

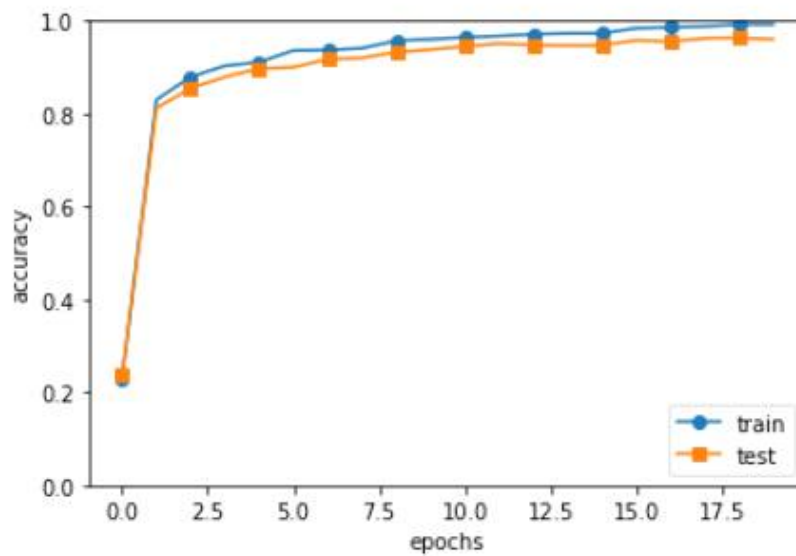
## 그래프 출력 화면

```
plt.plot(x, trainer.train_acc_list, marker='o', label='train', markevery=2,  
plt.plot(x, trainer.test_acc_list, marker='s', label='test', markevery=2)  
plt.xlabel("epochs")  
plt.ylabel("accuracy")  
plt.ylim(0, 1.0)  
plt.legend(loc='lower right')  
plt.show()
```

train loss:0.010988573829449608

===== Final Test Accuracy =====

test acc:0.959



In [ ]:

```
plt.ylim(0, 1.0)  
plt.legend(loc='lower right')  
plt.show()
```

```
train loss:0.040233404007417240  
train loss:0.0282329586052162  
train loss:0.047219647817534474  
=== epoch:16, train acc:0.984, test acc:0.958 ===  
train loss:0.06282979697597939  
train loss:0.026335824599687238  
train loss:0.09193259965683048  
train loss:0.061288765201927255  
train loss:0.03435585345123075  
train loss:0.054207465638251316  
train loss:0.03995793974892571  
train loss:0.02793888197079489  
train loss:0.04324783684747972  
train loss:0.037099503245758544  
train loss:0.06663333406132592  
train loss:0.07259583931529105  
train loss:0.028645794424057725  
train loss:0.02754991370763684  
train loss:0.048926888934533425  
train loss:0.05083018904857868
```

In [ ]:

```
plt.legend(loc='lower right')  
plt.show()
```

```
train loss:0.031607063001127075  
train loss:0.009833100821455616  
train loss:0.039105523539822024  
=== epoch:19, train acc:0.992, test acc:0.963 ===  
train loss:0.02304256951410398  
train loss:0.00673924825815309  
train loss:0.028127905109256283  
train loss:0.06688438124394341  
train loss:0.01899156597729266  
train loss:0.06729228186622904  
train loss:0.07382260216015449  
train loss:0.022342038369797007  
train loss:0.02130798476895891  
train loss:0.039013624533455304  
train loss:0.017005457721356778  
train loss:0.010211804934634923  
train loss:0.015747649144832024  
train loss:0.023190646866520517  
train loss:0.02827654859872451  
train loss:0.008080463212531282
```

```
train loss:0.0074317995286867725
train loss:0.01035604764693563
=== epoch:20, train acc:0.992, test acc:0.96 ===
train loss:0.02028288995388713
train loss:0.02301145890895927
train loss:0.013339373035011976
train loss:0.029412824393619096
train loss:0.03342051970954253
train loss:0.017687858775552023
train loss:0.018831155164787856
train loss:0.0327429350966913
train loss:0.00830294338551123
train loss:0.03950463513068596
train loss:0.00936376306184742
train loss:0.03795176981427972
train loss:0.02714132936429682
train loss:0.011485437569814419
train loss:0.009526149264328224
train loss:0.032699620407687424
train loss:0.006018045780467095
```

