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In [1]: %matplotlib inline #グラフの描写
import os, sys
import numpy as np
import matplotlib.pyplot as plt
from dataset.mnist import load_mnist
from simple_convnet import SimpleConvNet
from common.trainer import Trainer

# データの読み込み
(x_train, t_train), (x_test, t_test) = load_mnist(flatten=False)

# 処理に時間のかかる場合はデータを削減
x_train, t_train = x_train[:5000], t_train[:5000]
x_test, t_test = x_test[:1000], t_test[:1000]

max_epochs = 5 #20

network = SimpleConvNet(input_dim=(1,28,28),
                        conv_param = {'filter_num': 30, 'filter_size': 5, 'pad': 0, 'stride': 1},
                        hidden_size=100, output_size=10, weight_init_std=0.01)

trainer = Trainer(network, x_train, t_train, x_test, t_test,
                  epochs=max_epochs, mini_batch_size=100,
                  optimizer='Adam', optimizer_param={'lr': 0.001},
                  evaluate_sample_num_per_epoch=1000)
trainer.train()

# パラメータの保存
network.save_params("params.pkl")
print("Saved Network Parameters!")

# グラフの描写
markers = {'train': 'o', 'test': 's'}
x = np.arange(max_epochs)
plt.plot(x, trainer.train_acc_list, marker='o', label='train', mark
every=2)
plt.plot(x, trainer.test_acc_list, marker='s', label='test', marke
every=2)
plt.xlabel("epochs")
plt.ylabel("accuracy")
plt.ylim(0, 1.0)
plt.legend(loc='lower right')
plt.show()

Downloading train-images-idx3-ubyte.gz ...
Done
Downloading train-labels-idx1-ubyte.gz ...
Done
Downloading t10k-images-idx3-ubyte.gz ...
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Done
Downloading t10k-labels-idx1-ubyte.gz ...
Done
Converting train-images-idx3-ubyte.gz to NumPy Array ...
Done
Converting train-labels-idx1-ubyte.gz to NumPy Array ...
Done
Converting t10k-images-idx3-ubyte.gz to NumPy Array ...
Done
Converting t10k-labels-idx1-ubyte.gz to NumPy Array ...
Done
Creating pickle file ...
Done!
train loss:2.2999521236143403
=== epoch:1, train acc:0.235, test acc:0.261 ===
train loss:2.296565648475458
train loss:2.2916493494553554
train loss:2.287498284001357
train loss:2.275174587614748
train loss:2.268878230717062
train loss:2.2393648138455173
train loss:2.2408221717480563
train loss:2.2079749690519526
train loss:2.172444598584798
train loss:2.1712191454732617
train loss:2.0919197037069774
train loss:2.0472669467375244
train loss:1.9695862149531027
train loss:1.9759215562669439
train loss:1.8796559241206523
train loss:1.8765954398612619
train loss:1.7529532099411858
train loss:1.6627009510224309
train loss:1.6362224053254837
train loss:1.5102904979548533
train loss:1.359083669809043
train loss:1.2510029349366691
train loss:1.2334922980487388
train loss:1.255348176128429
train loss:1.239685210805228
train loss:1.0714121894771511
train loss:1.1531106819857817
train loss:0.9250239767613369
train loss:0.9787194371508403
train loss:0.9041010312967904
train loss:0.7346448105599132
train loss:0.8946626603524515
train loss:0.8942721907724117
train loss:0.6813748391049268
train loss:0.6359956916059528
train loss:0.7483210423198534
train loss:0.6682351644021226
train loss:0.7351295653329604
train loss:0.6213763652205819

