Result Got from the experiment :

The backbone models is on CIFAR :

accuracy of all the dataset, with 100 classes based on CIFAR , without meta-training and with 600 test episodes.

	Accuracy (Mobile net)	Accuracy (resnet 56)
Aircraft	**40.23%**	**41.49%**
Cu_birds	**42.53%**	**41.99%**
Dtd	**53.37%**	**53.98%**
Fungi	**39.72%**	**39.58%**
Omniglot	**85.57%**	**82.56%**
vgg_flowers	**69.97%**	**70.70%**

The backbone models is on imagenet :

Accuracy of all the dataset, with Resnet, 1000 classes based on imagenet , without meta-training and with 600 test episodes.

	Accuracy (resnet 18)	Accuracy (resnet 50)	Accuracy (resnet 152)
Aircraft	**53.38±1%**	**54.76%**	**54.51%**
Cu_birds	**53.53%**	**59.00%**	**62.25%**
Dtd	**65.30%**	**66.09%**	**67.44%**
Fungi	**49.86%**	**51.16%**	**51.09%**
Omniglot	**89.35%**	**84.13%**	**80.80%**
vgg_flowers	**83.07%**	**84.51%**	**82.32%**

With a meta-training on all the dataset(backbone model, resnet 18)

	Accuracy (500 episodes)	Accuracy (2000 episodes)	Accuracy (5000 episodes)
Aircraft	**92.77%**	**95.67%**	**96.89%**
Cu_birds	**54.27%**	**52.08%**	**49.53%**
Dtd	**59.90%**	**57.53%**	**55.50%**
Fungi	**48.39%**	**47.21%**	**45.63%**
Omniglot	**87.62%**	**90.51%**	**92.16%**
vgg_flowers	**78.67%**	**77.01%**	**77.01%**

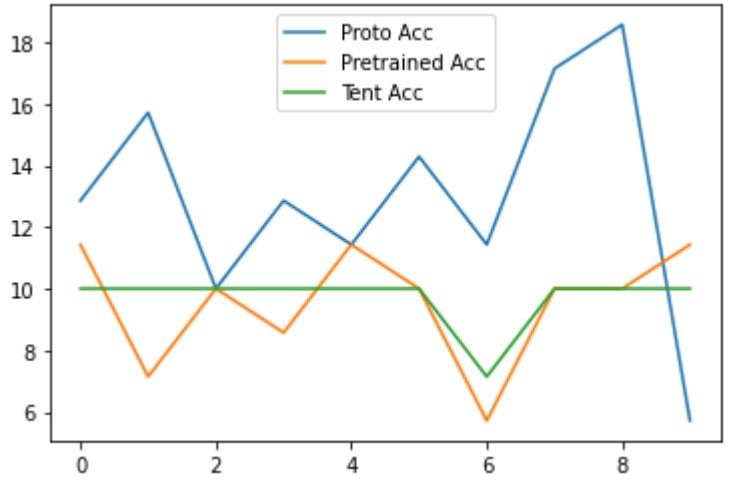
With a meta-training on all the dataset(backbone model, resnet 152)

	Accuracy (1000 episodes)	Accuracy (2000 episodes)
Aircraft	**94.11%**	**95.73%**
Cu_birds	**51.65%**	**48.61%**
Dtd	**60.09%**	**59.57%**
Fungi	**46.98%**	**48.39%**
Omniglot	**89.10%**	**90.61%**
vgg_flowers	**80.87%**	**78.25%**

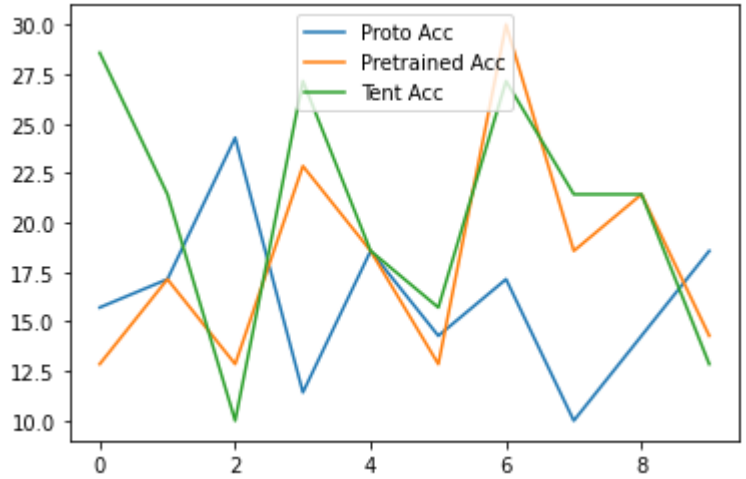
With a meta-training on all the dataset except the testing dataset.

	Accuracy (500 episodes)
Aircraft	**48.56%**
Cu_birds	**53.58%**
Dtd	**61.21%**
Fungi	**48.15%**
Omniglot	**91.67%**
vgg_flowers	**77.85%**

Some Results for 10 episode :
Without training of the pretrained model



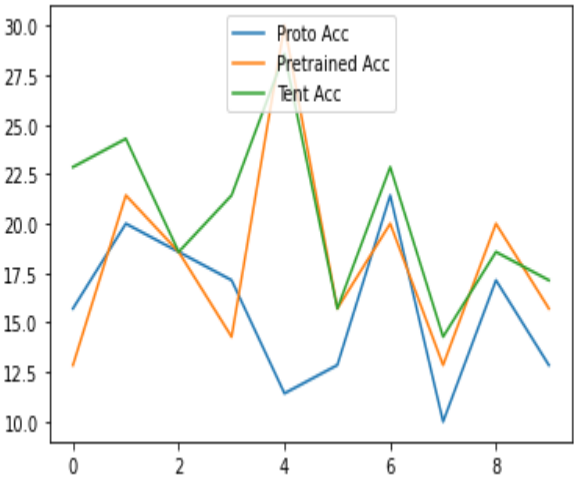
- 400 step for the pretrained model
- 400 step for TENT

