

연합 학습 3주차 과제

1. 실습 세팅
2. centralized
3. femnist

1. 실습환경 세팅

(base) C:\Users\GC>conda create -n test-fed python=3.8

```
Anaconda Prompt (anaconda3) - conda create -n test-fed python=3.8

(base) C:\Users\GC>conda create -n test-fed python=3.8
Collecting package metadata (current_repodata.json): done
Solving environment: done

==> WARNING: A newer version of conda exists. <==
  current version: 4.12.0
  latest version: 4.14.0

Please update conda by running

    $ conda update -n base -c defaults conda

## Package Plan ##

  environment location: C:\Users\GC\anaconda3\envs\test-fed

  added / updated specs:
    - python=3.8

The following NEW packages will be INSTALLED:

  ca-certificates pkgs/main/win-64::ca-certificates-2022.07.19-haa95532_0
  certifi         pkgs/main/win-64::certifi-2022.9.14-py38haa95532_0
  openssl         pkgs/main/win-64::openssl-1.1.1q-h2bfff1b_0
  pip             pkgs/main/win-64::pip-22.1.2-py38haa95532_0
  python          pkgs/main/win-64::python-3.8.13-h6244533_0
  setuptools      pkgs/main/win-64::setuptools-63.4.1-py38haa95532_0
  sqlite          pkgs/main/win-64::sqlite-3.39.2-h2bfff1b_0
  vc              pkgs/main/win-64::vc-14.2-h21ff451_1
  vs2015_runtime  pkgs/main/win-64::vs2015_runtime-14.27.29016-h5e58377_2
  wheel           pkgs/main/noarch::wheel-0.37.1-pyhd3eb1b0_0
  wincertstore    pkgs/main/win-64::wincertstore-0.2-py38haa95532_2

Proceed ([y]/n)?
```

```
선택 Anaconda Prompt (anaconda3)

done
#
# To activate this environment, use
#
#     $ conda activate test-fed
#
# To deactivate an active environment, use
#
#     $ conda deactivate
#

(base) C:\Users\GC>
```

(base) C:\Users\GC>conda env list

```
Anaconda Prompt (anaconda3)

(base) C:\Users\GC>conda env list
# conda environments:
#
base                  *  C:\Users\GC\anaconda3
test-fed              C:\Users\GC\anaconda3\envs\test-fed
```

(base) C:\Users\GC>activate test-fed

(test-fed) C:\Users\GC>pip install flwr

(test-fed) C:\Users\GC>pip install torch torchvision

```
Anaconda Prompt (anaconda3)

(base) C:\Users\GC>activate test-fed
(test-fed) C:\Users\GC>pip install flwr
Collecting flwr
  Downloading flwr-1.0.0-py3-none-any.whl (90 kB)
    90.2/90.2 kB 5.3 MB/s eta 0:00:00
Collecting numpy<2.0.0,>=1.21.0
  Downloading numpy-1.23.3-cp38-cp38-win_amd64.whl (14.7 MB)
    14.7/14.7 MB 10.9 MB/s eta 0:00:00
Collecting iterators<0.0.3,>=0.0.2
  Downloading iterators-0.0.2-py3-none-any.whl (3.9 kB)
Collecting grpcio<2.0.0,>=1.43.0
  Downloading grpcio-1.48.2-cp38-cp38-win_amd64.whl (3.6 MB)
    3.6/3.6 MB 11.4 MB/s eta 0:00:00
Collecting protobuf<4.0.0,>=3.19.0
  Downloading protobuf-3.20.2-cp38-cp38-win_amd64.whl (904 kB)
    904.4/904.4 kB 11.5 MB/s eta 0:00:00
Collecting six>=1.5.2
  Downloading six-1.16.0-py2.py3-none-any.whl (11 kB)
Installing collected packages: six, protobuf, numpy, iterators, grpcio, flwr
Successfully installed flwr-1.0.0 grpcio-1.48.2 iterators-0.0.2 numpy-1.23.3 protobuf-3.20.2 six-1.16.0

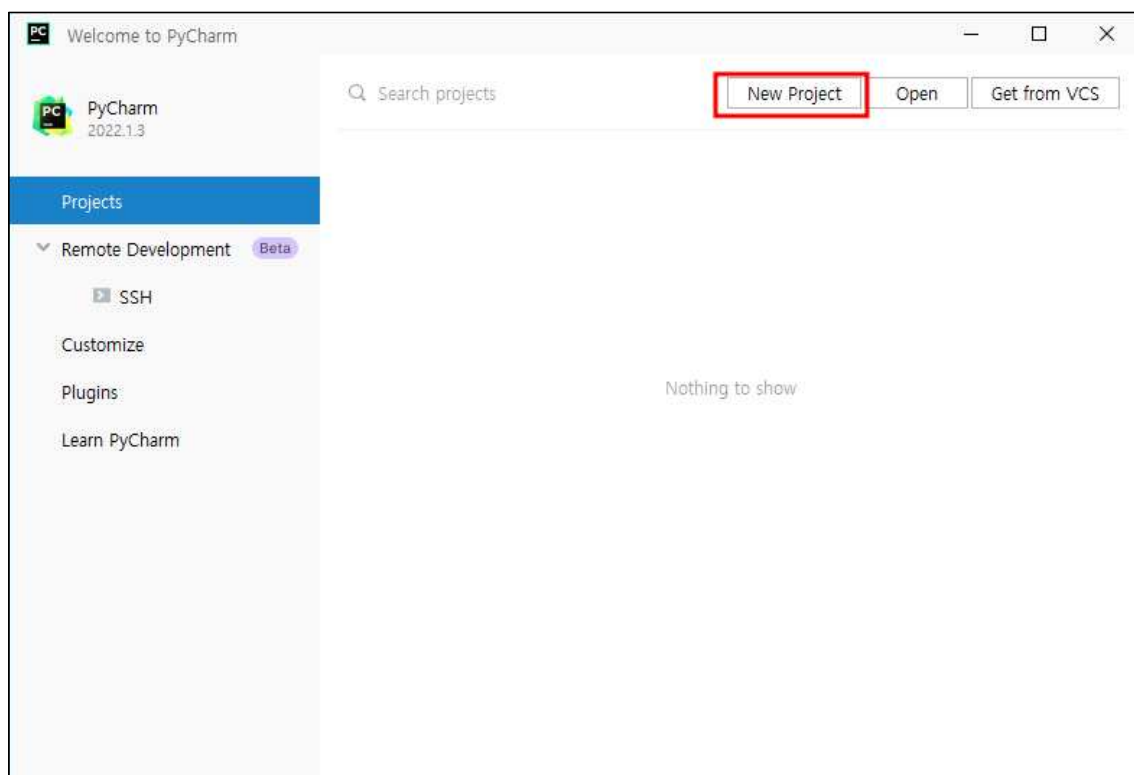
(test-fed) C:\Users\GC>pip install torch torchvision
Collecting torch
  Downloading torch-1.12.1-cp38-cp38-win_amd64.whl (161.9 MB)
    161.9/161.9 MB 6.4 MB/s eta 0:00:00
Collecting torchvision
  Downloading torchvision-0.13.1-cp38-cp38-win_amd64.whl (1.1 MB)
    1.1/1.1 MB 11.4 MB/s eta 0:00:00
Collecting typing-extensions
  Downloading typing_extensions-4.3.0-py3-none-any.whl (25 kB)
Requirement already satisfied: numpy in c:\users\gc\anaconda3\envs\test-fed\lib\site-packages (from torchvision) (1.23.3)
Collecting requests
  Downloading requests-2.28.1-py3-none-any.whl (62 kB)
    62.8/62.8 kB ? eta 0:00:00
Collecting pillow!=8.3.*,>=5.3.0
  Downloading Pillow-9.2.0-cp38-cp38-win_amd64.whl (3.3 MB)
    3.3/3.3 MB 11.6 MB/s eta 0:00:00
Collecting idna<4,>=2.5
  Downloading idna-3.4-py3-none-any.whl (61 kB)
    61.5/61.5 kB 3.4 MB/s eta 0:00:00
Requirement already satisfied: certifi>=2017.4.17 in c:\users\gc\anaconda3\envs\test-fed\lib\site-packages (from requests->torchvision) (2022.9.14)
Collecting charset-normalizer<3,>=2
  Downloading charset_normalizer-2.1.1-py3-none-any.whl (39 kB)
Collecting urllib3<1.27,>=1.21.1
  Downloading urllib3-1.26.12-py2.py3-none-any.whl (140 kB)
    140.4/140.4 kB 8.7 MB/s eta 0:00:00
```

