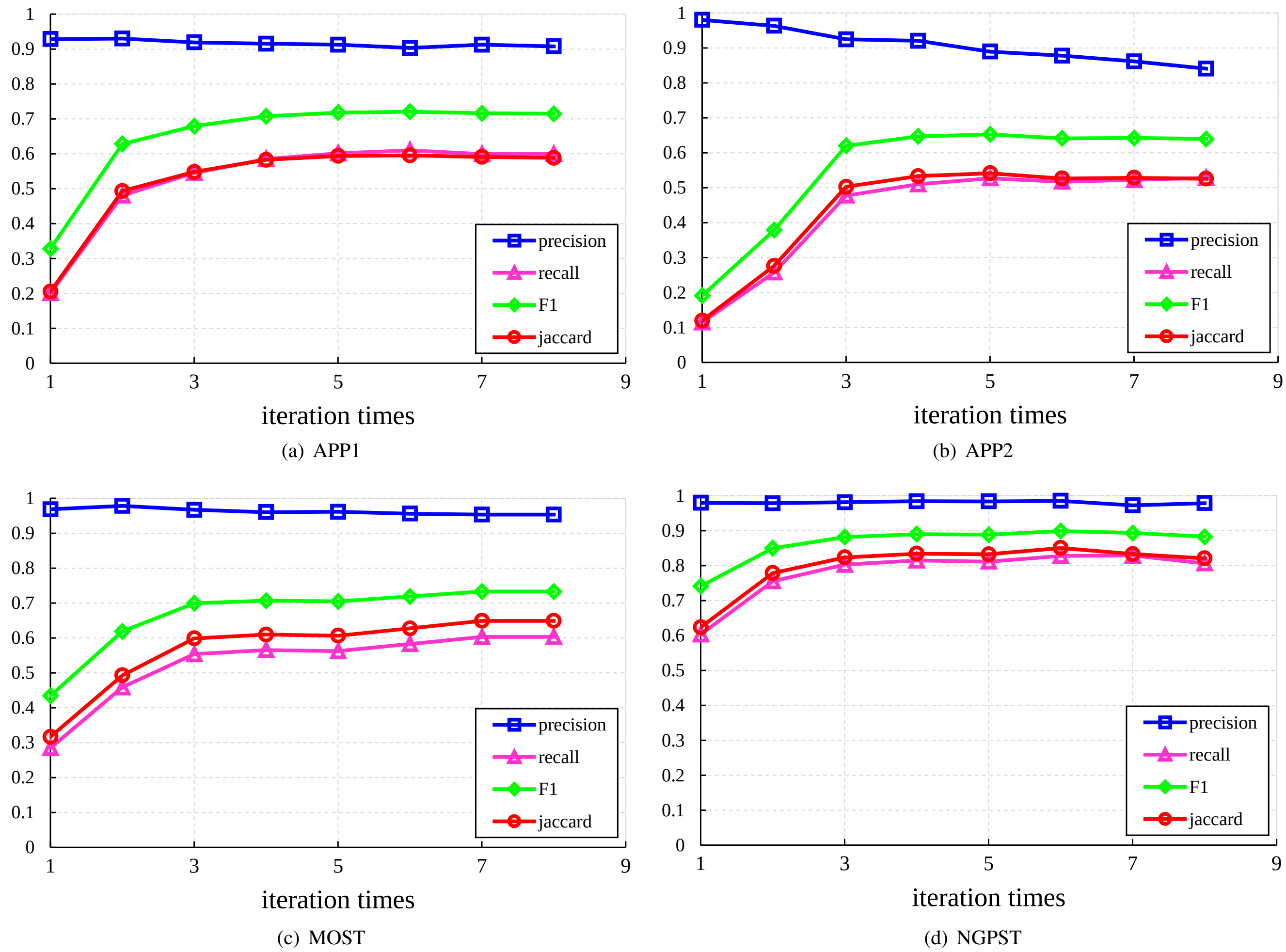
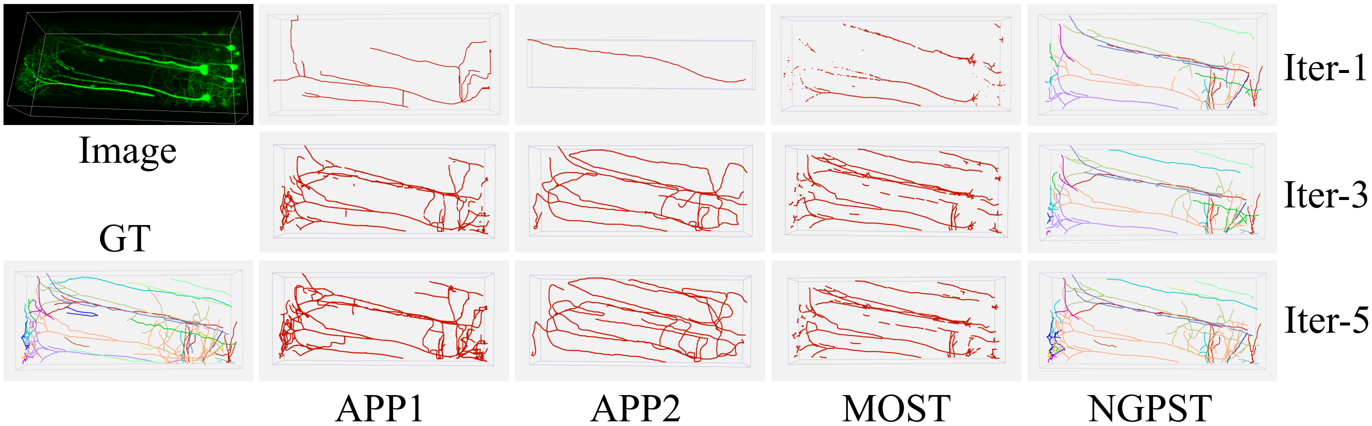