5 1 1

```
train loss:2.2998972453777236
=== epoch:1, train acc:0.231, test acc:0.236 ===
train loss:2.295721821361099
train loss:2.288797818059546
train loss:2.2841339059756702
train loss:2.27822485853553
train loss:2.2654685828974954
train loss:2.254407780657926
train loss:2.21511196094543
train loss:2.1833696380173278
train loss:2.168737485157131
train loss:2.131537804891339
train loss:2.1498446396043263
train loss:2.0676024018177785
train loss:2.00090114937646
train loss:1.9561788229597452
train loss:1.8821448089506156
train loss:1.8058231722747156
train loss:1.8361972511286495
train loss:1.6240014376661622
train loss:1.5942134177036036
train loss:1.482739976682936
train loss:1.3107105583848782
train loss:1.412410901215471
train loss:1.393048122557562
train loss:1.2309868660497612
train loss:1.035170638462059
train loss:1.0425710252773392
train loss:0.8970823858054569
```

train loss:0.8382165709730691  
train loss:0.8678618106363973  
train loss:0.8887877529012331  
train loss:0.8307713063549584  
train loss:0.6764925516209511  
train loss:0.7320237483199844  
train loss:0.5813300357168228  
train loss:0.5954408785613721  
train loss:0.5876015237018936  
train loss:0.7100260937790405  
train loss:0.6821419012441524  
train loss:0.8455022149695429  
train loss:0.42184531285834287  
train loss:0.9155940967557329  
train loss:0.6495304953337159  
train loss:0.5576716989574292  
train loss:0.7500396761757354  
train loss:0.5781258598867851  
train loss:0.5645826043118088  
train loss:0.43885959437197725  
train loss:0.3089960807098071  
train loss:0.6610091535602003  
train loss:0.676997192803789  
=== epoch:2, train acc:0.83, test acc:0.812 ===  
train loss:0.5866926194674182  
train loss:0.48354758370115714  
train loss:0.5369175526312173  
train loss:0.5955024826743811  
train loss:0.551076247993209  
train loss:0.37480928104601297  
train loss:0.5050715927019462  
train loss:0.4340796786140633  
train loss:0.5008122373489772  
train loss:0.49102893078791565  
train loss:0.4124061137492882  
train loss:0.5531937522505472  
train loss:0.40975425041347746  
train loss:0.4458389461704616  
train loss:0.41596780939410377  
train loss:0.47367420643496666  
train loss:0.39422905764879945  
train loss:0.4994055117311968  
train loss:0.40425788839531274  
train loss:0.3716450983032333  
train loss:0.4314925675681429  
train loss:0.3853702293417895  
train loss:0.3701439029568148  
train loss:0.3042265740636428  
train loss:0.3848605719955871

train loss:0.30516178375506053  
train loss:0.3662143420694766  
train loss:0.42073337459657295  
train loss:0.37460016828053666  
train loss:0.3635658234931098  
train loss:0.29748380822262344  
train loss:0.45254807816027715  
train loss:0.49769483177768165  
train loss:0.2968645310854414  
train loss:0.2969609194101691  
train loss:0.5272057591939102  
train loss:0.46550159541851654  
train loss:0.35155213234758653  
train loss:0.24334878234396576  
train loss:0.2979259238218249  
train loss:0.24753760166079097  
train loss:0.27754363876166177  
train loss:0.3397225229221729  
train loss:0.44824234604331714  
train loss:0.2880013314356626  
train loss:0.35518353631732646  
train loss:0.3508431081070947  
train loss:0.22182316143083886  
train loss:0.2909291750123166  
train loss:0.24697761432243082  
=== epoch:3, train acc:0.879, test acc:0.855 ===  
train loss:0.2104473327146279  
train loss:0.2267140179597399  
train loss:0.3459636842276459  
train loss:0.26634505239289546  
train loss:0.3526509766608803  
train loss:0.37887342626158643  
train loss:0.36916446681101367  
train loss:0.29692755745696275  
train loss:0.3606431825861178  
train loss:0.3725499167276334  
train loss:0.4497675866718793  
train loss:0.19500461557992732  
train loss:0.32701207081734573  
train loss:0.3406195355204548  
train loss:0.2967010825387845  
train loss:0.3921215793163669  
train loss:0.36155704075646683  
train loss:0.26317588602499525  
train loss:0.19223938016805678  
train loss:0.19417394853739917  
train loss:0.39142151243787643  
train loss:0.2903117052406735  
train loss:0.1703622120049967

train loss:0.26011869579256425  
train loss:0.3202317915340679  
train loss:0.30634644562977625  
train loss:0.2945006645617219  
train loss:0.3457024774294101  
train loss:0.25906196696664546  
train loss:0.26371285598768307  
train loss:0.24820172390156872  
train loss:0.18506835798149995  
train loss:0.24213111808171867  
train loss:0.3078902659500305  
train loss:0.2570679032883506  
train loss:0.3751612139897743  
train loss:0.17046655427041887  
train loss:0.2767420311823528  
train loss:0.3221887869921162  
train loss:0.15030951570608317  
train loss:0.4544311282846902  
train loss:0.2657180936971886  
train loss:0.2630976997998023  
train loss:0.27269565411023683  
train loss:0.23994904038972398  
train loss:0.3723428159012921  
train loss:0.2745381942085678  
train loss:0.1501162104172783  
train loss:0.28463401087258794  
train loss:0.3658481311848022  
=== epoch:4, train acc:0.903, test acc:0.879 ===  
train loss:0.3778350705102986  
train loss:0.2655439821719925  
train loss:0.20844206179160235  
train loss:0.2832652135287503  
train loss:0.2606367133006726  
train loss:0.2919890088126184  
train loss:0.3007390052833128  
train loss:0.16908336881178554  
train loss:0.2996213344783028  
train loss:0.3350839113157874  
train loss:0.25825946227846297  
train loss:0.30249420816815276  
train loss:0.21824251019842042  
train loss:0.21044651651061322  
train loss:0.19518154247989233  
train loss:0.27020926783901417  
train loss:0.21018320593917772  
train loss:0.18839892831475769  
train loss:0.15188824548936458  
train loss:0.2570602157341925  
train loss:0.2600577790019733