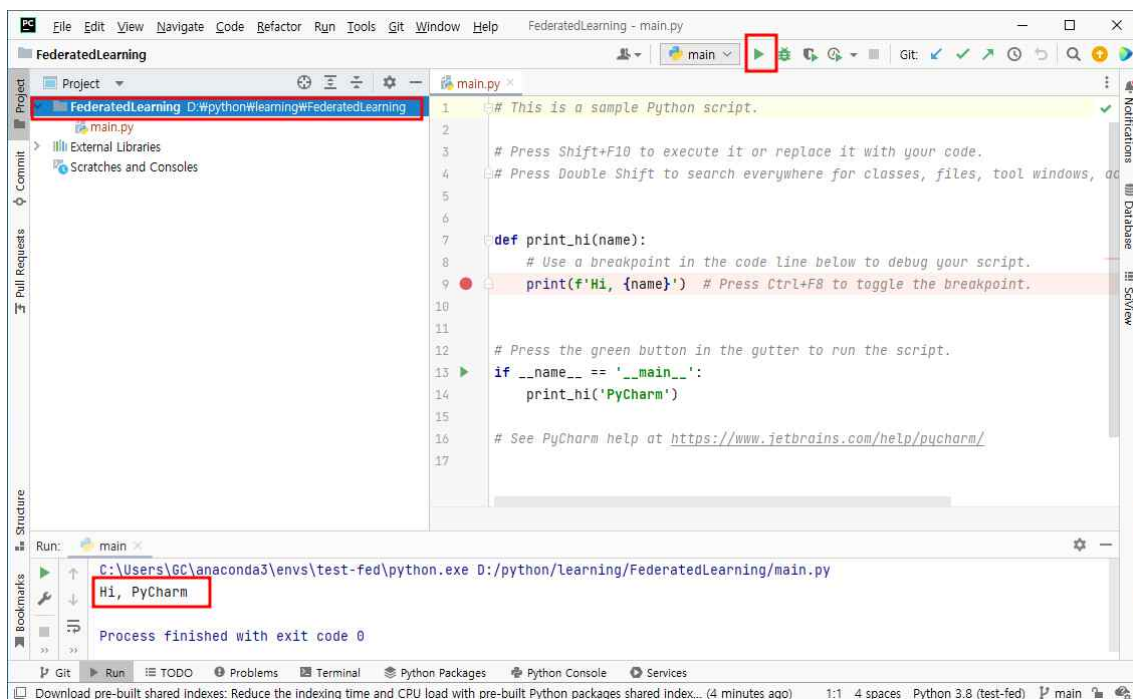
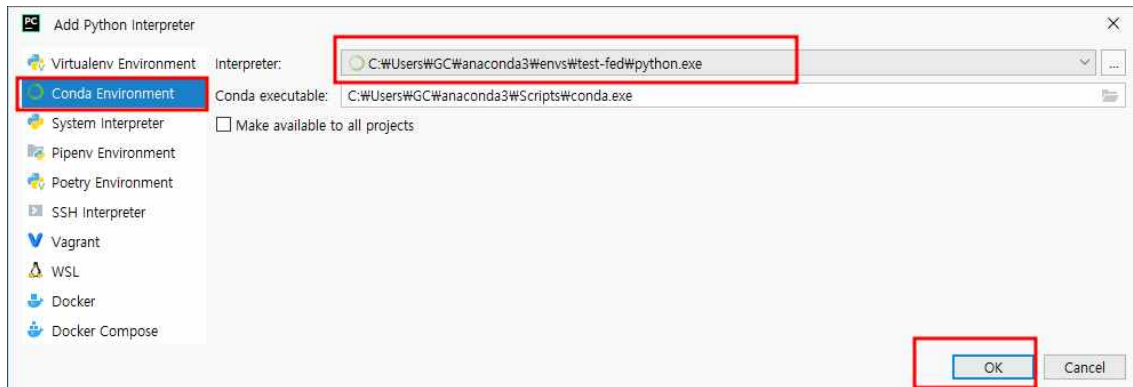
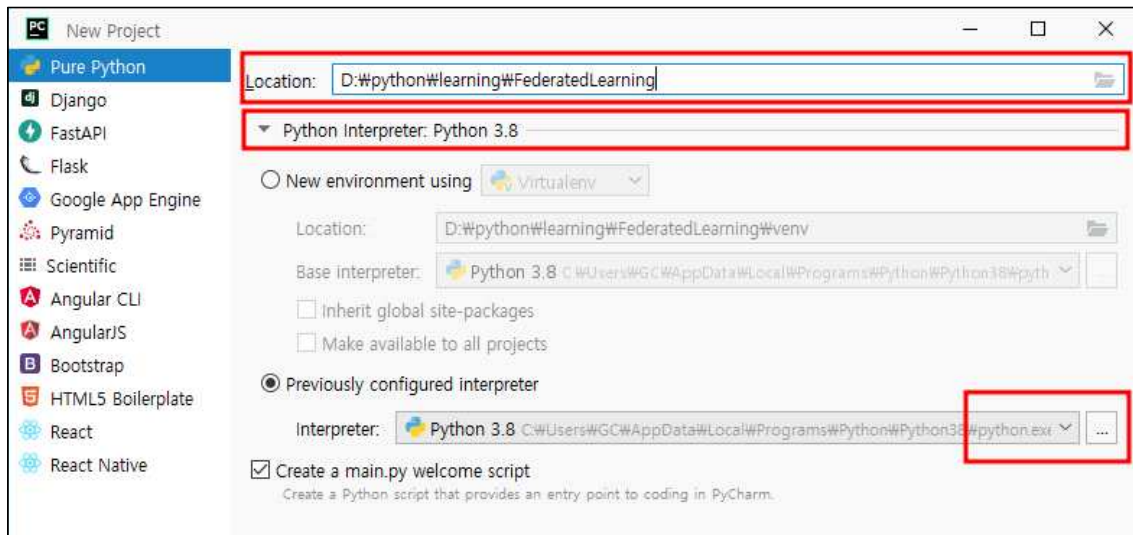
(test-fed) C:\Users\GC>conda list

```
Anaconda Prompt (anaconda3)

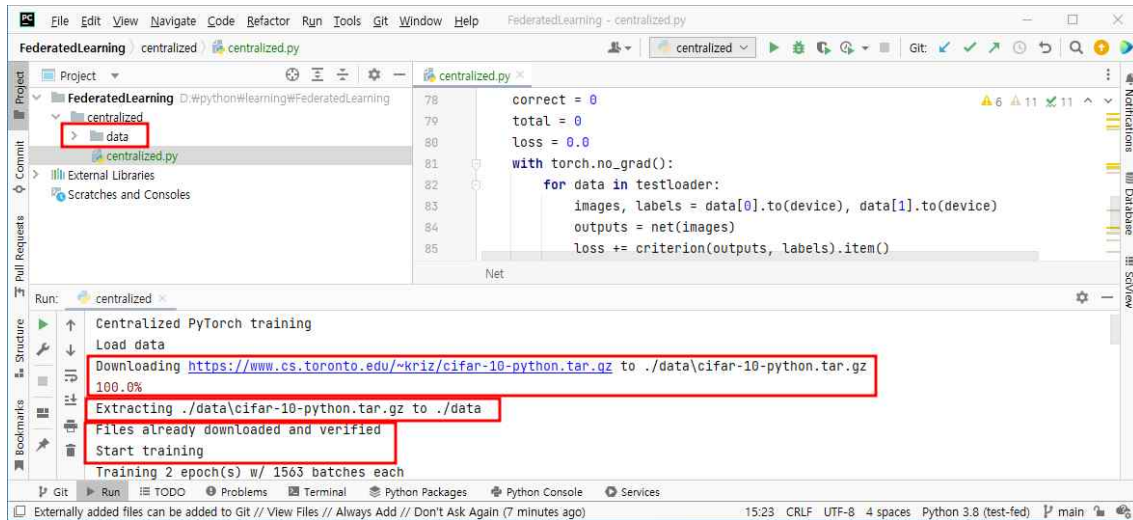
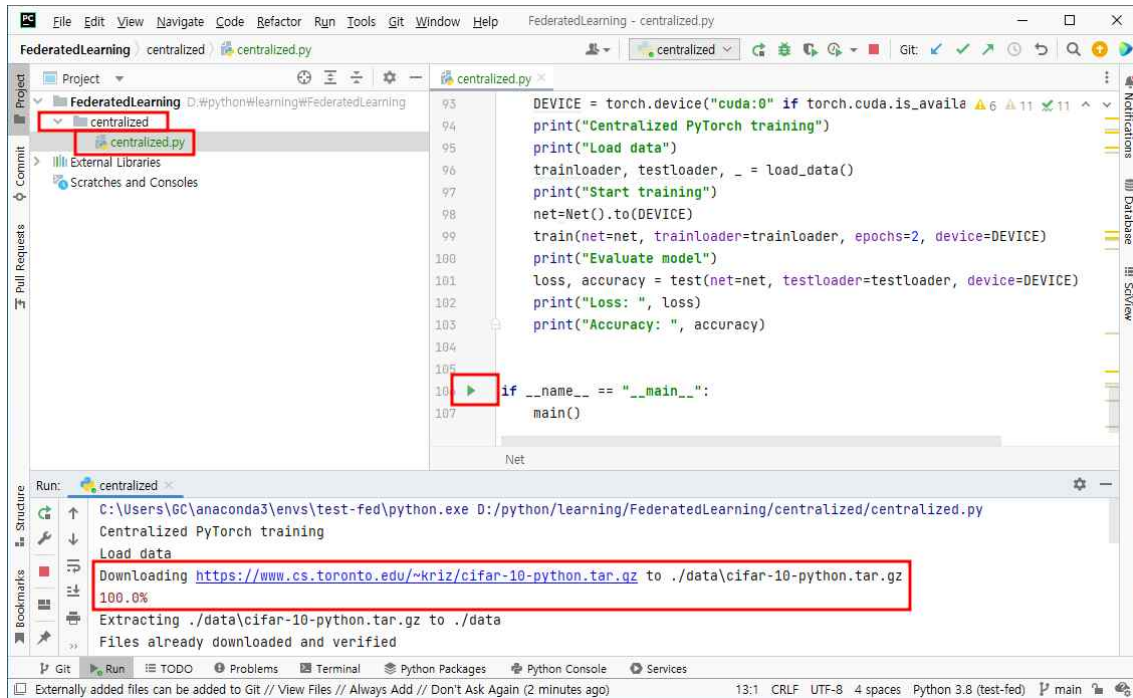
(test-fed) C:\Users\GC>conda list
# packages in environment at C:\Users\GC\anaconda3\envs\test-fed:
#
# Name                    Version            Build      Channel
ca-certificates           2022.07.19         haa95532_0
certifi                   2022.9.14          py38haa95532_0
charset-normalizer        2.1.1              pypi_0     pypi
flwr                      1.0.0              pypi_0     pypi