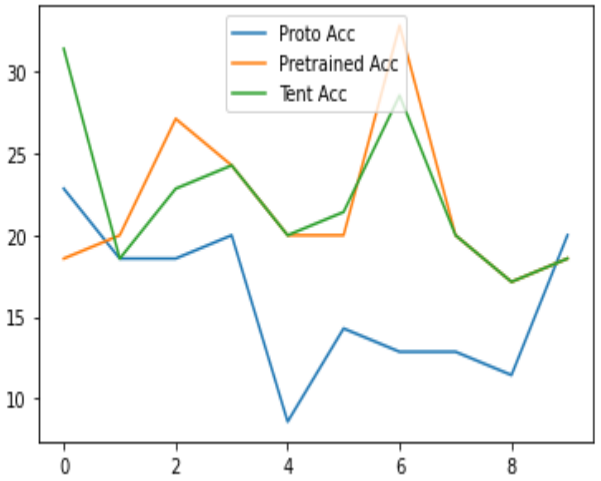


With 300 step for training the pretrained model

- 300 step for the pretrained model

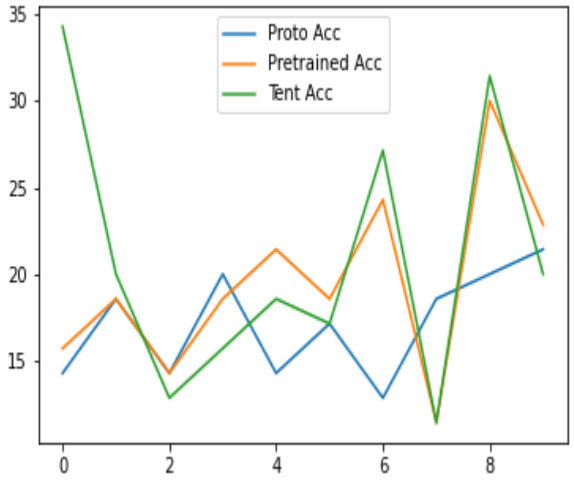
- 300 step for TENT

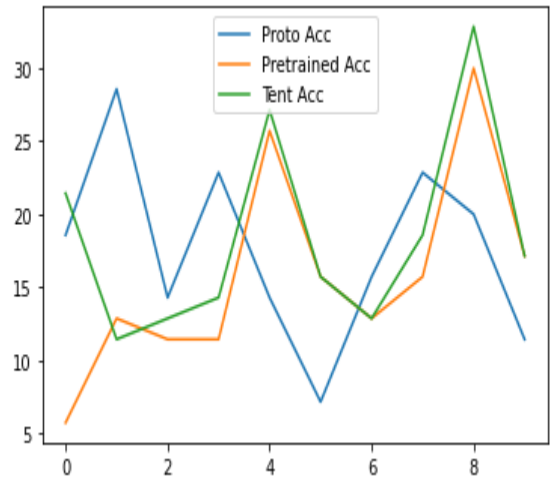




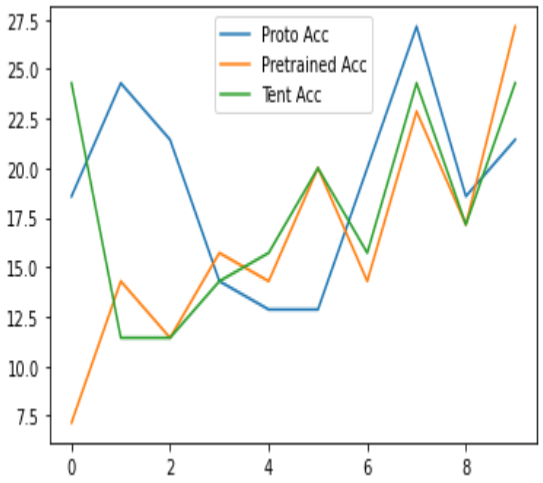
When I trained my model with a full trained (not just the last layer)

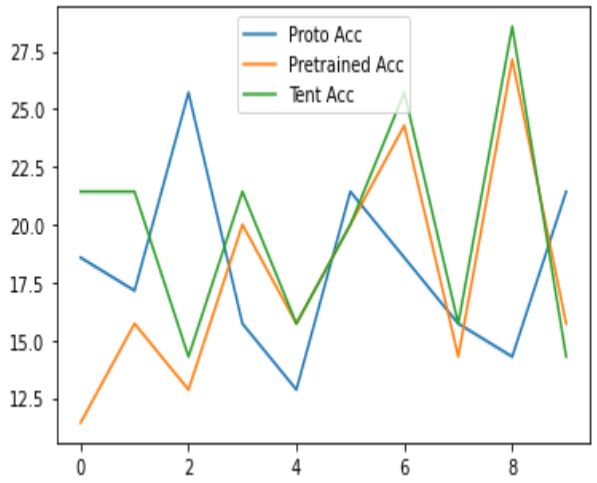
- 200 step for the pretrained model
- 200 step for TENT



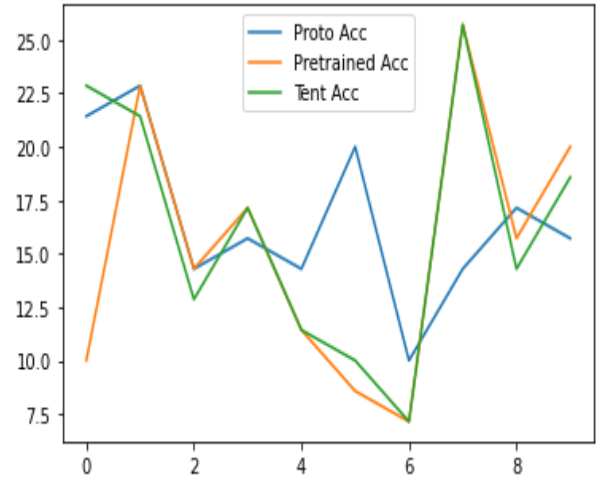


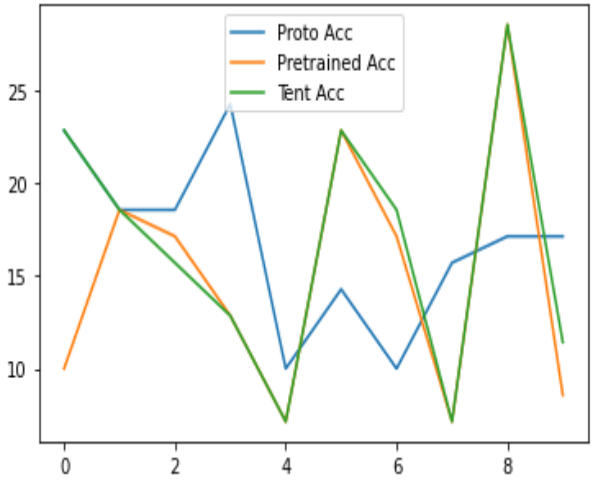
- 100 step for the pretrained model
- 100 step for TENT





- 50 step for the pretrained model
- 50 step for TENT





Train by adapting proto in the last layer :

With the default parameter of TENT : SGD, LR: 0.001, base_model : resnet18
Prototypical network based model is resnet50

Tent number iter	**Proto acc**	**Pretrained acc**	**Tent acc**
50	16.5	17.3571	17.42857
50	16.28571	19.28571	19.92857
50	15.35714	19.78571	19.14285
50	16.14285	20.21428	20.92857
100	14.8857	18.3142	17.9999

With the default parameter of TENT : SGD, LR: 0.01, base_model : resnet18
Prototypical network based model is resnet50, number of episode 20,

Tent number iter	Proto acc	Pretrained acc	Tent acc
50	16.0	18.5714	17.7857
50	15.78571	18.64285	18.35714
100	16.0714	19.7857	20.0
200	16.78571	17.85714	17.71428

With the default parameter of TENT : SGD, LR: 0.0001, base_model : resnet18
Prototypical network based model is resnet50, number of episode 100