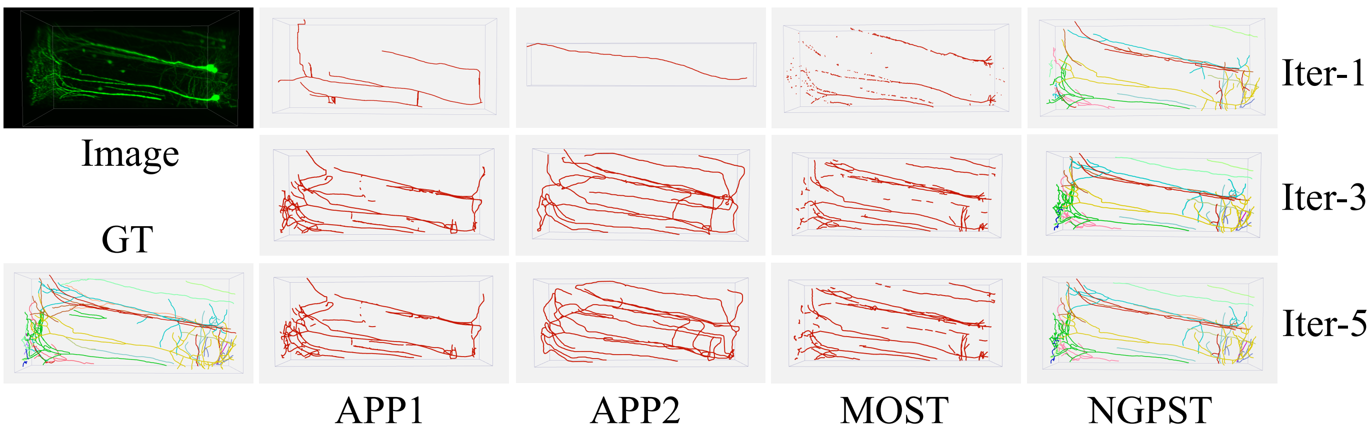


