FGAPA Supplementary materials

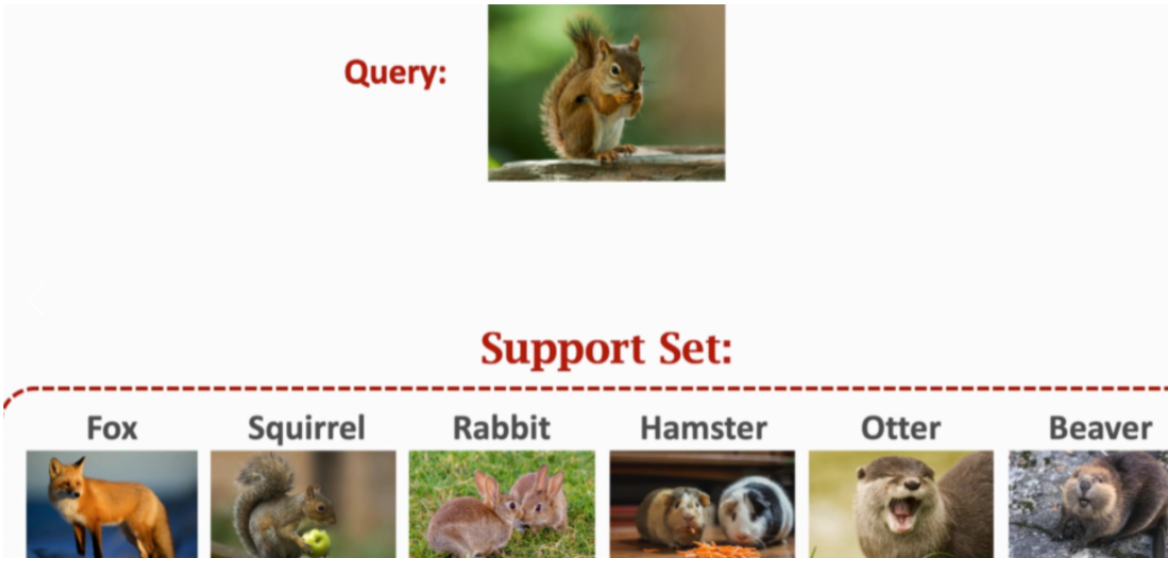
Preface

This document aims to help readers who are not focused on hyperspectral image analysis quickly understand the basic concepts and task requirements. While addressing the questions raised by reviewers, it also presents all experiments and supplementary experiments conducted on FGAPA.

About FSL

FSL

Few-shot learning (FSL) has attracted attention for its ability to learn and generalize from very limited samples. FSL is essentially a meta-learning approach that can acquire transferable knowledge from different tasks to quickly adapt to new tasks. Typically, it operates under an N-way K-shot setting, where K labeled samples per class are used to train an N-class classifier.



Taking natural images as an example, an FSL task consists of a Support set, which is a collection of labeled samples, and a Query set, which is a collection of query samples. The query set and the support set are used to construct the FSL task and are fed into the feature extractor together for feature extraction. **Support features** represent the feature representations obtained from the support set through the feature extractor, while **Query features** are the feature representations obtained from the query set. The loss in FSL is calculated through metric learning, determining the class of a query feature by computing its distance to the support features of each class, bringing features of the same class closer and pushing features of different classes apart in the metric space. Through such FSL tasks, the model learns to classify query samples based on the given support set.

About the Source Domain, Target Domain, and Their Selection

Source Domain and Target Domain

In the context of cross-domain few-shot learning, the setting usually consists of source domain data D_s containing C_s classes and target domain data D_t containing C_t classes. The classes in D_s are referred to as base classes, while the classes in C_t are referred to as novel classes, and their actual categories are typically different. To ensure diversity in the training samples, C_s is usually larger than C_t. Unlike the abundant labeled samples in C_s, C_t contains only a few labeled samples D_l and a large number of unlabeled samples D_u. To meet the requirements for constructing meta-learning tasks, labeled samples D_l are augmented using random Gaussian noise. The proposed FGAPA method uses the labeled samples D_l from both the source domain D_s and the target domain D_t to train the feature extractor and ultimately evaluates classification performance on the target domain D_t using the unlabeled samples D_u.

In general, the source domain consists of data with abundant labeled samples, while the target domain contains only a small number of labeled samples for downstream classification tasks. What we aim to do is fully transfer the knowledge acquired by the model from training on the source domain to the target domain for classification tasks.

Regarding the selection of the source domain, in order to facilitate downstream tasks and reverse operations, the number of categories in the source domain is usually required to be greater than or equal to that of the target domain. This ensures that the metric space obtained from training can serve the tasks of the target domain. In this study, only Chikusei was used as the source domain, but our method demonstrates good robustness and reliability across different source domains. To this end, we conducted experiments using the Hanchuan source domain. Due to time constraints, only partial validation was performed, with further experiments to be completed later.

Due to time constraints, we chose **DCFSL** and **MLPA**, **which are both domain adaptation methods**, and compared them with **CTF-SSCL**, based on contrastive learning tasks, and **GCC-FSL**, **which uses graphs to capture the correlation between the two domains**.

Indian_pines-5shot

IP-5shot	DCFSL-2022年	GCCFSL：2024年	CTF-SSCL-2024年	MLPA：2025年	FGAPA:2025年
train time per DataSet(s)	2023.52402	4478.06096	2587.71192	2126.25778	2347.09134
test time per DataSet(s)	0.47259	0.48637	0.75173	0.52211	0.97493
average OA	69.53 ± 2.85	67.09 ± 0.93	70.59 ± 4.221	68.13 ± 3.21	**76.37 ± 2.56**
average AA	80.72 ± 1.56	77.69 ± 1.42	81.69 ± 1.75	79.61 ± 1.84	**85.76 ± 1.18**
average Kappa	65.7726 ± 3.1936	63.0027 ± 1.0603	66.9550 ± 4.5188	64.2377 ± 3.5088	**73.3409 ± 2.7795**
Class 0	95.61 ± 7.54	**90.49 ± 15.97**	94.88 ± 7.75	95.37 ± 5.61	97.80 ± 3.69
Class 1	52.41 ± 13.50	46.45 ± 14.00	54.41 ± 7.07	52.28 ± 17.00	**62.37 ± 8.81**
Class 2	61.31 ± 10.94	51.90 ± 4.69	60.72 ± 5.99	58.56 ± 7.56	**68.12 ± 6.07**
Class 3	85.13 ± 6.98	81.08 ± 9.71	90.99 ± 5.31	83.41 ± 10.85	**94.35 ± 4.28**
Class 4	76.59 ± 6.16	72.99 ± 9.33	78.18 ± 8.33	74.48 ± 8.44	**79.64 ± 7.46**
Class 5	87.92 ± 8.11	82.88 ± 9.31	89.85 ± 5.98	83.34 ± 7.83	**93.21 ± 3.72**
Class 6	100.00 ± 0.00	**97.83 ± 4.46**	**99.57 ± 1.30**	100.00 ± 0.00	**100.00 ± 0.00**
Class 7	89.66 ± 12.21	90.21 ± 5.53	94.14 ± 8.09	85.69 ± 12.84	96.72 ± 4.56
Class 8	99.33 ± 2.00	**100.00 ± 0.00**	98.00 ± 4.27	99.33 ± 2.00	**99.33 ± 2.00**
Class 9	63.78 ± 9.02	63.22 ± 8.94	68.11 ± 10.04	63.02 ± 12.02	**73.57 ± 9.70**
Class 10	61.91 ± 10.35	**63.18 ± 5.99**	61.56 ± 13.51	59.83 ± 11.18	67.92 ± 10.76
Class 11	50.70 ± 11.94	45.70 ± 7.58	52.24 ± 11.89	50.15 ± 6.83	**73.04 ± 15.30**
Class 12	98.25 ± 2.40	98.45 ± 0.93	97.85 ± 2.06	98.40 ± 1.91	99.55 ± 0.91
Class 13	85.71 ± 7.63	**87.32 ± 3.82**	85.49 ± 7.29	86.37 ± 5.62	88.29 ± 7.62
Class 14	84.49 ± 10.42	74.59 ± 11.52	81.50 ± 9.29	84.91 ± 8.19	79.13 ± 13.71
Class 15	98.75 ± 1.79	96.70 ± 3.68	**99.55 ± 1.04**	98.64 ± 2.58	99.09 ± 1.22
seed:1309	73.32087718	66.9682368	75.326974	75.18930082	80.1848756
seed:1310	71.28527879	65.95535451	73.468384	64.85396794	78.65080146
seed:1332	64.79496509	67.46976104	67.450093	71.65896352	75.3958108
seed:1330	69.07267185	65.95535451	73.488052	68.66948569	75.71049267
seed:1236 (原为:1220)	69.38735372	67.21408201	61.648146	65.88651785	76.38902547
seed:1336	64.17543515	67.25341725	69.603698	65.07031173	74.20591995
seed:1337	70.31173173	69.14150851	74.176419	70.44940505	80.04720228
seed:1224	71.57045924	66.27003639	69.525027	67.48942866	72.41616678
seed:1246	69.1316747	67.97128528	74.736946	66.67322254	73.26187432
seed:1227	72.27849346	66.72239158	66.456879	65.40466123	77.39207395

Salinas-5shot

SA-5shot	DCFSL-2022年	GCCFSL：2024年	CTF-SSCL-2024年	MLPA：2025年	FGAPA:2025年
train time per DataSet(s)	2077.18069	4547.31169	2675.90003	2264.48634	2510.91029
test time per DataSet(s)	2.57945	2.64535	3.93145	4.78978	7.51542
average OA	91.06 ± 0.99	89.90 ± 0.90	89.79 ± 1.703	90.99 ± 1.07	**92.08 ± 0.87**
average AA	94.95 ± 0.62	93.65 ± 0.65	93.82 ± 1.01	94.61 ± 0.85	**95.22 ± 1.03**
average kappa	90.0684 ± 1.1004	88.7739 ± 1.0019	88.6587 ± 1.8889	89.9792 ± 1.1822	**91.1873 ± 0.9733**
Class 0	99.66 ± 0.67	**98.66 ± 1.85**	99.34 ± 1.54	99.68 ± 0.55	98.53 ± 1.74
Class 1	99.20 ± 1.67	99.12 ± 1.17	97.20 ± 3.76	98.88 ± 1.50	98.47 ± 3.03
Class 2	94.68 ± 4.38	93.54 ± 4.99	93.16 ± 6.40	95.61 ± 5.58	94.17 ± 8.47
Class 3	99.32 ± 0.94	99.15 ± 0.96	99.50 ± 0.55	99.56 ± 0.42	**98.92 ± 2.01**
Class 4	90.41 ± 4.49	**90.96 ± 3.47**	91.21 ± 5.14	89.98 ± 5.18	96.89 ± 1.80
Class 5	99.58 ± 0.73	99.55 ± 0.90	99.31 ± 0.84	99.24 ± 1.26	**99.42 ± 0.77**
Class 6	98.97 ± 0.89	98.68 ± 0.93	99.64 ± 0.35	98.99 ± 0.84	**99.80 ± 0.36**
Class 7	78.94 ± 5.31	79.44 ± 6.06	77.18 ± 6.96	81.31 ± 6.70	**84.93 ± 5.95**
Class 8	99.44 ± 1.06	99.34 ± 0.84	99.30 ± 1.04	99.59 ± 0.34	**99.62 ± 0.75**
Class 9	87.40 ± 6.01	83.41 ± 4.43	83.67 ± 5.92	87.16 ± 4.45	88.10 ± 6.20
Class 10	99.20 ± 0.78	97.43 ± 2.20	96.60 ± 2.78	98.85 ± 1.25	**97.73 ± 2.77**
Class 11	99.70 ± 0.27	98.15 ± 2.68	99.20 ± 0.93	99.30 ± 0.93	**99.50 ± 0.82**
Class 12	98.52 ± 2.18	**97.88 ± 3.39**	97.42 ± 3.82	98.83 ± 0.72	98.94 ± 1.24
Class 13	98.98 ± 0.59	97.34 ± 2.22	97.85 ± 1.47	98.24 ± 2.02	97.99 ± 2.62
Class 14	80.48 ± 8.13	75.77 ± 8.68	77.93 ± 9.82	77.62 ± 8.16	77.29 ± 9.22
Class 15	94.74 ± 4.29	89.98 ± 6.08	92.61 ± 4.80	90.85 ± 6.63	93.20 ± 5.41
seed:1309	92.27922811	90.78428833	90.127477	92.73622084	93.22836685
seed:1310	89.50396862	88.55112953	90.995208	89.62052952	92.02390424
seed:1332	92.06460804	90.9508039	91.700124	92.24777517	92.63816167
seed:1330	90.51786342	89.38740772	88.954467	91.98875095	92.25147551
seed:1236	91.92584507	90.78058798	91.056264	90.18853263	90.58446965
seed:1336	89.29489907	89.03032434	88.961868	90.14597865	91.23203019
seed:1337	91.81298451	90.45680771	90.281041	91.09511739	92.8620326
seed:1224	90.89344854	88.68064164	89.801846	89.61127865	92.93603952
seed:1246	91.40594646	89.61312883	85.34848	90.56596792	90.83054266
seed:1227	90.90824992	90.7861385	90.701031	91.68162223	92.2588762

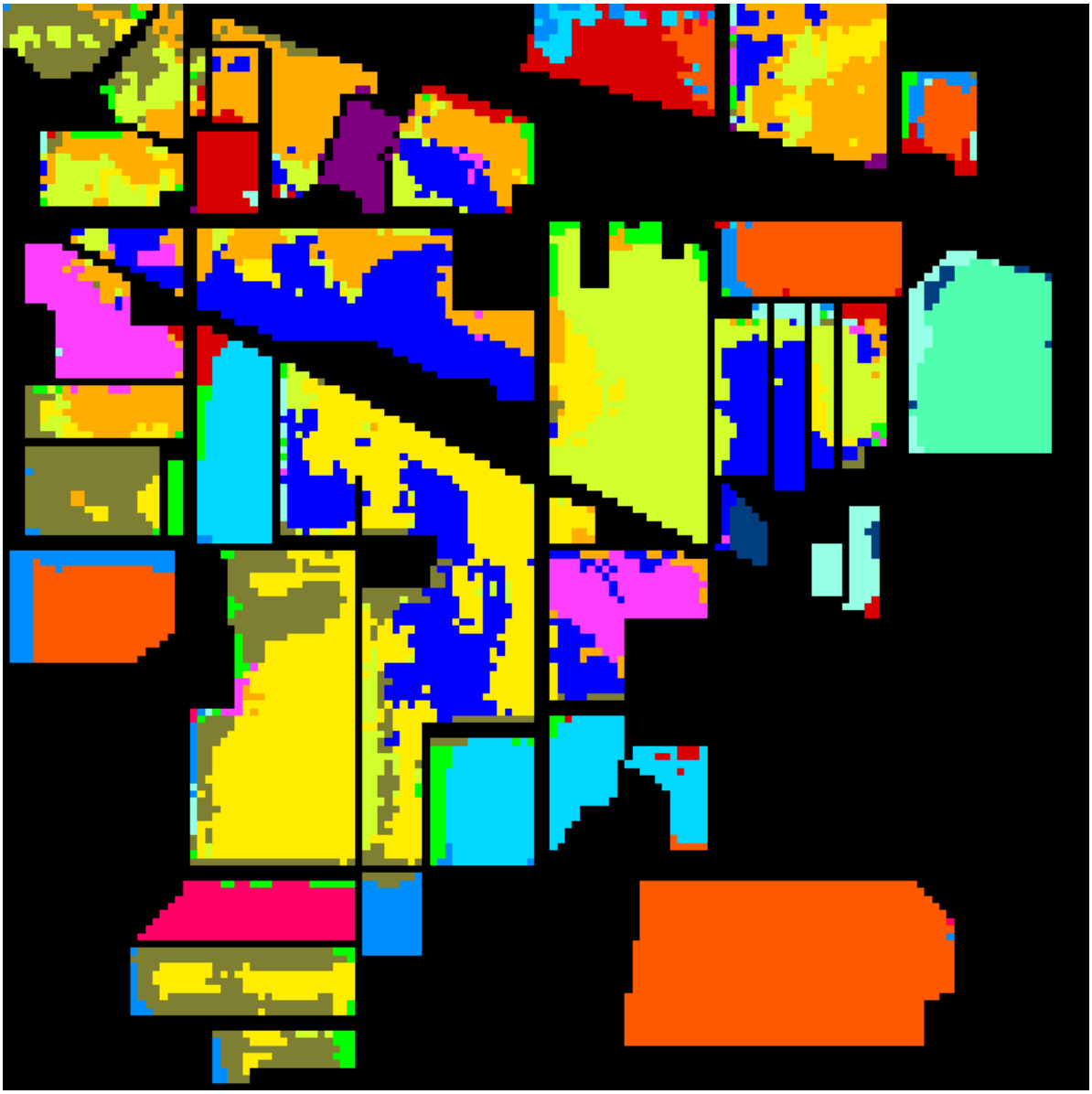
Botswana-5shot

Botswana-5shot	DCFSL-2022年	GCCFSL：2024年	CTF-SSCL-2024年	MLPA：2025年	FGAPA:2025年
train time per DataSet(s)	1601.37918	3712.06456	1830.86138	1658.61524	2028.85821
test time per DataSet(s)	0.15149	0.15149	0.27293	0.13654	0.24728
average OA	97.15 ± 0.83	96.43 ± 0.84	95.34 ± 1.397	96.38 ± 1.13	**97.65 ± 0.97**
average AA	97.06 ± 0.96	96.45 ± 0.88	95.60 ± 1.36	96.31 ± 1.18	**97.58 ± 1.09**
average kappa	96.9074 ± 0.9049	96.1265 ± 0.9062	94.9482 ± 1.5119	96.0823 ± 1.2286	**97.4494 ± 1.0475**
Class 0	99.85 ± 0.25	99.25 ± 0.92	99.32 ± 1.27	99.55 ± 0.75	99.81 ± 0.30
Class 1	100.00 ± 0.00	99.58 ± 0.83	99.38 ± 1.33	99.17 ± 1.02	**100.00 ± 0.00**
Class 2	97.80 ± 3.62	98.21 ± 1.08	98.05 ± 1.96	96.91 ± 3.33	99.55 ± 0.86
Class 3	99.81 ± 0.44	98.29 ± 2.07	98.24 ± 3.03	98.57 ± 3.08	98.57 ± 2.53
Class 4	88.64 ± 7.43	87.01 ± 5.14	79.89 ± 8.54	87.20 ± 10.15	**91.14 ± 6.44**
Class 5	93.45 ± 7.53	89.81 ± 8.64	92.77 ± 8.78	94.13 ± 4.85	**92.92 ± 8.26**
Class 6	97.44 ± 4.07	97.60 ± 3.09	98.94 ± 1.58	96.61 ± 3.96	99.84 ± 0.36
Class 7	100.00 ± 0.00	100.00 ± 0.00	98.23 ± 3.81	98.28 ± 4.67	98.43 ± 4.70
Class 8	98.25 ± 2.59	97.28 ± 2.34	**89.68 ± 8.77**	95.28 ± 7.37	97.83 ± 3.56
Class 9	99.84 ± 0.27	98.68 ± 3.95	99.01 ± 1.82	99.84 ± 0.49	**99.96 ± 0.12**
Class 10	98.17 ± 2.15	99.23 ± 1.47	97.37 ± 2.84	98.23 ± 1.96	97.53 ± 2.20
Class 11	99.20 ± 1.35	96.31 ± 2.58	98.24 ± 1.51	96.25 ± 2.17	**99.15 ± 1.17**
Class 12	96.69 ± 3.95	96.73 ± 3.52	97.68 ± 3.04	97.91 ± 2.65	**99.32 ± 1.06**
Class 13	89.67 ± 7.22	92.33 ± 11.07	91.67 ± 7.78	90.44 ± 8.14	92.11 ± 8.45
seed:1309	96.82190057	95.31151668	94.808055	97.01069855	97.41976086
seed:1310	98.55254877	97.41976086	97.828823	97.32536186	99.27627439
seed:1332	95.90937697	97.16803021	94.052863	94.30459408	96.3499056
seed:1330	95.87791064	95.24858402	95.342983	96.19257395	96.47577093
seed:1236 (原为:1220)	97.35682819	96.19257395	96.9163	96.82190057	98.42668345
seed:1336	98.01762115	97.10509755	95.720579	94.30459408	96.72750157
seed:1337	96.97923222	96.00377596	95.531781	96.38137193	98.20641913
seed:1224	96.66456891	96.38137193	96.381372	96.82190057	97.16803021
seed:1246	97.95468848	97.70295784	93.266205	97.92322215	98.89867841
seed:1227	97.32536186	95.72057898	93.517936	96.7589679	97.51415985

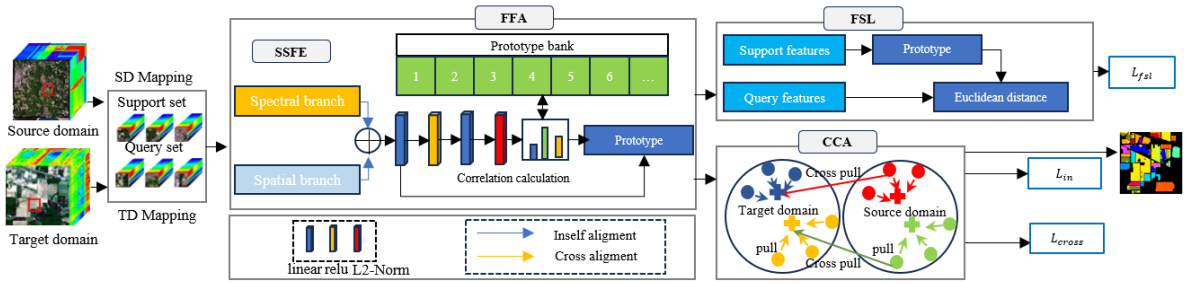
Obviously, our method not only performs well on the Chikusei source domain, but also shows strong robustness and stability on other source domains such as Hanchuan. **However, the performance has declined compared to before. This is precisely the issue we need to address next, such as adjusting the learning rate and re-optimizing the loss hyperparameters to develop an adversarial domain adaptation strategy for new source domains.**

About downstream tasks

Classification of hyperspectral images is precise down to each hyperspectral pixel, so the reviewer mistakenly thought it was image segmentation. However, image segmentation focuses on dividing regions, where a pixel and its neighboring pixels should be assigned to a representative area of a certain class. From the classification maps of the comparative methods in the paper, it can be seen that some regions have pixels of different classes scattered throughout. Therefore, this corresponds to a classification task rather than semantic segmentation.