Tent number iter	Proto acc	Pretrained acc	Tent acc
100	16.44285	18.7571	18.8428
100	16.75714	16.64285	16.7428
100	17.0571	20.3285	20.1285
100	16.6428	20.3142	20.3

With the default parameter of TENT : ADAM, LR: 0.001, base_model : resnet18
Prototypical network based model is resnet50, number of episode 100

Tent number iter	Proto acc	Pretrained acc	Tent acc
100	14.9285	18.2714	18.2142

With the default parameter of TENT : ADAM, LR: 0.001, base_model : **resnet50** Prototypical network based model is resnet50, number of episode 100

Tent number iter	Proto acc	Pretrained acc	Tent acc
100	16.1142	16.1571	15.9857

With the default parameter of TENT : ADAM, LR: 0.001, base_model : resnet18
Prototypical network based model is resnet18, number of episode 100

Tent number iter	Proto acc	Pretrained acc	Tent acc
150	46.9619	43.3809	43.8380

Number of EPISODE : 100

Number of tent loop	Tent learning rate	Tent accuracy	Pretrained accuracy	Proto Accuracy
20	SGD, LR = 10-2	21.8142	46.8285	46.6428
50	SGD, LR = 10-2	21.1571	47.0857	46.2571
100	SGD, LR = 10-4	26.7	46.1857	46.0428
10	SGD, LR = 10-4	25.8428	46.3000	46.6000

Result by changing hyperparameters :

This will be done with 100 episodes.

LR	Number of Iteration	10	50	100	200	300
1		10.014 10.342 9.871	9.871 10.242			
10-1		10.242	9.714			
10-2		12.428	10.742			
10-3		25.485 25.685	25.4			
10-4		26.028 26.314 26.471 26.299	26.114	27.357	25.857	
10-5		26.642 26.471				
10-6		25.857				
10-7		25.828 25.557 26.757 27.428	26.1	26.5 26.171	25.685	

10-8	25.628				
10-9					

Last Result

The number inside the parenthesis is the proto accuracy
Dataset : Aircraft

LR	Number of Iteration	0	5	10	50	100
1		45.728(=)	26.742(46.128) 27.385(45.599)	23.3	21.414	23.214(46.)
10-1		45.542(=)	45.628(46.428) 45.614(46.042)	45.2(46.485) 44.842(46.642)	43.814(46.071) 44.0(45.92)	45.128(46.642) 43.714(45.942)
10-2		45.614(=)	47.471(47.514) 46.1(45.82)	46.171 (46.242) 46.142(46.114)	Good. 46.171(46.157) 45.957(45.914) 46.69(46.45)	47.171(47.157) 45.785(45.771)
10-3		46.242(=)	47.042(46.928) 46.528(46.571)	46.785 (46.714) 46.214(46.228) 47.085(=)	46.371(46.271) 46.20(46.371)	46.357(=)
10-4		47.214(=)	45.828(=)	46.442(46.445) 46.0285=	46.385(46.414)	47.028(47.0)
10-5		46.7(=)	45.771(=)	46.657(=)	46.385(46.371) 45.985(46.028) 45.957(=)	46.557(46.571)
10-6		45.857(=)	46.242(=) 45.614(=)	46.857(=) 45.857(=)	47.114(47.128) 46.528(=)	45.985(45.971)
10-7						
10-8						
10-9						

The number inside the parenthesis is the proto accuracy

Dataset : Bird
Num way = 10

Num support = 8
Num query = 7

LR	Number of Iteration	0	5	10	50	100
1						
10-1						
10-2		72.942(=)	72.528(72.471) 72.371(72.385) 74.328(74.342)	72.342(72.271) 73.899(73.828) 73.185(73.157) 74.00(73.971)	72.428(72.471) 73.771(73.742) 73.614(73.685)	72.657(72.7)
10-3		73.8(=)	72.757(=) 73.27(73.285)	73.55(73.62) 73.62(73.60) 72.3(72.32)	73.185(73.128) 72.614(=)	74.128(74.028) 73.157(=)
10-4		72.828(=)	73.357(73.457) 73.557(=) 72.942(=)	72.942(=)	72.914(72.928) 73.114(=)	73.342(73.328) 73.442(73.471)
10-5		73.585(=)	72.585(=)	73.971(=) 72.257(72.242) 72.257(=)	72.185(=)	72.585(=)
10-6		71.82(=)	72.60(=)	73.0714(=)	73.557(=)	72.771(=)
10-7						
10-8						
10-9						

Result :

omniglot , aircraft, birds
Recap of any table (max cell value, comment),

Dataset : Cu Birds
Number Shot : 5 , 10, 15
Number of Way : 5 # 7
Number of query : 5 # 15
Number of Repeat episode : 5
Number of episode : 200

LR	Number of Iteratio	0	10	25	50	100	200

	n												
1													
10-1		79.28	79.28	79.56	79.66	78.14	78.4	79.12	79.36	79.12	79.34	78.2	79.1
		79.94	79.94	79.04	79.52	77.9	78.2	77.68	78.16	80.26	80.38	78.84	79.5
		79.4	79.4	79.2	79.24	78.22	78.9	78.58	79.38	77.74	78.0	78.46	78.94
		79.54	79.54	77.68	78.1	77.76	78.74	78.26	78.52	78.34	78.58	77.64	78.42
		79.22	79.22	78.48	79.36	78.48	79.38	77.12	78.52	78.56	79.3	79.02	79.08
		79.476± 0.251	**79.476±0.25**	**78.792 ±0.643**	**79.176 ±0.545**	**78.1 ± 0.246**	**78.724 ±0.402**	**78.152 ±0.682**	**78.788 ±0.483**	**78.804 ±0.835**	**79.12 ± 0.786**	**78.432 ± 0.479**	**79.008 ± 0.341**
10-2		79.52	79.52	80.08	80.1	79.84	79.88	79.68	79.7	78.52	78.52	77.56	77.58
		77.48	77.48	80.2	80.26	79.38	79.54	80.7	80.66	78.24	78.26	79.66	79.66
		78.62	78.62	78.58	78.58	78.6	78.62	80.14	80.14	78.34	78.3	78.84	78.9
		78.16	78.16	77.36	77.36	79.22	79.2	78.38	78.4	80.16	80.08	79.6	79.6
		79.3	79.3	78.68	78.68	79.64	79.66	79.74	79.76	78.26	78.22	78.12	78.12
		78.616 ±0.9	**78.616±0.9**	**78.98 ±1.035**	**78.996 ±1.052**	**79.336 ±0.417**	**79.38± 0.430**	**79.728 ±0.751**	**79.732 ±0.734**	**78.704± 0.720**	**78.676 ±0.695**	**78.756 ±0.805**	**78.772 ± 0.801**
10-3		79.36	79.36	79.6	79.6	79.52	79.48	77.92	77.92	78.84	78.86	78.42	78.42
		78.4	78.4	80.36	80.34	79.68	79.7	79.58	79.58	77.66	77.66		
		78.52	78.52	77.64	77.64	77.9	77.9	79.34	79.34	77.84	77.82		
		78.92	78.92	78.58	78.58	78.7	78.68	78.94	78.94	78.76	78.76		
		78.9	78.9	79.62	79.62	78.92	78.92	79.14	79.14	78.58	78.58		
		78.82 ±0.332	**78.82 ±0.332**	**79.16 ±0.929**	**79.156 ±0.924**	**78.944 ±0.623**	**78.936±0.623**	**78.984±0.561**	**78.984 ±0.561**	**78.336 ±0.479**	**78.336 ±0.487**		
10-4													