Fig. 2. Comparison of neuron population reconstruction performance of our method on the VISoR-40 test dataset using different traditional neuron tracing methods, including APP1, APP2, MOST and NGPST. Each subgraph shows the quantitative results of our method at eight iterations using the corresponding tracing method. It can be observed that, our progressive learning framework effectively facilitates traditional neuron tracing methods. Each tracing method is promoted to reconstruct more complete neurons. Furthermore, after about five iterations of the progressive learning, the reconstruction is relatively complete, and further iteration just improves the performance very slightly.

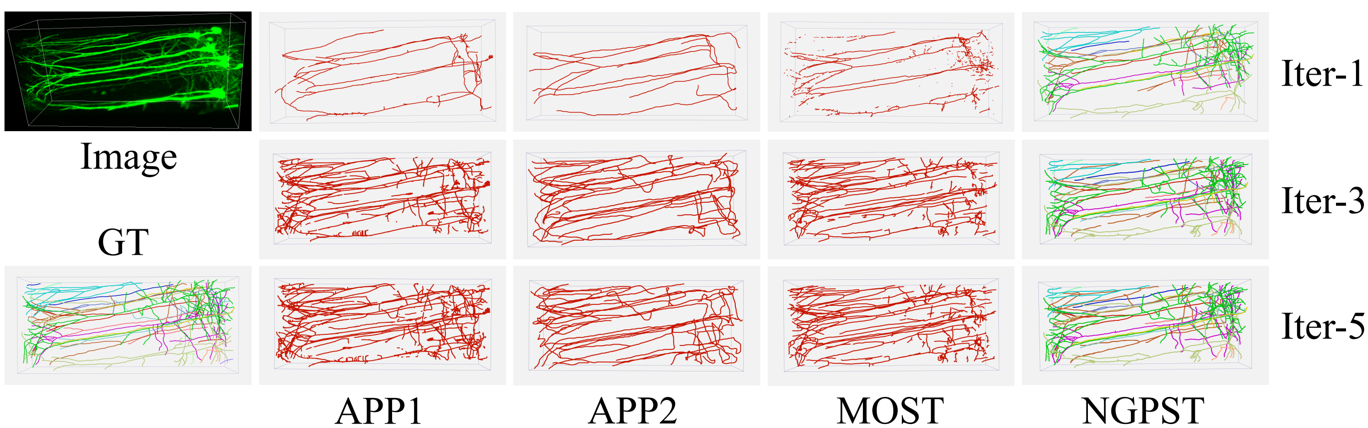
III. Supplementary Materials for Figure 7: VISoR-40 Dataset



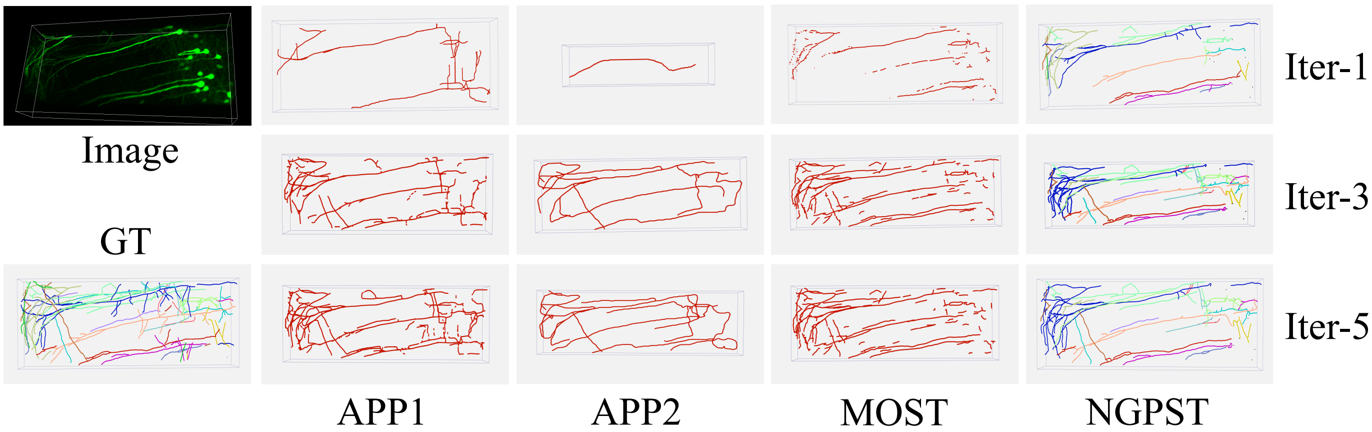
(a)



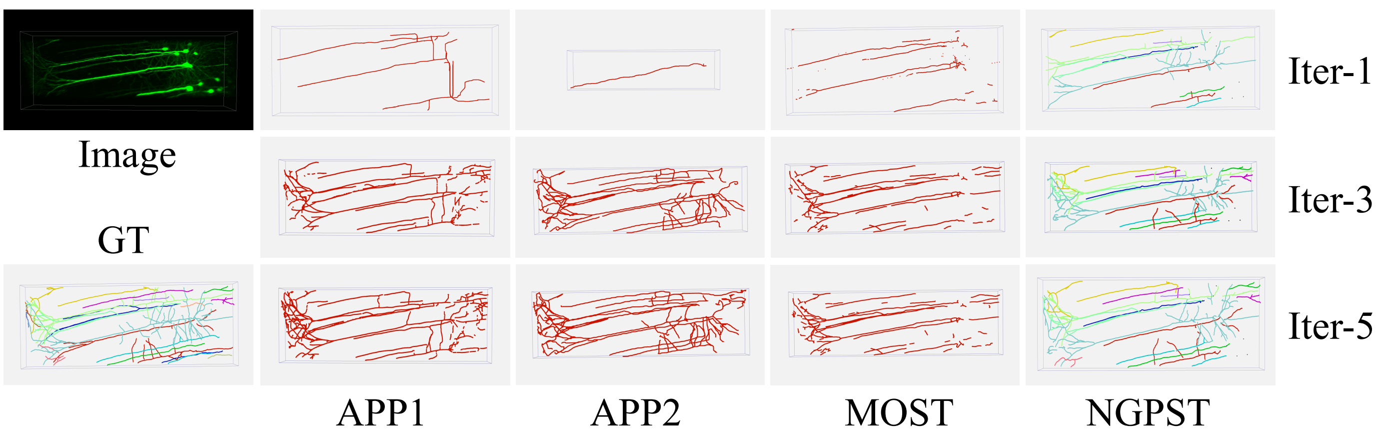
(b)