Regarding the issue of text corresponding to the model diagram



We have revised the issue raised by the reviewer regarding the attention scores not being represented in the text, replacing it with **Correlation calculation**. Meanwhile, p_i represents the prototype of each class in the prototype library.

About the method

- FFA

  Regarding the reviewer's question about why the transformation of features and prototypes is performed through the MLP layer, as well as the issue of the dimensions of the MLP's weights and biases:

  First, features and prototypes come from different semantic levels. They are jointly mapped into the same comparable feature space through an MLP layer. At the same time, the intermediate ReLU in the MLP layer ensures that the model can learn more complex nonlinear relationships to enhance its expressive power.

  The features obtained through feature extraction are ultimately unified into a feature dimension of 128*1. The MLP layer weights correspond to (64, 128), where 64 represents the output dimension, and the bias is 64. The weights of the second layer correspond to (128, 64), with a bias of 128. This design reduces the number of parameters while forcing the model to learn important features.

About Hyperparameters and Final Loss

For the temperature parameter, we set it to a universal value of 0.1 based on experience.

The final loss is defined as:

$$Loss = L_{\text{fsl}} + \lambda_1 L_{\text{in}} + \lambda_2 L_{\text{cross}}$$

λ_1 and λ_2 represent the weighting hyperparameters for the in-domain loss and cross-domain loss. Their values range from 0 to 1, with increments of 0.1. The optimal parameters obtained through tuning are λ_1 = 0.5 and λ_2 = 0.3.

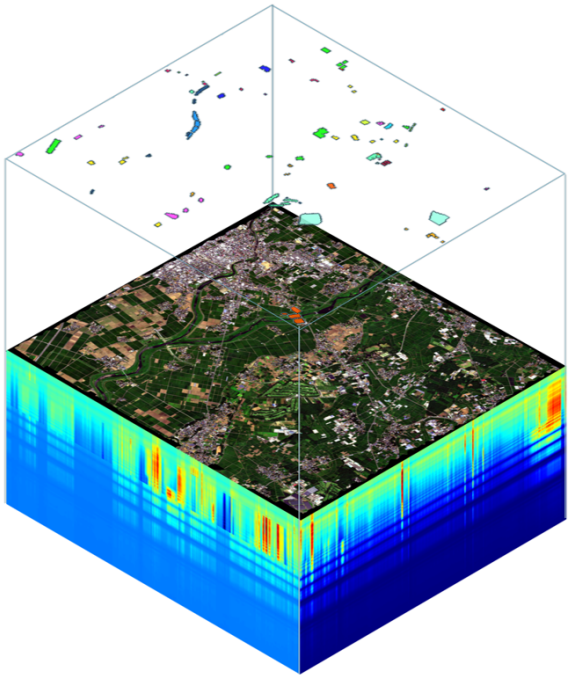
About the innovations of this paper

1. FFA: By updating through a moving average and incorporating the concept of momentum, we guide the model to improve its ability to extract discriminative features by injecting semantic correlation information of features. We distill between features and prototypes and inject the obtained semantic information to enhance feature representation and improve feature discriminability.
2. CCA: For the first time, we propose a dual-domain alignment function for cross-domain adaptation of hyperspectral images. The idea is that the essence of transfer learning is to find a common metric space where both the source and target domains perform well. In the field of hyperspectral image classification, domain adaptation is usually conducted within a single domain. For the first time, we approach it from a joint perspective, modeling the source and target domains together to achieve dual-domain alignment. Furthermore, in non-hyperspectral fields, dual-domain alignment requires that the categories of the source and target domains correspond. We remove this restriction, allowing the source and target domains to seek a metric space for universal domain adaptation even when their categories differ.

About the dataset

This study uses the publicly available Chikusei dataset as the source domain and validates it on three public datasets: Indian Pines, Salinas, and Botswana.

Chikusei



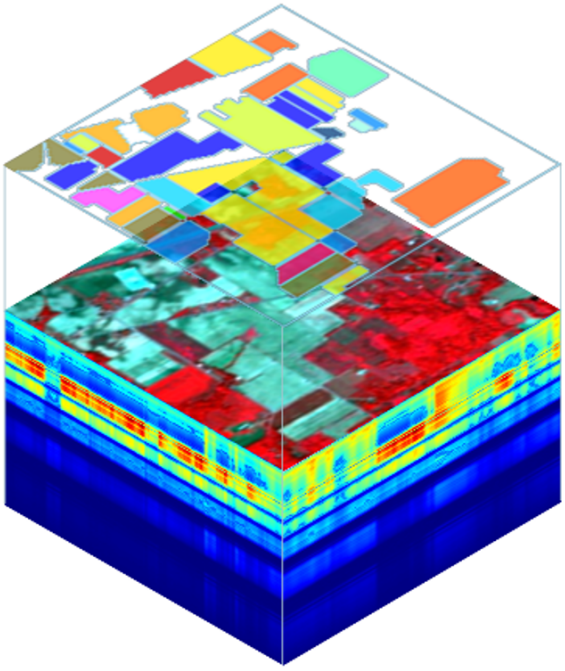
1. Water(2845)
2. Bare soil-shcool (2859)
3. Bare soil-park (286)
4. Bare soil-farmland (4852)
5. Natural plants (4297)
6. Weeds in farmland (1108)
7. Forest (20516)
8. Grass (6515)
9. Rice field-grown (13369)
10. Rice field-frist stage (1268)
11. Row crops (5961)
12. Plastic house (2193)
13. Manmade-non-dark (1220)
14. Manmade-dark (7664)
15. Manmade-blue (431)
16. Manmade-red (222)
17. Manmade grass (1040)
18. Asphalt (801)
19. Paved ground (145)

This dataset was captured by the Headwall Hyperspec-VNIR-C sensor in Chikusei City, Japan. It consists of 2517 × 2335 pixels with a spatial resolution of 2.5 m. A total of 128 bands are provided, covering wavelengths from 343 to 1018 nm, spanning 19 categories.

Publish Link: https://naotoyokoya.com/Download.html

Publish paper: https://www.researchgate.net/profile/Naoto-Yokoya/publication/304013716_Airborne_hyperspectral_data_over_Chikusei/links/5762f36808ae570d6e15c026/Airborne-hyperspectral-data-over-Chikusei.pdf

Indian_pines

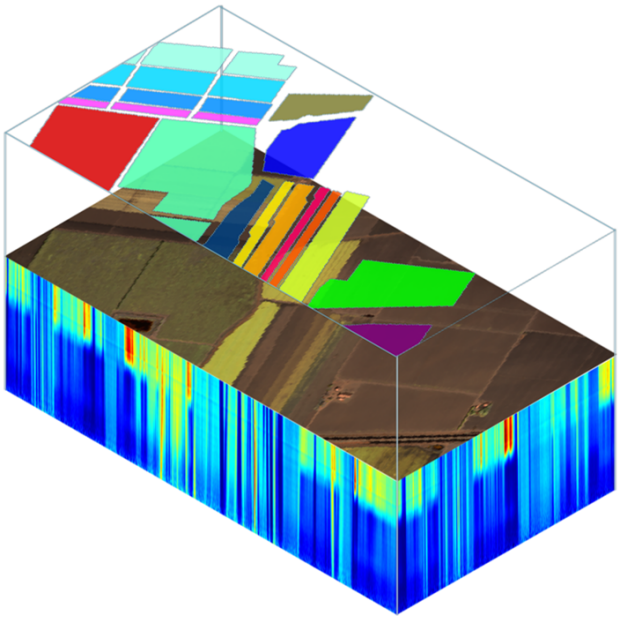


1. Alfalfa (46)
2. Corn-notill (1428)
3. Corn-mintill (830)
4. Corn (237)
5. Grass-pasture (483)
6. Grass-trees (730)
7. Grass-pasture-moved (28)
8. Hay-windrowed (478)
9. Oats (20)
10. Soybean-notill (972)
11. Soybean-mintill (2455)
12. Soybean-clean (593)
13. Wheat (205)
14. Woods (1265)
15. Bldg-grass- tree-drives (386)
16. Stone-steel-towers (93)

This dataset was collected by the Airborne Visible/Infrared Imaging Spectrometer (AVIRIS) over Indiana, USA. It contains 145 × 145 pixels with a spatial resolution of about 20 m. After removing 20 water absorption bands (104-105, 150-163, and 220), 200 absorption bands in the range of 400 to 2500 nm are used. The dataset includes 16 classes.

Publish paper: https://purr.purdue.edu/publications/1947/1

Salinas

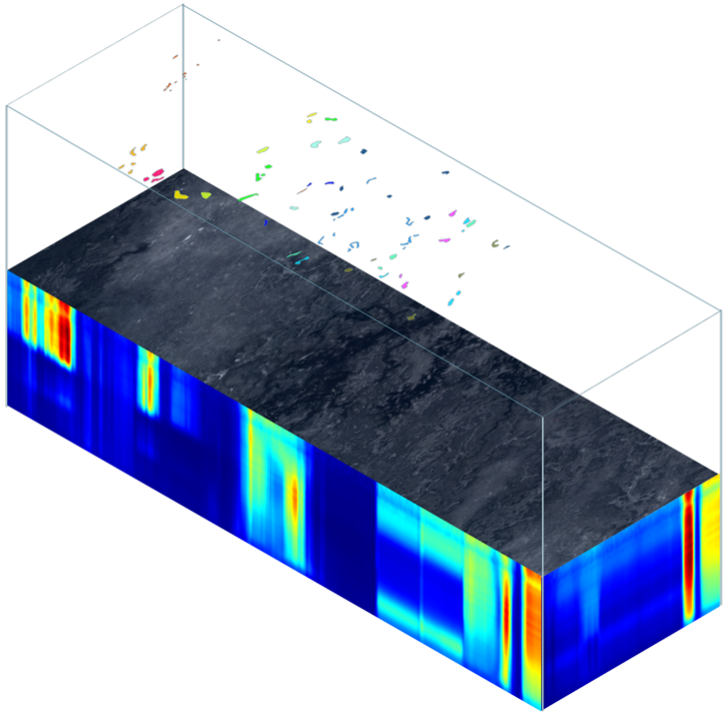


1. Brocoli_green_weeds_1 (2009)
2. Brocoli_green_weeds_2 (3726)
3. Fallow (1976)
4. Fallow_rough_Plow (1394)
5. Fallow_smooth (2678)
6. Stubble (3959)
7. Celery (3579)
8. Grapes_untrained (1127)
9. Soil_vinyard_develop (6206)
10. Corn_senesced_green_weeds (3278)
11. Lettuce_Romaine_4wk (1068)
12. Lettuce_Romaine_5wk (1927)
13. Lettuce_Romaine_6wk (916)
14. Lettuce_Romaine_7wk (1070)
15. Vinyard_vertical_trellis (7268)
16. Weeds (958)

This dataset was collected by the AVIRIS sensor in the Salinas Valley, California, USA. It consists of 512 × 217 pixels with a spatial resolution of approximately 3.7 m. A total of 204 bands covering 400-2500 nm were used, divided into 16 categories.

Publish Link: http://www.ehu.eus/ccwintco/index.php/Hyperspectral_Remote_Sensing_Scenes

Botswana



1. Water (270)
2. Botswana Swamp (108)
3. Seasonal Swamp (85)
4. Occasional Swamp (65)
5. Dry Woodland (61)
6. Riparian (41)
7. Perennial Swamp(74)
8. Island Freshwater (48)
9. Kalahari Sands (105)
10. Mixed Grassland (205)
11. Open Grassland (101)
12. Shrubs (185)
13. Bare Soil (170)
14. Exposed Soil (59)

This dataset was acquired by NASA's EO1 satellite over the Okavango Delta in Botswana. It has a size of 1476×256 pixels and a spatial resolution of approximately 20m. Out of 242 spectral bands (400-2500 nm), 145 bands were used after removing noisy bands (1-9, 56-81, 98-101, 120-133, and 165-186). It contains 14 classes.

Publish Link：http://www.ehu.eus/ccwintco/index.php/Hyperspectral_Remote_Sensing_Scenes

During the experiment, we used a publicly available hyperspectral dataset with noise bands already removed.

About the experiment

Due to the strict length restrictions of the article, the experiments in the paper were not fully presented, which may have led to misunderstandings by the reviewers. To address this, we are now presenting all the experiments in full detail.

- **Three Metrics**

  OA: The overall proportion of correctly classified samples by the model, that is, the percentage of all correctly classified samples out of the total number of samples.

$$OA = \frac{\text{Total number of correctly classified samples}}{\text{Total sample size}} = \frac{\sum_{i=1}^{K} TP_i}{N}$$

AA: The average classification accuracy for each category, eliminating the impact of the number of categories.

$$PA_i = \frac{TP_i}{\text{Number of actual samples in class } i} = \frac{TP_i}{TP_i + FN_i}$$

$$AA = \frac{1}{K} \sum_{i=1}^{K} PA_i$$

Kappa: Consider the consistency difference between classification results and random classification.

$$\kappa = \frac{OA - EA}{1 - EA}$$

OA: Overall Classification Accuracy EA: Expected Agreement

$$EA = \frac{\sum_{i=1}^{K} (\text{row sum}_i \times \text{column sum}_i)}{N^2}$$

R_i is the row sum for class i (actual number of samples in class i),
C_i is the column sum for class i (predicted number of samples in class i),
and N is the total number of samples.

Comparative Experiment

IP-5shot

IP-5shot	DPSL+KNN-2019年	DCFSL-2022年	HFSL：2022年	DM-MRN：2023年	FSCP-SSL：2023年	GCCFSL：2024年	CTF-SSCL-2024年	MLPA：2025年	PGAPA：2025年
train time per DataSet(s)	456.08517	876.43519	350.875031	83.30	590.214683	2152.57852	983.20153	935.41667	1284.10828
test time per DataSet(s)	0.49139	0.53322	2.45316	12.81	2.51515	0.47441	1.04364	0.491	0.56231
average OA	63.16 ± 2.92	65.74 ± 2.57	74.03 ± 2.71	69.28 ± 3.30	76.96 ± 2.74	64.79±2.58	70.86 ± 3.215	66.59 ± 2.81	**79.65 ± 2.76**
average AA	75.64 ± 1.06	77.14 ± 1.70	83.17 ± 2.25	81.51 ± 1.84	85.29 ± 2.60	76.02±2.07	81.32 ± 2.28	78.02 ± 1.43	**87.74 ± 1.37**
average Kappa	58.71 ± 3.08	61.47 ± 2.66	70.64 ± 2.98	65.66 ± 3.61	73.87 ± 3.06	60.3013±2.6360	67.10 ± 3.49	62.43 ± 2.99	**77.0143 ± 3.2716**
Class 0	94.15 ± 8.18	94.15 ± 7.33	**99.51 ± 0.98**	99.02 ± 2.24	**99.51 ± 0.98**	**88.54±15.54**	96.83 ± 5.78	92.20 ± 11.94	98.75 ± 2.25
Class 1	42.13 ± 9.90	47.48 ± 12.01	54.10 ± 11.53	64.45 ± 9.29	59.16 ± 11.24	43.18±8.15	54.26 ± 13.26	50.51 ± 11.08	**65.71 ± 14.53**
Class 2	53.05 ± 7.41	52.69 ± 8.68	55.98 ± 13.67	45.25 ± 11.41	65.25 ± 13.64	51.56±8.41	59.37 ± 7.54	50.69 ± 12.59	**68.12 ±7.94**
Class 3	75.86 ± 11.08	78.06 ± 9.52	90.78 ± 12.87	90.00 ± 6.38	92.28 ± 11.50	76.81±11.48	87.07 ± 11.37	82.41 ± 6.00	**95.13 ± 2.76**
Class 4	67.15 ± 13.42	70.84 ± 10.29	68.12 ± 12.68	73.74 ± 6.44	70.94 ± 12.17	73.62±7.61	77.15 ± 10.82	72.24 ± 12.19	**80.36 ± 7.71**
Class 5	81.34 ± 6.45	86.50 ± 4.80	74.90 ± 14.07	92.79 ± 2.41	85.12 ± 6.54	81.90±7.43	87.75 ± 6.09	87.20 ± 6.19	**93.97 ± 3.90**
Class 6	**100.00 ± 0.00**	99.13 ± 1.74	**100.00 ± 0.00**	**100.00 ± 0.00**	**100.00 ± 0.00**	**97.39±3.98**	**100.00 ± 0.00**	99.57 ± 1.30	**100 ± 0.00**
Class 7	84.95 ± 9.22	83.51 ± 11.89	**99.92 ± 0.19**	98.44 ± 1.20	99.83 ± 0.39	88.75±7.83	93.78 ± 10.40	82.62 ± 12.68	93.26 ± 10.94
Class 8	**100.00 ± 0.00**	99.33 ± 2.00	99.33 ± 2.00	**100.00 ± 0.00**	**100.00 ± 0.00**	**94.00±15.90**	98.67 ± 2.67	**100.00 ± 0.00**	**100 ± 0.00**
Class 9	62.18 ± 9.40	67.44 ± 7.21	67.37 ± 13.11	61.25 ± 15.53	66.63 ± 10.74	61.22±8.73	64.06 ± 11.13	66.06 ± 9.94	**74.08 ±11.39**
Class 10	54.24 ± 13.85	58.64 ± 11.66	74.95 ± 7.44	54.56 ± 9.62	**76.04 ± 8.94**	**58.69±12.31**	65.87 ± 13.85	57.64 ± 12.64	75.08 ±11.43
Class 11	38.16 ± 9.16	40.97 ± 6.50	67.28 ± 10.78	53.33 ± 11.74	71.41 ± 16.33	43.30±10.98	47.82 ± 11.09	46.00 ± 10.46	**78.20 ± 15.70**
Class 12	97.80 ± 3.79	98.10 ± 2.81	98.45 ± 2.44	98.55 ± 2.09	99.75 ± 0.46	99.10±1.39	99.10 ± 1.70	97.85 ± 3.61	99.50 ±1.05
Class 13	87.73 ± 5.86	84.33 ± 9.55	91.57 ± 6.84	88.77 ± 6.35	**92.75 ± 4.51**	**85.62±7.14**	87.48 ± 5.40	87.33 ± 6.99	85.79 ± 9.26
Class 14	72.94 ± 5.26	73.70 ± 8.93	**91.00 ± 9.76**	87.38 ± 9.65	90.47 ± 10.47	74.62±10.05	82.20 ± 9.77	77.43 ± 9.44	88.37 ± 10.54
Class 15	98.52 ± 2.10	99.43 ± 1.37	97.50 ± 3.69	96.70 ± 6.81	95.45 ± 6.06	98.07±2.04	**99.77 ± 0.45**	98.52 ± 1.76	99.20 ± 1.25
seed:1309	66.61421969	69.65286656	75.9661717	0.724161668	82.39748254	64.21477038	0.68718655	70.69525027	83.8233848
seed:1310	64.93263841	64.63762415	77.80509391	0.734585505	78.43445767	67.52876389	0.65729177	70.80342217	83.29235913
seed:1332	58.84551087	66.93873537	74.28459042	0.670469073	77.30356967	62.78886813	0.69731537	65.36532599	76.58570164
seed:1330	62.8675386	69.15134231	72.92752483	0.649719736	78.57213099	68.36463762	0.74648441	66.97807061	75.43514603
seed:1236 (原为:1220)	63.31989379	66.72239158	74.23542138	0.676074344	75.26797129	64.87363556	0.7593667	62.60202576	81.6599469
seed:1336	60.37958501	63.18222047	70.57724457	0.754843151	71.5212902	64.1262661	0.7164913	65.61117121	74.7959847
seed:1337	67.36158914	65.7193431	69.1316747	0.671255777	74.36326089	69.01366899	0.66574884	66.26020258	81.72878356
seed:1224	58.44232471	60.46808929	77.85426296	0.657685121	76.30052119	61.51047301	0.72907857	62.37584817	80.7552365
seed:1246	63.79191661	64.82446652	72.51450487	0.694561904	77.74609106	61.2744616	0.73281542	69.34801849	76.4283607
seed:1227	65.01130888	66.12252926	75.0516275	0.694463566	77.64775297	64.21477038	0.69446357	65.84718261	81.97462877