Experiment :

Dataset : Cu Birds
Number Shot : 5
Number of Way : 8
Number of query : 15
Number of episode : 200

LR	Number of Iteration	0	10	25	50	100	200
1							
10-1		**68.90833333333333 ± 0.9895081940596101**	**68.57083333333333 ± 1.0174222978111565**	**68.27916666666665 ± 1.1639764955029517**	**68.15416666666667 ± 1.2660112751275163**	**68.11666666666666 ± 1.2940618704082292**	**68.125 ± 1.2903204113277014**
10-2		69.91666666666667 ± 1.0081782249847162	69.8875 ± 1.0062365714079808	69.88333333333334 ± 1.0066581964323562	69.875 ± 1.0066389827871096	69.875 ± 1.0066389827871096	69.875 ± 1.0066389827871096
10-3		68.68333333333334 ± 1.0241507961883998	68.6875 ± 1.0222655786019816	68.6875 ± 1.0222655786019816	68.6875 ± 1.0222655786019816	68.6875 ± 1.0222655786019816	68.6875 ± 1.0222655786019816
10-4		69.025 ± 0.8751763666700431	69.025 ± 0.8751763666700431	69.02083333333333 ± 0.8752775254328068	69.02083333333333 ± 0.8752775254328068	69.02083333333333 ± 0.8752775254328068	69.02083333333333 ± 0.8752775254328068
10-5		69.5375 ± 1.0540188354183555	69.5375 ± 1.0540188354183555	69.5375 ± 1.0540188354183555	69.5375 ± 1.0540188354183555	69.5375 ± 1.0540188354183555	69.54166666666666 ± 1.0542752315637927

Recap:

We can see that for the learning rate equal to 0.001, all the iterations of Tent were greater than Proto-Network. This learning rate can be seen as the optimal learning rate. But something happens for the learning rate 10-5. We can see that for the number of Tent iterations equal to 200, the accuracy was good compared to the previous value.

Dataset : Cu Birds
Number Shot : 10
Number of Way : 8

Number of query : 15
Number of episode : 200

LR	Number of Iteration	0	10	25	50	100	200
1							
10-1		78.49583333333334 ± 0.8449795098600517	76.85 ± 1.1836405037942146	75.275 ± 1.5563494164586276	75.09583333333335 ± 1.6116364729591541	75.10833333333333 ± 1.5998043510587994	75.12083333333334 ± 1.594379213875698
10-2		78.6 ± 0.8300130106075314	78.62916666666666 ± 0.8412774643857598	78.64166666666667 ± 0.8492791489126399 ---	78.63333333333333 ± 0.8509839089743902	78.63333333333334 ± 0.8501998144273	78.63333333333334 ± 0.8491008656219824
10-3		78.02916666666665 ± 0.8487974230737664	78.00833333333333 ± 0.8461699261312049	78.01666666666667 ± 0.8444159572680332	78.0125 ± 0.8445042160772332	78.025 ± 0.8443962113052537	78.03333333333335 ± 0.8433474320297127
10-4		77.51666666666667 ± 0.8692003975557714	77.5125 ± 0.8692401048393426	77.5125 ± 0.8688563836 54207	77.51666666666667 ± 0.8675106774879231	77.51666666666667 ± 0.8679718364606587	77.52083333333333 ± 0.8660084820440399
10-5		78.6875 ± 0.7156383877932578 ---	78.68333333333334 ± 0.7162832447200385	78.68333333333334 ± 0.7162832447200385	78.6875 ± 0.7162904608505934	78.68333333333334 ± 0.7159107005144643	78.68333333333334 ± 0.7159107005144643

For this one, We can see that the good learning rate for this operation is 10-2(0.01), but here the margin between Proto-network and our model is bigger than the first with 5 shot, as for the previous, the number of iteration 200 and 10-4 of learning rate is good.

Dataset : Flower
Number Shot : 5
Number of Way : 8
Number of query : 15
Number of episode : 200

LR	Number of Iteration	0	10	25	50	100	200

1						
10-1	84.925 ± 0.668888389 2116998	84.9125 ± 0.67020400 698013	84.8375 ± 0.69629610 15058337	84.82083333 333333 ± 0.706109996 0542818	84.8125 ± 0.711525959 4506881	84.8125 ± 0.7115259594 506881
10-2	84.68333333 333332 ± 0.740114501 651978	84.6833333 3333332 ± 0.74011450 1651978	84.6833333 3333332 ± 0.74011450 1651978	84.68333333 333332 ± 0.740114501 651978	84.68333333 333332 ± 0.740114501 651978	84.683333333 33332 ± 0.7401145016 51978
10-3	85.05833333 333332 ± 0.631163410 3428013	85.0583333 3333332 ± 0.63116341 03428013	85.0666666 6666666 ± 0.63093618 09600432	85.06666666 666666 ± 0.630936180 9600432	85.06666666 666666 ± 0.630936180 9600432	85.066666666 66666 ± 0.6309361809 600432
10-4	85.1375 ± 0.709304736 9509886	85.1375 ± 0.70930473 69509886	85.1375 ± 0.70930473 69509886	85.1375 ± 0.709304736 9509886	85.1375 ± 0.709304736 9509886	85.1375 ± 0.7093047369 509886
10-5	85.50416666 666668 ± 0.627707818 5084733	85.5041666 6666668 ± 0.62770781 85084733	85.5041666 6666668 ± 0.62770781 85084733	85.50416666 666668 ± 0.627707818 5084733	85.50416666 666668 ± 0.627707818 5084733	85.504166666 66668 ± 0.6277078185 084733

Recap: here the best learning rate is 10-3, for this learning rate, all the iteration of Tent is slightly greater than proto-network. Globally our model and proto-network is sensibly the same.

