Mini Project 3

ResNet을 이용하여 현업에서 얻어진 이미지로 분류 학습하기

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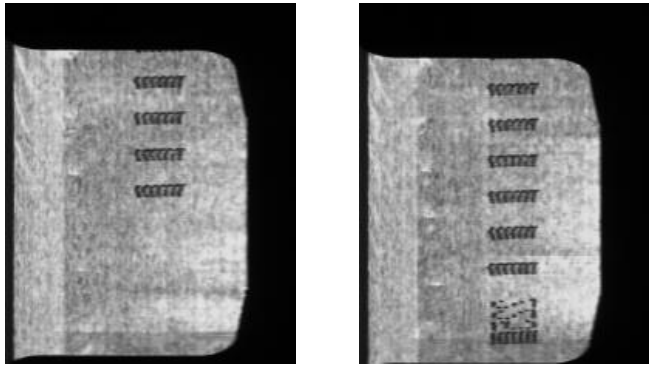
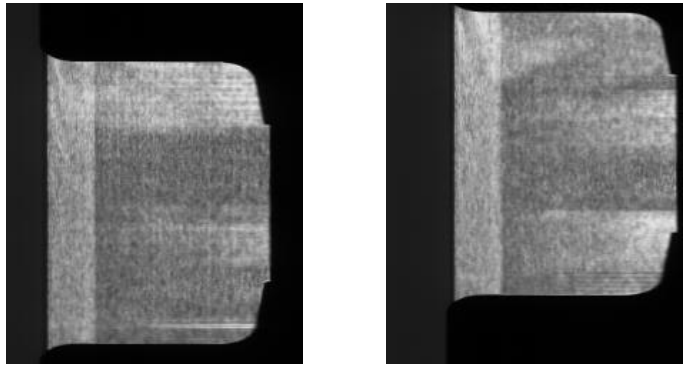
사용한 이미지 데이터

1. 이미지 데이터

   학습에 사용된 이미지는 2차 전지 배터리의 전극이미지로써 불량 셀에는 NG 마킹을 한다.



<NG마킹>



<양품>

실제 코드(Colab)

```
%matplotlib inline
from __future__ import print_function, division

import torch
import torch.nn as nn
import torch.optim as optim
from torch.optim import lr_scheduler
import numpy as np
import torchvision
from torchvision import datasets, models, transforms
import matplotlib.pyplot as plt
import time
import os
import copy
plt.ion()

from google.colab import drive
drive.mount('/content/drive')

data_transforms = {
    'train' : transforms.Compose([
                                transforms.RandomResizedCrop(224),
                                transforms.RandomHorizontalFlip( ),
                                transforms.ToTensor(),
                                transforms.Normalize([0.485, 0.456, 0.406], [0.229, 0.224, 0.225])

    ]),
    'val' : transforms.Compose([
                                transforms.Resize(256),
                                transforms.CenterCrop(224),
                                transforms.ToTensor(),
                                transforms.Normalize([0.485, 0.456, 0.406], [0.229, 0.224, 0.225])

    ]),
}

```

```
data_dir = '/content/drive/My Drive/hymenoptera_data'
image_datasets = {x : datasets.ImageFolder(os.path.join(data_dir, x), data_transforms[x]) for x in ['train', 'val']}
dataloaders = {x : torch.utils.data.DataLoader(image_datasets[x], batch_size=4, shuffle=True, num_workers=4) for x in ['train', 'val']}
dataset_sizes = {x : len(image_datasets[x]) for x in ['train', 'val']}
class_names = image_datasets['train'].classes
device = torch.device("cuda:0" if torch.cuda.is_available() else "cpu")

def imshow(inp, title=None):
  inp = inp.numpy().transpose((1,2,0))
  mean = np.array([0.485, 0.456, 0.406])
  std = np.array([0.229, 0.224, 0.225])
  inp = std * inp + mean
  inp = np.clip(inp, 0, 1)
  plt.imshow(inp)
  if title is not None :
    plt.title(title)
  plt.pause(0.001)

inputs, classes = next(iter(dataloaders['train']))
out = torchvision.utils.make_grid(inputs)

imshow(out, title = [class_names[x] for x in classes])

def train_model(model, criterion, optimizer, scheduler, num_epochs=25) :
  since = time.time()
  best_model_wts = copy.deepcopy(model.state_dict())
  best_acc = 0.0

  for epoch in range(num_epochs) :
    print('Epoch {}/{}'.format(epoch, num_epochs - 1))
    print('-'*10)
    for phase in ['train', 'val'] :
      if phase == 'train' :
        scheduler.step()
        model.train()
      else:
        model.eval()
      running_loss = 0.0
      running_corrects = 0
      for inputs, labels in dataloaders[phase] :
        inputs = inputs.to(device)
```