IP-4shot

IP-4shot	DPSL+KNN-2019年	DCFSL-2022年	HFSL：2022年	DM-MRN：2023年	FSCP-SSL：2023年	GCCFSL：2024年	CTF-SSCL-2024年	MLPA：2025年	PGAPA：2025年
train time per DataSet(s)	【空缺！】	862.86157	3527.34718	【空缺！】	583.450666	2144.0343	705.53819	【空缺！】	1286.73987
test time per DataSet(s)		0.50132	2.51267		2.25754	0.50557	0.62579		0.519
average OA	60.44 ± 2.82	61.96 ± 3.98	69.96 ± 3.93	63.95 ± 3.07	72.92 ± 5.56	61.70±4.20	67.29 ± 3.043	63.31 ± 2.05	**76.12 ± 2.76**
average AA	72.24 ± 1.59	73.77 ± 2.32	80.76 ± 1.96	78.68 ± 1.96	82.52 ± 3.22	73.34±2.28	79.00 ± 1.83	75.08 ± 1.82	**85.84 ± 1.37**
average kappa	55.60 ± 2.99	57.18 ± 4.33	66.11 ± 4.32	59.96 ± 3.29	69.43 ± 6.12	56.8880±4.5170	63.17 ± 3.28	58.83 ± 2.02	**72.7143 ± 3.2716**
Class 0	90.24 ± 15.00	86.43 ± 10.54	99.76 ± 0.71	99.05 ± 1.58	100.00 ± 0.00	95.00±6.94	94.76 ± 11.11	88.81 ± 15.43	97.86 ± 3.60
Class 1	40.80 ± 11.68	45.18 ± 13.20	53.74 ± 15.04	48.04 ± 15.63	57.86 ± 12.01	45.53±13.66	47.07 ± 11.19	42.58 ± 11.65	**62.79 ± 15.85**
Class 2	44.82 ± 7.19	38.32 ± 10.88	55.88 ± 9.25	43.95 ± 8.52	56.37 ± 11.60	48.16±5.93	53.68 ± 8.32	50.68 ± 8.16	**65.06 ±9.67**
Class 3	65.92 ± 12.43	73.26 ± 9.82	87.94 ± 15.84	86.22 ± 8.21	89.01 ± 14.67	69.70±15.88	80.21 ± 12.33	82.83 ± 8.65	**93.52 ± 6.88**
Class 4	69.16 ± 11.45	68.12 ± 14.11	68.66 ± 10.46	74.95 ± 7.93	73.07 ± 13.27	65.91±15.71	74.95 ± 6.91	69.10 ± 13.09	**80.58 ± 7.72**
Class 5	77.13 ± 8.61	82.02 ± 8.84	73.00 ± 12.18	90.01 ± 5.32	74.93 ± 12.58	76.61±6.93	89.52 ± 3.32	83.07 ± 7.82	**95.94 ± 1.66**
Class 6	97.50 ± 5.34	100.00 ± 0.00	100.00 ± 0.00	100.00 ± 0.00	100.00 ± 0.00	98.75±2.67	99.58 ± 1.25	96.67 ± 6.40	**100 ± 0.00**
Class 7	79.37 ± 10.73	78.42 ± 16.23	97.43 ± 4.51	98.90 ± 0.94	99.03 ± 1.66	79.77±9.70	92.62 ± 12.17	76.77 ± 15.75	93.65 ± 6.84
Class 8	99.38 ± 1.88	99.38 ± 1.88	100.00 ± 0.00	100.00 ± 0.00	100.00 ± 0.00	100.00±0.00	98.75 ± 2.50	99.38 ± 1.88	**100 ± 0.00**
Class 9	57.85 ± 10.01	59.09 ± 11.33	57.94 ± 12.72	69.57 ± 12.16	64.49 ± 9.30	56.38±9.71	60.50 ± 12.06	60.92 ± 9.30	**69.38 ±8.73**
Class 10	54.63 ± 11.53	56.26 ± 16.09	66.82 ± 11.57	46.04 ± 13.46	71.63 ± 14.39	59.22±9.29	59.75 ± 12.33	56.94 ± 11.59	66.17 ±12.83
Class 11	35.87 ± 5.62	35.01 ± 7.70	59.85 ± 16.22	50.15 ± 6.86	60.19 ± 16.70	36.91±7.28	47.35 ± 13.50	37.28 ± 7.62	**70.08 ± 18.38**
Class 12	97.01 ± 3.74	98.01 ± 2.13	98.16 ± 2.65	98.86 ± 1.07	97.56 ± 6.02	96.17±7.77	99.30 ± 0.87	97.36 ± 3.37	99.20±0.81
Class 13	85.47 ± 7.48	85.47 ± 7.56	88.27 ± 8.41	81.69 ± 16.42	88.83 ± 8.17	78.34±10.29	87.94 ± 8.17	85.51 ± 5.80	86.52 ±8.71
Class 14	61.65 ± 11.50	75.94 ± 11.51	90.45 ± 9.94	76.36 ± 10.82	91.20 ± 9.95	68.77±9.79	78.38 ± 7.80	76.02 ± 7.87	88.56 ± 10.65
Class 15	99.10 ± 1.31	99.44 ± 0.75	94.27 ± 5.87	95.06 ± 5.95	96.07 ± 5.78	98.20±2.20	99.66 ± 1.01	97.30 ± 4.53	99.33 ± 1.68
seed:1309	64.21207658	64.00589102	75.58173785		83.77025037	64.54590083	0.67088856	65.87137948	78.78252332
seed:1310	58.47815415	64.7520864	70.41728031		78.12469318	54.16789396	0.60756014	60.24545901	75.11045655
seed:1332	55.46391753	61.21747668	64.22189494		66.54884634	59.99018164	0.66941581	61.88512518	75.69955817
seed:1330	58.85125184	61.52184585	68.56161021		71.42857143	60.33382425	0.71045655	65.31173294	75.04172803
seed:1236 (原为:1220)	58.87088856	51.89985272	77.71232204		80.37309769	64.01570938	0.66961217	66.9808542	78.79234168
seed:1336	61.7574865	67.09867452	70.60382916		70.76092293	60.59891998	0.70004909	63.38733432	73.81443299
seed:1337	64.89936181	63.10260187	69.9754541		69.95581738	66.97103584	0.63102602	62.60186549	75.57191949
seed:1224	58.0952381	60.35346097	65.09572901		67.11831124	57.55522828	0.69769269	62.16985763	81.36475209
seed:1246	61.59057437	60.36327933	68.37506136		68.54197349	59.93127148	0.67943054	63.50515464	74.74717722
seed:1227	62.21894944	65.31173294	69.05252823		72.57731959	68.89543446	0.69297987	61.16838488	72.27295042

IP-3shot

IP-3shot	DPSL+KNN-2019年	DCFSL-2022年	HFSL：2022年	DM-MRN：2023年	FSCP-SSL：2023年	GCCFSL：2024年	CTF-SSCL-2024年	MLPA：2025年	PGAPA：2025年
train time per DataSet(s)	【空缺！】	794.22379	348.043304	【空缺！】	578.172529	2111.80885	551.91914	【空缺！】	1199.81316
test time per DataSet(s)		0.51443	2.6299		2.41064	0.4789	0.52086		0.52815
average OA	56.47 ± 2.44	56.03 ± 3.45	63.65 ± 4.13	62.40 ± 2.49	67.72 ± 1.62	57.21±2.68	63.61 ± 3.5	57.65 ± 2.63	**71.19 ± 4.18**
average AA	68.38 ± 1.99	68.71 ± 2.23	76.13 ± 2.74	77.32 ± 1.38	77.70 ± 2.46	67.52±3.65	75.47 ± 2.60	70.16 ± 2.83	**81.35 ± 2.02**
average kappa	51.16 ± 2.52	50.73 ± 3.75	59.37 ± 4.40	58.44 ± 2.59	63.58 ± 1.62	51.8273±2.7527	59.15 ± 3.64	52.44 ± 2.78	**67.4986 ± 4.5539**
Class 0	89.53 ± 14.19	86.74 ± 12.40	98.14 ± 4.13	97.44 ± 5.04	99.77 ± 0.70	85.81±17.88	91.40 ± 14.15	89.53 ± 14.90	98.14 ±3.26
Class 1	34.58 ± 10.52	34.55 ± 11.50	43.50 ± 17.62	46.97 ± 7.11	45.33 ± 11.18	35.10±13.51	43.56 ± 12.40	33.11 ± 10.55	**52.46 ± 18.17**
Class 2	38.07 ± 9.82	38.20 ± 9.90	49.70 ± 13.35	41.21 ± 12.07	49.92 ± 7.72	38.02±11.81	48.80 ± 9.90	39.85 ± 9.49	**59.38 ±16.46**
Class 3	65.00 ± 16.17	54.19 ± 14.92	78.72 ± 19.22	87.09 ± 6.28	81.67 ± 16.68	59.19±12.45	72.35 ± 12.81	70.21 ± 13.81	**86.45 ±10.02**
Class 4	57.17 ± 18.37	59.58 ± 17.30	59.69 ± 19.40	74.50 ± 4.73	61.48 ± 20.40	57.27±20.43	68.58 ± 18.28	59.08 ± 16.00	**69.54 ±17.47**
Class 5	80.58 ± 9.98	86.11 ± 8.25	61.72 ± 14.46	89.20 ± 4.70	67.96 ± 16.71	77.80±10.37	89.13 ± 6.04	82.76 ± 9.50	**95.61 ± 2.96**
Class 6	94.80 ± 8.40	97.60 ± 5.99	98.80 ± 1.83	100.00 ± 0.00	100.00 ± 0.00	89.20±13.03	97.20 ± 5.95	94.00 ± 9.67	**100 ± 0.00**
Class 7	64.27 ± 13.09	72.63 ± 11.62	91.85 ± 7.51	95.87 ± 5.81	87.54 ± 15.88	62.34±18.82	78.59 ± 13.93	69.62 ± 17.44	83.47 ± 13.51
Class 8	100.00 ± 0.00	97.65 ± 3.90	98.82 ± 3.53	100.00 ± 0.00	100.00 ± 0.00	95.88±6.98	99.41 ± 1.76	99.41 ± 1.76	**97.65 ± 5.39**
Class 9	54.22 ± 9.60	55.62 ± 10.24	62.36 ± 8.41	62.90 ± 11.39	60.28 ± 13.20	55.50±6.85	62.23 ± 10.44	52.77 ± 7.41	**66.03 ±8.97**
Class 10	54.72 ± 11.90	48.33 ± 14.95	55.95 ± 9.86	44.28 ± 11.52	70.43 ± 10.68	58.26±11.30	55.38 ± 17.68	53.99 ± 11.51	65.94 ±10.75
Class 11	30.53 ± 7.21	36.07 ± 11.13	57.88 ± 14.60	47.08 ± 13.64	58.00 ± 14.11	34.53±8.87	51.51 ± 14.98	37.39 ± 7.91	**65.90 ± 13.14**
Class 12	91.98 ± 14.77	93.02 ± 9.38	95.94 ± 7.10	94.46 ± 9.28	96.88 ± 8.21	92.92±10.61	97.03 ± 3.25	94.26 ± 10.64	99.11±1.19
Class 13	79.10 ± 12.82	78.97 ± 13.09	88.34 ± 8.66	83.88 ± 6.45	89.77 ± 9.66	78.15±10.88	82.98 ± 9.58	81.75 ± 8.86	85.74 ±11.55
Class 14	61.85 ± 19.08	61.54 ± 13.53	81.02 ± 14.98	78.02 ± 10.66	78.46 ± 22.40	62.25±10.57	69.56 ± 12.35	66.29 ± 11.42	76.79 ± 16.18
Class 15	97.67 ± 3.99	98.56 ± 1.86	95.67 ± 4.48	94.22 ± 4.76	95.67 ± 4.91	98.11±2.39	99.89 ± 0.33	98.44 ± 2.69	99.44±0.75
seed:1309	57.41593961	59.85687678	63.54278992		68.80697971	55.26909127	0.63748652	56.84736791	73.55161259
seed:1310	56.46505245	52.62229193	65.013234		68.72855602	58.77855112	0.57200274	62.24879914	67.50318596
seed:1332	51.75963141	52.86736594	55.83766297		66.25820998	55.14165278	0.61964513	58.11194981	70.46368003
seed:1330	57.87667876	60.85677875	60.45485737		69.61082247	60.61170473	0.66032742	59.4549554	72.26742476
seed:1236 (原为:1220)	55.65140672	49.07362023	71.7380649		68.88540339	61.45475934	0.68424664	58.37662974	72.26742476
seed:1336	60.54308401	56.24938731	67.42476228		67.56200373	57.26889521	0.68120772	60.3960396	70.17939418
seed:1337	55.39652975	59.06283698	61.89589256		64.56229781	51.83805509	0.62072346	55.40633271	74.90442114
seed:1224	59.29810803	56.71012646	61.92530144		69.76766984	58.63150672	0.60513675	54.30840114	78.66875796
seed:1246	56.6513087	57.16106264	62.06254289		66.61111656	56.55327909	0.61101853	58.08254093	69.8264876
seed:1227	53.64179982	55.88667778	66.62091952		66.41505735	56.53367317	0.66934614	53.26928732	62.21939026

IP-2shot

IP-2shot	DPSL+KNN-2019年	DCFSL-2022年	HPSL：2022年	DN-MRN：2023年	FSCP-SSL：2023年	GCCFSL：2024年	CTF-SSCL-2024年	MLPA：2025年	PGAPA:2025年
train time per DataSet(s)	【空缺！】	870.97141	351.31511	【空缺！】	5880.18484	2055.27654	731.93303	【空缺！】	1267.22414
test time per DataSet(s)		0.51318	2.60139		2.48757	0.50999	0.7		0.52235
average OA	50.98 ± 3.09	51.60 ± 4.53	53.78 ± 5.59	55.41 ± 3.88	60.14 ± 4.84	49.79±3.85	56.82 ± 0.04915	53.47 ± 4.82	**64.81 ± 4.32**
average AA	63.52 ± 1.86	64.12 ± 2.44	67.59 ± 3.97	70.84 ± 3.51	71.40 ± 3.66	62.42±3.35	69.47 ± 2.64	64.85 ± 2.81	**77.63 ± 2.19**
average kappa	45.19 ± 3.52	45.79 ± 5.19	48.64 ± 5.91	50.88 ± 4.15	55.09 ± 5.24	43.8372±4.2252	51.79 ± 5.26	47.91 ± 5.25	**60.6580 ± 4.5898**
Class 0	76.82 ± 17.92	77.95 ± 12.03	96.59 ± 4.34	97.05 ± 4.32	99.77 ± 0.68	68.41±13.35	94.32 ± 8.82	70.23 ± 17.29	97.05 ±3.38
Class 1	31.94 ± 14.32	32.81 ± 14.82	33.46 ± 12.67	40.05 ± 15.52	37.17 ± 10.24	29.00±13.22	36.53 ± 17.16	38.18 ± 12.77	**51.65 ± 13.21**
Class 2	31.67 ± 9.10	37.60 ± 12.97	40.83 ± 15.09	25.22 ± 8.86	42.83 ± 10.69	34.37±13.24	39.23 ± 8.84	38.18 ± 10.21	**49.12 ±16.58**
Class 3	53.36 ± 11.10	53.40 ± 14.39	60.34 ± 21.73	83.11 ± 12.85	67.36 ± 18.97	60.72±14.03	61.87 ± 17.07	59.74 ± 10.32	**81.06 ±20.61**
Class 4	46.20 ± 18.38	44.74 ± 18.07	49.23 ± 15.87	53.08 ± 24.81	54.32 ± 19.37	46.11±16.40	61.77 ± 17.24	47.84 ± 18.35	**62.52 ±20.62**
Class 5	78.82 ± 9.98	74.04 ± 12.26	46.96 ± 16.98	85.38 ± 4.49	54.07 ± 18.63	66.48±9.83	80.63 ± 14.09	75.55 ± 13.82	**91.24 ± 8.38**
Class 6	97.69 ± 4.93	98.85 ± 1.76	98.08 ± 4.63	99.23 ± 2.31	99.62 ± 1.15	88.85±12.22	95.38 ± 6.84	96.54 ± 5.29	**100 ± 0.00**
Class 7	59.43 ± 15.73	62.16 ± 15.02	80.95 ± 14.75	85.82 ± 11.68	80.38 ± 22.90	71.66±12.21	73.93 ± 18.21	69.22 ± 9.48	80.42 ± 18.50
Class 8	98.89 ± 2.22	97.22 ± 2.78	100.00 ± 0.00	100.00 ± 0.00	98.33 ± 5.00	95.00±6.78	88.33 ± 14.58	97.78 ± 4.44	**96.67 ± 7.11**
Class 9	45.71 ± 18.64	48.63 ± 15.79	56.14 ± 20.61	53.41 ± 13.89	52.14 ± 22.48	46.33±17.75	56.34 ± 16.43	45.55 ± 18.75	**59.55 ±22.49**
Class 10	47.05 ± 10.87	47.34 ± 14.38	48.72 ± 16.93	39.62 ± 12.28	62.28 ± 13.13	44.21±12.46	48.72 ± 13.71	49.20 ± 13.06	51.55 ±15.95
Class 11	32.23 ± 9.57	29.00 ± 10.89	36.09 ± 9.37	38.83 ± 13.36	38.93 ± 10.17	25.97±7.31	43.38 ± 14.17	28.66 ± 11.59	**62.32 ± 15.89**
Class 12	88.87 ± 10.72	92.51 ± 6.50	97.68 ± 3.71	85.52 ± 12.38	98.03 ± 3.36	89.11±15.52	99.51 ± 0.82	88.28 ± 13.62	98.82±1.95
Class 13	74.20 ± 12.74	74.81 ± 16.85	79.24 ± 18.03	84.89 ± 6.08	90.98 ± 6.50	74.96±15.20	79.41 ± 11.53	76.10 ± 17.04	83.70 ±11.16
Class 14	56.25 ± 13.27	55.18 ± 18.04	65.81 ± 29.32	68.80 ± 7.64	72.84 ± 19.55	58.23±14.00	52.89 ± 17.17	60.91 ± 18.52	76.77 ± 16.65
Class 15	97.25 ± 2.66	99.67 ± 0.50	91.32 ± 5.26	93.41 ± 8.90	93.41 ± 5.34	99.23±1.10	99.34 ± 1.12	95.60 ± 9.41	99.67±0.70
seed:1309	55.92639718	56.24938827	58.12860918		65.07781149	51.05216796	0.60595087	56.84643242	68.1706959
seed:1310	48.00822159	47.84183224	54.81060977		65.58676715	50.62151316	0.57531565	53.51864539	63.36497994
seed:1332	53.56758344	54.38974259	53.65567192		58.4809631	51.27728296	0.60193795	56.69961828	62.76793579
seed:1330	51.85475188	55.70128218	58.60820202		61.97513947	53.24459235	0.56278751	59.68483899	67.50513849
seed:1236 (原为:1220)	47.42096506	45.55153176	48.60526573		55.71106979	45.12087697	0.63639033	46.04091221	57.59029069
seed:1336	51.66878732	47.34266419	65.17568758		63.33561711	52.65733581	0.49075071	52.36370755	68.00430655
seed:1337	54.49740628	54.35059215	45.02300088		48.3507879	43.31995693	0.52187531	55.59361848	68.93412939
seed:1224	51.61984927	58.86267985	54.54634433		61.99471469	54.69315846	0.51061956	58.47117549	71.22442987
seed:1246	49.39806205	46.94137222	50.26915924		61.46618381	44.12254086	0.63629245	44.54340805	60.3503964
seed:1227	45.87452285	48.76186748	48.98698248		59.40099834	51.78623862	0.54047176	50.96407948	60.14485661

IP-1shot

IP-1shot	DPSL+KNN-2019年	DCFSL-2022年	HPSL：2022年	DN-MRN：2023年	FSCP-SSL：2023年	GCCFSL：2024年	CTF-SSCL-2024年	MLPA：2025年	PGAPA:2025年
train time per DataSet(s)	【空缺！】	880.47375	370.061426	【空缺！】	593.846091	1741.64057	826.75358	【空缺！】	1273.26774
test time per DataSet(s)		0.51001	2.7637		2.43595	0.46207	0.95069		0.55045
average OA	40.93 ± 4.82	41.32 ± 5.75	42.95 ± 6.74	41.65 ± 5.36	46.44 ± 5.10	39.91±5.34	43.52 ± 0.04843	41.83 ± 5.51	**52.16 ± 4.48**
average AA	52.23 ± 3.77	49.53 ± 2.39	54.60 ± 6.55	60.48 ± 4.77	58.26 ± 5.25	50.83±4.43	57.84 ± 3.69	49.55 ± 3.60	**65.16 ± 3.25**
average kappa	34.15 ± 5.09	34.41 ± 5.95	36.32 ± 7.24	36.46 ± 5.58	39.76 ± 5.68	33.1970±5.6347	37.59 ± 4.95	35.06 ± 5.77	**46.6591 ± 4.5809**
Class 0	62.89 ± 16.18	52.22 ± 14.61	83.33 ± 15.08	93.56 ± 6.00	92.00 ± 9.39	70.67±19.16	66.00 ± 28.86	60.00 ± 20.82	90.22 ±10.29
Class 1	23.52 ± 10.30	23.55 ± 11.93	26.89 ± 14.29	19.80 ± 6.78	23.64 ± 11.58	24.18±13.00	23.46 ± 14.37	22.61 ± 10.65	**27.30 ± 14.00**
Class 2	27.73 ± 14.01	20.58 ± 10.39	26.65 ± 9.37	24.07 ± 4.77	21.80 ± 8.10	21.63±9.72	29.93 ± 10.71	24.45 ± 10.21	**38.64 ±13.27**
Class 3	37.50 ± 18.13	28.86 ± 7.10	35.38 ± 11.37	71.31 ± 14.29	36.10 ± 14.19	26.65±10.68	45.97 ± 14.10	27.50 ± 9.38	**60.08 ±19.12**
Class 4	30.27 ± 24.12	29.15 ± 22.86	32.84 ± 20.32	41.54 ± 22.61	30.62 ± 17.77	31.16±21.85	42.80 ± 25.69	28.84 ± 24.39	**34.54 ±24.23**
Class 5	67.16 ± 15.96	64.10 ± 20.24	41.63 ± 17.37	63.79 ± 14.48	53.70 ± 11.37	64.28±13.36	76.64 ± 10.85	65.49 ± 8.17	**85.13 ±10.94**
Class 6	91.11 ± 8.95	67.78 ± 15.98	92.59 ± 10.48	85.93 ± 16.55	98.15 ± 1.85	75.56±20.83	96.67 ± 4.52	73.70 ± 16.01	**99.26 ± 1.48**
Class 7	45.12 ± 17.69	46.25 ± 17.21	46.16 ± 21.88	80.25 ± 12.21	52.01 ± 19.34	44.05±21.63	53.48 ± 17.45	49.90 ± 16.84	56.33 ± 21.78
Class 8	96.84 ± 4.21	95.79 ± 3.94	92.11 ± 15.30	97.37 ± 6.34	96.84 ± 9.47	95.79±8.09	87.89 ± 13.73	88.42 ± 12.85	**97.89 ±4.82**
Class 9	34.75 ± 16.17	31.60 ± 16.04	36.84 ± 21.69	38.30 ± 19.83	39.63 ± 23.74	32.15±14.92	37.25 ± 20.37	37.00 ± 14.33	**52.45 ±22.71**
Class 10	42.65 ± 16.56	48.49 ± 19.26	42.53 ± 21.24	28.46 ± 13.06	52.32 ± 21.77	40.81±15.33	36.04 ± 19.74	46.43 ± 15.47	48.73 ±20.01
Class 11	21.62 ± 12.69	26.00 ± 6.18	23.67 ± 6.57	28.38 ± 4.20	23.45 ± 9.43	20.64±10.84	28.80 ± 7.82	19.51 ± 9.64	**32.09± 13.48**
Class 12	70.25 ± 19.40	68.73 ± 21.10	93.24 ± 6.72	93.63 ± 6.37	96.42 ± 4.25	82.30±21.88	98.33 ± 2.19	62.16 ± 17.71	98.14±1.84
Class 13	57.30 ± 36.18	59.30 ± 38.50	78.81 ± 30.36	63.73 ± 19.37	80.01 ± 22.60	63.92±29.64	64.41 ± 33.81	65.71 ± 31.99	77.97 ±22.34
Class 14	39.45 ± 19.23	35.69 ± 15.52	35.92 ± 28.39	40.47 ± 13.55	46.21 ± 29.55	25.82±14.38	38.13 ± 20.94	30.49 ± 15.22	44.57 ± 18.76
Class 15	87.50 ± 14.95	94.35 ± 5.56	85.00 ± 12.36	97.07 ± 5.35	89.24 ± 9.68	93.70±7.32	99.57 ± 1.00	90.65 ± 10.89	99.24±1.20
seed:1309	46.2132317	46.07641943	50.49350142		51.27528584	46.04710251	0.41590931	46.06664712	50.71826444
seed:1310	40.6625623	40.1153132	39.76351021		47.66930519	39.9296394	0.52633636	42.1381804	48.27518812
seed:1332	46.69207466	49.75080622	55.35033714		50.75735366	43.58448158	0.46047103	47.45431447	53.25906381
seed:1330	41.18049448	37.42792925	38.53219975		51.05052282	36.44092641	0.41600704	39.5485195	52.87794391
seed:1236 (原为:1220)	36.85136324	38.35629825	38.18039676		37.68200919	37.58428613	0.49526043	37.65269227	46.04710251
seed:1336	32.75676732	34.55487149	45.4803088		45.43144728	42.91019251	0.40965504	38.88400274	55.10602951
seed:1337	37.23248314	36.28456953	36.90022476		38.98172579	32.87403498	0.35756865	35.59073585	44.68875208
seed:1224	44.64966286	47.49340369	40.78960227		48.38268348	43.08607401	0.46867976	48.44131731	53.93335288
seed:1246	46.96569921	48.70516955	50.39577836		51.95934721	46.78979771	0.39587609	49.61399394	58.62405942
seed:1227	36.06957881	34.39851461	33.56786866		41.20981139	29.85439265	0.40662562	32.94244112	58.0474934