train loss:0.2783269315156989  
train loss:0.3330979402120113  
train loss:0.2563060926752122  
train loss:0.5437106164827815  
train loss:0.22462095143440788  
train loss:0.1791177186332254  
train loss:0.320870392283842  
train loss:0.24823151702851345  
train loss:0.16513603083738637  
train loss:0.20103627167369612  
train loss:0.1975601924345992  
train loss:0.19753542724048942  
train loss:0.1720574693922511  
train loss:0.3128828695733825  
train loss:0.2839549582313135  
train loss:0.2409475431147308  
train loss:0.3154181108012939  
train loss:0.18754719550695476  
train loss:0.16479195502095564  
train loss:0.1879996185552947  
train loss:0.31978133712152396  
train loss:0.20785998528489683  
train loss:0.15727133934875565  
train loss:0.23888312547885357  
train loss:0.26231937449906223  
train loss:0.2187855819788022  
train loss:0.21449900931428745  
train loss:0.15239385410005515  
train loss:0.1607134391934807  
=== epoch:5, train acc:0.911, test acc:0.897 ===  
train loss:0.2840499418596136  
train loss:0.3012803666615602  
train loss:0.19623624804647105  
train loss:0.2592180289740677  
train loss:0.3158027808798588  
train loss:0.32040571274137525  
train loss:0.17820996872962744  
train loss:0.2754377211097262  
train loss:0.243584468256012  
train loss:0.340804505217349  
train loss:0.2532835700294585  
train loss:0.1388826090700791  
train loss:0.17412750901519583  
train loss:0.2474685139285005  
train loss:0.14930096934115814  
train loss:0.16859785895196353  
train loss:0.12953458815405072  
train loss:0.2954613709525601  
train loss:0.14708093118306403

train loss:0.20487399133169934  
train loss:0.13270649695101974  
train loss:0.13266821064785708  
train loss:0.18035642235136823  
train loss:0.2336559303084298  
train loss:0.16662544778088517  
train loss:0.28659564527709125  
train loss:0.22386696457449878  
train loss:0.1852247178176279  
train loss:0.16302084291214985  
train loss:0.18636098052038605  
train loss:0.451505490884585  
train loss:0.16260310510245385  
train loss:0.4263922808723104  
train loss:0.26771560049594906  
train loss:0.24339227135228278  
train loss:0.15037472364921967  
train loss:0.2587355025445441  
train loss:0.31641312552803247  
train loss:0.2708575842888296  
train loss:0.3378400954112491  
train loss:0.2856198123319538  
train loss:0.197585284645219  
train loss:0.20868982177319104  
train loss:0.1778164859753906  
train loss:0.174327839244098  
train loss:0.1833006739589588  
train loss:0.19535856840809182  
train loss:0.14906840049655268  
train loss:0.2279949233077575  
train loss:0.1966831434695125  
=== epoch:6, train acc:0.936, test acc:0.9 ===  
train loss:0.1529343062857253  
train loss:0.21753843422099994  
train loss:0.27259121545191467  
train loss:0.2654916894887017  
train loss:0.16086166555967352  
train loss:0.33410851090527854  
train loss:0.21452574531542998  
train loss:0.23837436215848182  
train loss:0.1664874604583834  
train loss:0.17211641087870821  
train loss:0.17911965133376356  
train loss:0.16449666979399644  
train loss:0.17754374900412143  
train loss:0.15226978381163947  
train loss:0.15777115004269948  
train loss:0.3016738467541814  
train loss:0.12276027830322692



train loss:0.1657865689700952  
train loss:0.11852511716131929  
train loss:0.1435273385484474  
train loss:0.1720000905946132  
train loss:0.1162212284689653  
train loss:0.17980367391084667  
train loss:0.1874433484931004  
train loss:0.13710831938378618  
train loss:0.20320226145708276  
train loss:0.22656464317035646  
train loss:0.11600708628225544  
train loss:0.13312522555207063  
train loss:0.11775014191137143  
train loss:0.11302190815712593  
train loss:0.2015829675568776  
train loss:0.199389357295707  
train loss:0.14051953284921084  
train loss:0.19193645043148724  
train loss:0.18315021193309156  
train loss:0.13297242167011303  
train loss:0.07140574099394126  
train loss:0.15834215954034334  
train loss:0.16538371490409318  
train loss:0.1579172814567766  
train loss:0.10891936823044583  
train loss:0.09234667245407945  
train loss:0.22762674352899775  
train loss:0.18541028916700242  
train loss:0.20509475465863486  
train loss:0.1153810415672039  
train loss:0.17070368066768485  
train loss:0.12074017511020103  
train loss:0.24499670930750064  
=== epoch:7, train acc:0.937, test acc:0.917 ===  
train loss:0.20173980961383844  
train loss:0.12491338155359126  
train loss:0.11601889259162947  
train loss:0.17625312799413223  
train loss:0.15642689525019815  
train loss:0.19385190889908863  
train loss:0.0954035535231857  
train loss:0.16806557929275343  
train loss:0.10503723192590343  
train loss:0.2827391563458656  
train loss:0.1875002639872395  
train loss:0.26151260015753985  
train loss:0.13554065518495415  
train loss:0.22268158696610788  
train loss:0.280564958179079