grpcio                    1.48.2             pypi_0     pypi
idna                      3.4                pypi_0     pypi
iterators                 0.0.2              pypi_0     pypi
numpy                     1.23.3             pypi_0     pypi
openssl                   1.1.1q             h2bfff1b_0
pillow                    9.2.0              pypi_0     pypi
pip                       22.1.2             py38haa95532_0
protobuf                  3.20.2             pypi_0     pypi
python                    3.8.13             h6244533_0
requests                  2.28.1             pypi_0     pypi
setuptools                63.4.1             py38haa95532_0
six                       1.16.0             pypi_0     pypi
sqlite                    3.38.2             h2bfff1b_0
torch                     1.12.1             pypi_0     pypi
torchvision               0.13.1             pypi_0     pypi
typing-extensions         4.3.0              pypi_0     pypi
urllib3                   1.26.12            pypi_0     pypi
vc                        14.2               h21ff451_1
vs2015_runtime            14.27.29016        h5e58377_2
wheel                     0.37.1             pyhd3eb1b0_0
wincertstore              0.2                py38haa95532_2

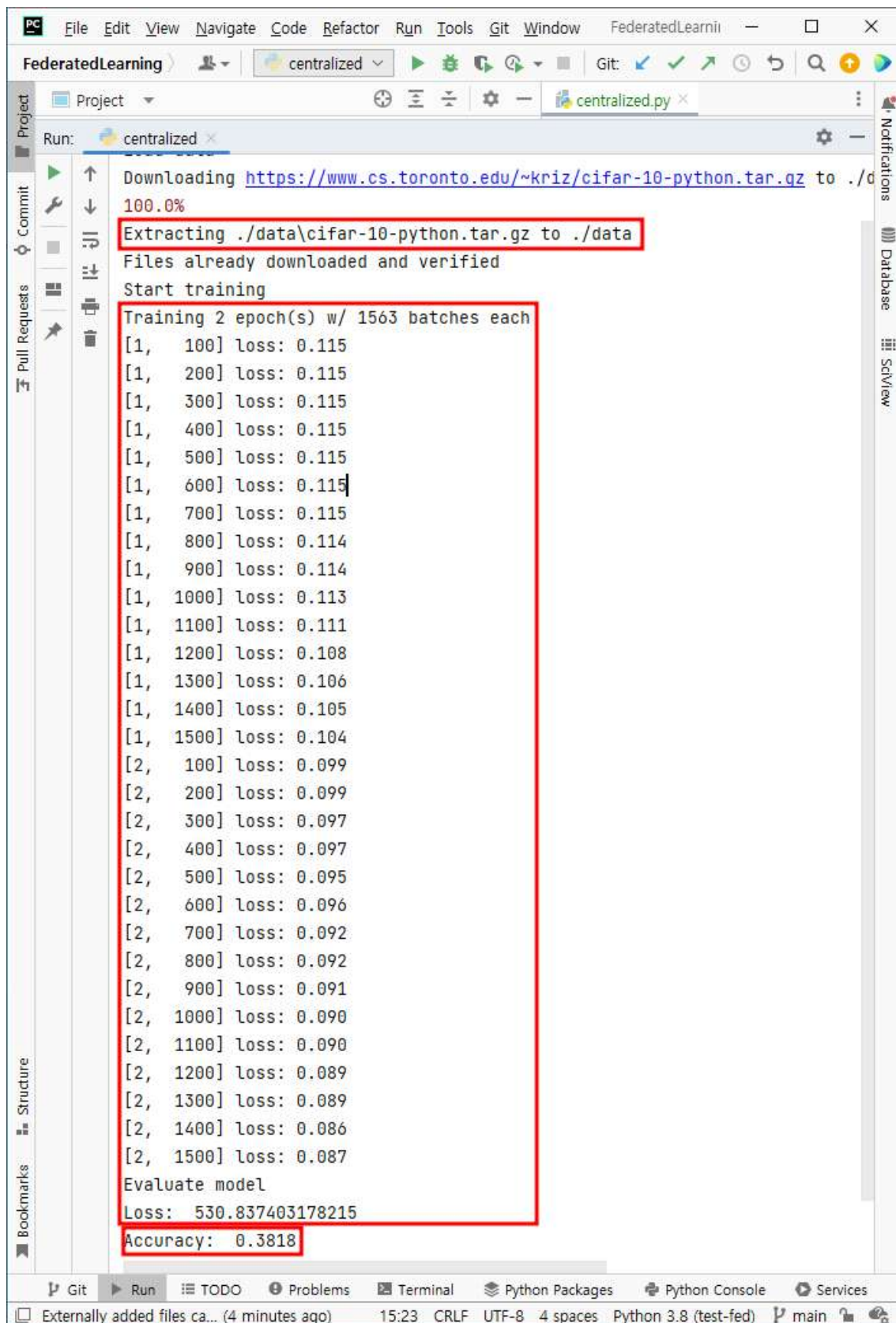
(test-fed) C:\Users\GC>
```