Salinas-5shot

SA-5shot	DPSL+KNN	DCFSL-2022年	HPSL：2022年	DN-MRN：2023年	FSCP-SSL：2023年	GCCFSL：2024年	CTF-SSCL-2024年	MLPA：2025年	PGAPA:2025年
train time per DataSet(s)	472.40637	895.13205	1535.947012	96.20	2677.327241	2184.37481	747.94554	956.0544	1299.31266
test time per DataSet(s)	2.56784	2.66784	155.56796	65.71	145.33205	2.59853	2.67912	2.61181	2.91105
average OA	89.74 ± 1.26	90.12 ± 1.22	89.14 ± 2.09	91.08 ± 2.39	90.96 ± 2.06	89.83±1.15	89.96 ± 1.428	89.94 ± 1.30	**93.15 ± 1.00**
average AA	93.93 ± 0.84	94.30 ± 0.60	94.05 ± 1.49	95.14 ± 1.09	95.59 ± 1.09	93.36±0.99	94.29 ± 0.99	93.89 ± 0.96	**95.99 ± 0.50**
average kappa	88.59 ± 1.39	89.01 ± 1.35	87.93 ± 2.31	90.11 ± 2.62	89.96 ± 2.26	88.6957±1.2795	88.86 ± 1.57	88.81 ± 1.44	**92.3767±1.1041**
Class 0	98.00 ± 2.02	99.01 ± 1.21	97.01 ± 7.78	99.28 ± 0.82	**99.98 ± 0.05**	**98.26±1.79**	99.54 ± 0.78	98.93 ± 0.89	99.40 ± 0.49
Class 1	99.56 ± 0.51	**99.77 ± 0.23**	93.13 ± 9.21	99.55 ± 1.11	97.22 ± 6.29	98.87±1.27	99.64 ± 0.49	99.15 ± 1.34	99.54 ± 0.98
Class 2	96.01 ± 4.07	95.63 ± 4.86	95.63 ± 6.21	**100.00 ± 0.00**	97.97 ± 2.97	93.80±4.79	91.34 ± 10.43	93.84 ± 4.32	94.15± 6.21
Class 3	99.51 ± 0.58	99.73 ± 0.27	99.22 ± 1.41	99.66 ± 0.30	98.98 ± 2.54	99.42±0.91	99.40 ± 0.64	99.19 ± 1.28	**99.82± 0.23**
Class 4	92.49 ± 2.67	90.17 ± 2.41	95.42 ± 5.20	97.18 ± 3.04	**97.86 ± 0.71**	**90.91±4.00**	93.50 ± 3.82	91.57 ± 3.10	96.95 ± 2.17
Class 5	99.63 ± 0.43	98.52 ± 1.62	98.52 ± 2.62	96.90 ± 3.54	99.81 ± 0.23	99.18±0.95	99.46 ± 0.63	99.67 ± 0.56	**99.93 ± 0.16**
Class 6	98.69 ± 2.48	99.41 ± 0.57	98.63 ± 1.18	**99.82 ± 0.27**	99.61 ± 0.53	98.98±1.23	99.36 ± 0.98	99.05 ± 0.81	**99.85 ± 0.16**
Class 7	77.70 ± 6.14	77.93 ± 4.22	76.82 ± 12.17	75.02 ± 13.53	76.43 ± 9.65	79.25±6.91	76.38 ± 7.10	80.93 ± 3.95	**85.56± 5.51**
Class 8	99.10 ± 1.16	99.45 ± 0.84	99.09 ± 1.27	**99.79 ± 0.30**	99.65 ± 0.42	98.54±1.60	98.91 ± 1.38	98.82 ± 1.30	**99.97 ± 0.05**
Class 9	81.96 ± 5.81	84.53 ± 3.81	94.03 ± 3.68	89.92 ± 8.51	94.99 ± 4.79	81.53±7.09	84.99 ± 7.20	85.26 ± 5.45	89.58 ± 4.37
Class 10	98.20 ± 2.40	99.16 ± 0.60	98.85 ± 1.38	99.31 ± 1.32	99.01 ± 1.93	95.09±3.85	97.42 ± 2.22	97.67 ± 1.98	**99.44 ± 0.74**
Class 11	99.05 ± 1.25	99.65 ± 0.43	98.36 ± 2.23	94.42 ± 5.97	97.21 ± 5.35	98.36±2.74	99.59 ± 0.48	98.62 ± 2.27	**99.90 ± 0.16**
Class 12	98.89 ± 0.82	99.13 ± 0.94	98.69 ± 1.06	96.20 ± 2.85	**99.45 ± 0.65**	**97.45 +- 3.52**	98.94 ± 1.27	99.15 ± 0.90	98.87 ± 0.78
Class 13	98.25 ± 1.62	97.81 ± 1.89	95.88 ± 3.53	93.56 ± 5.80	97.38 ± 2.52	97.06 +- 3.52	98.24 ± 2.88	**98.85 ± 0.54**	98.38 ± 1.47
Class 14	76.22 ± 8.29	77.17 ± 7.14	69.94 ± 19.36	**84.00 ± 6.54**	77.31 ± 10.04	77.80 +- 4.86	77.72 ± 6.82	72.35 ± 7.98	81.67 ± 6.64
Class 15	89.53 ± 6.46	91.73 ± 4.17	95.57 ± 4.97	**97.64 ± 2.36**	96.60 ± 4.60	89.27 +- 7.39	94.26 ± 4.09	89.25 ± 5.58	92.84± 6.07
seed:1309	91.19687691	91.37079317	89.4780662	0.87872116	90.86939629	90.97670632	0.90934152	88.84715721	94.1090492
seed:1310	88.09228663	87.12094581	89.65753298	0.918832911	88.9026624	87.20420359	0.90007216	87.50023127	93.20246443
seed:1332	91.35229144	91.28383504	86.93407834	0.853059261	87.39662158	90.51046273	0.9048641	90.66957761	94.44578068
seed:1330	90.66402709	89.7722437	86.76201225	0.9272697	90.7454347	90.91195027	0.91159873	90.47715961	92.36988658
seed:1236	90.7176821	90.99150771	89.01552295	0.923051305	93.43003571	90.80279006	0.91709375	91.41149697	92.48644748
seed:1336	87.70560047	89.76484301	86.2310126	0.918888416	91.96654887	90.68992951	0.90434606	88.58998316	92.87313364
seed:1337	89.69453644	90.65477622	93.29497308	0.910858665	93.68165924	89.17833817	0.8962608	91.23388037	93.50404263
seed:1224	90.09602398	89.2930489	91.7796814	0.919387963	92.42724195	89.86290218	0.86247664	88.86380877	90.87124646
seed:1246	88.19959666	89.82219838	89.37075617	0.933319765	88.20514718	88.72504579	0.89785195	90.6769783	93.84262429
seed:1227	89.7037873	91.11361912	88.89711188	0.924938482	91.99615164	89.44661326	0.89244944	91.15432293	93.80192048

Salinas-4shot

SA-4shot	DFSL+NN	DCFSL-2022年	HFSL：2022年	DM-MRN：2023年	FSCP-SSL：2023年	GCCFSL：2024年	CTF-SSCL-2024年	MLPA：2025年	PGAPA:2025年
train time per DataSet(s)	【空缺！】	889.53971	1549.827509	【空缺！】	2852.190233	2217.53756	744.17312	【空缺！】	1292.10148
test time per DataSet(s)		2.64946	131.8554		141.18213	2.55587	3.16451		2.93045
average OA	88.61 ± 1.53	88.05 ± 1.90	86.98 ± 2.57	90.04 ± 2.03	88.11 ± 3.66	86.60±2.53	88.58 ± 1.59	89.04 ± 1.50	**91.83 ± 1.09**
average AA	92.81 ± 1.09	92.77 ± 1.11	92.65 ± 1.27	94.31 ± 1.16	94.44 ± 1.09	91.21±1.66	92.75 ± 1.18	93.04 ± 1.14	**95.10 ± 0.84**
average kappa	87.31 ± 1.70	86.72 ± 2.09	85.56 ± 2.84	88.95 ± 2.23	86.83 ± 3.99	85.0964±2.7969	87.33 ± 1.75	87.81 ± 1.66	**90.9064±1.2236**
Class 0	98.73 ± 1.68	98.19 ± 3.07	98.34 ± 3.61	98.89 ± 1.52	99.21 ± 2.35	98.30 +- 2.05	99.31 ± 0.99	98.93 ± 0.81	99.26 ± 0.74
Class 1	98.33 ± 3.04	99.74 ± 0.41	91.73 ± 10.88	99.19 ± 2.35	94.30 ± 6.28	99.14 +- 1.83	98.78 ± 1.96	98.98 ± 1.93	99.17 ± 1.18
Class 2	92.95 ± 6.17	94.75 ± 4.46	91.60 ± 7.75	98.66 ± 3.73	96.78 ± 4.76	92.26 +- 9.56	90.23 ± 11.89	92.52 ± 7.42	92.21±8.40
Class 3	98.60 ± 1.79	98.96 ± 1.60	98.81 ± 2.43	98.71 ± 1.50	99.51 ± 1.16	98.19 +- 3.11	98.40 ± 2.46	98.94 ± 1.35	**99.59± 0.66**
Class 4	90.13 ± 4.60	88.56 ± 5.88	96.03 ± 2.58	93.48 ± 4.71	96.49 ± 3.69	88.93 +- 5.56	89.61 ± 8.22	90.63 ± 4.97	96.29 ± 3.20
Class 5	99.02 ± 1.05	99.22 ± 0.53	99.05 ± 2.06	98.06 ± 1.66	99.70 ± 0.50	98.17 +- 1.73	98.52 ± 1.62	99.33 ± 0.86	**99.89 ± 0.30**
Class 6	99.30 ± 0.53	99.28 ± 0.72	98.02 ± 3.77	98.95 ± 1.96	99.48 ± 0.89	98.98 +- 1.92	99.43 ± 0.51	99.27 ± 0.81	**99.68 ± 0.41**
Class 7	79.37 ± 7.30	74.05 ± 9.38	67.90 ± 11.47	75.39 ± 7.89	64.46 ± 21.32	75.36 +- 14.19	75.46 ± 8.85	79.35 ± 7.50	**83.20± 4.53**
Class 8	99.73 ± 0.32	99.32 ± 0.64	99.10 ± 0.97	99.85 ± 0.19	99.50 ± 0.59	98.99 +- 1.54	98.95 ± 1.19	99.13 ± 0.86	**99.88 ±0.19**
Class 9	76.12 ± 9.79	79.03 ± 6.94	88.06 ± 7.58	92.51 ± 7.07	91.02 ± 6.01	72.75 +- 8.20	80.67 ± 10.04	78.75 ± 10.00	86.74 ± 7.90
Class 10	95.58 ± 6.79	95.95 ± 4.62	98.57 ± 1.52	99.32 ± 0.60	99.14 ± 0.60	91.90 +- 9.06	95.79 ± 4.57	95.88 ± 4.86	**98.67± 1.71**
Class 11	99.01 ± 1.18	98.68 ± 2.65	94.51 ± 7.14	93.57 ± 4.17	97.33 ± 5.06	98.63 +- 2.57	98.91 ± 1.47	98.84 ± 1.14	**99.72 ± 0.55**
Class 12	98.56 ± 1.72	99.01 ± 0.71	99.09 ± 0.88	95.36 ± 4.99	99.62 ± 0.34	97.40 +- 3.75	97.74 ± 2.82	98.88 ± 0.75	97.91±1.98
Class 13	98.30 ± 1.25	97.80 ± 1.65	93.21 ± 6.04	92.88 ± 4.98	96.98 ± 3.36	97.63 +- 1.91	95.39 ± 4.61	98.14 ± 2.35	98.78 ± 1.65
Class 14	69.47 ± 10.75	72.70 ± 10.73	73.11 ± 13.37	77.02 ± 8.88	78.44 ± 13.28	66.08 +- 14.04	75.34 ± 7.99	72.11 ± 11.11	78.40± 10.89
Class 15	91.77 ± 5.29	89.10 ± 6.90	95.31 ± 3.84	97.07 ± 4.01	99.05 ± 1.09	86.71 +- 7.98	91.49 ± 5.60	88.90 ± 6.99	92.15± 6.87
seed:1309	89.28696939	88.96513456	87.85720892		90.23212799	85.7486359	0.91332655	89.71793212	92.93443078
seed:1310	87.70923888	87.32821604	81.63321927		81.83297882	87.6962915	0.87805419	89.93063905	91.63784334
seed:1332	90.75187275	91.27346712	86.133358		91.11509109	89.91214279	0.87370757	90.9812263	93.07685194
seed:1330	90.1451956	89.32951077	86.52547859		86.61611024	89.72902987	0.91502821	90.87579765	91.02931656
seed:1236 (原为:1220)	88.4157958	87.94229169	85.11236475		81.29103856	83.80467955	0.87809119	89.64579673	90.45963192
seed:1336	87.86275779	87.52242671	88.29741977		91.48617405	88.16239711	0.88282623	88.38990105	91.42883566
seed:1337	90.60760196	89.9343383	91.78396375		92.00036993	88.29741977	0.88210487	89.76972163	91.35115139
seed:1224	85.96874133	85.37501156	89.53666882		88.43799131	86.71044114	0.86647554	86.46444095	90.23767687
seed:1246	86.73078702	84.6148155	86.04827522		87.65929899	81.96800148	0.8957921	86.85656155	92.51271617
seed:1227	88.57301396	88.21788588	86.85656155		90.3412559	83.96374734	0.87278276	87.8128179	93.62434107

Salinas-3shot

SA-3shot	DFSL+NN	DCFSL-2022年	HFSL：2022年	DM-MRN：2023年	FSCP-SSL：2023年	GCCFSL：2024年	CTF-SSCL-2024年	MLPA：2025年	PGAPA:2025年
train time per DataSet(s)	【空缺！】	810.45712	15215.74448	【空缺！】	27567.50503	2130.16034	875.9935	【空缺！】	1209.67799
test time per DataSet(s)		2.62127	161.13557		145.80547	2.60182	6.05307		2.77343
average OA	84.99 ± 1.53	84.88 ± 1.84	85.28 ± 2.65	87.48 ± 3.23	84.33 ± 3.52	84.04±2.32	85.57 ± 2.17	85.37 ± 2.01	**90.70 ± 1.86**
average AA	90.85 ± 1.22	90.74 ± 1.56	91.24 ± 1.82	92.21 ± 2.03	91.94 ± 1.33	88.79±2.46	90.99 ± 1.43	90.41 ± 1.98	**94.03 ± 1.28**
average kappa	83.36 ± 1.67	83.23 ± 2.00	83.63 ± 2.93	86.14 ± 3.55	82.66 ± 3.84	82.2955±2.5605	84.01 ± 2.38	83.75 ± 2.22	**89.6603±2.0559**
Class 0	99.23 ± 0.90	98.67 ± 2.41	95.80 ± 8.88	98.66 ± 1.84	99.03 ± 2.53	98.33 +- 1.67	99.21 ± 1.03	99.09 ± 1.14	99.40 ± 0.77
Class 1	96.47 ± 6.88	96.69 ± 4.73	93.71 ± 7.97	97.67 ± 3.94	93.77 ± 7.40	95.18 +- 4.52	95.87 ± 4.94	95.84 ± 7.40	95.32 ± 6.89
Class 2	88.00 ± 13.19	87.88 ± 11.58	86.55 ± 13.63	99.76 ± 0.65	90.33 ± 12.52	83.00 +- 13.20	85.98 ± 12.16	89.87 ± 11.40	86.07±11.15
Class 3	97.94 ± 2.47	98.59 ± 1.88	98.85 ± 2.19	98.20 ± 2.20	99.31 ± 1.24	97.14 +- 3.92	98.40 ± 2.94	97.35 ± 3.15	**99.51± 0.86**
Class 4	87.64 ± 5.31	86.64 ± 6.82	94.24 ± 7.52	94.61 ± 3.61	96.78 ± 3.51	85.03 +- 8.61	88.84 ± 6.01	88.25 ± 7.11	95.58±4.35
Class 5	99.23 ± 0.92	99.61 ± 0.48	99.74 ± 0.19	97.58 ± 2.47	98.77 ± 2.81	97.90 +- 1.74	99.48 ± 0.64	98.98 ± 1.24	**99.93 ± 0.18**
Class 6	99.22 ± 0.58	99.03 ± 0.80	97.22 ± 3.16	99.18 ± 1.48	96.34 ± 5.50	98.91 +- 1.21	98.75 ± 1.98	98.83 ± 1.15	**99.81 ± 0.13**
Class 7	63.09 ± 10.71	63.64 ± 13.00	72.88 ± 17.87	65.65 ± 13.18	58.29 ± 22.96	65.66 +- 10.23	66.62 ± 10.69	69.90 ± 9.66	**79.87± 6.78**
Class 8	99.24 ± 0.91	98.49 ± 2.03	99.37 ± 0.59	99.49 ± 0.68	98.86 ± 2.84	96.36 +- 2.95	98.65 ± 1.72	98.27 ± 1.40	**99.00 ±1.65**
Class 9	71.10 ± 16.43	72.42 ± 15.63	86.01 ± 9.88	86.69 ± 7.53	83.44 ± 15.47	67.28 +- 15.27	73.87 ± 18.44	67.64 ± 19.19	81.95 ± 12.10
Class 10	93.83 ± 7.53	95.33 ± 6.95	98.54 ± 1.16	98.60 ± 1.88	99.10 ± 0.94	89.00 +- 12.36	96.89 ± 1.74	95.31 ± 7.21	**98.44± 1.73**
Class 11	98.60 ± 2.30	98.19 ± 2.22	94.27 ± 6.40	80.60 ± 9.63	96.28 ± 5.75	95.47 +- 5.47	94.95 ± 5.17	98.59 ± 1.80	**99.51 ± 1.03**
Class 12	98.74 ± 1.86	98.51 ± 1.81	99.20 ± 0.43	89.30 ± 6.87	99.63 ± 0.36	97.32 +- 3.04	97.51 ± 5.72	98.50 ± 1.20	98.58±1.46
Class 13	97.21 ± 3.11	96.79 ± 3.39	94.03 ± 6.43	90.84 ± 6.34	96.57 ± 3.38	94.24 +- 5.22	96.49 ± 2.89	95.26 ± 7.96	98.80 ± 1.05
Class 14	74.70 ± 11.97	73.67 ± 11.20	55.36 ± 22.73	80.84 ± 7.98	69.22 ± 15.91	75.51 +- 10.94	73.69 ± 7.13	70.92 ± 11.05	82.30± 8.40
Class 15	89.41 ± 5.84	87.64 ± 5.98	94.11 ± 3.33	97.62 ± 2.04	95.32 ± 6.97	84.23 +- 8.03	90.57 ± 5.81	83.92 ± 7.27	90.40± 6.72
seed:1309	87.67774265	87.65555371	83.2214641		88.22691888	85.99508145	0.89345611	87.70547882	92.8810488
seed:1310	83.18633161	81.42231098	80.05584216		78.22340563	81.39827296	0.87775744	83.73550785	92.39474122
seed:1332	85.79907916	85.97289251	87.01392356		84.81906769	84.31611841	0.83918567	88.84081285	91.538618
seed:1330	86.96399845	86.764298	84.65080158		85.14450546	87.80532904	0.8471367	86.6958821	90.14256393
seed:1236 (原为:1220)	85.71587064	84.58608384	85.01506999		84.44185573	82.36903903	0.85641908	83.53026017	88.80937852
seed:1336	85.1075239	86.4665964	89.24761007		90.16475287	83.86309425	0.84872691	85.45884876	90.52532313
seed:1337	84.63785803	84.97254119	88.2934857		82.45409663	87.39113552	0.84621216	87.11192471	91.26310534
seed:1224	83.7909802	84.81536954	82.91266803		86.24655609	84.30687302	0.8475435	84.62676356	87.30977608
seed:1246	82.55949409	83.29912539	84.89857806		78.92420628	82.30617037	0.88339713	83.39342838	88.82786931
seed:1227	84.48253546	82.81651597	87.45770234		84.70442484	80.65864167	0.81683031	82.65009893	93.32112942