Dataset : Flower
Number Shot : 10
Number of Way : 8
Number of query : 15
Number of episode : 200

LR	Number of Iteration	0	10	25	50	100	200
1							
10-1		91.11666666 666667 ± 0.414242443 77202846	90.7375 ± 0.48647257 416699924	90.3333333 3333334 ± 0.78323400 07941432	90.19583333 333333 ± 0.893343562 674642	90.15416666 666665 ± 0.949940088 096203	90.154166666 66665 ± 0.9563077746 526537
10-2		90.87916666 666666 ± 0.497456262 594456	90.8833333 3333333 ± 0.49938882 869185436	90.875 ± 0.50073722 03949781	90.87083333 333332 ± 0.501874392 0710307	90.875 ± 0.501402740 6519966	90.879166666 66666 ± 0.5017281909 947745

10-3	91.2125 ± 0.46882606331014587	91.2125 ± 0.47067178924856373	91.2125 ± 0.47067178924856373	91.22083333333332 ± 0.4699741055219011 6	91.22083333333332 ± 0.4699741055219011 6	91.22083333333332 ± 0.4699741055219011 6
10-4	91.02916666666668 ± 0.45616188509855415	91.03333333333335 ± 0.4553222448625441	91.0375 ± 0.45535996124555733	91.0375 ± 0.45535996124555733	91.0375 ± 0.45535996124555733	91.0375 ± 0.45535996124555733
10-5	91.2375 ± 0.4595123609448511	91.2375 ± 0.4595123609448511	91.2375 ± 0.4595123609448511	91.23333333333332 ± 0.4599450426107691	91.23333333333332 ± 0.4599450426107691	91.23333333333332 ± 0.4599450426107691

Omniglot , quickdraw.

Dataset : Omniglot
Number Shot : 5
Number of Way : 8
Number of query : 15
Number of episode : 200

LR	Number of Iteration	0	10	25	50	100	200
1							
10-1		86.59583333333335 ± 0.6338277796890536	82.0875 ± 2.325909033731638	80.8 ± 2.7864216682572174	80.70833333333334 ± 2.7805970956493 02	80.70833333333334 ± 2.7782935185109 58	80.7125 ± 2.7768923817571887
10-2		86.48333333333332 ± 0.6657872182612 1	86.08333333333331 ± 0.7175521661253007	85.85 ± 0.8135541353291195	85.85833333333332 ± 0.8146150730389305	85.85 ± 0.8132261527739719	85.84583333333332 ± 0.8134325922185152
10-3		86.675 ± 0.6841493091586238	86.72916666666666 ± 0.6852156974875381	86.71666666666668 ± 0.6836275642970 13	86.71666666666668 ± 0.6832372143780746	86.71666666666668 ± 0.6832372143780746	86.71666666666668 ± 0.6832372143780746
10-4		86.975 ± 0.6947246580880482	86.975 ± 0.6958757196671128	86.97916666666666 ± 0.6958879394741336	86.98333333333332 ± 0.6941724313486127	86.98333333333332 ± 0.6941724313486127	86.97916666666666 ± 0.6949288707 60646
10-5		86.45416666666667 ±	86.45416666666667 ±	86.45833333333331 ±	86.45416666666667 ±	86.45 ± 0.719523655	86.45 ± 0.7195236556

	0.7205201052596195	0.7205201052596195	0.7206823059511807	0.7205201052596195	6994573	994573

Dataset : Omniglot
Number Shot : 10
Number of Way : 5
Number of query : 10
Number of episode : 200

LR	Number of Iteration	0	10	25	50	100	200
1							
10-1		93.87 ± 0.6435713051403084	87.84 ± 2.4101402023948735	85.84 ± 2.9442253370284006	85.59 ± 3.008366642415781	85.62 ± 2.9934006555755275	85.62 ± 2.995581567041698 5
10-2		93.67 ± 0.6319457641285366	93.49 ± 0.6417301607373616	93.34 ± 0.6722028527163508	93.36 ± 0.6645296104764633	93.36 ± 0.6645296104764633	93.36 ± 0.6645296104764633
10-3		93.92 ± 0.5753459731326881	93.91 ± 0.5776499417467296	93.92 ± 0.5740090145633602	93.91 ± 0.5763183280097901	93.91 ± 0.5763183280097901	93.91 ± 0.5763183280097901
10-4		93.88 ± 0.5350764102443687	93.87 ± 0.5339534294299456	93.87 ± 0.5339534294299456	93.87 ± 0.5339534294299456	93.86 ± 0.5349830681432824	93.86 ± 0.5349830681432824
10-5							

Dataset : Dtd
Number Shot : 10
Number of Way : 5
Number of query : 10
Number of episode : 200

LR	Number of Iteration	0	10	25	50	100	200
1							
10-1		66.9 ± 1.365474481	60.75 ± 1.99986043	55.36 ± 2.86062788	54.28 ± 3.075019507	54.0 ± 3.113748557	53.8 ± 3.1529815223

	6363282	01300626	9677369	710479	6070527	055144
10-2	66.68 ± 1.3631345571145936	66.58 ± 1.365429466797901	66.51 ± 1.3579271258797359	66.52 ± 1.3534619598644062	66.5 ± 1.3541741985431563	66.5 ± 1.35417419854315 63
10-3	67.05 ± 1.3144974933410865	67.01 ± 1.3148072403208004	66.99 ± 1.3130529917714668	67.0 ± 1.3159761699701	67.01 ± 1.3150993875749466	67.01 ± 1.3150993875749466
10-4	66.91 ± 1.4106003031333858	66.89 ± 1.4124781850 35082	66.91 ± 1.4097830525297146	66.92 ± 1.4100671008147094	66.94 ± 1.4103585824888647	66.94 ± 1.4103585824888647
10-5	66.83 ± 1.3901575481 93729	66.84 ± 1.3907329129635206	66.83 ± 1.3940209786082847	66.83 ± 1.3940209786082847	66.83 ± 1.3940209786082847	66.83 ± 1.3940209786082847

Dataset : Dtd
Number Shot : 15
Number of Way : 5
Number of query : 10
Number of episode : 200

LR	Number of Iteration	0	10	25	50	100	200
1							
10-1		74.49 ± 1.0064929205910988	62.9 ± 2.298094776113466	50.41 ± 3.5803462758789126	48.15 ± 3.7394352488042895	48.44 ± 3.691170748041873	48.06 ± 3.74261576590491
10-2		74.13 ± 1.1358119671847096	74.06 ± 1.1320285381561723	74.08 ± 1.1323440946991334	74.09 ± 1.1311416247314037	74.09 ± 1.1301223000992242	74.1 ± 1.130276107860376
10-3		74.35 ± 1.1243765116721356	74.37 ± 1.1198025650 97973	74.4 ± 1.1221748883306917	74.42 ± 1.1189488767 58898	74.39 ± 1.1189857832877057	74.39 ± 1.1189857832877057
10-4		74.53 ± 1.0018946016423083	74.5 ± 0.9996960738144368	74.45 ± 0.9957253336136426	74.43 ± 0.9908677211414245	74.43 ± 0.9916428191164239	74.43 ± 0.991642819164239
10-5		74.3 ± 1.1190038069640333	74.29 ± 1.1192260751072 59	74.29 ± 1.1188827852818184	74.3 ± 1.1217468876711894	74.31 ± 1.1167176327075703	74.31 ± 1.116717632 7075703

Visual Domain Bridge Results :

Dataset : Omniglot
Number Support : 10
Number of Way : 5
Number of Query : 10
Number of episode : 200

Prototypical Network	Proto + VDB Networks
93.95 ± 0.5622416384438277	94.23 ± 0.6254688295990456
93.87 ± 0.6670208578447903	94.0 ± 0.6766969188639771
93.77 ± 0.6542863415967047	94.05 ± 0.6256284999902098
93.65 ± 0.6383930920678889	94.15 ± 0.6234756611127655
93.36 ± 0.6102874758669066	94.09 ± 0.64250791061278
94.13 ± 0.5714853845900173	93.86 ± 0.7357235372067418

