Assignment2

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2021.12.18

1 数据准备

调用 paddle.vision.datasets.MNIST API 载入数据，并利用其 transform 参数进行归一化处理

```
transform = Compose([Normalize(mean=[127.5],
    std=[127.5],
    data_format='CHW')])

def prepare_dataset():
    train = paddle.vision.datasets.MNIST(mode = 'train', transform=transform)
    test = paddle.vision.datasets.MNIST(mode = 'test', transform=transform)
    train_split = [(x, y) for (x, y) in train if y >= 5 or random.random() <= 0.1]
    return train, test, train_split
```

2 神经网络模型

采用了经典的 LeNet-5 ，具体结构如下图:

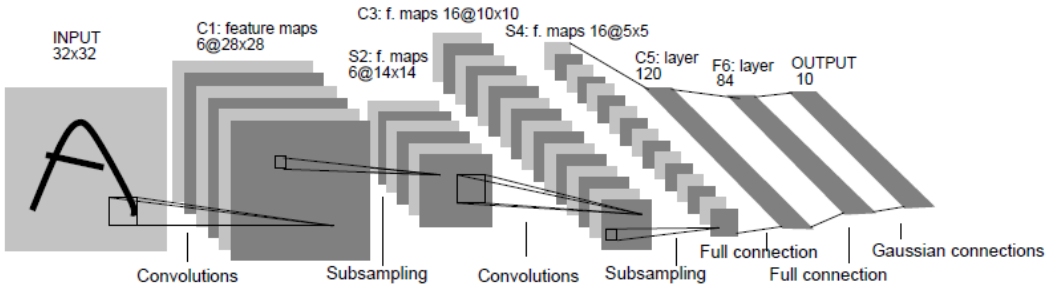

图 1: LeNet-5 网络结构

模型训练优化器采用的是 Adam 优化器

3 训练与结果

Adam 优化器学习率设置为 0.001，epsilon 设置为 1e-8，进行 5 个 epoch 的训练

3.1 在完整训练集上训练

```
Training on original train set...
The loss value printed in the log is the current step, and the metric is the average value of previous steps.
Epoch 1/5
C:\Anaconda3\envs\DL\lib\site-packages\paddle\fluid\layers\utils.py:77: DeprecationWarning: Using or importing
will stop working
  return (isinstance(seq, collections.Sequence) and
step 938/938 [==============================] - loss: 0.0336 - acc: 0.9326 - 11ms/step
Epoch 2/5
step 938/938 [==============================] - loss: 0.0114 - acc: 0.9799 - 10ms/step
Epoch 3/5
step 938/938 [==============================] - loss: 0.0063 - acc: 0.9852 - 11ms/step
Epoch 4/5
step 938/938 [==============================] - loss: 0.0040 - acc: 0.9890 - 10ms/step
Epoch 5/5
step 938/938 [==============================] - loss: 0.0421 - acc: 0.9906 - 9ms/step
Eval begin...
step 157/157 [==============================] - loss: 6.9006e-05 - acc: 0.9876 - 8ms/step
Eval samples: 10000
```

3.2 在划分后的训练集上训练

```
Training on split train set...
The loss value printed in the log is the current step, and the metric is the average value of previous steps.
Epoch 1/5
step 508/508 [==============================] - loss: 0.0390 - acc: 0.9232 - 5ms/step
Epoch 2/5
step 508/508 [==============================] - loss: 0.0855 - acc: 0.9740 - 5ms/step
Epoch 3/5
step 508/508 [==============================] - loss: 0.1987 - acc: 0.9835 - 5ms/step
Epoch 4/5
step 508/508 [==============================] - loss: 3.0328e-04 - acc: 0.9868 - 5ms/step
Epoch 5/5
step 508/508 [==============================] - loss: 0.0048 - acc: 0.9899 - 5ms/step
Eval begin...
step 157/157 [==============================] - loss: 0.0012 - acc: 0.9694 - 7ms/step
Eval samples: 10000
```

3.3 分析与改进

将 Adam 优化器的 epsilon 参数设置为 1e-2 后，加载之前训练好的模型分析验证，结果如下:

```
The loss value printed in the log is the current step, and the metric is the average value
Epoch 1/1
step 664/664 [==============================] - loss: 0.0160 - acc: 0.9949 - 4ms/step
Eval begin...
step 157/157 [==============================] - loss: 5.0823e-04 - acc: 0.9762 - 7ms/step
Eval samples: 10000
```

acc 得到了 0.01 的提升!