Salinas-2shot

SA-2shot	DFSL+NN	DCFSL-2022年	HFSL：2022年	DM-MRN：2023年	FSCP-SSL：2023年	GCCFSL：2024年	CTF-SSCL-2024年	MLPA：2025年	PGAPA:2025年
train time per DataSet(s)	【空缺！】	899.87388	15676.39302	【空缺！】	27637.7247	2133.97637	740.62713	【空缺！】	1296.62445
test time per DataSet(s)		2.67091	173.37068		158.44393	2.51533	3.15556		2.78893
average OA	82.16 ± 2.64	82.04 ± 3.26	80.18 ± 2.76	84.89 ± 3.23	81.40 ± 2.99	81.05 +- 2.42	81.79 ± 3.26	81.63 ± 2.86	**87.55 ± 3.13**
average AA	88.44 ± 1.42	88.56 ± 1.82	86.30 ± 2.13	88.77 ± 2.15	86.53 ± 3.45	86.34 +- 1.67	87.78 ± 2.22	87.83 ± 1.66	**91.91 ± 1.74**
average kappa	80.23 ± 2.90	80.10 ± 3.58	77.96 ± 2.92	83.27 ± 3.53	79.34 ± 3.27	78.9760±2.6751	79.85 ± 3.56	79.62 ± 3.16	**86.1732±3.4457**
Class 0	96.28 ± 8.66	99.31 ± 0.89	91.61 ± 14.01	97.41 ± 2.38	91.01 ± 16.49	97.01 +- 1.69	99.15 ± 1.11	98.52 ± 1.99	99.65 ± 0.45
Class 1	94.59 ± 7.87	95.46 ± 9.77	84.55 ± 8.61	99.13 ± 1.90	87.34 ± 8.59	94.29 +- 8.18	93.87 ± 9.78	92.96 ± 12.20	96.55 ± 5.36
Class 2	80.80 ± 15.92	77.10 ± 13.60	78.68 ± 14.67	96.29 ± 4.39	79.25 ± 7.93	74.15 +- 13.03	81.77 ± 15.11	77.61 ± 14.17	76.98±15.24
Class 3	98.69 ± 2.25	98.89 ± 2.13	98.60 ± 3.24	95.85 ± 3.69	99.00 ± 2.71	97.76 +- 2.75	98.25 ± 3.78	98.15 ± 2.64	**99.55± 1.03**
Class 4	88.30 ± 6.29	85.76 ± 7.00	91.88 ± 6.73	86.94 ± 6.21	95.24 ± 3.94	79.94 +- 9.92	88.68 ± 4.70	86.93 ± 6.26	94.85±3.91
Class 5	98.55 ± 1.68	99.35 ± 0.91	94.52 ± 13.01	96.31 ± 4.28	99.23 ± 0.89	99.26 +- 1.13	98.53 ± 2.20	99.60 ± 0.74	**99.94 ± 0.14**
Class 6	99.30 ± 0.52	98.30 ± 2.05	97.71 ± 3.11	98.47 ± 1.31	96.40 ± 5.42	96.93 +- 3.86	98.99 ± 1.38	98.54 ± 1.03	**99.87 ± 0.07**
Class 7	59.53 ± 19.05	56.44 ± 14.26	72.85 ± 22.53	63.65 ± 11.10	68.51 ± 22.30	63.19 +- 13.78	61.57 ± 16.44	63.33 ± 14.18	**72.24± 13.17**
Class 8	98.95 ± 1.26	98.59 ± 1.16	98.51 ± 2.19	98.35 ± 2.74	99.35 ± 0.79	96.71 +- 3.75	93.66 ± 11.95	98.80 ± 0.97	**99.45 ±1.24**
Class 9	64.16 ± 17.01	64.48 ± 15.64	70.58 ± 20.73	85.12 ± 9.27	66.89 ± 22.33	61.88 +- 17.95	58.68 ± 19.74	58.38 ± 16.05	71.35 ± 17.55
Class 10	90.09 ± 10.39	90.53 ± 9.45	97.76 ± 2.42	98.62 ± 1.29	98.03 ± 2.37	89.05 +- 10.74	92.18 ± 5.87	92.28 ± 9.37	**97.30±3.98**
Class 11	98.05 ± 2.23	98.04 ± 1.86	86.70 ± 10.66	84.09 ± 9.02	92.45 ± 6.05	97.60 +- 1.98	93.56 ± 8.59	96.39 ± 3.70	**99.86 ± 0.25**
Class 12	97.19 ± 4.74	98.63 ± 0.98	92.68 ± 14.98	69.73 ± 18.86	82.31 ± 34.22	93.11 +- 6.02	95.22 ± 7.32	97.74 ± 1.99	96.75±4.51
Class 13	97.13 ± 2.03	96.19 ± 3.93	94.72 ± 4.23	84.13 ± 10.39	96.44 ± 1.88	94.53 +- 3.68	95.32 ± 4.05	98.51 ± 1.79	98.99 ± 1.18
Class 14	68.12 ± 23.25	72.06 ± 17.17	40.88 ± 28.30	75.39 ± 9.49	55.12 ± 30.09	65.18 +- 17.72	70.02 ± 12.13	62.41 ± 21.39	77.46±11.63
Class 15	85.26 ± 5.83	87.86 ± 5.65	88.63 ± 8.36	90.83 ± 5.65	77.93 ± 23.56	80.80 +- 9.62	85.04 ± 13.48	85.18 ± 11.42	89.69± 5.43
seed:1309	83.90298908	86.43362848	81.14867738		82.97687487	83.603527	0.82588683	85.03613879	86.98449082
seed:1310	82.75505111	77.72889439	73.4532414		75.09658576	82.65523042	0.83854927	79.47390798	84.79028412
seed:1332	85.58884966	84.48712498	77.07266577		82.40567869	83.32439877	0.77536647	82.49995379	91.52633233
seed:1330	78.76592048	78.91380298	83.6331035		83.26709429	78.17069338	0.83100726	82.60347154	90.43569884
seed:1236 (原为:1220)	86.699817	87.43922953	82.0230327		86.55378302	83.28927667	0.84350334	85.44466421	90.53551953
seed:1336	77.95441522	78.64576594	80.30205002		79.88428194	79.37039022	0.86097196	77.43312938	80.49244875
seed:1337	82.54062148	84.4945191	79.86764516		81.43704827	84.0989334	0.7812448	84.07675102	86.85879069
seed:1224	82.09142836	81.34647023	81.12464647		80.5368135	79.78446125	0.82180158	83.25970017	86.41884023
seed:1246	80.3482633	80.2299573	81.4980498		78.44427602	77.86198865	0.84298575	78.45536721	89.86265412
seed:1227	80.96382424	80.64033126	81.71802503		83.43161358	78.34075827	0.75738026	78.06347857	87.54829288

Salinas-1shot

SA-1shot	DFSL+NN	DCFSL-2022年	HFSL，2022年	DM-MKN，2023年	FSCP-SSL，2023年	GCCFSL，2024年	CTF-SSCL-2024年	MLPA，2025年	PGAPA:2025年
train time per DataSet(s)	【空缺！】	896.28813	14891.94456	【空缺！】	2685.233882	1789.23007	755.10528	【空缺！】	1293.71043
test time per DataSet(s)		2.81962	141.26512		135.36955	2.63571	3.37544		2.84454
average OA	75.65 ± 2.46	74.81 ± 4.12	68.41 ± 4.76	76.77 ± 5.72	68.30 ± 4.83	73.85 +- 3.43	74.19 ± 3.14	73.37 ± 3.08	**79.47± 3.30**
average AA	82.45 ± 2.95	81.46 ± 3.97	73.29 ± 3.15	80.52 ± 3.67	72.46 ± 3.76	79.66 +- 2.95	80.68 ± 3.59	79.90 ± 3.22	**86.82 ± 1.55**
average kappa	73.06 ± 2.68	72.16 ± 4.53	65.10 ± 5.05	74.40 ± 6.13	64.96 ± 5.03	71.0931 +- 3.7265	71.58 ± 3.38	70.57 ± 3.44	**77.3052±3.5380**
Class 0	97.95 ± 1.98	97.78 ± 2.12	90.18 ± 14.03	94.49 ± 5.98	66.48 ± 23.00	97.98 +- 2.74	99.21 ± 0.79	96.96 ± 3.11	98.82± 1.27
Class 1	92.44 ± 7.94	95.29 ± 5.54	74.82 ± 22.56	90.25 ± 8.95	72.51 ± 21.61	89.83 +- 11.30	91.99 ± 8.00	86.97 ± 13.96	91.72 ± 10.57
Class 2	50.62 ± 10.55	50.52 ± 15.01	42.10 ± 16.40	82.97 ± 18.32	50.62 ± 23.09	43.31 +- 12.26	45.44 ± 16.21	46.23 ± 14.37	54.06±9.31
Class 3	98.92 ± 1.93	99.69 ± 0.30	93.98 ± 7.61	86.73 ± 11.06	95.03 ± 8.44	96.15 +- 6.74	98.67 ± 2.19	98.49 ± 1.54	**99.83±0.15**
Class 4	83.23 ± 7.55	82.16 ± 5.66	90.30 ± 9.22	83.02 ± 10.91	88.24 ± 14.48	78.00 +- 11.07	82.91 ± 11.73	79.94 ± 14.36	90.90±7.87
Class 5	99.08 ± 1.31	99.22 ± 1.20	87.30 ± 28.83	91.77 ± 10.38	89.94 ± 27.82	97.97 +- 2.64	99.56 ± 0.57	98.75 ± 1.59	**99.87 ±0.35**
Class 6	99.05 ± 1.37	98.65 ± 1.62	95.73 ± 6.60	93.92 ± 4.72	82.56 ± 21.21	98.44 +- 0.94	97.55 ± 4.17	97.90 ± 2.06	**99.78 ± 0.32**
Class 7	45.43 ± 24.00	42.68 ± 25.40	55.41 ± 20.41	52.90 ± 24.66	54.25 ± 34.83	44.32 +- 23.90	42.94 ± 18.68	43.14 ± 23.07	**44.63± 18.65**
Class 8	95.06 ± 8.30	93.85 ± 4.88	80.51 ± 20.12	90.65 ± 12.13	87.75 ± 20.07	96.69 +- 2.88	97.68 ± 3.37	95.73 ± 2.71	**99.28 ±1.12**
Class 9	56.88 ± 17.54	51.50 ± 22.62	45.54 ± 28.56	74.94 ± 16.34	51.80 ± 20.41	52.39 +- 17.05	42.79 ± 19.20	47.23 ± 20.67	67.73 ± 15.24
Class 10	70.25 ± 23.35	68.64 ± 27.31	65.42 ± 22.50	94.63 ± 7.32	80.08 ± 25.22	66.55 +- 24.07	79.53 ± 21.56	61.25 ± 21.70	**93.74±4.95**
Class 11	95.91 ± 3.11	92.97 ± 7.89	76.27 ± 27.98	53.49 ± 16.47	69.15 ± 26.69	92.85 +- 10.33	88.18 ± 12.42	91.43 ± 5.00	**96.43± 8.91**
Class 12	98.49 ± 1.40	97.38 ± 2.94	96.92 ± 4.37	79.34 ± 15.90	87.62 ± 25.09	89.60 +- 12.32	89.78 ± 25.20	95.45 ± 4.88	97.25±2.44
Class 13	89.32 ± 21.33	90.42 ± 10.94	71.80 ± 22.38	65.66 ± 26.14	77.51 ± 25.64	91.38 +- 8.60	88.40 ± 25.35	95.43 ± 4.94	98.58 ± 1.72
Class 14	63.66 ± 30.85	66.92 ± 31.48	45.95 ± 18.35	72.16 ± 20.16	50.27 ± 33.76	63.16 +- 30.95	65.06 ± 21.27	62.89 ± 30.91	76.05±22.25
Class 15	82.92 ± 6.76	75.67 ± 16.00	60.48 ± 19.65	81.48 ± 9.49	55.48 ± 18.72	75.91 +- 19.41	81.17 ± 12.28	80.62 ± 6.34	80.42± 10.37
seed:1309	79.52987267	80.22841092	71.26568477		71.41906751	78.91634173	0.72485355	75.98174191	84.01862769
seed:1310	73.24118049	72.60362575	67.69907416		67.51612367	69.76327315	0.771663	70.71498531	73.57566574
seed:1332	76.78007133	79.19169146	66.83791326		64.45216491	75.76552769	0.72416979	79.23973906	81.70679874
seed:1330	73.93047881	72.02890248	68.49001164		70.07188661	68.80047308	0.76547225	71.42461146	80.79759023
seed:1236 (原为:1220)	79.67401549	80.99162863	72.8401678		68.46783583	77.53035315	0.72407739	76.65995232	84.41224844
seed:1336	72.0991259	67.44220428	59.33324709		61.33091863	71.07719032	0.81422209	69.49716334	77.83896661
seed:1337	75.96326206	76.39199453	72.7182008		72.31718811	75.81172731	0.70101454	69.77990501	79.59640013
seed:1224	73.79187995	71.86627982	72.7182008		70.11623824	70.82771238	0.71788664	72.11575777	75.63247279
seed:1246	76.95747787	74.87110306	60.37920648		60.39214237	77.1718441	0.73557186	74.96719827	77.30120304
seed:1227	74.55324968	72.5241624	71.82562416		76.94084601	72.79766415	0.74028422	73.34651562	79.7941345

Botswana-5shot

Botswana-5shot	DFSL+NN	DCFSL-2022年	HFSL，2022年	DM-MKN，2023年	FSCP-SSL，2023年	GCCFSL，2024年	CTF-SSCL-2024年	MLPA，2025年	PGAPA:2025年
train time per DataSet(s)	290.17602	581.81145	1626.26683	116.59	2854.27055	1472.79012	384.52205	654.81142	1030.54856
test time per DataSet(s)	0.14846	0.144	0.43386	3.40	0.44905	0.13953	0.15554	0.14	0.159
average OA	96.48 +- 0.84	96.90 ± 1.03	94.56 ± 1.61	92.55 ± 1.79	95.81 ± 1.43	96.24 ± 0.87	96.05 +- 1.32	96.65 ± 1.04	**98.22 ± 1.31**
average AA	96.58 +- 0.83	97.02 ± 1.13	94.77 ± 1.33	93.32 ± 1.76	95.58 ± 1.46	96.00 ± 1.01	96.04 +- 1.41	96.74 ± 1.08	**98.231 ± 1.36**
average kappa	96.18+- 0.90	96.63 ± 1.12	94.10 ± 1.73	91.93 ± 1.94	95.45 ± 1.55	95.9290 ± 0.9392	95.71 +- 1.43	96.37 ± 1.12	**98.0655 ±1.4181**
Class 0	99.74 +- 0.59	99.77 ± 0.68	**100.00 ± 0.00**	94.75 ± 6.43	**100.00 ± 0.00**	99.77 ± 0.56	99.66 +- 0.78	99.85 ± 0.35	99.89 ± 0.24
Class 1	100.00 +- 0.00	**100.00 ± 0.00**	96.98 ± 9.06	99.90 ± 0.31	89.27 ± 13.98	99.27 ± 1.48	99.48 +- 1.07	99.38 ± 1.06	**100.00 ± 0.00**
Class 2	**98.54 +- 2.08**	98.41 ± 1.70	97.15 ± 4.02	97.85 ± 3.12	97.56 ± 4.02	97.97 ± 2.06	96.91 +- 4.34	95.89 ± 6.22	98.13 ± 5.22
Class 3	99.14 +- 1.04	99.33 ± 0.86	91.00 ± 12.61	**99.86 ± 0.22**	93.76 ± 10.41	97.00 ± 3.09	98.19 +- 2.39	98.10 ± 3.36	98.95 ± 1.60
Class 4	82.77 +- 10.24	86.40 ± 7.93	84.77 ± 9.19	75.34 ± 10.60	90.64 ± 6.82	81.97 ± 7.52	82.16 +- 7.39	82.69 ± 7.41	**95.49 ± 3.05**
Class 5	90.00 +- 11.33	89.85 ± 8.64	86.44 ± 8.61	89.77 ± 6.78	83.48 ± 11.89	93.22 ± 6.67	91.44 +- 8.64	**94.28 ± 8.13**	**94.77 ± 7.53**
Class 6	98.74 +- 2.15	99.17 ± 1.37	95.47 ± 5.70	**100.00 ± 0.00**	97.05 ± 3.33	99.29 ± 0.70	98.82 +- 2.54	99.69 ± 0.55	98.90 ± 2.49
Class 7	99.04 +- 2.88	**99.75 ± 0.76**	93.74 ± 11.44	91.16 ± 11.38	98.18 ± 5.45	99.70 ± 0.76	98.23 +- 4.50	98.69 ± 2.71	100.00 ± 0.00
Class 8	95.40 +- 2.01	96.47 ± 3.76	93.75 ± 6.07	91.04 ± 9.23	95.08 ± 7.09	95.89 ± 3.92	**96.54 +- 3.74**	96.25 ± 3.48	96.63 ± 5.37
Class 9	99.71 +- 0.49	99.55 ± 0.72	99.26 ± 1.65	99.88 ± 0.26	99.71 ± 0.74	99.59 ± 0.86	98.89 +- 1.59	99.84 ± 0.33	**99.92 ±0.16**
Class 10	98.90 +- 1.05	99.17 ± 1.05	96.33 ± 5.17	85.83 ± 10.04	**99.57 ± 0.68**	99.07 ± 0.87	96.73 +- 4.36	98.37 ± 1.93	98.40 ±1.57
Class 11	98.75 +- 1.93	99.49 ± 0.54	99.94 ± 0.17	93.07 ± 9.06	98.69 ± 3.23	98.58 ± 2.68	99.32 +- 0.84	98.75 ± 1.78	**99.89 ± 0.23**
Class 12	99.54 +- 0.61	97.76 ± 3.49	97.26 ± 4.80	91.90 ± 9.69	99.73 ± 0.54	97.53 ± 2.39	99.09 +- 1.79	99.24 ± 1.55	**99.85± 0.35**
Class 13	91.89 +- 6.69	93.22 ± 7.28	94.67 ± 6.88	**96.11 ± 7.24**	95.33 ± 6.32	85.11 ± 8.88	89.11 +- 6.57	93.33 ± 6.46	94.33 ± 6.69
seed:1309	97.07363121	96.53870359	96.47577093	0.932976715	93.6123348	97.01069855	0.96633103	94.02139711	98.30081812
seed:1310	97.07363121	97.54562618	94.87098804	0.951227187	96.09817495	96.57016992	0.9845815	97.19949654	99.43360604
seed:1332	97.01069855	96.06670862	93.14033984	0.942731278	93.92699811	94.99685337	0.94430459	97.32536186	96.69603524
seed:1330	95.28005035	95.56324733	94.39899308	0.935179358	93.76966646	95.59471366	0.9408433	96.8533669	95.50031466
seed:1236 (原为:1220)	97.57709251	98.23788546	95.68911265	0.887665198	96.8533669	97.41976086	0.97073631	96.00377596	99.30774072
seed:1336	96.97923222	95.75204531	94.87098804	0.912838263	95.56324733	94.83952171	0.95342983	98.04908748	96.88483323
seed:1337	96.00377596	96.09817495	94.1157961	0.935808685	97.45122719	96.79043424	0.96475771	96.50723726	98.74134676
seed:1224	94.83952171	96.8533669	90.59156702	0.90874764	96.57016992	95.72057898	0.95563247	96.63310258	98.61548143
seed:1246	96.82190057	98.77281309	95.8464443	0.931718062	97.13656388	97.19949654	0.97419761	96.47577093	99.43360604
seed:1227	96.09817495	97.54562618	95.59471366	0.916299559	97.10509755	96.28697294	0.94996853	97.45122719	99.24480806

Botswana-4shot

Botswana-4shot	DFSL+NN	DCFSL-2022年	HFSL，2022年	DM-MKN，2023年	FSCP-SSL，2023年	GCCFSL，2024年	CTF-SSCL-2024年	MLPA，2025年	PGAPA:2025年
train time per DataSet(s)	758.1925	588.96043	1636.47192	缺失!	2881.99636	1516.88411	385.79938	642.70551	1030.19631
test time per DataSet(s)	0.33694	0.147	0.42013		0.42706	0.13854	0.156	0.13716	0.173
average OA	95.54 ± 1.46	95.98 ± 1.23	94.19 ± 2.49	88.82 ± 2.46	93.32 ± 2.36	95.18 ± 1.12	94.93 +- 0.85	95.30 ± 1.34	**97.16 ±1.35**
average AA	95.67 ± 1.40	96.13 ± 1.09	94.51 ± 1.97	89.49 ± 2.14	93.57 ± 2.28	95.21 ± 1.13	94.94 +- 0.93	95.49 ± 1.20	**97.21± 1.27**
average kappa	95.16 ± 1.58	95.64 ± 1.33	93.71 ± 2.69	87.89 ± 2.66	92.76 ± 2.54	94.7767 ± 1.2120	94.50 +- 0.92	94.90 ± 1.44	**96.9272 ±1.4681**
Class 0	99.74 ± 0.45	99.85 ± 0.45	100.00 ± 0.00	86.13 ± 17.41	100.00 ± 0.00	99.85 ± 0.34	98.87 +- 2.47	99.85 ± 0.18	99.89 ± 0.24
Class 1	99.79 ± 0.41	100.00 ± 0.00	96.29 ± 5.94	98.45 ± 3.97	89.90 ± 16.76	99.07 ± 1.26	99.07 +- 1.87	99.69 ± 0.66	**99.90 ± 0.31**
Class 2	97.29 ± 3.16	95.10 ± 7.91	95.95 ± 4.00	97.17 ± 5.26	92.43 ± 8.16	97.04 ± 2.86	96.19 +- 5.26	97.04 ± 1.49	95.99 ± 6.52
Class 3	97.16 ± 5.92	97.58 ± 2.32	93.51 ± 9.78	96.82 ± 6.24	88.29 ± 15.05	97.96 ± 2.37	97.77 +- 2.96	97.73 ± 2.46	98.86 ± 1.83
Class 4	79.21 ± 10.60	82.30 ± 10.22	84.30 ± 11.41	71.28 ± 10.78	89.25 ± 9.49	80.08 ± 13.60	77.06 +- 12.49	77.85 ± 11.82	**93.92 ± 6.08**
Class 5	88.75 ± 13.46	90.00 ± 7.08	88.49 ± 11.82	73.43 ± 11.88	79.25 ± 12.53	86.45 ± 10.04	91.70 +- 5.48	90.34 ± 10.87	**88.91±9.35**
Class 6	98.43 ± 2.23	98.86 ± 1.00	95.18 ± 5.32	99.88 ± 0.35	94.16 ± 6.00	98.12 ± 3.78	96.24 +- 6.96	98.71 ± 1.41	99.29± 1.20
Class 7	99.25 ± 1.94	98.94 ± 3.17	95.88 ± 8.41	83.57 ± 13.60	96.48 ± 4.93	99.70 ± 0.60	98.59 +- 2.13	95.68 ± 8.43	97.14 ±8.59
Class 8	94.19 ± 8.87	94.71 ± 6.61	86.94 ± 15.41	89.68 ± 11.52	88.45 ± 13.02	94.55 ± 3.94	95.00 +- 4.01	92.45 ± 9.11	96.06 ± 4.54
Class 9	99.30 ± 1.23	99.80 ± 0.38	99.75 ± 0.61	96.23 ± 11.18	99.59 ± 1.23	97.66 ± 3.26	99.59 +- 0.73	99.88 ± 0.26	**99.92 ±0.25**
Class 10	98.67 ± 1.04	98.97 ± 0.91	96.01 ± 7.39	86.38 ± 8.52	96.01 ± 4.07	97.67 ± 1.78	96.91 +- 2.39	98.41 ± 1.54	98.11 ±1.88
Class 11	97.91 ± 2.29	99.66 ± 0.68	99.89 ± 0.34	85.31 ± 17.95	98.64 ± 2.30	99.32 ± 0.83	98.76 +- 1.49	99.32 ± 0.71	**99.83 ± 0.26**
Class 12	99.09 ± 1.21	98.45 ± 2.18	97.69 ± 6.56	96.21 ± 5.19	99.36 ± 1.15	98.33 ± 2.31	96.86 +- 3.23	98.75 ± 2.11	**99.92±0.15**
Class 13	90.66 ± 6.80	91.65 ± 5.80	93.30 ± 7.56	92.31 ± 7.89	98.24 ± 1.98	87.14 ± 6.45	86.48 +- 6.00	91.21 ± 5.92	93.19 ± 7.19
seed:1309	96.86716792	96.96115288	89.78696742		88.34586466	95.26942356	0.93640351	95.77067669	97.65037594
seed:1310	95.42606516	96.89849624	93.6716792		91.66666667	96.55388471	0.96177945	95.98997494	97.71303258
seed:1332	95.86466165	96.05263158	93.85964912		92.66917293	95.42606516	0.95582707	94.5802005	96.17794486
seed:1330	95.83333333	96.05263158	95.98997494		94.23558897	94.4235589	0.95175439	95.39473684	95.70802005
seed:1236 (原为:1220)	97.08646617	97.68170426	96.80451128		97.7443609	96.42857143	0.94360902	93.70300752	98.08897243
seed:1336	93.23308271	93.04511278	89.7556391		92.41854637	92.35588972	0.94486216	97.33709273	96.86716792
seed:1337	94.98746867	94.95614035	96.74185464		94.48621554	95.39473684	0.9608396	93.45238095	98.40225564
seed:1224	95.55137845	95.39473684	93.85964912		94.26691729	95.64536341	0.95551378	95.77067669	98.27694236
seed:1246	97.65037594	96.67919799	94.92481203		95.08145363	95.4887218	0.94298246	93.73433584	98.59022556
seed:1227	92.9197995	96.0839599	96.52255639		92.3245614	94.7994987	0.93953634	97.27443609	94.17293233

