Supplementary Materials for the Paper: Hierarchical Prompt Learning for Multi-Task Learning

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Paper ID 10747

1. Loss and Error Landscape Visualizations

Inspired by [1], we provide visualizations of train loss and test error surfaces. Given three classifier weights $\boldsymbol{w}_1$, $\boldsymbol{w}_2$, and $\boldsymbol{w}_3$ (i.e., $\boldsymbol{w}_{rand}$, $\boldsymbol{w}_{shr}$, and $\boldsymbol{w}_{ind}$), we set $\boldsymbol{u}{=}\boldsymbol{w}_2{-}\boldsymbol{w}_1$ and $\boldsymbol{v}{=}\boldsymbol{w}_3{-}\boldsymbol{w}_1{-}{<}\boldsymbol{w}_3{-}\boldsymbol{w}_1, \hat{\boldsymbol{u}}{>}\hat{\boldsymbol{u}}$, where $\hat{\boldsymbol{u}}$ is the normalized vector $\hat{\boldsymbol{u}}{=}\boldsymbol{u}/||\boldsymbol{u}||$. Thus, $\hat{\boldsymbol{u}}$ and $\hat{\boldsymbol{v}}$ represent an orthonormal basis in the plane which contains $\boldsymbol{w}_1$, $\boldsymbol{w}_2$, and $\boldsymbol{w}_3$. We can evaluate the train loss and test error of the corresponding model parameters by sampling on this plane. Note that $\boldsymbol{w}_{avg}$ is a linear combination of $\boldsymbol{w}_{ind}$ and $\boldsymbol{w}_{shr}$, which lies in the plane defined by $\boldsymbol{w}_{ind}$, $\boldsymbol{w}_{shr}$, and $\boldsymbol{w}_{rand}$.

2. Additional Visualizations of Hierarchical Task Clustering

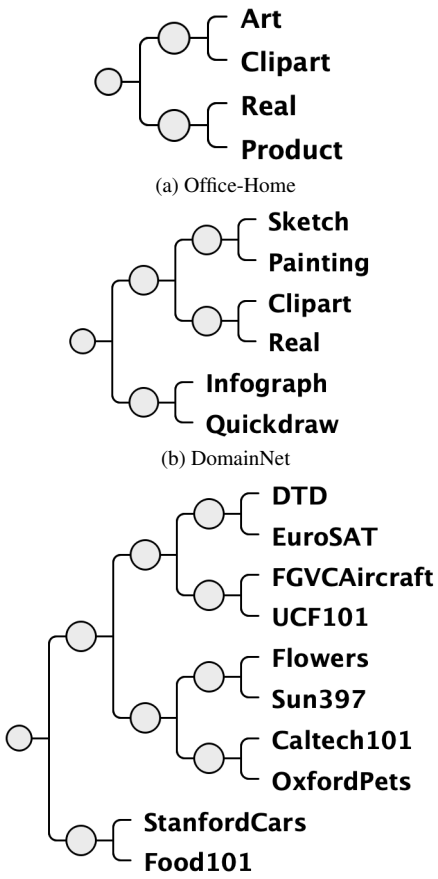
As shown in Figure A1, we provide additional hierarchical task clustering results on Office-Home (with the split of 20%), DomainNet (with the split of 2%), and the large-scale multi-task learning benchmark (with 16-shot). Similar tasks, e.g., Real and Product on Office-Home, are clustered together.

3. Detail Results of 10 Downstream Tasks

Detail results of our HiPro and other baselines on 10 downstream classification tasks are shown in Figure A2.

References

[1] T. Garipov, Pavel Izmailov, Dmitrii Podoprikhin, Dmitry P. Vetrov, and Andrew Gordon Wilson. Loss surfaces, mode connectivity, and fast ensembling of dnns. In *NeurIPS*, 2018. 1



(a) Office-Home

(b) DomainNet

(c) 10 Downstream Tasks

Figure A1. **Hierarchical task clustering results of HiPro** on Office-Home, DomainNet, and the large-scale multi-task learning benchmark.