train loss:0.0942010512554728  
train loss:0.16839885598700038  
train loss:0.17458094465303714  
train loss:0.14693684166324833  
train loss:0.08905909995785777  
train loss:0.16153731806387378  
train loss:0.134271071525521  
train loss:0.17072691066131507  
train loss:0.07800908819259143  
train loss:0.19841564831272063  
train loss:0.0999886186798232  
train loss:0.20910235580865819  
train loss:0.11490299853383626  
train loss:0.11110621700856876  
train loss:0.10003062590338964  
train loss:0.11847004499108377  
train loss:0.13806091776392707  
train loss:0.09081699698599598  
train loss:0.12286581918461092  
train loss:0.16282771236985621  
train loss:0.20260807826030525  
train loss:0.11654426097108869  
train loss:0.11962770957628162  
train loss:0.14529075067128866  
train loss:0.16062164401610293  
train loss:0.09251105424176038  
train loss:0.1965830345058321  
train loss:0.210915590530914  
train loss:0.11865213604065718  
train loss:0.20646138847933163  
train loss:0.12778038618705043  
train loss:0.0646868759641299  
train loss:0.14115258116728746  
train loss:0.2356737116790462  
train loss:0.12195779661938788  
=== epoch:8, train acc:0.941, test acc:0.92 ===  
train loss:0.20091720287693582  
train loss:0.17193203782571664  
train loss:0.11011330083613341  
train loss:0.1648326381044777  
train loss:0.09614438401061878  
train loss:0.24738012562525338  
train loss:0.09769323334371613  
train loss:0.21757136470228985  
train loss:0.06149849639383844  
train loss:0.10479033976241635  
train loss:0.1655250807815127  
train loss:0.1486039203200234  
train loss:0.11084594590776042

train loss:0.17027296638539344  
train loss:0.09911122944491452  
train loss:0.10935365094321073  
train loss:0.20146543735901173  
train loss:0.1490988985874275  
train loss:0.06445293611831839  
train loss:0.06068141748519947  
train loss:0.046408518315901176  
train loss:0.11481078282075406  
train loss:0.060948209518454005  
train loss:0.10441862729641752  
train loss:0.10538708892120113  
train loss:0.22711882383404125  
train loss:0.06926626704630601  
train loss:0.13036965745109017  
train loss:0.08887719166148733  
train loss:0.13139513475714754  
train loss:0.1503777280825192  
train loss:0.0899568875460191  
train loss:0.09418978948913455  
train loss:0.09660875048195822  
train loss:0.14694193358577773  
train loss:0.15257143328760575  
train loss:0.1693014744734996  
train loss:0.068135303446926  
train loss:0.13559870540718968  
train loss:0.11686238298954935  
train loss:0.20742772464072257  
train loss:0.19407700230747063  
train loss:0.10636367001146668  
train loss:0.06446010213147368  
train loss:0.09152556518758233  
train loss:0.08796845206917965  
train loss:0.10071333787537214  
train loss:0.07634328493301475  
train loss:0.14427700218944028  
train loss:0.11178333285617369  
=== epoch:9, train acc:0.957, test acc:0.932 ===  
train loss:0.07953699333846038  
train loss:0.07671349650734709  
train loss:0.1019800895094898  
train loss:0.08105558730293443  
train loss:0.06569139697823027  
train loss:0.16529161268658385  
train loss:0.05792595656937366  
train loss:0.08815072364224574  
train loss:0.20604147020299313  
train loss:0.050296912369779435  
train loss:0.12032133425315099

train loss:0.1908170950410765  
train loss:0.061988105001777614  
train loss:0.09947788710395913  
train loss:0.15972089663998043  
train loss:0.09033266850460847  
train loss:0.26178340995233873  
train loss:0.08725693637239126  
train loss:0.16933720740331562  
train loss:0.11274722773684877  
train loss:0.09120866882603403  
train loss:0.0952192555093313  
train loss:0.09903121889644957  
train loss:0.07697677573410734  
train loss:0.06022383248061468  
train loss:0.13546532510446213  
train loss:0.11180745079604101  
train loss:0.09627620046771543  
train loss:0.11396786157857398  
train loss:0.0817548858338217  
train loss:0.13658267914704186  
train loss:0.14828909627024053  
train loss:0.19111198712331887  
train loss:0.07478064798672956  
train loss:0.08460544726764685  
train loss:0.09155712527895267  
train loss:0.147134814643152  
train loss:0.09785145989192498  
train loss:0.08036953002815127  
train loss:0.1004837687279875  
train loss:0.09639851627135826  
train loss:0.08560219529518408  
train loss:0.11974251622596277  
train loss:0.06762250993731145  
train loss:0.03417165439336231  
train loss:0.061195473897478016  
train loss:0.10429869618338115  
train loss:0.15776931073765543  
train loss:0.09323820646737593  
train loss:0.15675056409042418  
=== epoch:10, train acc:0.96, test acc:0.938 ===  
train loss:0.20060387771497465  
train loss:0.09441364785851197  
train loss:0.09766048321121634  
train loss:0.11569931069124056  
train loss:0.09745979913085495  
train loss:0.04894957382249217  
train loss:0.15534388364445392  
train loss:0.07455429339716059  
train loss:0.07465658844726143