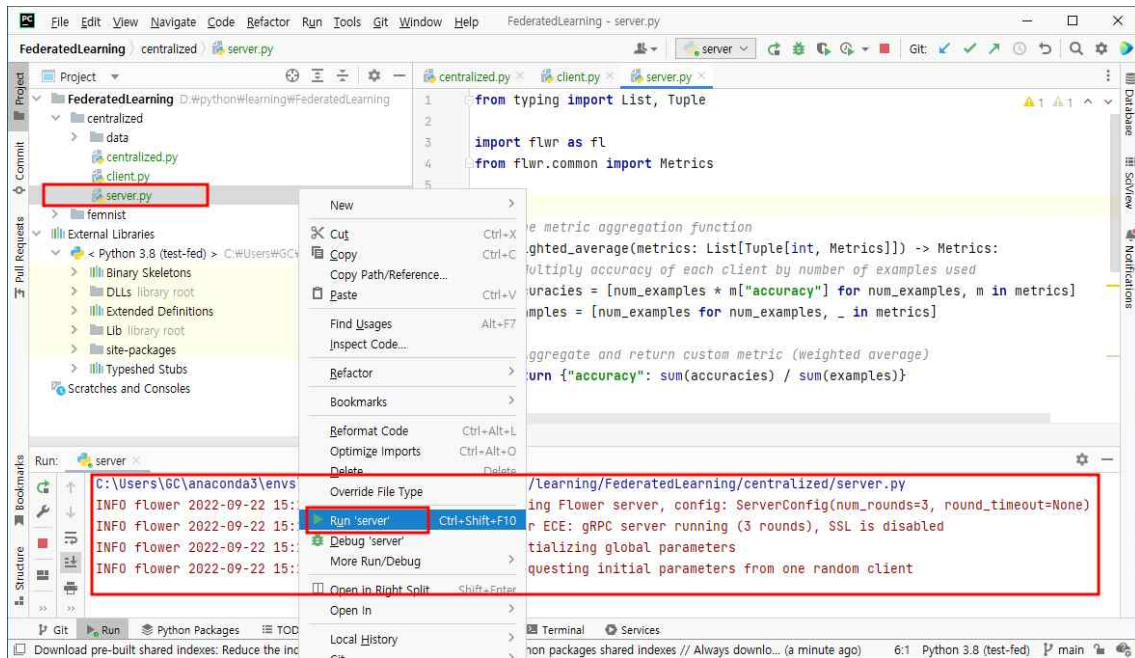
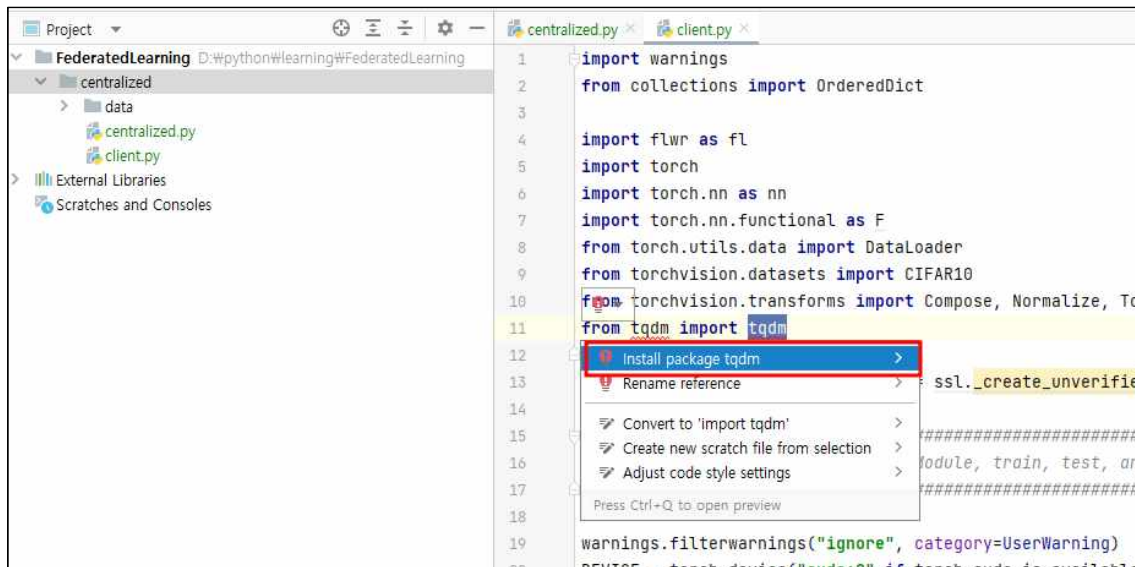