Dataset : Aircraft
Number Support : 10
Number of Way : 5
Number of Query : 10
Number of episode : 200

Prototypical Network	Proto + VDB Networks
61.3 ± 1.4200872930915198	63.39 ± 1.424799348399626
61.44 ± 1.4307087094164204	63.08 ± 1.4222741046647793
62.08 ± 1.4244332868899126	63.37 ± 1.3651445728566627
61.41 ± 1.2607531460202668	62.85 ± 1.3523822462602797
61.7 ± 1.3688463756024631	63.29 ± 1.447190922857105
61.5 ± 1.3855827654817303	63.25 ± 1.4592295432864562

Dataset : Birds

Number Support : 10
Number of Way : 5
Number of Query : 10
Number of episode : 200

Prototypical Network	**Proto + VDB Networks**
82.37 ± 1.0860159965672695	84.96 ± 1.05365633258667
83.03 ± 1.0047662378881965	85.61 ± 1.0362813050518667
83.04 ± 0.9893477382599102	85.2 ± 0.9016
83.76 ± 0.9527938807528099	86.11 ± 0.9921540521511768
83.38 ± 1.0861265325918525	85.53 ± 1.0289449318598152
84.07 ± 1.0420778285713597	86.4 ± 1.0763951690712847

Dataset : Flower
Number Support : 10
Number of Way : 5
Number of Query : 10
Number of episode : 200

Prototypical Network	**Proto + VDB Networks**
94.84 ± 0.5441321486550853	94.99 ± 0.5050547685152572
94.97 ± 0.5687226325723287	94.97 ± 0.6021874731344052
94.79 ± 0.584656862783633	94.86 ± 0.5896375863189184
95.61 ± 0.48937043555981186	95.72 ± 0.5237565969035617
95.05 ± 0.500424120122122	95.5 ± 0.5183820212931771
95.01 ± 0.48882062067797427	95.23 ± 0.48935473513597477

Dataset : DTD
Number Support : 10
Number of Way : 5
Number of Query : 10
Number of episode : 200

Prototypical Network	**Proto + VDB Networks**
67.37 ± 1.256412744602664	73.39 ± 1.236260580622063
67.33 ± 1.351768533736453	72.86 ± 1.221981015891818

66.79 ± 1.2635229349718984	72.27 ± 1.2289301594476392
66.64 ± 1.3913957033137625	72.6 ± 1.3264436663499886
67.41 ± 1.317375912638454	72.73 ± 1.3031207069185877
67.68 ± 1.2109057026870425	73.48 ± 1.1392439935325531

Dataset : Fungi
Number Support : 5
Number of Way : 5
Number of Query : None
Number of episode : 200

Prototypical Network	**Proto + VDB Networks**
64.82238095238095 ± 1.8728469522436675	70.10460317460317 ± 1.7702556901347106
63.30563492063492 ± 1.834141680009521	68.2415873015873 ± 1.647533177197179
64.91630952380952 ± 1.8356100677322176	68.70734126984127 ± 1.8568432261244676
64.59611111111111 ± 1.728689112115926	69.2168253968254 ± 1.6762797911100493
63.454206349206345 ± 1.8034429342192073	67.44996031746032 ± 1.795282406800469
65.01472222222222 ± 1.795711892429219	69.62734126984127 ± 1.693796706035633

Conclusion :

We can see that combining VDB with prototypical network increased the accuracy of the prediction, this improvement is very important for some dataset like : Aircraft, Birds, DTD, Fungi. Some other dataset like Omniglot and Flowers does’nt improve a lot.

Understand vdb, and implement it from scratch
Give a recap of this paper vdb

Load the same weight used by vdb with tent

Combine vdb and tent,

finetune the pretrained model, define a new classifier for this episode, and then finetune.
I can repeat the process with the same episode, until the model step

Combination of VDB and TENT

Dataset : Aircraft
Number Shot : 10
Number of Way : 5
Number of query : 10
Number of episode : 200

LR	Number of Iteration	VDB	Proto	0	5	10	20
10-1		61.97 ± 1.36427	60.68 ± 1.3998	60.72 ± 1.402746	60.72 ± 1.402746	60.72 ± 1.402746	60.72 ± 1.402746
10-2		63.44 ± 1.3195	61.43 ± 1.2981	61.41 ± 1.2956	61.41 ± 1.2956	61.41 ± 1.2956	61.41 ± 1.2956
10-3		62.98 ± 1.373	60.65 ± 1.380	60.7 ± 1.381	60.7 ± 1.3819	60.7 ± 1.3819	60.7 ± 1.3819
10-4		62.93 ± 1.4335	60.96 ± 1.36	61.05 ± 1.363	61.05 ± 1.363	61.05 ± 1.363	61.05 ± 1.363
10-5		63.3 ± 1.4007	61.62 ± 1.3259	61.55 ± 1.3225	61.55 ± 1.3225	61.55 ± 1.3225	61.55 ± 1.3225

Dataset : Birds
Number Shot : 10
Number of Way : 5
Number of query : 10
Number of episode : 200

LR	Number of Iteration	VDB	Proto	0	5	10	20
10-1		85.87 ± 0.9546	83.75 ± 0.9440	83.69 ± 0.9509	83.69 ± 0.9509	83.69 ± 0.9509	83.69 ± 0.9509
10-2		84.6 ± 1.040	82.98 ± 1.0728	83.02 ± 1.0706	83.02 ± 1.0706	83.02 ± 1.0706	83.02 ± 1.0706

10-3	85.89 ± 1.03646	82.87 ± 1.0295	82.86 ± 1.030635	82.86 ± 1.030635	82.86 ± 1.030635	83.25 ± 0.992
10-4	85.39 ± 0.9630	83.21 ± 0.9993	83.25 ± 0.992	83.25 ± 0.992	83.25 ± 0.992	83.25 ± 0.992
10-5	86.21 ± 1.023	84.02 ± 1.0009	83.99 ± 1.0072	83.99 ± 1.0072	83.99 ± 1.0072	83.99 ± 1.0072

Dataset : Flower
Number Shot : 10
Number of Way : 5
Number of query : 10
Number of episode : 200

LR	Number of Iteration	VDB	Proto	0	5	10	20
10-1		94.88 ± 0.6133	94.78 ± 0.548	94.69 ± 0.5785	94.69 ± 0.5785	94.69 ± 0.5785	
10-2		94.7 ± 0.579	94.82 ± 0.5959	94.83 ± 0.5972	94.83 ± 0.5972	94.83 ± 0.5972	
10-3		94.95 ± 0.5155	94.97 ± 0.5288	95.0 ± 0.5288	95.0 ± 0.5288	95.0 ± 0.5288	
10-4		95.15 ± 0.5448	95.26 ± 0.5022	95.25 ± 0.5031	95.25 ± 0.5031	95.25 ± 0.5031	
10-5		95.42 ± 0.5248	94.83 ± 0.5319	94.83 ± 0.5319	94.83 ± 0.5319	94.83 ± 0.5319	

