train_ThermoClassifier

February 12, 2022

[1]:
```
from Neural_Nets.Classification.PhaseClassifier.Development.PhaseClassifier␣
 ↪import PhaseClassifier
from Neural_Nets.Classification.ClassificationDataset.Development.
 ↪ClassificationDataset import *
from torch.utils.data import DataLoader
import torch
import torch.nn as nn
from torch.optim import Adam
import numpy as np
import matplotlib.pyplot as plt
```

[8]:
```
def epoch(net, train_loader, loss_func, optimizer, batch_size, seq_len):
    epoch_losses = np.zeros([len(train_loader), ])

    for i, d in enumerate(train_loader):
        #d = d.reshape(seq_len, -1, 3)
        inp = d[:, :, :-1].squeeze(1)/1000
        predictions = net(inp.float())

        # Each batch consists of measurement batches, where seq_len␣
 ↪measurements are put into one batch. In such a
        # measurement batch, every measurement has the same label as it needs␣
 ↪to be from the same element an phase.
        # This leads to a target array where the target class is contained for␣
 ↪each measurement in the measurement
        # batch. With this, CrossEntropyLoss would not work as the predictions␣
 ↪are made for the whole measurement
        # batch and CEL therefore expects only on class label per measurement␣
 ↪batch. Therefore, only the first
        # element of the last dimension of d is considered as target (all the␣
 ↪entries in the last dimension are the
        # same anyways so it could be any entry)
        #targets = d[:, :, -1].reshape(-1, seq_len)[:, 0].long()
        targets = d[:, :, -1][:, 0].long()

        loss = loss_func(predictions, targets)
        epoch_losses[i] = loss
```

```
        # Backward step
        net.zero_grad()
        loss.backward()
        optimizer.step()

    print(epoch_losses.mean())

    return epoch_losses.mean()
```

[23]:
```
def train(net, train_loader, batch_size, seq_len):
    # Hyperparameters
    nr_epochs = 1000
    lr = 0.0025

    loss_func = nn.CrossEntropyLoss()
    optimizer = Adam(net.parameters(), lr=lr)

    losses = np.zeros([nr_epochs, ])

    for i in range(nr_epochs):
        losses[i] = epoch(net, train_loader, loss_func, optimizer, batch_size,␣
↪seq_len)
```

[32]:
```
seq_len = 1
batch_size = 32

dc = DatasetCreator(r"C:
↪\Users\danie\Documents\Montanuni\Masterarbeit\4_Daten\Elements.xlsx",␣
↪elements=['Fe'],
                    splits=(0.8, 0.2), validation=False, seq_len=seq_len,␣
↪measurement='G')
train_dataset, test_dataset, val_dataset = dc.get_datasets()

train_loader = DataLoader(train_dataset, batch_size=batch_size, shuffle=True)
test_loader = DataLoader(test_dataset, batch_size=1, shuffle=True)

if val_dataset:
    val_loader = DataLoader(val_dataset)

net = PhaseClassifier(num_classes=5)
```

[33]:
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train(net, train_loader, batch_size, seq_len)
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```

[34]:
```
correct = 0
incorrect = 0

for d in test_loader:
    inp = d[:, :, :-1].squeeze(1)/1000
    prediction = net(inp.float()).argmax()
    target = d[:, :, -1][:, 0].long()
    if prediction == target:
        correct += 1
    else:
```

```
        incorrect += 1

print('accuracy: ', correct/(correct + incorrect))
```

```
accuracy:  0.8158415841584158
```

[36]:
```
torch.save(net, 'Neural_Nets/Classification/PhaseClassifier/Models/
↪model_12_02_22_1446')
```

[ ]:
```

```