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train loss:0.5790221027233171
train loss:0.4142508763634158
train loss:0.539581269241321
train loss:0.6454518369799682
train loss:0.6978389782744385
train loss:0.6391458904336104
train loss:0.6349741754073454
train loss:0.5014594709224633
train loss:0.6472564813761517
train loss:0.5163651460064266
train loss:0.5184539876925122
=== epoch:2, train acc:0.811, test acc:0.808 ===
train loss:0.5338464526354457
train loss:0.5166215252553074
train loss:0.4817279324519803
train loss:0.6691999201469768
train loss:0.5843827286527137
train loss:0.47641147695860053
train loss:0.509676687028464
train loss:0.29634696697055113
train loss:0.4255193418029188
train loss:0.5454531780237715
train loss:0.5160202979182147
train loss:0.41937591276383807
train loss:0.3808419306661057
train loss:0.4005381749735595
train loss:0.5385088739099887
train loss:0.41891671471190794
train loss:0.5125868630219252
train loss:0.3511873230344101
train loss:0.596066288782822
train loss:0.4363210562851695
train loss:0.35267044980312096
train loss:0.4659107687398228
train loss:0.4238921707088435
train loss:0.37434765696172434
train loss:0.5946977429841201
train loss:0.5513226919717636
train loss:0.586131339908454
train loss:0.3274447972343252
train loss:0.3177137268160593
train loss:0.34406764148788477
train loss:0.47940734380334915
train loss:0.34702250719226685
train loss:0.45917772123930045
train loss:0.4615236557781226
train loss:0.35741637964067974
train loss:0.34280466145505933
train loss:0.39410891733786196
train loss:0.32479662880351995
train loss:0.31846286490416703
train loss:0.39047850123913036
train loss:0.33228580747569836

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train loss:0.39363587171415815
train loss:0.3184106725657705
train loss:0.22196091288452757
train loss:0.31988176923459544
train loss:0.2544115214264177
train loss:0.4116871587214247
train loss:0.4178477803141709
train loss:0.4080833024009866
train loss:0.2968981399285443
=== epoch:3, train acc:0.858, test acc:0.847 ===
train loss:0.39511642362066984
train loss:0.34107030400793603
train loss:0.3258679491830307
train loss:0.19112099225437768
train loss:0.4289798886659375
train loss:0.4088771995688751
train loss:0.23082202969749147
train loss:0.34269449304567523
train loss:0.38485558477968895
train loss:0.4105707613386537
train loss:0.2615117268614798
train loss:0.3487480952150174
train loss:0.3548256524955181
train loss:0.41959537515516276
train loss:0.4501026701762101
train loss:0.28721579758949195
train loss:0.44926353221367665
train loss:0.41676060076668014
train loss:0.4362313566017425
train loss:0.32508700897256426
train loss:0.3940149468707237
train loss:0.2972407027141544
train loss:0.2385421659818367
train loss:0.28721146655762836
train loss:0.3251839732087201
train loss:0.383903032091161
train loss:0.31910772347283917
train loss:0.3273764034151514
train loss:0.24792764909450807
train loss:0.36841341360940855
train loss:0.423922599449141
train loss:0.36783624128814624
train loss:0.2451813266877226
train loss:0.35465910037319515
train loss:0.32277102673936037
train loss:0.26741192358826016
train loss:0.22881266340587922
train loss:0.2555883206527241
train loss:0.22547668349049718
train loss:0.2014064050175588
train loss:0.2582208412870393
train loss:0.2321067434105638
train loss:0.3046661193174342

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train loss:0.17322662380672565
train loss:0.2975026619009647
train loss:0.3829536930412545
train loss:0.2615676706981064
train loss:0.24972139479171648
train loss:0.43858554842034975
train loss:0.37107854852076516
=== epoch:4, train acc:0.894, test acc:0.891 ===
train loss:0.275463155670152
train loss:0.3116123202607312
train loss:0.1235210510381435
train loss:0.16192634803339712
train loss:0.21240006303206477
train loss:0.4205687418289855
train loss:0.4918512316133732
train loss:0.20962705059698755
train loss:0.2822105238223265
train loss:0.20490113814480534
train loss:0.4180862309703736
train loss:0.1422834543644551
train loss:0.2939066719893383
train loss:0.18339144845152727
train loss:0.26927265785260196
train loss:0.26237132218607806
train loss:0.42399303757901435
train loss:0.25115419085850166
train loss:0.2804102660545303
train loss:0.3131103142214615
train loss:0.23685007997372154
train loss:0.3231135734635571
train loss:0.20997626333280447
train loss:0.21617686111897977
train loss:0.16534686999417783
train loss:0.3714849372606634
train loss:0.15955280513529535
train loss:0.3468626283108183
train loss:0.28432802090097115
train loss:0.19838997575109812
train loss:0.22892050972111685
train loss:0.26080815680460484
train loss:0.17124414823432896
train loss:0.2637193248194016
train loss:0.14578221826663446
train loss:0.22405584425904698
train loss:0.23201193797919598
train loss:0.12770478161402682
train loss:0.20662444026443696
train loss:0.24396159434166279
train loss:0.24264863975288212
train loss:0.28213482500811815
train loss:0.3545208718959637
train loss:0.24789609151930436
train loss:0.2833063376542504
train loss:0.1536613168189875