Botswana-3shot

Botswana-3shot	DFSL+NN	DCFSL-2022年	HFSL：2022年	DM-MRN：2023年	FSCP-SSL：2023年	GCCFSL：2024年	CTF-SSCL-2024年	MLPA：2025年	PGAPA：2025年
train time per DataSet(s)	751.7711	583.23487	1647.09559	缺失！	2726.32088	1472.51226	381.32142	642.64696	1020.2133
test time per DataSet(s)	0.45355	0.1435	0.43605		0.43229	0.14551	0.158	0.14164	0.178
average OA	94.44 ± 1.94	94.67 ± 1.36	88.83 ± 3.45	86.91 ± 1.93	90.19 ± 3.24	93.72 ± 1.85	93.31 +- 1.65	94.42 ± 1.98	**96.90 ±1.31**
average AA	94.67 ± 1.64	94.83 ± 1.04	89.78 ± 2.78	87.86 ± 1.64	90.44 ± 2.96	93.75 ± 1.64	93.50 +- 1.48	94.82 ± 1.69	**96.95±1.21**
average kappa	93.97 ± 2.10	94.22 ± 1.47	87.91 ± 3.72	85.83 ± 2.08	89.37 ± 3.50	93.2038 ± 2.0051	92.75 +- 1.79	93.95 ± 2.13	**96.6404 ±1.4249**
Class 0	99.85 ± 0.45	99.93 ± 0.15	99.74 ± 0.67	91.09 ± 10.70	99.81 ± 0.56	99.74 ± 0.58	99.48 +- 0.81	99.63 ± 0.56	99.70 ± 0.69
Class 1	99.18 ± 1.10	99.18 ± 2.13	92.24 ± 12.75	99.59 ± 0.68	87.24 ± 14.22	99.69 ± 0.65	99.90 +- 0.31	100.00 ± 0.00	**100.00 ± 0.00**
Class 2	91.90 ± 8.28	95.93 ± 3.31	88.55 ± 18.07	90.40 ± 7.88	91.61 ± 10.35	94.60 ± 7.83	96.25 +- 3.71	94.96 ± 4.08	97.54 ± 4.37
Class 3	99.15 ± 1.21	97.03 ± 4.16	86.04 ± 12.88	91.56 ± 12.10	75.09 ± 22.42	95.57 ± 5.70	97.45 +- 5.43	98.44 ± 1.86	98.77 ± 3.22
Class 4	76.95 ± 11.90	77.71 ± 15.50	80.04 ± 12.40	71.62 ± 9.40	88.91 ± 7.75	71.84 ± 18.44	71.84 +- 12.04	74.10 ± 20.15	**91.58 ± 8.63**
Class 5	87.14 ± 11.14	88.20 ± 11.86	65.60 ± 13.13	68.76 ± 12.53	73.68 ± 18.05	88.72 ± 11.69	86.35 +- 9.35	85.75 ± 13.69	**90.15±9.77**
Class 6	96.68 ± 4.12	98.55 ± 1.69	94.57 ± 5.16	95.82 ± 5.83	93.24 ± 6.49	95.59 ± 5.83	98.24 +- 3.54	97.81 ± 3.34	99.53± 0.62
Class 7	99.10 ± 2.70	98.20 ± 5.40	92.40 ± 13.13	90.70 ± 8.59	92.65 ± 8.09	96.60 ± 6.19	97.35 +- 5.45	97.80 ± 3.78	97.20±8.40
Class 8	93.22 ± 6.64	92.67 ± 7.17	70.93 ± 28.81	81.90 ± 14.08	78.55 ± 21.30	92.93 ± 6.52	89.61 +- 10.64	94.92 ± 6.54	95.21 ± 4.37
Class 9	98.53 ± 3.64	98.65 ± 2.10	98.98 ± 2.08	99.35 ± 1.19	99.43 ± 1.71	98.04 ± 3.74	95.84 +- 8.43	98.04 ± 4.07	**99.92 ±0.24**
Class 10	98.64 ± 1.58	97.55 ± 3.94	95.56 ± 7.98	86.16 ± 10.16	96.16 ± 7.22	97.98 ± 1.85	96.19 +- 3.26	96.56 ± 4.27	96.26 ±2.54
Class 11	99.21 ± 0.80	98.31 ± 1.49	97.53 ± 4.27	82.13 ± 13.62	97.02 ± 4.45	99.49 ± 0.92	96.63 +- 3.90	98.37 ± 2.08	**99.78 ± 0.28**
Class 12	96.42 ± 4.01	96.57 ± 3.89	98.49 ± 3.45	90.30 ± 11.95	97.25 ± 5.08	97.81 ± 3.48	98.57 +- 3.44	98.15 ± 1.75	**99.96±0.11**
Class 13	89.46 ± 5.65	89.13 ± 7.19	96.30 ± 5.26	90.65 ± 8.30	95.54 ± 4.22	83.91 ± 8.81	85.33 +- 5.31	92.93 ± 6.00	91.74± 5.78
seed:1309	92.85714286	93.94884591	83.03181535		85.65190268	91.484716l6	0.91703057	92.88833437	96.63131628
seed:1310	95.25888958	94.66625078	84.46662508		84.68496569	95.47723019	0.95134124	91.23518403	98.12850905
seed:1332	97.19276357	95.00935745	91.79663132		91.20399251	95.35246413	0.95446039	92.29569557	96.63131628
seed:1330	92.79475983	93.51216469	89.33250156		87.77292576	92.04616344	0.94198378	95.53961323	96.91203993
seed:1236 (原为:1220)	95.85152838	95.47723019	92.66999376		94.54148472	94.72863381	0.9176544	92.66999376	98.47161572
seed:1336	90.33063007	91.32875858	86.4628821		91.20399251	91.35995009	0.92326887	97.09918902	96.41297567
seed:1337	95.04054897	95.60199626	92.07735496		93.82407985	96.6625078	0.95851528	94.79101684	97.19276357
seed:1224	94.07361198	95.07174049	88.89582034		91.07922645	92.10854648	0.92857143	94.82220836	95.13412352
seed:1246	96.6625078	95.82033687	93.29382408		93.44978166	95.19650655	0.92981909	95.38365565	98.93948846
seed:1227	94.3231441	96.22582658	86.275733		88.49033063	92.82595134	0.90829694	97.47348721	94.54148472

Botswana-2shot

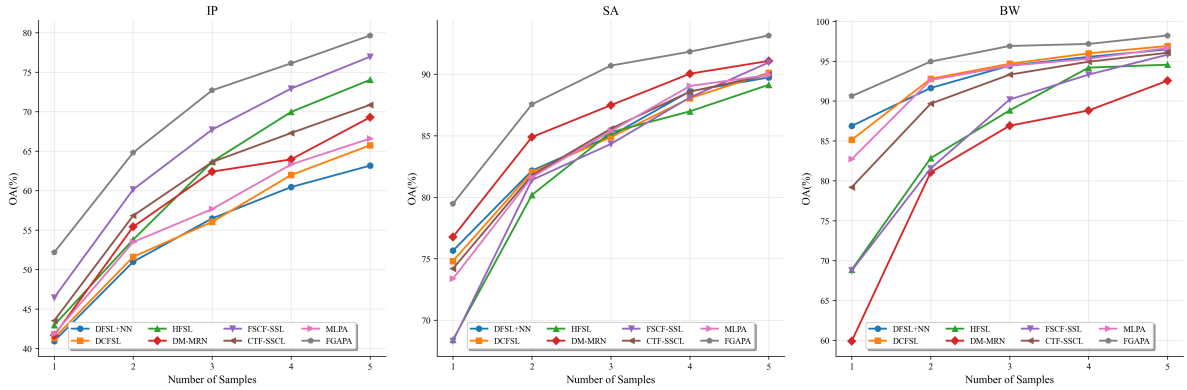
Botswana-2shot	DFSL+NN	DCFSL-2022年	HFSL：2022年	DM-MRN：2023年	FSCP-SSL：2023年	GCCFSL：2024年	CTF-SSCL-2024年	MLPA：2025年	PGAPA：2025年
train time per DataSet(s)	291.41512	584.45027	1635.11273	缺失！	2730.77842	1473.33883	381.63695	645.48966	1019.75608
test time per DataSet(s)	0.145	0.14314	0.4277		0.42324	0.14252	0.16721	0.1424	0.15914
average OA	91.64 +- 2.69	92.79 ± 1.92	82.84 ± 3.75	81.07 ± 3.70	81.55 ± 3.14	90.45 ± 2.51	89.67 +- 3.57	92.63 ± 1.55	**94.95 ±2.15**
average AA	92.05 +- 2.59	93.10 ± 1.84	84.21 ± 3.43	81.55 ± 3.80	82.36 ± 2.80	91.19 ± 2.16	90.33 +- 3.41	92.79 ± 1.74	**95.22±2.05**
average kappa	90.94 +- 2.90	92.19 ± 2.07	81.44 ± 4.02	79.50 ± 4.01	80.02 ± 3.37	89.6675 ± 2.7115	88.82 +- 3.86	92.01 ± 1.67	**94.5250 ±2.3329**
Class 0	99.93 +- 0.15	99.96 ± 0.11	97.57 ± 7.15	79.22 ± 21.00	99.89 ± 0.34	99.85 ± 0.34	99.78 +- 0.56	99.74 ± 0.47	99.96± 0.11
Class 1	98.18 +- 4.54	98.69 ± 2.56	88.08 ± 17.02	96.77 ± 4.40	82.02 ± 20.20	98.38 ± 3.50	100.00 +- 0.00	96.16 ± 6.04	**100.00 ± 0.00**
Class 2	93.09 +- 9.69	94.98 ± 2.63	83.21 ± 18.85	85.70 ± 11.76	85.18 ± 12.37	92.09 ± 7.70	89.40 +- 7.74	92.33 ± 10.51	97.67 ± 4.05
Class 3	96.85 +- 4.57	93.05 ± 9.18	68.59 ± 21.25	93.10 ± 12.21	62.07 ± 22.17	93.80 ± 7.60	92.49 +- 9.20	96.34 ± 5.59	96.67 ± 7.36
Class 4	70.30 +- 17.32	71.09 ± 12.27	70.90 ± 19.25	57.04 ± 9.79	72.88 ± 20.41	66.22 ± 15.84	65.47 +- 14.09	69.51 ± 15.11	**90.79 ± 7.39**
Class 5	82.81 +- 8.63	86.97 ± 9.00	61.12 ± 15.28	56.93 ± 17.50	56.93 ± 18.54	76.44 ± 13.25	73.82 +- 17.04	83.33 ± 8.40	**85.36±12.40**
Class 6	93.23 +- 6.88	95.21 ± 7.34	90.00 ± 7.49	95.56 ± 6.09	89.11 ± 5.63	93.23 ± 5.93	91.40 +- 11.85	96.46 ± 6.05	94.79± 6.76
Class 7	94.93 +- 8.41	96.37 ± 6.13	88.81 ± 19.04	75.12 ± 10.56	90.05 ± 16.03	96.87 ± 3.79	92.69 +- 10.97	93.23 ± 11.27	97.11±5.94
Class 8	84.10 +- 13.46	91.19 ± 6.57	65.77 ± 25.74	78.97 ± 10.02	69.65 ± 28.67	84.29 ± 14.83	88.11 +- 11.45	93.88 ± 4.74	90.51±7.67
Class 9	98.37 +- 2.80	97.20 ± 6.81	99.76 ± 0.61	93.50 ± 9.85	98.05 ± 5.72	96.91 ± 6.81	93.62 +- 11.36	98.37 ± 2.43	**94.67 ±14.12**
Class 10	95.45 +- 6.23	98.58 ± 1.22	81.29 ± 11.88	88.94 ± 11.33	83.04 ± 14.17	95.25 ± 3.94	95.94 +- 4.30	95.12 ± 5.33	95.31 ±4.70
Class 11	97.21 +- 2.79	97.93 ± 2.47	93.35 ± 10.14	68.04 ± 20.17	81.23 ± 23.12	97.26 ± 3.55	97.82 +- 2.93	98.72 ± 1.30	**99.50 ±1.16**
Class 12	97.93 +- 2.23	92.56 ± 6.66	93.65 ± 9.41	93.27 ± 8.11	86.88 ± 20.35	96.02 ± 4.95	96.09 +- 3.82	97.67 ± 1.95	**99.81±0.30**
Class 13	86.34 +- 12.67	89.68 ± 5.77	96.77 ± 5.00	79.46 ± 21.57	96.13 ± 5.21	90.11 ± 7.62	87.96 +- 5.67	88.17 ± 7.97	90.86±5.32
seed:1309	92.26708075	91.95652174	80.55900621		78.44720497	89.22360248	0.92236025	93.50931677	96.21118012
seed:1310	86.98757764	90.83850932	83.32298137		80.83850932	88.01242236	0.94782609	91.89440994	96.39751553
seed:1332	91.92546584	93.54037267	87.36024845		85.74534161	89.44099379	0.86521739	91.24223602	93.81987578
seed:1330	92.67080745	91.18012422	82.60869565		81.61490683	87.82608696	0.87546584	93.22981366	95.62111801
seed:1236 (原为:1220)	94.56521739	94.09937888	86.73913043	缺失！	84.00621118	94.09937888	0.86304348	90.62111801	96.98757764
seed:1336	88.35403727	92.04968944	85.31055901		75.80745342	90.49689441	0.8673913	94.53416149	94.34782609
seed:1337	93.32298137	95.0310559	86.52173913		84.09937888	93.88198758	0.93478261	91.24223602	96.45962733
seed:1224	88.63354037	89.47204969	76.64596273		80.40372671	87.14285714	0.8447205	94.65838509	94.00621118
seed:1246	95.86956522	95.96273292	76.42857143		85.65217391	93.85093168	0.93881988	90.83850932	96.27329193
seed:1227	91.77018634	93.78881988	82.88819876		78.85093168	90.55900621	0.90776398	94.50310559	89.34782609

Botswana-1shot

Botswana-1shot	DFSL+NN	DCFSL-2022年	HFSL：2022年	DM-MRN：2023年	FSCP-SSL：2023年	GCCFSL：2024年	CTF-SSCL-2024年	MLPA：2025年	PGAPA：2025年
train time per DataSet(s)	291.32242	580.17656	1634.89161	缺失！	2854.09322	1409.85607	713.50491	639.9531	1024.33517
test time per DataSet(s)	0.144	0.14251	0.41402		0.44536	0.13953	0.315	0.1374	0.169
average OA	86.88 +- 3.37	85.14 ± 2.96	68.85 ± 5.00	59.91 ± 4.66	68.76 ± 4.89	81.69 ± 3.92	79.20 +- 3.64	82.72 ± 2.81	**90.62 ±1.71**
average AA	87.52 +- 2.97	85.74 ± 2.29	70.19 ± 4.63	61.64 ± 4.05	70.22 ± 4.92	82.73 ± 3.13	80.80 +- 3.36	83.23 ± 2.72	**91.01±1.82**
average kappa	85.80 +- 3.64	83.92 ± 3.19	66.33 ± 5.37	56.66 ± 5.01	66.21 ± 5.27	80.1937 ± 4.2256	77.50 +- 3.93	81.29 ± 3.04	**89.8455 ±1.8526**
Class 0	99.85 +- 0.34	99.96 ± 0.11	100.00 ± 0.00	73.98 ± 18.39	98.85 ± 3.34	99.48 ± 0.67	100.00 +- 0.00	99.70 ± 0.78	100.00± 0.00
Class 1	98.30 +- 3.00	97.80 ± 3.19	64.10 ± 21.31	84.60 ± 12.19	71.60 ± 24.66	97.80 ± 4.17	97.40 +- 7.47	94.70 ± 6.36	**100.00 ± 0.00**
Class 2	72.12 +- 27.44	74.36 ± 23.17	61.28 ± 27.29	49.24 ± 16.41	70.32 ± 28.17	74.68 ± 27.82	72.12 +- 23.87	76.80 ± 25.06	88.56 ± 7.50
Class 3	88.97 +- 5.66	94.58 ± 4.73	48.55 ± 20.71	82.20 ± 10.57	45.42 ± 19.34	89.16 ± 7.52	90.37 +- 13.51	80.05 ± 12.08	94.67± 4.88
Class 4	62.99 +- 22.65	54.44 ± 22.43	60.56 ± 24.59	37.91 ± 15.62	57.57 ± 21.21	56.49 ± 22.60	42.50 +- 14.09	51.87 ± 23.46	**79.07 ± 10.95**
Class 5	74.66 +- 17.77	78.13 ± 15.07	37.20 ± 16.27	30.49 ± 5.06	46.68 ± 18.71	64.29 ± 21.19	58.73 +- 24.19	73.17 ± 10.52	**74.03±18.40**
Class 6	95.31 +- 4.99	93.10 ± 7.83	82.13 ± 10.67	91.09 ± 7.14	87.25 ± 10.47	89.69 ± 8.73	91.32 +- 9.26	96.40 ± 6.26	93.76± 6.86
Class 7	87.92 +- 9.43	67.23 ± 19.18	62.82 ± 22.08	44.21 ± 13.97	60.79 ± 29.59	76.88 ± 19.63	69.46 +- 15.66	64.26 ± 25.81	79.41±20.16
Class 8	87.70 +- 15.37	79.17 ± 28.85	54.03 ± 25.91	41.63 ± 14.27	51.28 ± 22.86	71.95 ± 27.50	71.50 +- 25.11	78.21 ± 16.62	90.99±7.28
Class 9	88.91 +- 16.70	92.47 ± 9.24	84.45 ± 20.96	57.57 ± 19.03	77.04 ± 23.68	86.23 ± 12.97	76.76 +- 19.94	90.93 ± 10.71	**90.04 ±17.32**
Class 10	93.26 +- 7.03	97.37 ± 2.70	64.24 ± 25.92	67.01 ± 21.86	64.87 ± 22.24	96.58 ± 3.55	90.13 +- 11.33	92.40 ± 5.61	95.39 ±5.17
Class 11	95.94 +- 4.81	97.83 ± 2.40	82.33 ± 13.97	68.83 ± 13.99	75.61 ± 21.47	97.17 ± 1.92	89.94 +- 7.27	97.56 ± 2.89	**98.67 ±2.36**
Class 12	93.00 +- 7.67	89.81 ± 7.96	83.45 ± 17.80	69.93 ± 12.57	79.03 ± 18.08	77.12 ± 15.61	89.36 +- 6.87	86.89 ± 9.33	**99.51±0.75**
Class 13	86.38 +- 8.13	84.15 ± 8.09	97.55 ± 4.69	64.26 ± 16.56	96.70 ± 3.73	80.74 ± 15.09	91.60 +- 5.54	82.34 ± 9.55	90.11±5.71
seed:1309	88.86827458	87.87878788	66.57390229		68.76932591	78.29313544	0.76345083	79.87012987	89.20841064
seed:1310	82.12739641	82.71490414	69.66604824		58.71985158	78.35497835	0.77860235	82.28200371	88.65182437
seed:1332	90.2288188	86.85837972	80.33395176		67.53246753	83.08596166	0.7585034	80.82869511	88.71366729
seed:1330	87.69325912	85.93073593	73.09833024		70.16079159	85.86889301	0.84570192	78.35497835	91.15646259
seed:1236 (原为:1220)	84.44650588	87.38404453	70.40816327		74.21150278	82.09647495	0.80983302	85.93073593	90.32158318
seed:1336	88.18800247	84.69387755	70.5318491		66.32653061	85.03401361	0.78849722	83.48794063	90.78540507
seed:1337	82.40568955	78.1694496	64.31663575		77.05627706	74.48979592	0.75108225	88.28076685	94.68150897
seed:1224	90.63079777	85.15769944	61.81199753		70.56277056	81.66357452	0.79128015	84.1991342	91.03277675
seed:1246	83.0550402	83.67346939	64.93506494		70.47000618	79.65367965	0.76592455	83.2096475	89.70315399
seed:1227	91.18738404	88.96103896	66.85219542		63.82189239	88.34260977	0.86703772	80.73593074	91.99134199

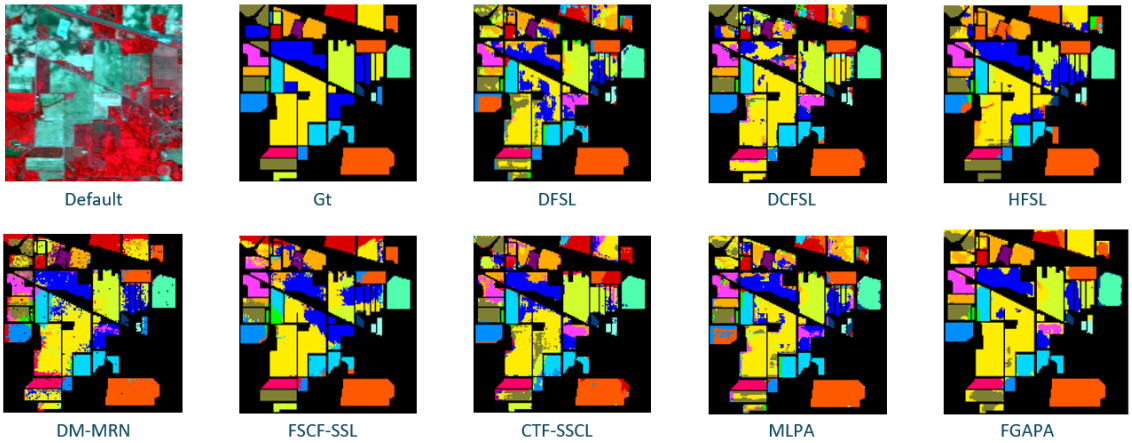
About the paper images

We apologize for the lack of clarity caused by the inability to display images across columns due to the length constraints of the paper.