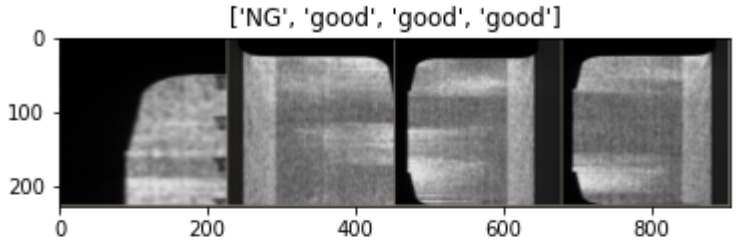
학습에 사용할 이미지데이터를 가져오는 경로

```
        labels = labels.to(device)
        optimizer.zero_grad()
        with torch.set_grad_enabled(phase == 'train') :
          outputs = model(inputs)
          _, preds = torch.max(outputs, 1)
          loss = criterion(outputs, labels)
          if phase == 'train' :
            loss.backward()
            optimizer.step()
        running_loss += loss.item() * inputs.size(0)
        running_corrects += torch.sum(preds == labels.data)
      epoch_loss = running_loss / dataset_sizes[phase]
      epoch_acc = running_corrects.double() / dataset_sizes[phase]
      print('{} Loss: {:.4f} Acc: {:.4f}'.format(phase, epoch_loss, epoch_acc))
      if phase == 'val' and epoch_acc > best_acc :
        best_acc = epoch_acc
        best_model_wts = copy.deepcopy(model.state_dict())
    print()
  time_elapsed = time.time() - since
  print('Training complete in {:.0f}m {:.0f}s'.format(time_elapsed // 60, time_elapsed % 60))
  print('Best val Acc: {:4f}'.format(best_acc))
  model.load_state_dict(best_model_wts)
  return model

def visualize_model(model, num_images = 6) :
  was_training = model.training
  model.eval()
  images_so_far = 0
  fig = plt.figure()

  with torch.no_grad() :
    for i, (inputs, labels) in enumerate(dataloaders['val']) :
      inputs = inputs.to(device)
      labels = labels.to(device)

      outputs = model(inputs)
      _, preds = torch.max(outputs, 1)
```

```
      for j in range(inputs.size()[0]):
        images_so_far += 1
        ax = plt.subplot(num_images//2, 2, images_so_far)
        ax.axis('off')
        ax.set_title('predicted: {}'.format(class_names[preds[j]]))
        imshow(inputs.cpu().data[j])

        if images_so_far == num_images :
          model.train(mode = was_training)
          return
    model.train(mode = was_training)

model_ft = models.resnet18(pretrained = True)
num_ftrs = model_ft.fc.in_features
model_ft.fc = nn.Linear(num_ftrs, 2)

model_ft = model_ft.to(device)
criterion = nn.CrossEntropyLoss()

optimizer_ft = optim.SGD(model_ft.parameters(), lr=0.001, momentum=0.9)
exp_lr_scheduler = lr_scheduler.StepLR(optimizer_ft, step_size=7, gamma=0.1)
model_ft = train_model(model_ft, criterion, optimizer_ft, exp_lr_scheduler, num_epochs=25)

visualize_model(model_ft)
```

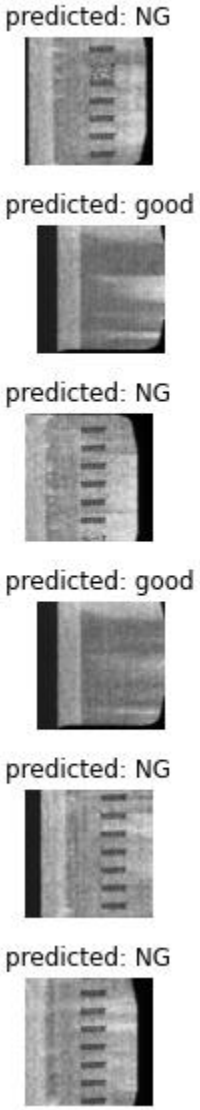
학습 결과

```
Drive already mounted at /content/drive; to attempt to forci
/usr/local/lib/python3.7/dist-packages/torch/utils/data/data
  cpuset_checked))
```




```
Epoch 0/24
----------
/usr/local/lib/python3.7/dist-packages/torch/optim/lr_schedu
  "https://pytorch.org/docs/stable/optim.html#how-to-adjust-
train Loss: 0.4922 Acc: 0.7746
val Loss: 0.0495 Acc: 0.9833

Epoch 1/24
----------
train Loss: 0.5255 Acc: 0.8279
val Loss: 0.0095 Acc: 1.0000

Epoch 2/24
----------
train Loss: 0.5791 Acc: 0.8607
val Loss: 0.0155 Acc: 1.0000

Epoch 3/24
----------
train Loss: 0.2617 Acc: 0.9344
val Loss: 0.1846 Acc: 0.9333
```

```
Training complete in 32m 9s
Best val Acc: 1.000000
```



학습 시간 : 약 32분
정확도 : 1(100% 정확하게 분류)