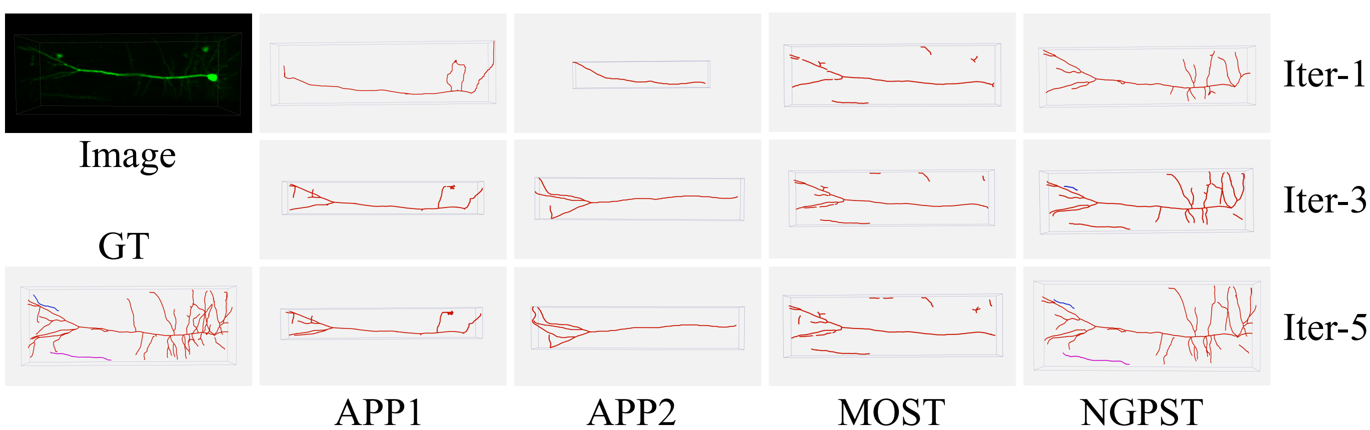
(c)



(d)



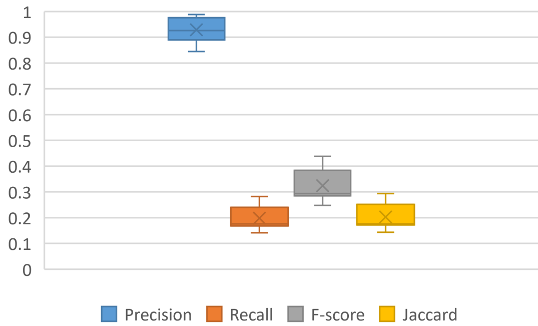
(e)



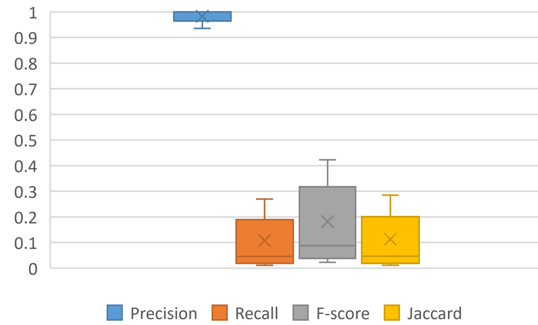
(f)

Fig. 3. Comparison of neural population reconstruction results of our method for six test images in the VISoR-40 dataset at different iterations using different traditional neuron tracing methods, including APP1, APP2, MOST and NGPST. For each subgraph, the first column shows the raw image and corresponding ground truth (GT). The remaining columns show reconstruction results generated by our system with the corresponding traditional neuron tracing method at the first, third and fifth iteration, respectively. It can be seen that our progressive learning framework effectively facilitates traditional tracing methods. Each tracing method is promoted to reconstruct more complete and accurate neurons.