train loss:0.11408072557092  
train loss:0.2088214786898618  
train loss:0.07312132786359041  
train loss:0.08415952753640771  
train loss:0.06468805158560746  
train loss:0.05678270286318158  
train loss:0.06084246348510632  
train loss:0.0726827194456717  
train loss:0.143789469967781  
train loss:0.04310033135829906  
train loss:0.21774207242050886  
train loss:0.14373163142025558  
train loss:0.039621674073002044  
train loss:0.06034677649824545  
train loss:0.05973320472623804  
train loss:0.07533114719803899  
train loss:0.10285953271646857  
train loss:0.10523424232575267  
train loss:0.13883587093339833  
train loss:0.05550222384819099  
train loss:0.06461621603080653  
train loss:0.1419537407166313  
train loss:0.08650044392611267  
train loss:0.07230566330592397  
train loss:0.060251703550652326  
train loss:0.09539312723270658  
train loss:0.1298898576589875  
train loss:0.08891813909984167  
train loss:0.07782807746604463  
train loss:0.11754954885678645  
train loss:0.29470345143560084  
train loss:0.10944524622654932  
train loss:0.06235005610434342  
train loss:0.25094398749323454  
train loss:0.17460744918696242  
train loss:0.10853422043406359  
train loss:0.14967465731202145  
train loss:0.1181038075127745  
train loss:0.0699634019431723  
train loss:0.15903707474874987  
train loss:0.07305709370572394  
=== epoch:11, train acc:0.964, test acc:0.945 ===  
train loss:0.08217612333129455  
train loss:0.09581030946589345  
train loss:0.12323605330410276  
train loss:0.09152595789696932  
train loss:0.12705640656614123  
train loss:0.07121982068590817  
train loss:0.16972599206371505

train loss:0.09098953420761025  
train loss:0.0725511680971808  
train loss:0.12042515393811483  
train loss:0.12440534585256763  
train loss:0.12643002919716648  
train loss:0.1830738173453883  
train loss:0.166731449603847  
train loss:0.12477318294440677  
train loss:0.12051359810219699  
train loss:0.07501366003810579  
train loss:0.07761205083427805  
train loss:0.0922066591884469  
train loss:0.08789019879094434  
train loss:0.06764051123078806  
train loss:0.08048817871241942  
train loss:0.08360758809501495  
train loss:0.060974782995182865  
train loss:0.18063967817236562  
train loss:0.12091837963385499  
train loss:0.06982424192182805  
train loss:0.06931443688554544  
train loss:0.04866865617027354  
train loss:0.08672213577154159  
train loss:0.18713296700642856  
train loss:0.12985945465072468  
train loss:0.05688453948632032  
train loss:0.11003848266392822  
train loss:0.10186432280767392  
train loss:0.16675982910918655  
train loss:0.03754229290742021  
train loss:0.1416082929752038  
train loss:0.1636464995277929  
train loss:0.05221457067204132  
train loss:0.054443020922480254  
train loss:0.04295349970431851  
train loss:0.08968580408668289  
train loss:0.13193238613297276  
train loss:0.11219675948890058  
train loss:0.05433765374738495  
train loss:0.059073822233533635  
train loss:0.07006949567422761  
train loss:0.06812992480584987  
train loss:0.08373005355572072  
=== epoch:12, train acc:0.967, test acc:0.951 ===  
train loss:0.061401594164269185  
train loss:0.09724190833865594  
train loss:0.10771750334944553  
train loss:0.06965240331065517  
train loss:0.08597584409818645

train loss:0.056619871876448576  
train loss:0.054899164842150655  
train loss:0.06834300343754912  
train loss:0.07318684972125505  
train loss:0.10804284798631804  
train loss:0.03580903712586713  
train loss:0.06710472288636914  
train loss:0.024547565038243895  
train loss:0.11705141712453378  
train loss:0.09855985290579561  
train loss:0.08393753077717168  
train loss:0.07679691772717663  
train loss:0.03263463259931781  
train loss:0.0183963545622131  
train loss:0.04549224881367331  
train loss:0.08902307946331446  
train loss:0.11792267377271744  
train loss:0.06848443421407346  
train loss:0.1226808163230036  
train loss:0.12868865575019525  
train loss:0.03340941098954869  
train loss:0.0295268425100041  
train loss:0.11294031103217093  
train loss:0.028317402422383148  
train loss:0.06582231805780794  
train loss:0.04815121390342454  
train loss:0.0737324763832988  
train loss:0.03910550980429448  
train loss:0.04752162227180471  
train loss:0.12970638733982456  
train loss:0.06515871359596287  
train loss:0.06459538749623932  
train loss:0.18686772869241747  
train loss:0.09173655519037034  
train loss:0.02905021961310859  
train loss:0.049069176744003976  
train loss:0.03317204569502924  
train loss:0.042545019100058486  
train loss:0.06580573180260774  
train loss:0.0777032774874716  
train loss:0.05636752601291503  
train loss:0.04230492181856453  
train loss:0.030777600605280026  
train loss:0.03329222678379575  
train loss:0.09190547175207467  
=== epoch:13, train acc:0.971, test acc:0.948 ===  
train loss:0.06059929633238948  
train loss:0.06239567953513415  
train loss:0.03935058921177848