Dataset : Omniglot
Number Shot : 10
Number of Way : 5
Number of query : 10
Number of episode : 200

LR	Number of Iteration	VDB	Proto	0	5	10	20
10-1		93.93 ± 0.6359	93.88 ± 0.617	93.86 ± 0.6163	93.86 ± 0.6163	93.86 ± 0.6163	
10-2		93.98 ± 0.6210	93.98 ± 0.5445	93.98 ± 0.5445	93.98 ± 0.5445	93.98 ± 0.5445	
10-3		93.85 ± 0.68512	93.64 ± 0.60459	93.54 ± 0.62824	93.54 ± 0.62824	93.54 ± 0.62824	

10-4	93.67 ± 0.675	93.47 ± 0.6758	93.5 ± 0.6754	93.5 ± 0.6754	93.5 ± 0.6754	
10-5	94.03 ± 0.60314	93.67 ± 0.61904	93.65 ± 0.6200	93.65 ± 0.6200	93.65 ± 0.6200	

Dataset : DTD
Number Shot : 10
Number of Way : 5
Number of query : 10
Number of episode : 200

LR	Number of Iteration	VDB	Proto	0	5	10	20
10-1		73.04 ± 1.2252	67.77 ± 1.2966	67.7 ± 1.30564	67.7 ± 1.30564	67.7 ± 1.30564	
10-2		72.29 ± 1.2700	66.72 ± 1.2995	66.74 ± 1.29576	66.74 ± 1.29576	66.74 ± 1.29576	
10-3		72.69 ± 1.2839	67.37 ± 1.3404	67.42 ± 1.3358	67.42 ± 1.3358	67.42 ± 1.3358	
10-4		72.3 ± 1.2509	67.26 ± 1.3718	67.23 ± 1.3735	67.23 ± 1.3735	67.23 ± 1.3735	
10-5		72.26 ± 1.1506	67.46 ± 1.198	67.63 ± 1.2240	67.63 ± 1.2240	67.63 ± 1.2240	

Dataset : Fungi
Number Shot : 10
Number of Way : 5
Number of query : 10
Number of episode : 200

LR	Number of Iteration	VDB	Proto	0	5	10	20
10-1							
10-2							
10-3							

10-4						
10-5						

Fine Tuning

Dataset : DTD
Number Shot : 10
Number of Way : 5
Number of query : 10
Number of episode : 200
Pretrained model : Resnet 18

LR	Number of Iteration	Proto	0	5	10	25	50
10-1							
10-2		67.59 ± 1.290	67.59 ± 1.2907	30.15 ± 2.205	28.54 ± 2.048	29.06 ± 1.971	30.3 ± 1.9899
10-3		67.24 ± 1.301	67.24 ± 1.301	68.31 ± 1.259	66.51 ± 1.2411	63.1 ± 1.327	60.97 ± 1.4258
10-4		67.88 ± 1.3710	67.88 ± 1.371	68.84 ± 1.4170	69.21 ± 1.3919	69.32 ± 1.3693	69.36 ± 1.3632
10-5		67.35 ± 1.2668	67.35 ± 1.2668	67.54 ± 1.2661	67.84 ± 1.2624	68.17 ± 1.2631	

Dataset : Omniglot
Number Shot : 10
Number of Way : 5
Number of query : 10
Number of episode : 200
Pretrained model : Resnet 18

LR	Number of Iteration	Proto	0	5	10	25	50
10-1		94.03 ± 0.6005	94.03 ± 0.6005	76.02 ± 3.711	77.76 ± 3.351	86.08 ± 1.9935	

10-2	93.58 ± 0.6955	93.58 ± 0.6955	84.96 ± 2.7567	90.11 ± 1.3571	91.91 ± 0.9194	
10-3	94.05 ± 0.6299	94.05 ± 0.6299	93.89 ± 0.6267	94.13 ± 0.6079	94.13 ± 0.6129	
10-4	94.17 ± 0.5746	94.17 ± 0.5746	94.21 ± 0.5849	94.11 ± 0.608	93.97 ± 0.6268	
10-5	93.25 ± 0.5986	93.25 ± 0.5986	93.22 ± 0.6065	93.22 ± 0.6115	93.33 ± 0.5842	

Dataset : Fungi
Number Shot : 5
Number of Way : 5
Number of query : None
Number of episode : 200
Pretrained model : Resnet 18

LR	Number of Iteration	Proto	0	5	10	25	50
10-1		63.3013 ± 1.662	63.3013 ± 1.662	59.153 ± 2.305	59.0716 ± 2.3342	59.232 ± 2.3105	
10-2		64.138 ± 1.833	64.138± 1.8326	60.172± 2.4178	59.918 ± 2.4475	59.985± 2.4450	
10-3		62.4998 ± 1.888	62.4998 ± 1.888	62.5379 ± 1.87462	62.37 ± 1.8701	62.043 ± 1.858	
10-4		63.2003 ±1.7742	63.2003± 1.7742	63.2778 ± 1.7701	63.3339 ± 1.7651	63.4291± 1.7582	
10-5		65.6896 ± 1.649	65.6896 ± 1.649	65.6921 ± 1.648	65.6796± 1.650	65.6598 ± 1.6528	

Dataset : Aircraft
Number Shot : 10
Number of Way : 5
Number of query : 10
Number of episode : 200
Pretrained model : Resnet 18

LR	Number of Iteration	Proto	0	5	10	25	50
10-1		60.32 ±	60.32 ±	40.66 ±	41.57 ±	42.87 ±	

	1.436	1.436	3.024	2.902	2.747	
10-2	60.37 ± 1.350	60.37 ± 1.350	57.36 ± 1.5674	55.85 ± 1.613	54.21 ± 1.8130	
10-3	60.53 ± 1.429	60.53 ± 1.429	60.96 ± 1.409	61.0 ± 1.4005	60.98 ± 1.369	
10-4	60.6 ± 1.337	60.6 ± 1.337	60.71 ± 1.3304	60.81 ± 1.337	60.95 ± 1.337	
10-5	61.88 ± 1.393	61.88 ± 1.393	61.92 ± 1.3867	61.97 ± 1.386	62.02 ± 1.383	

Dataset : Bird
Number Shot : 10
Number of Way : 5
Number of query : 10
Number of episode : 200
Pretrained model : Resnet 18

LR	Number of Iteration	Proto	0	5	10	25	50
10-1		82.94 ± 1.044	82.94 ± 1.044	62.94 ± 4.126	63.25 ± 4.074	63.76 ± 3.967	
10-2		83.05 ± 1.0251	83.05 ± 1.0251	76.88 ± 1.846	70.69 ± 3.019	68.95 ± 3.218	
10-3							
10-4							
10-5							

Fine Tuning + VDB

Dataset : Omniglot
Number Shot : 15
Number of Way : 5
Number of query : 5
Number of episode : 200
Pretrained model : Resnet vdb 18