Classification map

Indian_pines



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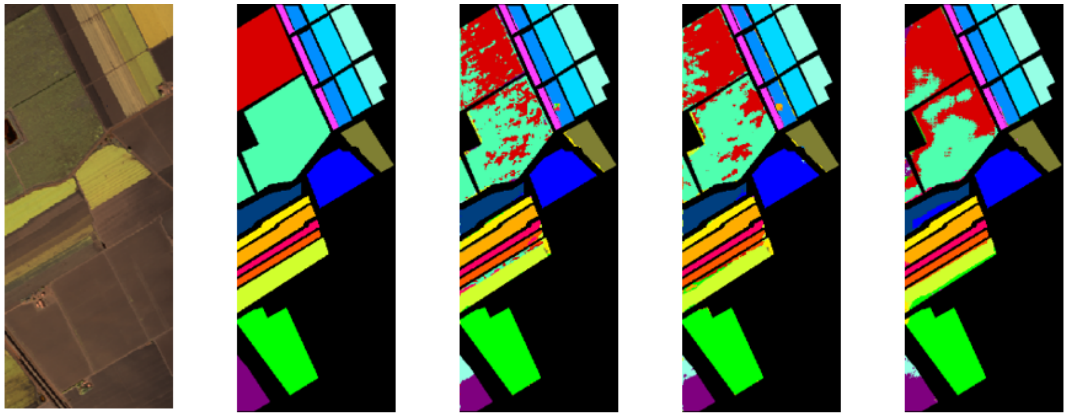
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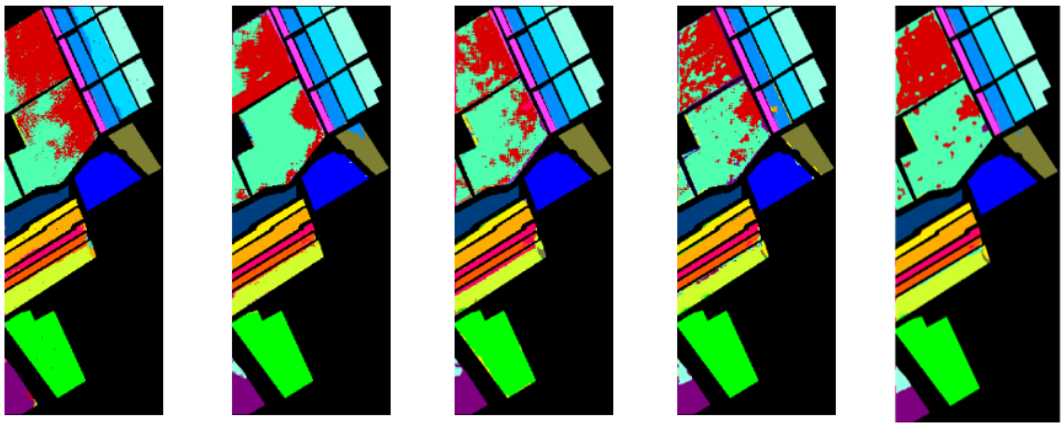
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CTF-SSCL
MLPA
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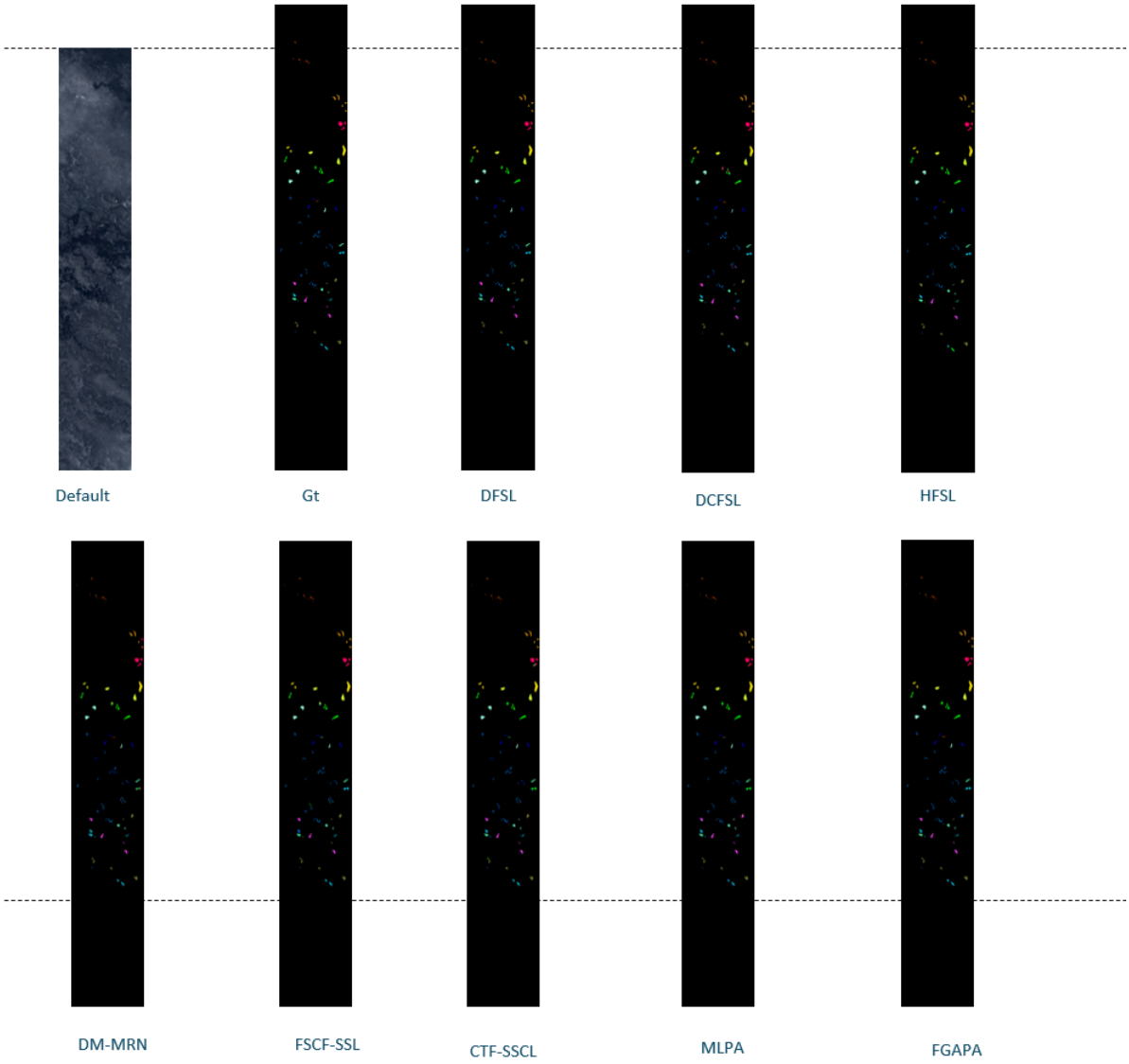
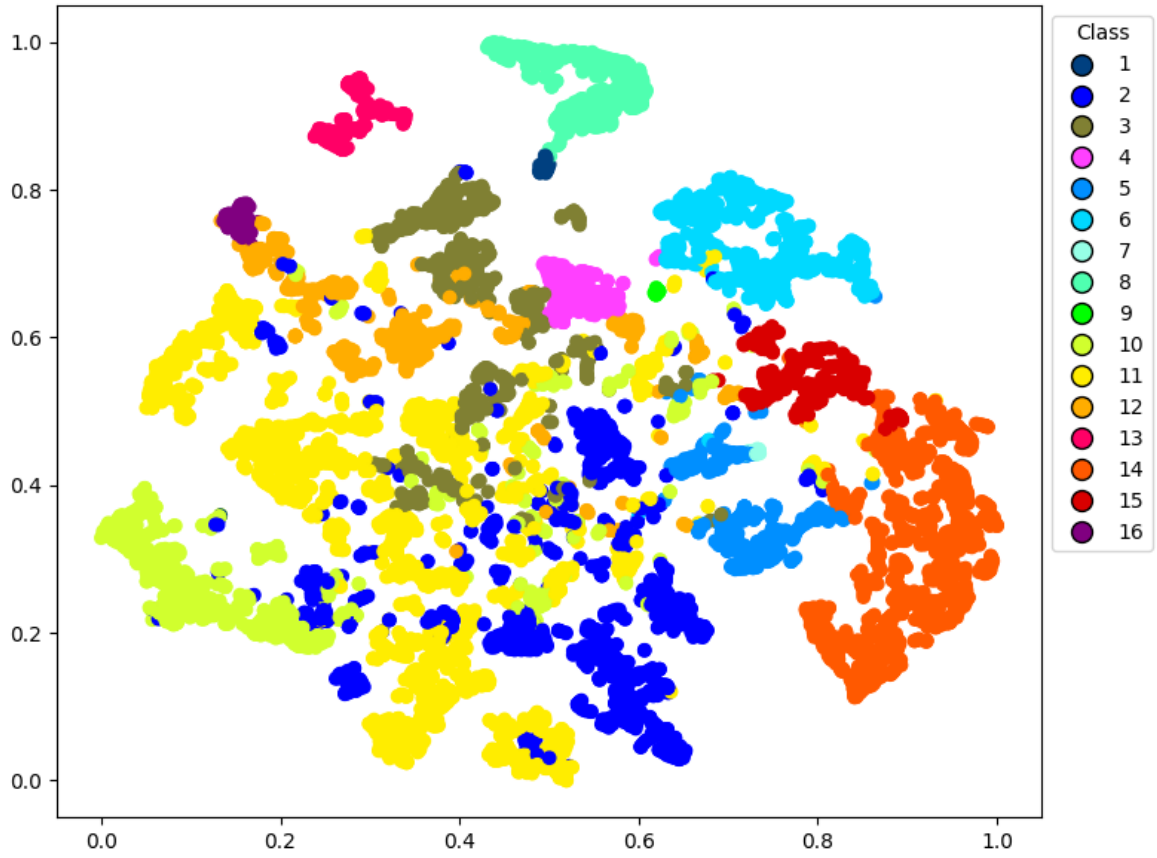
Botswana



T-SNE

Indian_pines

CTF-SSCL



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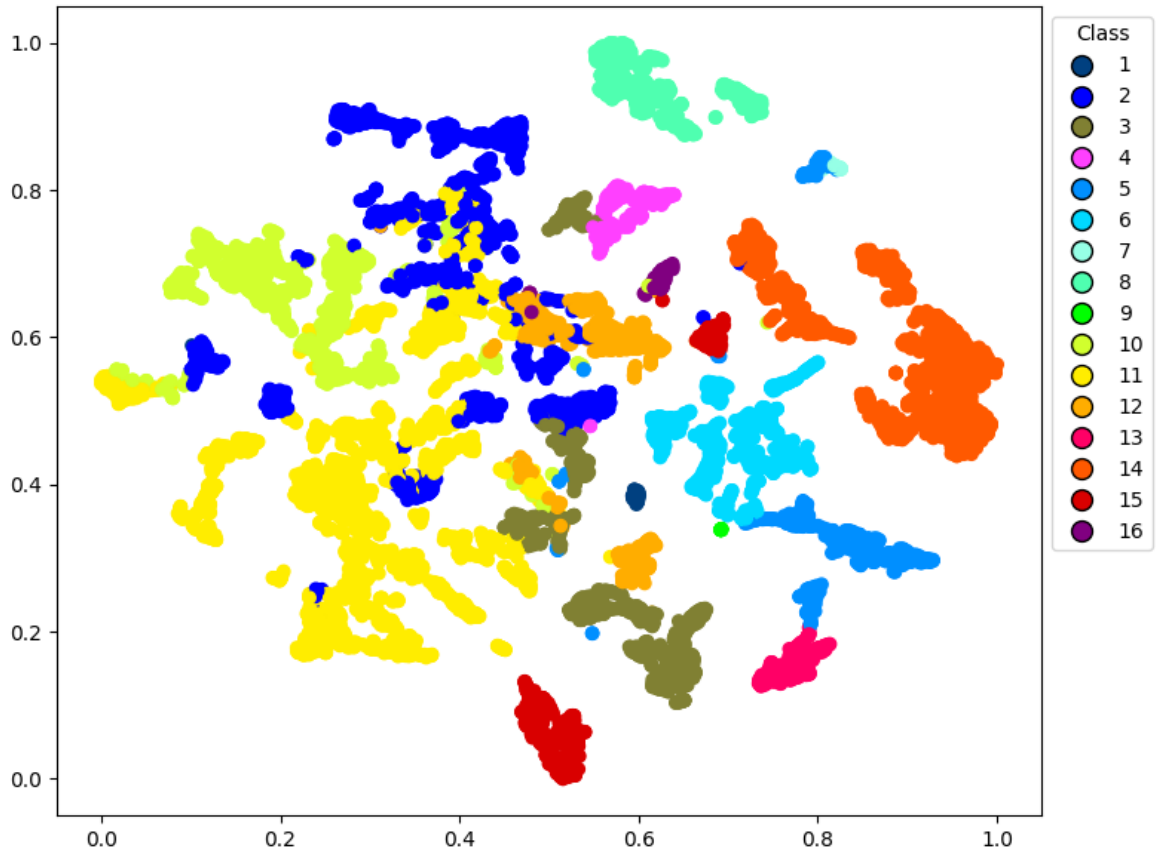

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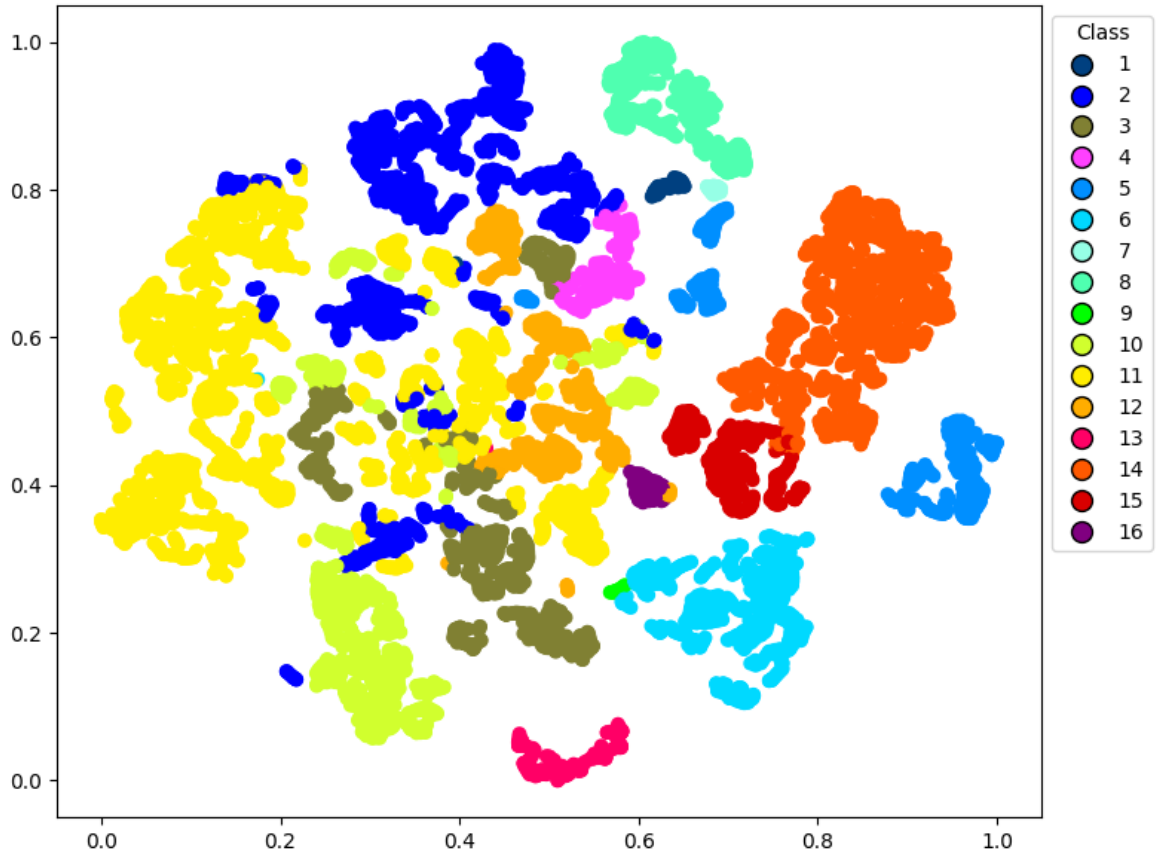

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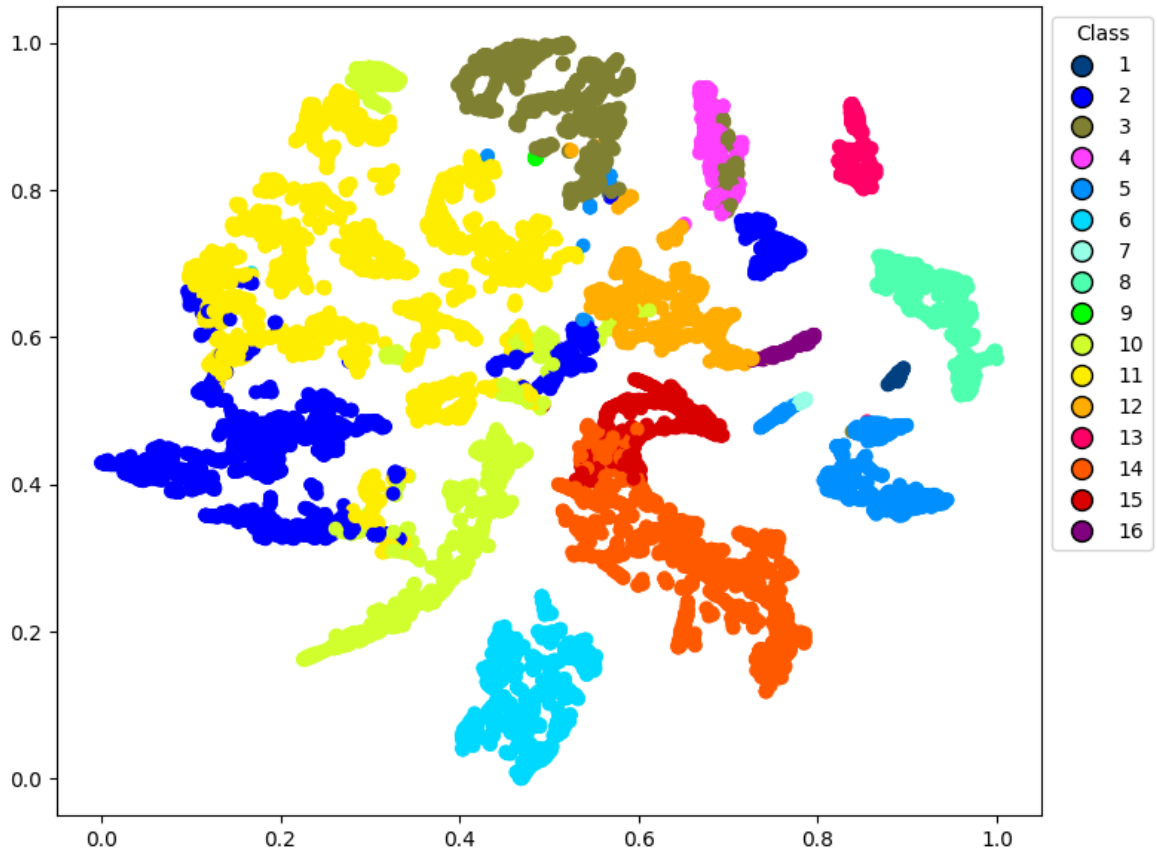

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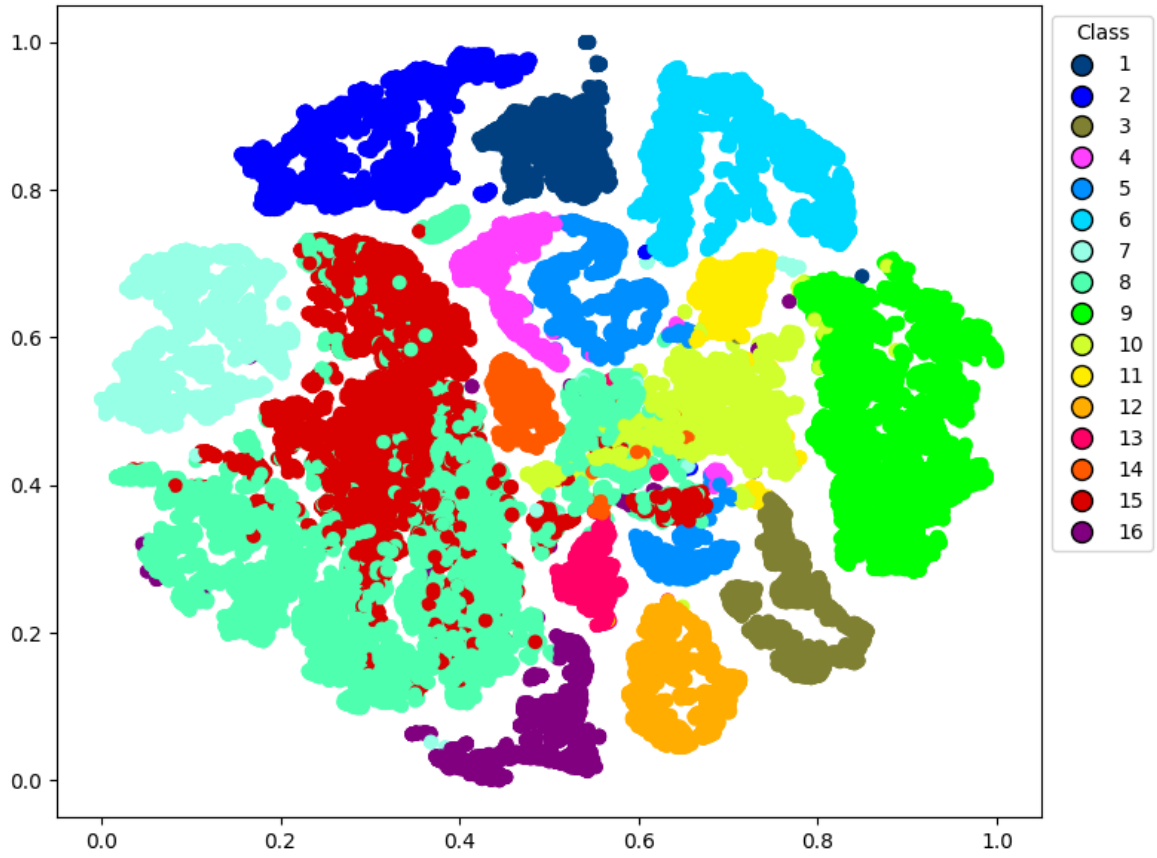