train loss:0.038679015822240224  
train loss:0.08016049675119037  
train loss:0.07570584935420596  
train loss:0.04490793211441453  
train loss:0.03800216963150368  
train loss:0.08708712296398848  
train loss:0.16537674754385867  
train loss:0.04107081348925191  
train loss:0.04254299454392142  
train loss:0.04429835180723192  
train loss:0.050612885577438475  
train loss:0.09743460003766971  
train loss:0.04556626831351793  
train loss:0.056072028250003444  
train loss:0.09827708807030962  
train loss:0.08971928869681133  
train loss:0.07617038873412031  
train loss:0.060672278146465024  
train loss:0.054633659303697464  
train loss:0.07509410956035459  
train loss:0.03394148895155194  
train loss:0.08072006008397324  
train loss:0.08015227308430543  
train loss:0.06449765341428897  
train loss:0.0835551678771667  
train loss:0.0510099254720081  
train loss:0.06092281735040255  
train loss:0.045432468670253565  
train loss:0.01963683788596288  
train loss:0.0260125006550994  
train loss:0.046746456441686235  
train loss:0.13486901593156872  
train loss:0.034393895960199775  
train loss:0.046486220005573654  
train loss:0.03610698421510589  
train loss:0.06398673484559189  
train loss:0.0986721029591076  
train loss:0.09843319272885304  
train loss:0.0243067054063434  
train loss:0.11066831780836911  
train loss:0.03478593030271294  
train loss:0.10695095536170975  
train loss:0.15624853710827863  
train loss:0.04709135059958047  
train loss:0.017763758289893624  
train loss:0.07452436747139009  
train loss:0.0843949413150864  
=== epoch:14, train acc:0.973, test acc:0.947 ===  
train loss:0.14875875995366286



train loss:0.09044723070296862  
train loss:0.05289261993243519  
train loss:0.043140886958301865  
train loss:0.023545849910063005  
train loss:0.07834746308271812  
train loss:0.06095479522470737  
train loss:0.0637451685597925  
train loss:0.08541351419550047  
train loss:0.04242976733400094  
train loss:0.057417825837842676  
train loss:0.06039664440823033  
train loss:0.04538827105777782  
train loss:0.07676930172486043  
train loss:0.04103045491233038  
train loss:0.04861365833497886  
train loss:0.0327577550482771  
train loss:0.0352948772804738  
train loss:0.07991025682245077  
train loss:0.14799036924779327  
train loss:0.034439926629150006  
train loss:0.05010183193801252  
train loss:0.04849153068422806  
train loss:0.024208729713350415  
train loss:0.031610495755400654  
train loss:0.05173007018215544  
train loss:0.05292139776051737  
train loss:0.027840529525490845  
train loss:0.13313585449854276  
train loss:0.03387348734142823  
train loss:0.0894412132771392  
train loss:0.1364006324717233  
train loss:0.018736586530325915  
train loss:0.053211360916860156  
train loss:0.12263068792172536  
train loss:0.022063593616175967  
train loss:0.04302644104136773  
train loss:0.06487275064989889  
train loss:0.033419576574938666  
train loss:0.1106453533930104  
train loss:0.0956415000684559  
train loss:0.0652275623674473  
train loss:0.0275776855500069  
train loss:0.06455351218404223  
train loss:0.04540817664502941  
train loss:0.0337133411255559  
train loss:0.10013389461087892  
train loss:0.04577980162691274  
train loss:0.050710534666450986  
train loss:0.05073827820588621