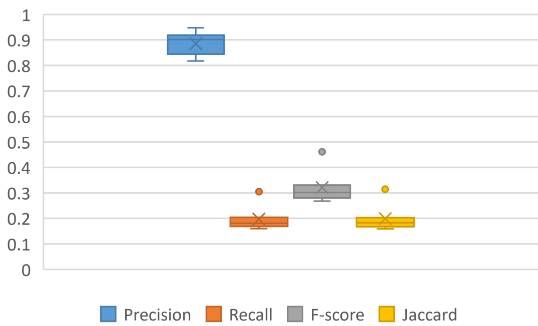
IV. Supplementary Materials for Table 1: VISoR-40 Dataset



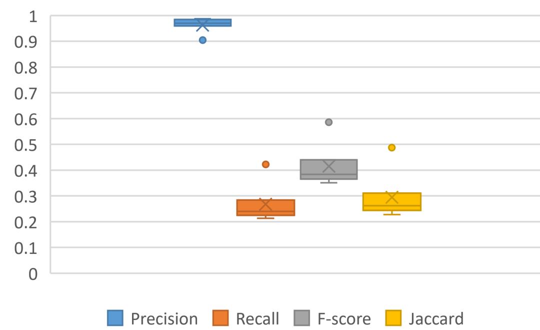
(a) APP1



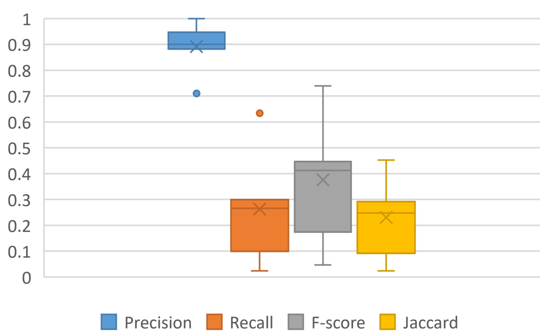
(b) APP2



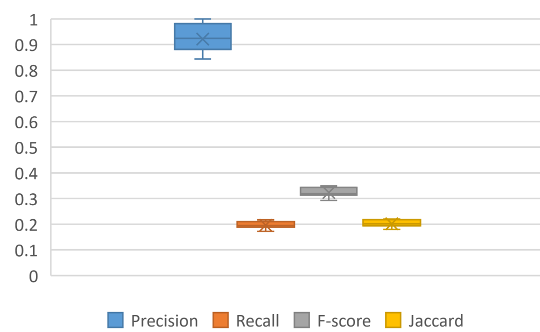
(c) FMST



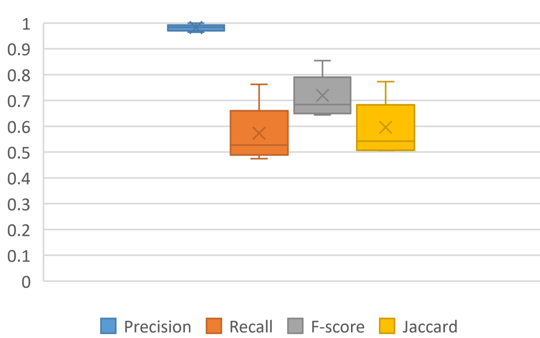
(d) MOST



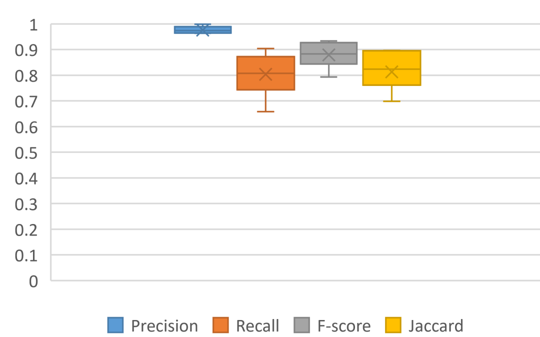
(e) SmartTracing



(f) TReMAP



(g) NGPST



(h) Ours

Fig. 4. Performance comparison with different methods for neuronal population reconstruction on the VISoR-40 test dataset. Each subgraph shows the quantitative results on the test images by using the corresponding tracing method, including APP1, APP2, FMST, MOST, SmartTracing, TReMAP, NGPST and our PLNPR method. It shows that our method makes a significant improvement on the overall performance compared with other methods.