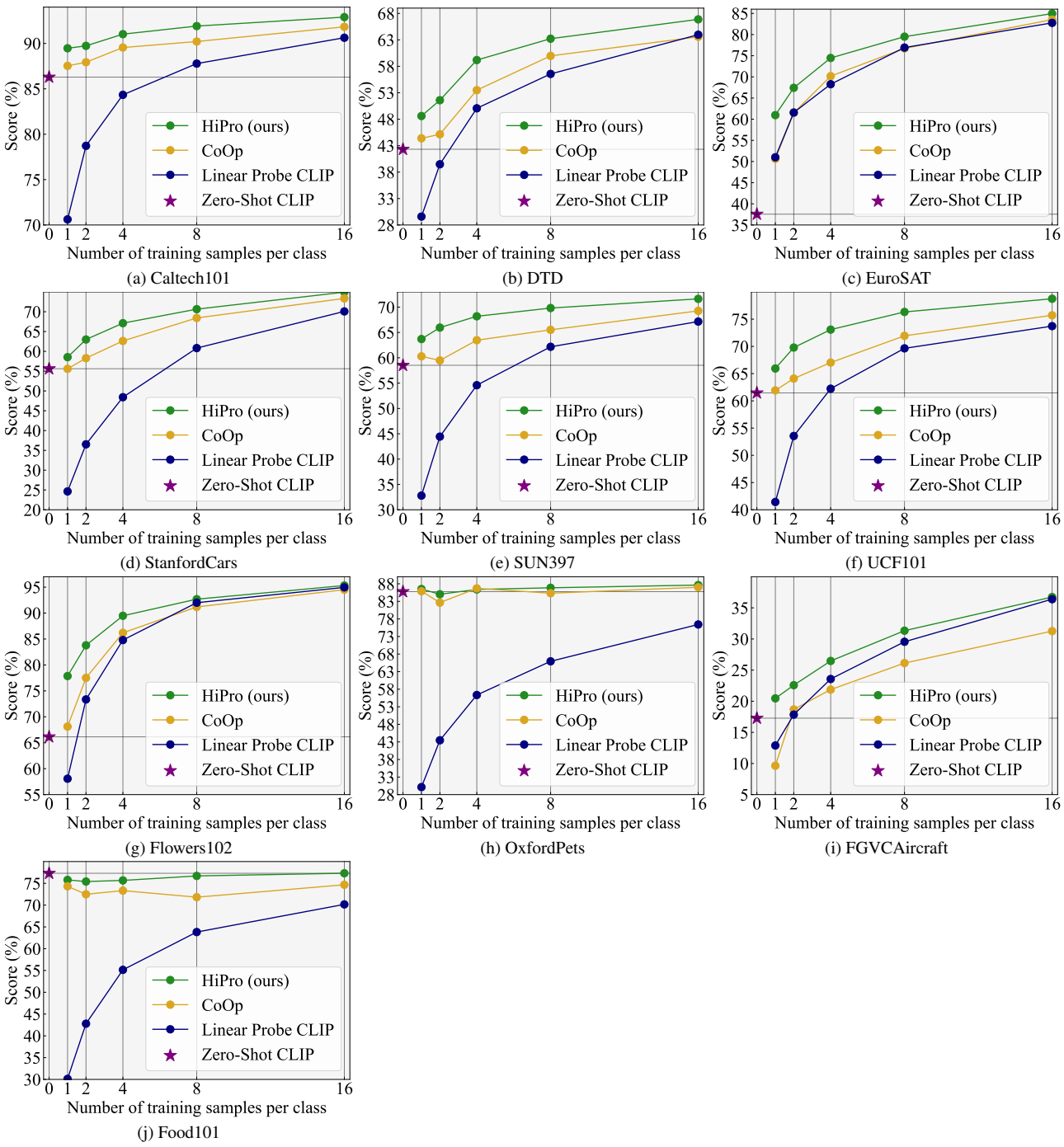


Figure A2. **Detail results on 10 downstream tasks.**