=== epoch:15, train acc:0.973, test acc:0.947 ===

train loss:0.04884999564824992  
train loss:0.059203403919781336  
train loss:0.06376823533083542  
train loss:0.03804461332316666  
train loss:0.03842568385051129  
train loss:0.04978700425888846  
train loss:0.03907490862350748  
train loss:0.05836610864470173  
train loss:0.0500678103456906  
train loss:0.030457932306991235  
train loss:0.03554616735390659  
train loss:0.02700536844367608  
train loss:0.033671610609154363  
train loss:0.0427453445375376  
train loss:0.0535744349865435  
train loss:0.07709001059168061  
train loss:0.03318018957346741  
train loss:0.055016989628228305  
train loss:0.050807753184839745  
train loss:0.13121180085819073  
train loss:0.05174541228912622  
train loss:0.041690181652822095  
train loss:0.056555111510088685  
train loss:0.12832230178493223  
train loss:0.07169344484486634  
train loss:0.030621723071586716  
train loss:0.040507895251373716  
train loss:0.048392650288670236  
train loss:0.04115463060308421  
train loss:0.01644919075774125  
train loss:0.05190159885030199  
train loss:0.0211607905118643  
train loss:0.05632444490967839  
train loss:0.049795523432852436  
train loss:0.045437442549786454  
train loss:0.039484184252229056  
train loss:0.0874188299637374  
train loss:0.031870260645215205  
train loss:0.03728711975707954  
train loss:0.04278260612804642  
train loss:0.03343853973613069  
train loss:0.02576676770017998  
train loss:0.04551185663977174  
train loss:0.045735003567115094  
train loss:0.029435907564312885  
train loss:0.023199187864687543  
train loss:0.03193031686360774  
train loss:0.040239464887417246

train loss:0.0282329586052162  
train loss:0.047219647817534474  
=== epoch:16, train acc:0.984, test acc:0.958 ===  
train loss:0.06282979697597939  
train loss:0.026335824599687238  
train loss:0.09193259965683048  
train loss:0.061288765201927255  
train loss:0.03435585345123075  
train loss:0.054207465638251316  
train loss:0.03995793974892571  
train loss:0.02793888197079489  
train loss:0.04324783684747972  
train loss:0.037099503245758544  
train loss:0.06663333406132592  
train loss:0.07259583931529105  
train loss:0.028645794424057725  
train loss:0.02754991370763684  
train loss:0.048926888934533425  
train loss:0.05083018904857868  
train loss:0.03473154789289259  
train loss:0.04543305849731996  
train loss:0.015007645760661104  
train loss:0.038407160721090045  
train loss:0.05670928037613954  
train loss:0.06433723357934361  
train loss:0.029465908225430573  
train loss:0.023437380181923283  
train loss:0.04467061842495511  
train loss:0.07097492398373664  
train loss:0.05230099932298961  
train loss:0.014834095259596674  
train loss:0.026517188792140246  
train loss:0.016301072504478008  
train loss:0.025055219816674676  
train loss:0.04206502322818272  
train loss:0.031558584115593334  
train loss:0.04941747691692266  
train loss:0.022616085276146832  
train loss:0.05840165953152053  
train loss:0.014582359958420723  
train loss:0.04235786884699186  
train loss:0.09008515383684135  
train loss:0.04189459109570266  
train loss:0.051675632479397965  
train loss:0.06152933225505046  
train loss:0.0181250177535062  
train loss:0.07707658272410228  
train loss:0.0776160015125807  
train loss:0.04023666029237476

train loss:0.06222192337101588  
train loss:0.04378130253913311  
train loss:0.07542792125682453  
train loss:0.048419539569731614  
=== epoch:17, train acc:0.986, test acc:0.955 ===  
train loss:0.015486227346885047  
train loss:0.03471530888672902  
train loss:0.027569747218207232  
train loss:0.0230129145003793  
train loss:0.043476000062385625  
train loss:0.01606642727524883  
train loss:0.02576728164383394  
train loss:0.04344118111553572  
train loss:0.05995346494402147  
train loss:0.038022139782959354  
train loss:0.03845864933457428  
train loss:0.09100067431374032  
train loss:0.023036607551710615  
train loss:0.025306495193415376  
train loss:0.07245443946913598  
train loss:0.018625917921011113  
train loss:0.013567200996060933  
train loss:0.03031300541880841  
train loss:0.018985458503168396  
train loss:0.02630566130752215  
train loss:0.04549545073669526  
train loss:0.04682995259619994  
train loss:0.029106071882400504  
train loss:0.01659466823859102  
train loss:0.031714348236707955  
train loss:0.04807613243986558  
train loss:0.014534264500673516  
train loss:0.0244143959885592  
train loss:0.04927275873341021  
train loss:0.016180446658904314  
train loss:0.022052338892220393  
train loss:0.014941765256998543  
train loss:0.03829406227229134  
train loss:0.03482838295125753  
train loss:0.02430551112810431  
train loss:0.023465661423554093  
train loss:0.02653021928722182  
train loss:0.024970439251148547  
train loss:0.029196061656695794  
train loss:0.01582235672581466  
train loss:0.031663843331179  
train loss:0.0490899762368052  
train loss:0.026665964791676447  
train loss:0.02675537305694871