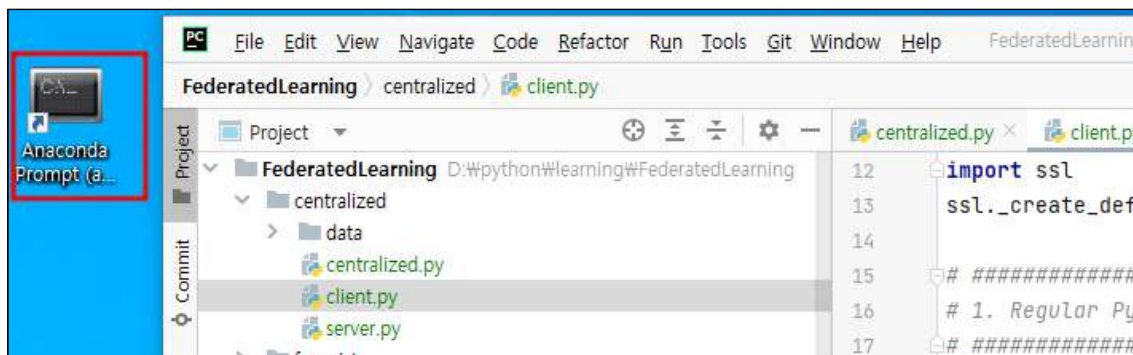
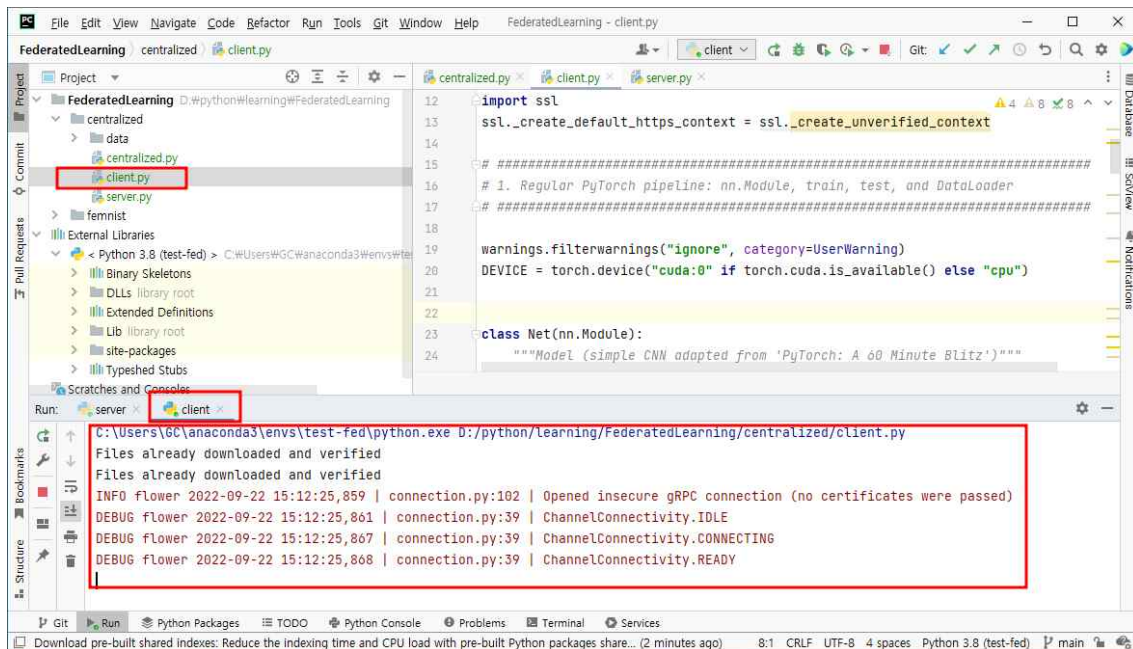
2. centralized 실험





```
File Edit View Navigate Code Refactor Run Tools Git Window FederatedLearnin - □ X
FederalLearning centralized centralized.py
Run: centralized
Downloading https://www.cs.toronto.edu/~kriz/cifar-10-python.tar.gz to ./d
100.0%
Extracting ./data\cifar-10-python.tar.gz to ./data
Files already downloaded and verified
Start training
Training 2 epoch(s) w/ 1563 batches each
[1, 100] loss: 0.115
[1, 200] loss: 0.115
[1, 300] loss: 0.115
[1, 400] loss: 0.115
[1, 500] loss: 0.115
[1, 600] loss: 0.115
[1, 700] loss: 0.115
[1, 800] loss: 0.114
[1, 900] loss: 0.114
[1, 1000] loss: 0.113
[1, 1100] loss: 0.111
[1, 1200] loss: 0.108
[1, 1300] loss: 0.106
[1, 1400] loss: 0.105
[1, 1500] loss: 0.104
[2, 100] loss: 0.099
[2, 200] loss: 0.099
[2, 300] loss: 0.097
[2, 400] loss: 0.097
[2, 500] loss: 0.095
[2, 600] loss: 0.096
[2, 700] loss: 0.092
[2, 800] loss: 0.092
[2, 900] loss: 0.091
[2, 1000] loss: 0.090
[2, 1100] loss: 0.090
[2, 1200] loss: 0.089
[2, 1300] loss: 0.089
[2, 1400] loss: 0.086
[2, 1500] loss: 0.087
Evaluate model
Loss: 530.837403178215
Accuracy: 0.3818
Git Run TODO Problems Terminal Python Packages Python Console Services
Externally added files ca... (4 minutes ago) 15:23 CRLF UTF-8 4 spaces Python 3.8 (test-fed) main
```