LR	Number of Iteration	Proto	0	5	10	25	50

10-1	94.88 ± 0.6747	94.82 ± 0.6624	94.08 ± 0.7353	93.82 ± 0.6985	94.08 ± 0.7290	
10-2	94.9 ± 0.6367	94.4 ± 0.7375	94.42 ± 0.7310	94.36 ± 0.750	94.02 ± 0.7681	
10-3	94.76 ± 0.6684	93.28 ± 0.82554	93.28 ± 0.82554	93.38 ± 0.8064	93.36 ± 0.7945	
10-4	94.5 ± 0.7216	94.6 ± 0.7158	94.6 ± 0.7158	94.6 ± 0.7158	94.58 ± 0.7204	
10-5	94.54 ± 0.69722	94.54 ± 0.68835	94.54 ± 0.68835	94.54 ± 0.68835	94.54 ± 0.68835	

Dataset : Omniglot
Number Shot : 10
Number of Way : 5
Number of query : 10
Number of episode : 200
Pretrained model : Resnet vdb 18

LR	Number of Iteration	Proto	0	5	10	25	50
10-1		93.48 ± 0.6930	94.16 ± 0.6751	93.89 ± 0.6779	93.61 ± 0.7237	93.41 ± 0.7625	
10-2		94.52 ± 0.5627	94.12 ± 0.62329	94.16 ± 0.6056	94.14 ± 0.61327	93.93 ± 0.6187	
10-3		94.0 ± 0.564670	94.34 ± 0.55375	94.35 ± 0.5532	94.36 ± 0.5542	94.41 ± 0.5412	
10-4		93.14 ± 0.6533	93.61 ± 0.6872	93.62 ± 0.6848	93.63 ± 0.6857	93.63 ± 0.6863	
10-5		93.19 ± 0.7212	93.49 ± 0.7281	93.48 ± 0.7319	93.48 ± 0.7319	93.48 ± 0.7298	

Dataset : Omniglot
Number Shot : 5
Number of Way : 5
Number of query : 10
Number of episode : 200
Pretrained model : Resnet vdb 18

LR	Number of Iteration	Proto	0	5	10	25	50
10-1		91.59 ± 0.7812	93.09 ± 0.6856	92.64 ± 0.7518	92.2 ± 0.8412	92.4 ± 0.8194	
10-2		90.65 ± 0.7839	92.03 ± 0.776	92.1 ± 0.7705	92.0 ± 0.78791	91.9 ± 0.7926	
10-3		91.65 ± 0.8504	93.19 ± 0.7297	93.17 ± 0.73924	93.17 ± 0.73872	93.24 ± 0.7336	
10-4		90.77 ± 0.7823	92.58 ± 0.7362	92.58 ± 0.7362	92.6 ± 0.7296	92.62 ± 0.7293	
10-5		91.34 ± 0.8019	93.34 ± 0.627	93.34 ± 0.6272	93.34 ± 0.62726	93.34 ± 0.6272	

Dataset : Omniglot
Number Shot : 2
Number of Way : 5
Number of query : 10
Number of episode : 200
Pretrained model : Resnet vdb 18

LR	Number of Iteration	Proto	0	5	10	25	50
10-1		83.63 ± 1.1435	89.06 ± 0.8964	89.12 ± 0.8924	89.09 ± 0.8925	89.09 ± 0.89252	
10-2		82.71 ± 1.10732	87.74 ± 1.0313	87.74 ± 1.0313	87.74 ± 1.0313	87.74 ± 1.0313	
10-3		82.89 ± 1.1155	87.58 ± 1.0280	87.58 ± 1.0280	87.59 ± 1.02532	87.57 ± 1.0311	
10-4		84.31 ± 1.0375	88.38 ± 0.9376	88.38 ± 0.93768	88.38 ± 0.9376	88.38 ± 0.9376	
10-5		83.09 ± 1.0798	87.8 ± 0.9913	87.8 ± 0.9913	87.8 ± 0.9913	87.8 ± 0.99130	

Dataset : Omniglot
Number Shot : 1
Number of Way : 5
Number of query : 10
Number of episode : 200
Pretrained model : Resnet vdb 18

LR	Number of Iteration	Proto	0	5	10	25	50
10-1		70.46 ± 1.4505	77.79 ± 1.304	77.79 ± 1.3046	77.79 ± 1.3046	77.79 ± 1.30465	
10-2		71.05 ± 1.5714	78.97 ± 1.377	78.97 ± 1.3778	78.97 ± 1.3778	78.97 ± 1.3778	
10-3		70.72 ± 1.3859	78.1 ± 1.3217	78.1 ± 1.3217	78.1 ± 1.321	78.1 ± 1.321	
10-4		72.06 ± 1.419	79.3 ± 1.4939	79.3 ± 1.4939	79.3 ± 1.4939	79.3 ± 1.4939	
10-5		72.79 ± 1.4149	78.88 ± 1.4605	78.88 ± 1.4605	78.88 ± 1.4605	78.88 ± 1.4605	

Dataset : DTD
Number Shot : 10
Number of Way : 5
Number of query : 10
Number of episode : 200
Pretrained model : Resnet vdb 18

LR	Number of Iteration	Proto	0	5	10	25	50
10-1		67.6 ± 1.2834	73.07 ± 1.183	71.94 ± 1.2367	70.96 ± 1.2485	69.81 ± 1.213	
10-2		66.97 ± 1.35054	73.02 ± 1.1799	73.01 ± 1.1821	72.91 ± 1.1778	72.75 ± 1.1981	
10-3		66.3 ± 1.42305	72.18 ± 1.3477	72.19 ± 1.3464	72.24 ± 1.3475	72.18 ± 1.35826	
10-4		67.24 ± 1.3918	73.33 ± 1.2468	73.33 ± 1.2468	73.3 ± 1.2497	73.34 ± 1.2479	
10-5		67.29 ± 1.4128	72.75 ± 1.373	72.75 ± 1.373	72.75 ± 1.3732	72.74 ± 1.3737	

Dataset : DTD
Number Shot : 15
Number of Way : 5
Number of query : 10
Number of episode : 200
Pretrained model : Resnet vdb 18

LR	Number of Iteration	Proto	0	5	10	25	50
10-1		75.04 ± 1.07566	78.49 ± 1.1085	77.74 ± 1.1793	76.37 ± 1.1812	77.06 ± 1.0856	
10-2		75.14 ± 1.1033	77.92 ± 1.2142	78.3 ± 1.2100	78.65 ± 1.18671	77.71 ± 1.1456	
10-3		74.34 ± 1.0467	78.02 ± 1.0713	78.02 ± 1.068	78.12 ± 1.0546	78.45 ± 1.0761	
10-4		74.59 ± 1.06303	77.92 ± 1.0954	77.91 ± 1.0956	77.91 ± 1.0949	77.9 ± 1.0975	
10-5		75.18 ± 1.0739	78.7 ± 1.1759	78.69 ± 1.1778	78.69 ± 1.1778	78.71 ± 1.1779	