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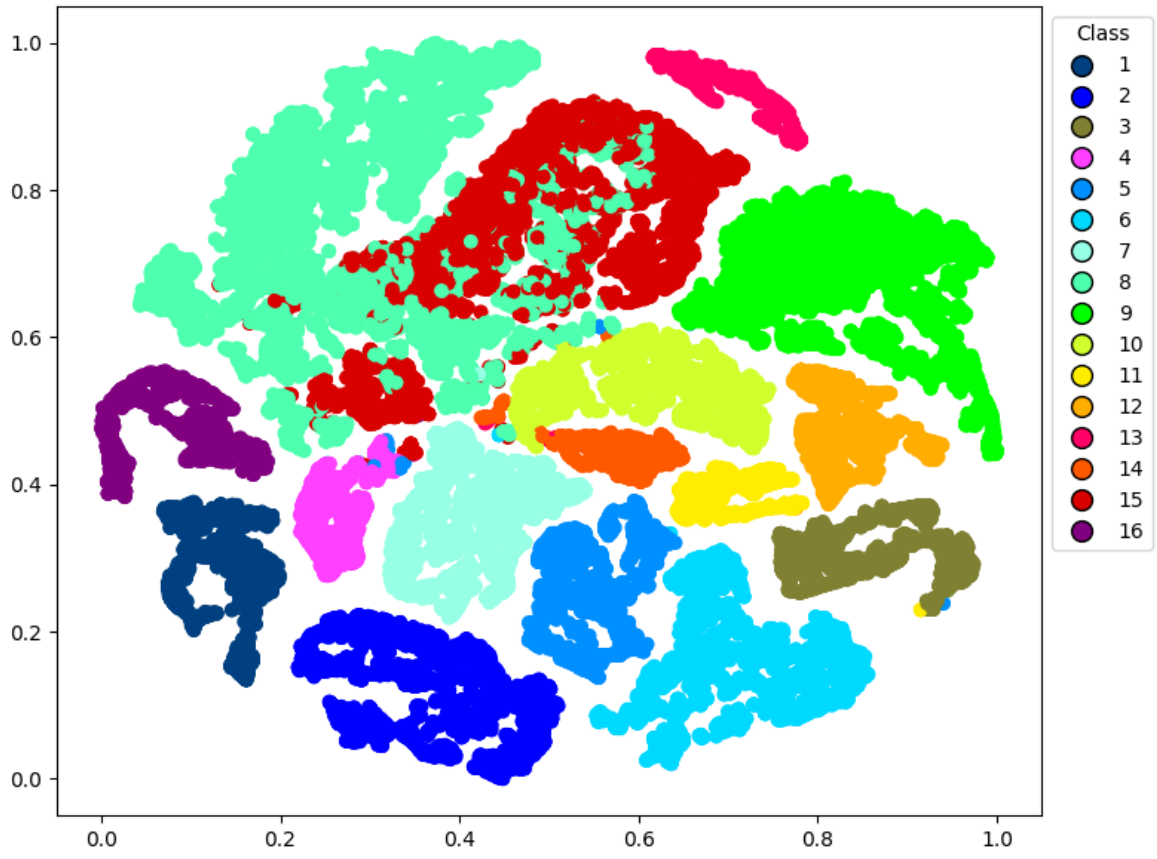

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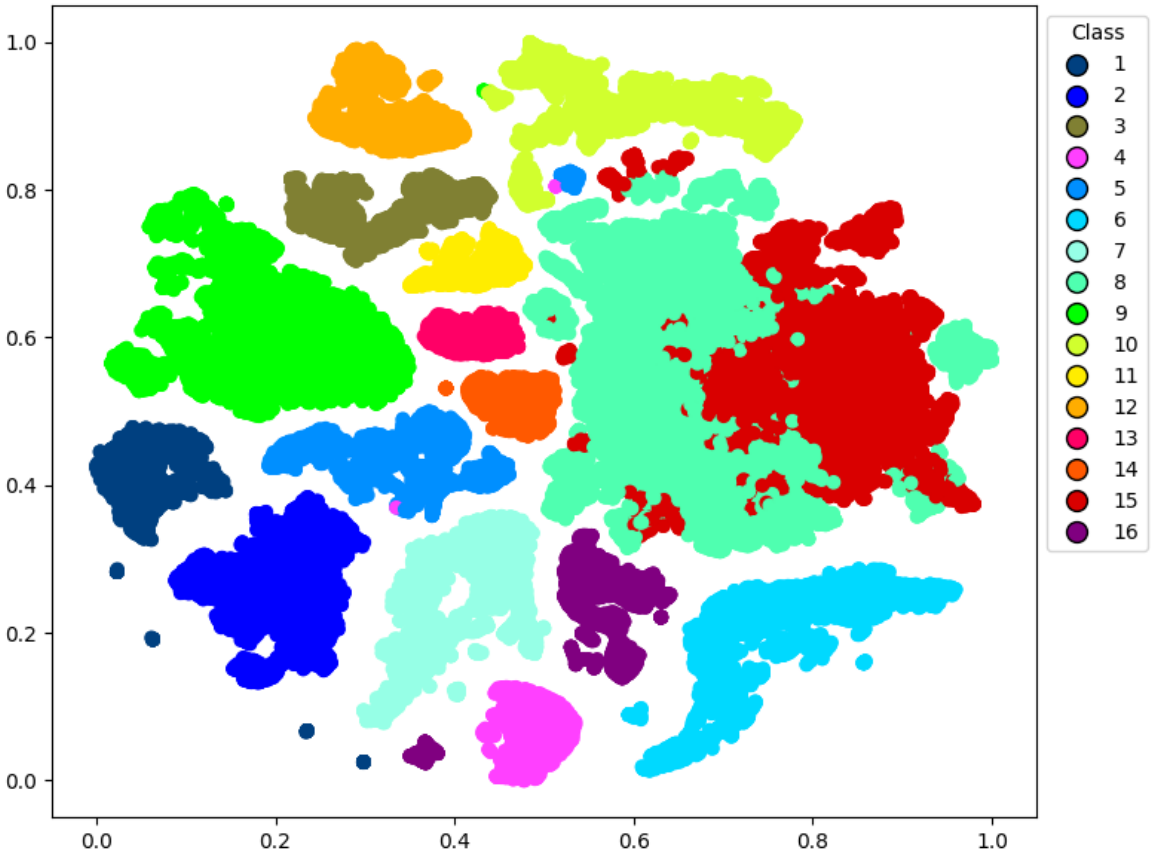

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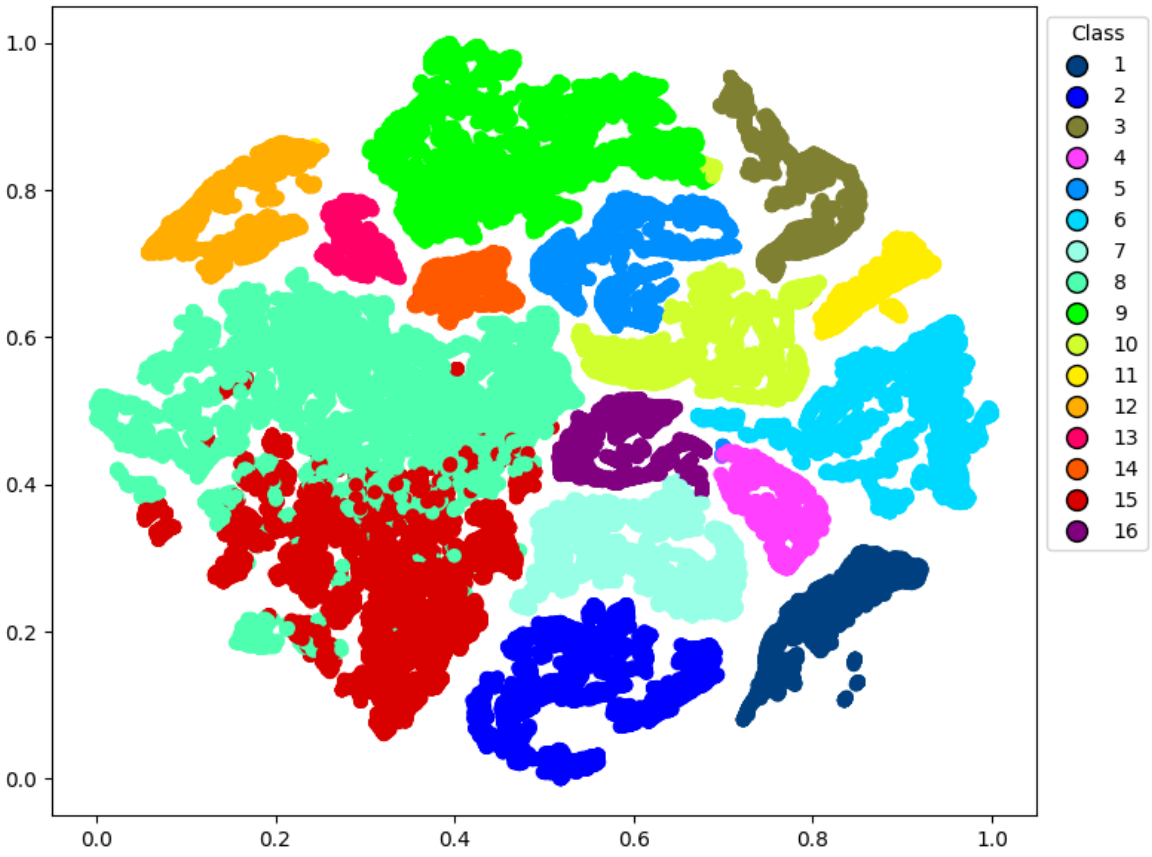

Botswana

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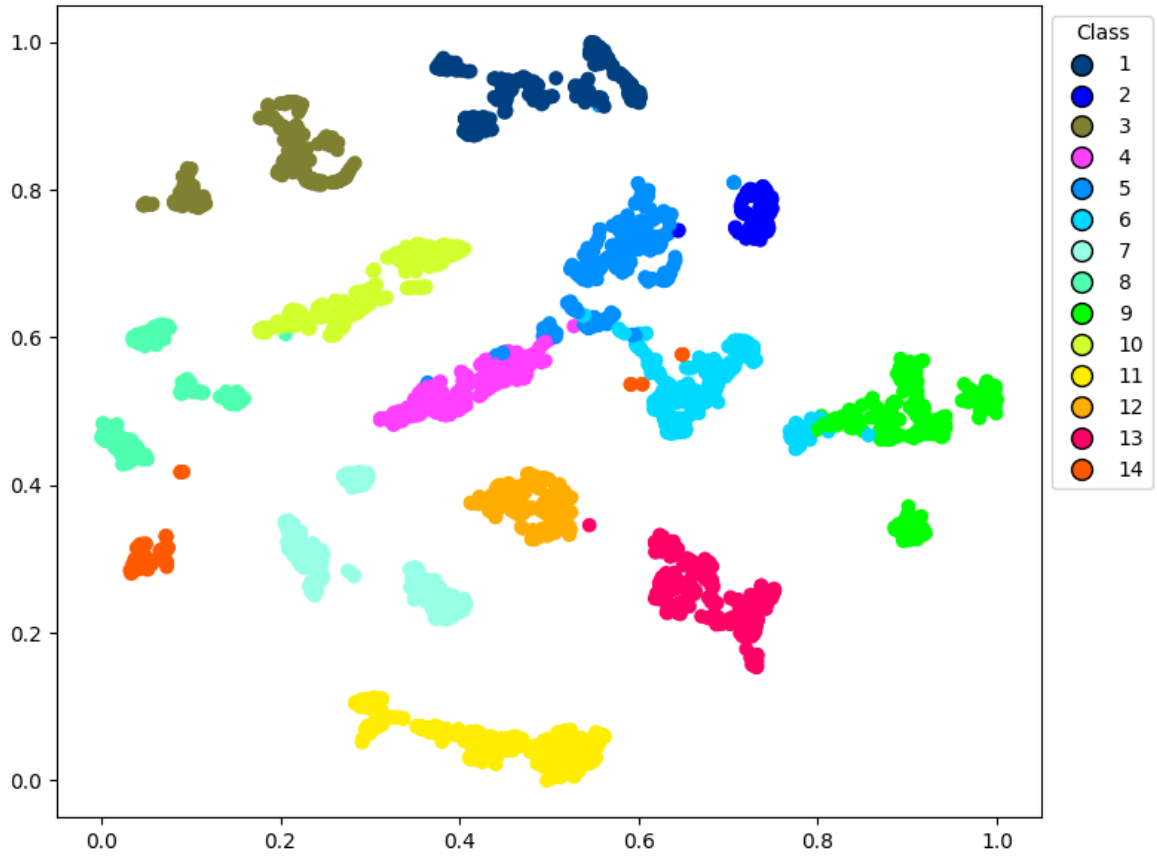

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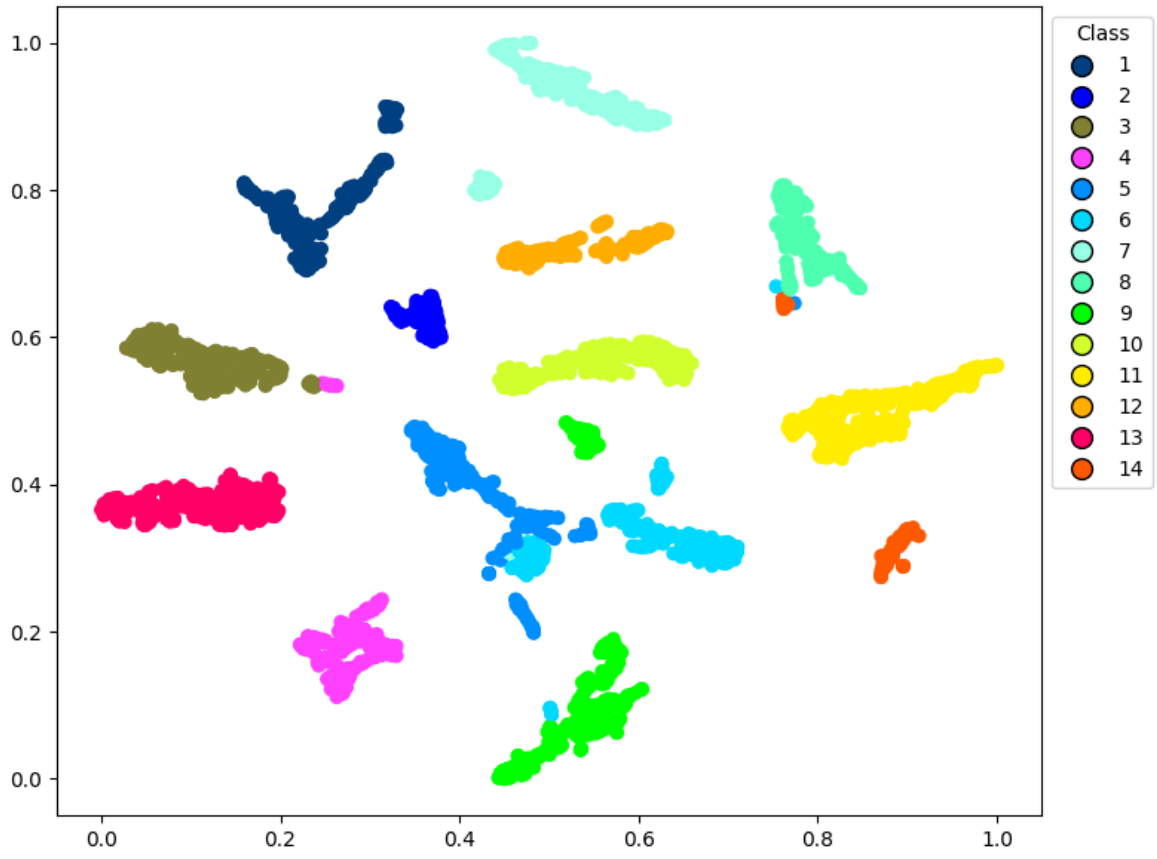

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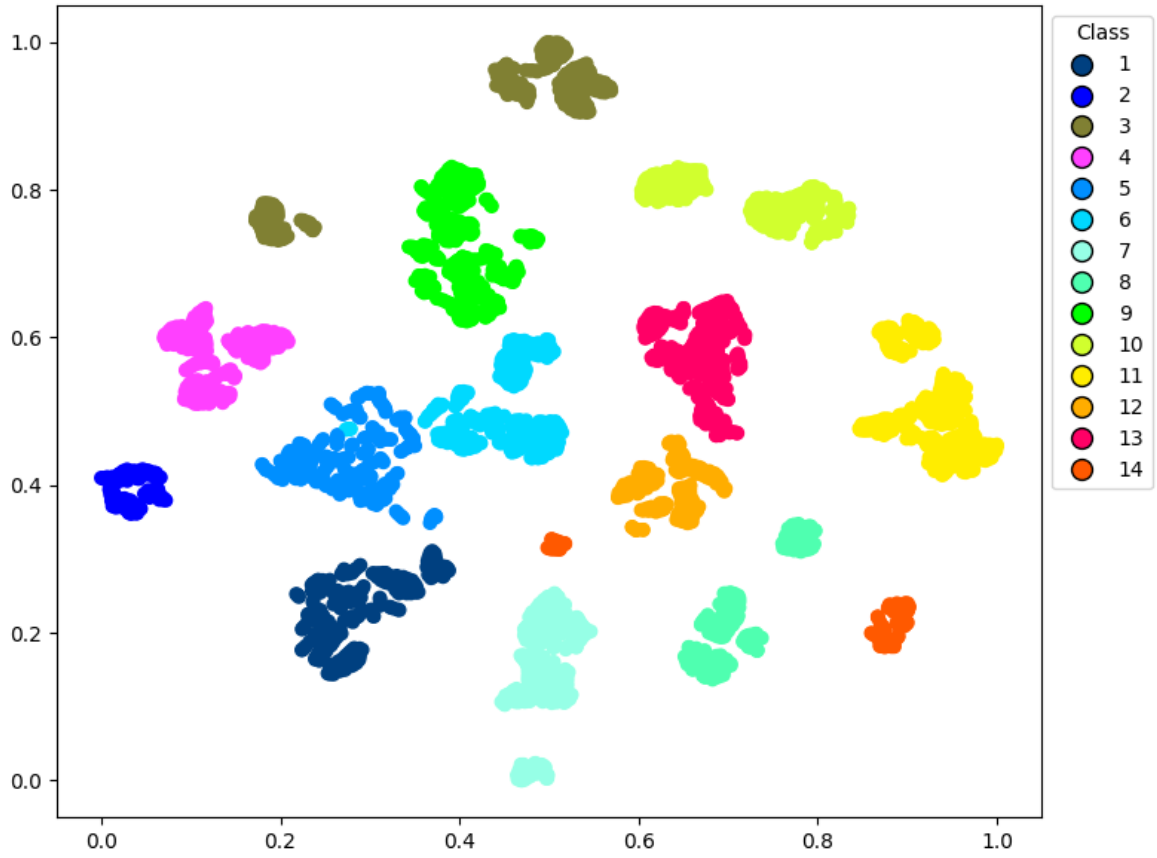
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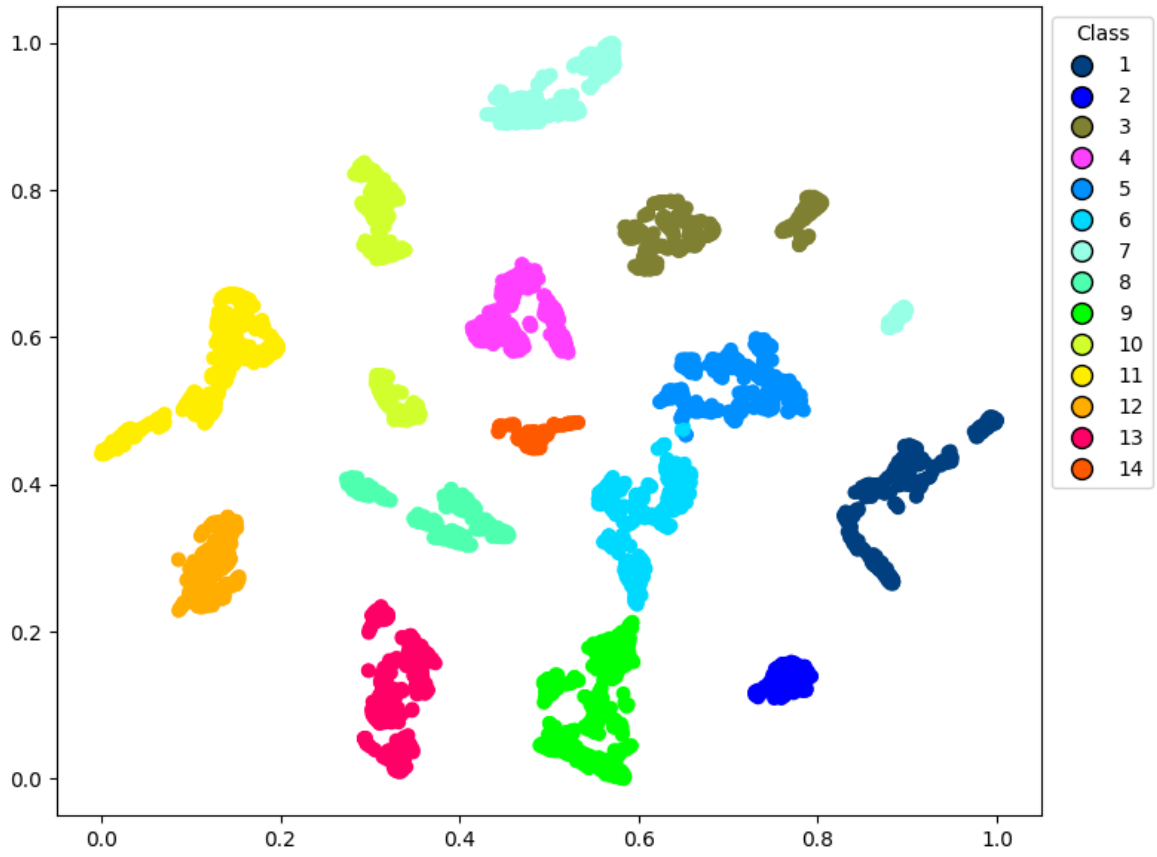
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