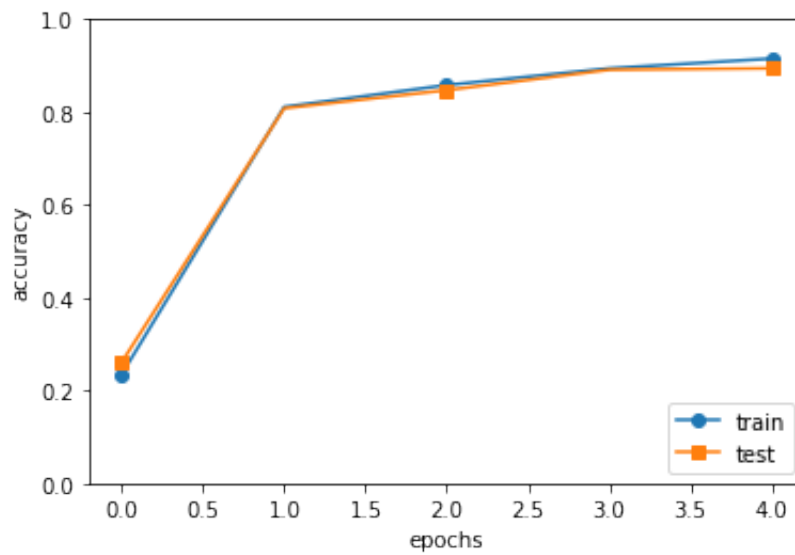
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train loss:0.22846990204573403
train loss:0.2759666373804589
train loss:0.26495780871823177
train loss:0.20487651262536166
=== epoch:5, train acc:0.915, test acc:0.894 ===
train loss:0.17366838556606828
train loss:0.14138165672276742
train loss:0.22279988480438082
train loss:0.1415600234443105
train loss:0.16117977735180739
train loss:0.16243484585941048
train loss:0.28734298040675293
train loss:0.23324956962059815
train loss:0.24008963087962393
train loss:0.45719925250146737
train loss:0.13901781829013526
train loss:0.29582324895279993
train loss:0.1934545364424888
train loss:0.17151691213333084
train loss:0.21690439918000545
train loss:0.11165770569337947
train loss:0.29318381717945974
train loss:0.21563996434614416
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train loss:0.1496327052469278
train loss:0.20834995338334117
train loss:0.13727464818780263
train loss:0.38233636504606394
train loss:0.16856859862648957
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train loss:0.18942606452041438
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train loss:0.1439773585712821
train loss:0.15605306973205596
train loss:0.14973342521594551
train loss:0.19172603041285427
train loss:0.34625349258842514
train loss:0.14486399720299545
train loss:0.20382230121888448
train loss:0.20623119515837982
train loss:0.16854332688447543
train loss:0.11132104782026567
train loss:0.19169242704120637
train loss:0.19243681614643024
train loss:0.1582584333632595
train loss:0.13321229444446078
train loss:0.11601590587696524
train loss:0.3123180422517986

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train loss:0.1881933207376911
===== Final Test Accuracy =====
test acc:0.908
Saved Network Parameters!
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感想

畳み込み層やプーリング層を通すことで本当に精度が良くなるのか疑問だったが、実際に学習アルゴリズムを実行してみると目に見えて精度が良くなっていることを実感できた。

参考文献

ゼロから作るDeepLearning pythonで学ぶディープラーニングの理論と実装 斎藤 廉毅