(base) C:\Users\GC>activate test-fed

(test-fed) C:\Users\GC>d:

(test-fed) D:\>cd python/learning/FederatedLearning/centralized

(test-fed) D:\python\learning\FederatedLearning\centralized>python client.py



```
Anaconda Prompt (anaconda3) - activate test-fed - deactivate test-fed - deactivate - conda deactivate - conda deactivate - python client.py
(test-fed) D:\python\learning\FederatedLearning\centralized>python client.py
Files already downloaded and verified
Files already downloaded and verified
INFO flower 2022-09-22 15:24:50,476 | connection.py:102 | Opened insecure gRPC connection (no certificates were passed)
DEBUG flower 2022-09-22 15:24:50,479 | connection.py:39 | ChannelConnectivity.IDLE
DEBUG flower 2022-09-22 15:24:50,481 | connection.py:39 | ChannelConnectivity.CONNECTING
DEBUG flower 2022-09-22 15:24:50,481 | connection.py:39 | ChannelConnectivity.READY
65% | 1010/1563 [00:20<00:10, 53.19it/s]
```

```
Run: server client
C:\Users\GC\anaconda3\envs\test-fed\python.exe D:\python\learning\FederatedLearning\centralized\client.py
Files already downloaded and verified
Files already downloaded and verified
INFO flower 2022-09-22 15:12:25,859 | connection.py:102 | Opened insecure gRPC connection (no certificates were passed)
DEBUG flower 2022-09-22 15:12:25,861 | connection.py:39 | ChannelConnectivity.IDLE
DEBUG flower 2022-09-22 15:12:25,867 | connection.py:39 | ChannelConnectivity.CONNECTING
DEBUG flower 2022-09-22 15:12:25,868 | connection.py:39 | ChannelConnectivity.READY
100% | 1563/1563 [00:33<00:00, 46.93it/s]
95% | 9486/10000 [00:10<00:00, 877.43it/s]
```

```
Anaconda Prompt (anaconda3) - activate test-fed - deactivate test-fed - deactivate - conda deactivate - conda deactivate - python client.py
(test-fed) D:\python\learning\FederatedLearning\centralized>python client.py
Files already downloaded and verified
Files already downloaded and verified
INFO flower 2022-09-22 15:24:50,476 | connection.py:102 | Opened insecure gRPC connection (no certificates were passed)
DEBUG flower 2022-09-22 15:24:50,479 | connection.py:39 | ChannelConnectivity.IDLE
DEBUG flower 2022-09-22 15:24:50,481 | connection.py:39 | ChannelConnectivity.CONNECTING
DEBUG flower 2022-09-22 15:24:50,481 | connection.py:39 | ChannelConnectivity.READY
100% | 1563/1563 [00:33<00:00, 46.95it/s]
100% | 10000/10000 [00:10<00:00, 923.70it/s]
14% | 223/1563 [00:04<00:26, 50.46it/s]
```

```
Run: server client
C:\Users\GC\anaconda3\envs\test-fed\python.exe D:\python\learning\FederatedLearning\centralized\server.py
INFO flower 2022-09-22 15:10:48,831 | app.py:119 | Starting Flower server, config: ServerConfig(num_rounds=3, ro
INFO flower 2022-09-22 15:10:48,886 | app.py:132 | Flower ECE: gRPC server running (3 rounds), SSL is disabled
INFO flower 2022-09-22 15:10:48,886 | server.py:86 | Initializing global parameters
INFO flower 2022-09-22 15:10:48,886 | server.py:270 | Requesting initial parameters from one random client
INFO flower 2022-09-22 15:12:25,874 | server.py:274 | Received initial parameters from one random client
INFO flower 2022-09-22 15:12:25,874 | server.py:88 | Evaluating initial parameters
INFO flower 2022-09-22 15:12:25,874 | server.py:101 | FL starting
DEBUG flower 2022-09-22 15:24:50,483 | server.py:215 | fit_round 1: strategy sampled 2 clients (out of 2)
DEBUG flower 2022-09-22 15:25:23,817 | server.py:229 | fit_round 1 received 2 results and 0 failures
WARNING flower 2022-09-22 15:25:23,828 | fedavg.py:243 | No fit_metrics_aggregation_fn provided
DEBUG flower 2022-09-22 15:25:23,828 | server.py:165 | evaluate_round 1: strategy sampled 2 clients (out of 2)
DEBUG flower 2022-09-22 15:25:34,681 | server.py:179 | evaluate_round 1 received 2 results and 0 failures
DEBUG flower 2022-09-22 15:25:34,681 | server.py:215 | fit_round 2: strategy sampled 2 clients (out of 2)
DEBUG flower 2022-09-22 15:26:07,924 | server.py:229 | fit_round 2 received 2 results and 0 failures
DEBUG flower 2022-09-22 15:26:07,930 | server.py:165 | evaluate_round 2: strategy sampled 2 clients (out of 2)
DEBUG flower 2022-09-22 15:26:18,714 | server.py:179 | evaluate_round 2 received 2 results and 0 failures
DEBUG flower 2022-09-22 15:26:18,715 | server.py:215 | fit_round 3: strategy sampled 2 clients (out of 2)