train loss:0.036435324993286736  
train loss:0.020465160062533273  
train loss:0.026774798125319375  
train loss:0.018921187146566817  
train loss:0.022647148639236874  
train loss:0.009974463102724436  
=== epoch:18, train acc:0.988, test acc:0.962 ===  
train loss:0.029838154338147585  
train loss:0.0523065612453355  
train loss:0.04979757518440885  
train loss:0.017274039691296185  
train loss:0.07480787069147594  
train loss:0.02549579877157036  
train loss:0.033904263674838606  
train loss:0.034461076906876054  
train loss:0.025461909883319662  
train loss:0.016384493267166414  
train loss:0.031086228394745424  
train loss:0.03497180314807367  
train loss:0.04202669046692489  
train loss:0.09520272104736063  
train loss:0.026821810077522653  
train loss:0.028425644343023505  
train loss:0.016205560300184968  
train loss:0.041082106186916774  
train loss:0.017380463011534356  
train loss:0.07946160866717453  
train loss:0.01750906059596317  
train loss:0.011941258047133836  
train loss:0.05811427093756528  
train loss:0.01490509252848237  
train loss:0.11315438383235772  
train loss:0.02050566427494501  
train loss:0.03602133655887173  
train loss:0.037862519347006504  
train loss:0.02039130665701277  
train loss:0.042903974136386115  
train loss:0.014053404536345262  
train loss:0.01659680199688034  
train loss:0.02116908146949714  
train loss:0.027860708637005627  
train loss:0.01983321663529771  
train loss:0.027308156723269302  
train loss:0.06595348358323569  
train loss:0.0348342373327271  
train loss:0.017379228039612057  
train loss:0.021419494484598112  
train loss:0.01805888769824016  
train loss:0.007619773341895919

train loss:0.02663588321534197  
train loss:0.00978949745102677  
train loss:0.025050517597237608  
train loss:0.02833166278143985  
train loss:0.00612708304093039  
train loss:0.031607063001127075  
train loss:0.009833100821455616  
train loss:0.039105523539822024  
=== epoch:19, train acc:0.992, test acc:0.963 ===  
train loss:0.02304256951410398  
train loss:0.00673924825815309  
train loss:0.028127905109256283  
train loss:0.06688438124394341  
train loss:0.01899156597729266  
train loss:0.06729228186622904  
train loss:0.07382260216015449  
train loss:0.022342038369797007  
train loss:0.02130798476895891  
train loss:0.039013624533455304  
train loss:0.017005457721356778  
train loss:0.010211804934634923  
train loss:0.015747649144832024  
train loss:0.023190646866520517  
train loss:0.02827654859872451  
train loss:0.008080463212531282  
train loss:0.05038020203306082  
train loss:0.009908706488896244  
train loss:0.022114017302632346  
train loss:0.05243588673457473  
train loss:0.010160226955923932  
train loss:0.03795824749501504  
train loss:0.049430759605948546  
train loss:0.030629923548284775  
train loss:0.00707306943360061  
train loss:0.01220625488269233  
train loss:0.013515666131621742  
train loss:0.015153596849407695  
train loss:0.034487642946467785  
train loss:0.026063754669020996  
train loss:0.02724304137381786  
train loss:0.024107668302704187  
train loss:0.04274666310957223  
train loss:0.013793705288975682  
train loss:0.029335648003818795  
train loss:0.009576132617807225  
train loss:0.018428136866840514  
train loss:0.014805221251220085  
train loss:0.010232361487442802  
train loss:0.004810612511532282

train loss:0.013135840955143514  
train loss:0.02692171012571068  
train loss:0.013453053775714638  
train loss:0.014060413605991029  
train loss:0.019948472709197404  
train loss:0.015050059046052576  
train loss:0.011273456965722907  
train loss:0.03237572517549728  
train loss:0.0074317995286867725  
train loss:0.01035604764693563  
=== epoch:20, train acc:0.992, test acc:0.96 ===  
train loss:0.02028288995388713  
train loss:0.02301145890895927  
train loss:0.013339373035011976  
train loss:0.029412824393619096  
train loss:0.03342051970954253  
train loss:0.017687858775552023  
train loss:0.018831155164787856  
train loss:0.0327429350966913  
train loss:0.00830294338551123  
train loss:0.03950463513068596  
train loss:0.00936376306184742  
train loss:0.03795176981427972  
train loss:0.02714132936429682  
train loss:0.011485437569814419  
train loss:0.009526149264328224  
train loss:0.032699620407687424  
train loss:0.006018045780467085  
train loss:0.02329075173344074  
train loss:0.023414945284306696  
train loss:0.010820929018885785  
train loss:0.014719465549765916  
train loss:0.02765267873274227  
train loss:0.02175389526287988  
train loss:0.01587365462136569  
train loss:0.020444813856519976  
train loss:0.03199878283012448  
train loss:0.011650660480786173  
train loss:0.016214991778756814  
train loss:0.03910276588060456  
train loss:0.016736613301029567  
train loss:0.019138090912377545  
train loss:0.009987111584983324  
train loss:0.0030341170428673354  
train loss:0.00975521624669709  
train loss:0.0195886597588073  
train loss:0.007142052079462194  
train loss:0.031566563127925946  
train loss:0.01771799267016266

```
train loss:0.008056665631558036
train loss:0.0177981097243
train loss:0.010554723903684959
train loss:0.01680242972915288
train loss:0.007446517280046835
train loss:0.026680851365053618
train loss:0.01717671437065174
train loss:0.015420954352350595
train loss:0.026621725236175533
train loss:0.03750761407937945
train loss:0.010988573829449608
===== Final Test Accuracy =====
test acc:0.959
```