```

```
Anaconda Prompt (anaconda3) - activate test-fed - deactivate test-fed - deactivate - conda deactivate - conda deactivate - python client.py
Files already downloaded and verified
Files already downloaded and verified
INFO flower 2022-09-22 15:24:50,476 | connection.py:102 | Opened insecure gRPC connection (no certificates were passed)
DEBUG flower 2022-09-22 15:24:50,479 | connection.py:39 | ChannelConnectivity.IDLE
```



```
PC File Edit View Navigate Code Refactor Run Tools Git Window Help FederatedLearning - client.py
FederatedLearning centralized client.py
Run: server client
C:\Users\GC\anaconda3\envs\test-fed\python.exe D:/python/learning/FederatedLearning/centralized/client.py
Files already downloaded and verified
Files already downloaded and verified
INFO flower 2022-09-22 15:12:25,859 | connection.py:102 | Opened insecure gRPC connection (no certificates were pass
DEBUG flower 2022-09-22 15:12:25,861 | connection.py:39 | ChannelConnectivity.IDLE
DEBUG flower 2022-09-22 15:12:25,867 | connection.py:39 | ChannelConnectivity.CONNECTING
DEBUG flower 2022-09-22 15:12:25,868 | connection.py:39 | ChannelConnectivity.READY
100%|██████████| 1563/1563 [00:33<00:00, 46.93it/s]
100%|██████████| 10000/10000 [00:10<00:00, 922.17it/s]
100%|██████████| 1563/1563 [00:33<00:00, 47.04it/s]
100%|██████████| 10000/10000 [00:10<00:00, 927.97it/s]
100%|██████████| 1563/1563 [00:35<00:00, 44.49it/s]
100%|██████████| 10000/10000 [00:09<00:00, 1030.39it/s]
DEBUG flower 2022-09-22 15:27:03,589 | connection.py:121 | gRPC channel closed
INFO flower 2022-09-22 15:27:03,589 | app.py:149 | Disconnect and shut down

Process finished with exit code 0

Anaconda Prompt (anaconda3) - activate test-fed - deactivate test-fed - deactivate - conda deactivate - conda deactivate
(test-fed) D:\python\learning\FederatedLearning\centralized>python client.py
Files already downloaded and verified
Files already downloaded and verified
INFO flower 2022-09-22 15:24:50,476 | connection.py:102 | Opened insecure gRPC connection (no certificates were passed)
DEBUG flower 2022-09-22 15:24:50,479 | connection.py:39 | ChannelConnectivity.IDLE
DEBUG flower 2022-09-22 15:24:50,481 | connection.py:39 | ChannelConnectivity.CONNECTING
DEBUG flower 2022-09-22 15:24:50,481 | connection.py:39 | ChannelConnectivity.READY
100%|██████████| 1563/1563 [00:33<00:00, 46.95it/s]
100%|██████████| 10000/10000 [00:10<00:00, 923.70it/s]
100%|██████████| 1563/1563 [00:33<00:00, 47.03it/s]
100%|██████████| 10000/10000 [00:10<00:00, 929.09it/s]
100%|██████████| 1563/1563 [00:35<00:00, 44.48it/s]
100%|██████████| 10000/10000 [00:09<00:00, 1032.51it/s]
DEBUG flower 2022-09-22 15:27:03,589 | connection.py:121 | gRPC channel closed
INFO flower 2022-09-22 15:27:03,590 | app.py:149 | Disconnect and shut down
```

```
PC File Edit View Navigate Code Refactor Run Tools Git Window Help FederatedLearning - client.py
FederatedLearning centralized client.py
Run: server client
rver.py:179 | evaluate_round 1 received 2 results and 0 failures
rver.py:215 | fit_round 2: strategy sampled 2 clients (out of 2)
rver.py:229 | fit_round 2 received 2 results and 0 failures
rver.py:165 | evaluate_round 2: strategy sampled 2 clients (out of 2)
rver.py:179 | evaluate_round 2 received 2 results and 0 failures
rver.py:215 | fit_round 3: strategy sampled 2 clients (out of 2)
rver.py:229 | fit_round 3 received 2 results and 0 failures
rver.py:165 | evaluate_round 3: strategy sampled 2 clients (out of 2)
rver.py:179 | evaluate_round 3 received 2 results and 0 failures
rver.py:144 | FL finished in 877.7039550999999
.py:180 | app_fit: losses_distributed [(1, 2.1070897579193115), (2, 1.6486903429031372), (3, 1.4878828525543213)]
.py:181 | app_fit: metrics_distributed {'accuracy': [(1, 0.2505), (2, 0.3967), (3, 0.4532)]}
.py:182 | app_fit: losses_centralized {}
.py:183 | app_fit: metrics_centralized {}

Download pre-built shared indexes: Reduce the indexing time and CPU load with pr... (21 minutes ago) 29:1 CRLF UTF-8 4 spaces Python 3.8 (test-fed) main
```

3. femnist 실습

data : <https://url.kr/7r1u3n>

참고 : <https://github.com/TalwalkarLab/leaf/tree/master/data/femnist>

