

arabic\_pretraining\_for\_urdu\_alhpabets\_recogntion\_performace\_boost\_(1)

October 4, 2025

# 1 arabic-pretraining-for-urdu-alphabets-recogntion-performace-boost

pre-trained on imagenet

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Date: 4/10/25

```
[1]: !unzip "/content/archive.zip" -d "/content/ahar/"
```

Streaming output truncated to the last 5000 lines.

```
inflating: /content/ahar/train images 13440x32x32/train/id_5500_label_16.png
inflating: /content/ahar/train images 13440x32x32/train/id_5501_label_16.png
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inflating: /content/ahar/train images 13440x32x32/train/id_5520_label_18.png
inflating: /content/ahar/train images 13440x32x32/train/id_5521_label_19.png
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```

### 1.0.1 Imports

```
[1]: import os
import time
import json
import logging
import torch
import timm
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns

from torch import nn
```

```

from torch.utils.data import DataLoader, SubsetRandomSampler
from torchvision import datasets, transforms
from sklearn.metrics import classification_report, confusion_matrix, \
    accuracy_score
from tqdm.auto import tqdm

```

### 1.0.2 Config

```

[10]: CONFIG = {
    "data_path": "/content/ahar",

    "num_classes": 28,
    "batch_size": 64,
    "image_size": 224,
    "num_epochs": 50,
    "learning_rate": 0.0001,
    "early_stopping_patience": 5,
    "validation_split": 0.15,

    "checkpoints_dir": "/content/drive/MyDrive/uhar/arabic_pretrained_models/",

    "models_to_evaluate": [
        "swin_tiny_patch4_window7_224",
        "deit_tiny_distilled_patch16_224",
    ]
}

os.makedirs(CONFIG["checkpoints_dir"], exist_ok=True)

```

### 1.0.3 setup device, logging, and directories

```

[3]: DEVICE = "cuda" if torch.cuda.is_available() else "cpu"

#os.makedirs(CONFIG["results_dir"], exist_ok=True)
os.makedirs(CONFIG["checkpoints_dir"], exist_ok=True)

logging.basicConfig(level=logging.INFO,
                    format='%(asctime)s - %(levelname)s - %(message)s',
                    handlers=[
                        logging.FileHandler("experiment_log.log"),
                        logging.StreamHandler()
                    ])

logging.info(f"Using device: {DEVICE}")

```

### 1.0.4 EarlyStopping

```
[4]: class EarlyStopping:
    def __init__(self, patience=5, min_delta=0, checkpoint_path='checkpoint.
    ↪pth'):
        self.patience = patience
        self.min_delta = min_delta
        self.counter = 0
        self.best_score = None
        self.early_stop = False
        self.val_loss_min = np.inf
        self.checkpoint_path = checkpoint_path

    def __call__(self, val_loss, model):
        score = -val_loss
        if self.best_score is None:
            self.best_score = score
            self.save_checkpoint(val_loss, model)
        elif score < self.best_score + self.min_delta:
            self.counter += 1
            logging.info(f'earlyStopping counter: {self.counter} out of {self.
    ↪patience}')
            if self.counter >= self.patience:
                self.early_stop = True
            else:
                self.best_score = score
                self.save_checkpoint(val_loss, model)
                self.counter = 0

        def save_checkpoint(self, val_loss, model):
            logging.info(f'validation loss decreased ({self.val_loss_min:.6f} -->
    ↪{val_loss:.6f}). Saving best model...')
            torch.save(model.state_dict(), self.checkpoint_path)
            self.val_loss_min = val_loss
```

### 1.0.5 Data Loading and Verification

```
[5]: import os
import glob
from PIL import Image
from torch.utils.data import DataLoader, Dataset, SubsetRandomSampler
from torchvision import transforms
import numpy as np
import logging

class ArabicImageDatasetFromFile(Dataset):
    def __init__(self, data_dir, transform=None):
```

```

        self.transform = transform
        self.image_paths = sorted(glob.glob(os.path.join(data_dir, "*", "*.
↪png"))))

        self.labels = [int(p.split('_')[-1].split('.')[0]) - 1 for p in self.
↪image_paths]

        self.class_names = [str(i) for i in range(len(set(self.labels)))]
        self.class_to_idx = {name: i for i, name in enumerate(self.class_names)}

    def __len__(self):
        return len(self.image_paths)

    def __getitem__(self, idx):
        img_path = self.image_paths[idx]
        image = Image.open(img_path).convert("RGB")
        label = self.labels[idx]
        if self.transform:
            image = self.transform(image)
        return image, label

def create_arabic_dataloaders(config):
    data_transform = transforms.Compose([
        transforms.Resize((config["image_size"], config["image_size"])),
        transforms.ToTensor(),
        transforms.Normalize(mean=[0.485, 0.456, 0.406], std=[0.229, 0.224, 0.
↪225])
    ])

    train_dir = "/content/ahar/train_organized"
    test_dir = "/content/ahar/test_organized"

    if not os.path.exists(train_dir):
        logging.error(f"Organized training directory not found at: {train_dir}")
        return None, None, None

    full_train_dataset = ArabicImageDatasetFromFile(train_dir,
↪transform=data_transform)

    logging.info("Using Custom Dataset that reads labels from FILENAMES.")
    print("Class to Index Mapping (based on unique labels found):")
    print(full_train_dataset.class_to_idx)

    val_split = config["validation_split"]
    dataset_size = len(full_train_dataset)
    indices = list(range(dataset_size))
    split = int(np.floor(val_split * dataset_size))

```

```

np.random.seed(42)
np.random.shuffle(indices)
train_indices, val_indices = indices[split:], indices[:split]

train_sampler = SubsetRandomSampler(train_indices)
val_sampler = SubsetRandomSampler(val_indices)

train_loader = DataLoader(
    full_train_dataset, batch_size=config["batch_size"],
    ↪sampler=train_sampler,
    num_workers=2, pin_memory=True
)
val_loader = DataLoader(
    full_train_dataset, batch_size=config["batch_size"],
    ↪sampler=val_sampler,
    num_workers=2, pin_memory=True
)

test_loader = None
if os.path.exists(test_dir):
    test_dataset = ArabicImageDatasetFromFile(test_dir,
    ↪transform=data_transform)
    test_loader = DataLoader(
        test_dataset, batch_size=config["batch_size"], shuffle=False,
        num_workers=2, pin_memory=True
    )
    logging.info(f"Test data loader created with {len(test_dataset)}
    ↪images.")
else:
    logging.warning(f"Organized test directory not found at: {test_dir}.
    ↪Skipping test data loading.")

logging.info(f"Data loaders created: {len(train_indices)} train images,
    ↪{len(val_indices)} validation images.")
return train_loader, val_loader, test_loader

```

```

[6]: from torchvision.utils import make_grid

train_loader, val_loader, test_loader = create_arabic_dataloaders(CONFIG)

if train_loader:
    images, labels = next(iter(train_loader))

    images = images[:16]
    labels = labels[:16]

```

```

grid = make_grid(images, nrow=4)

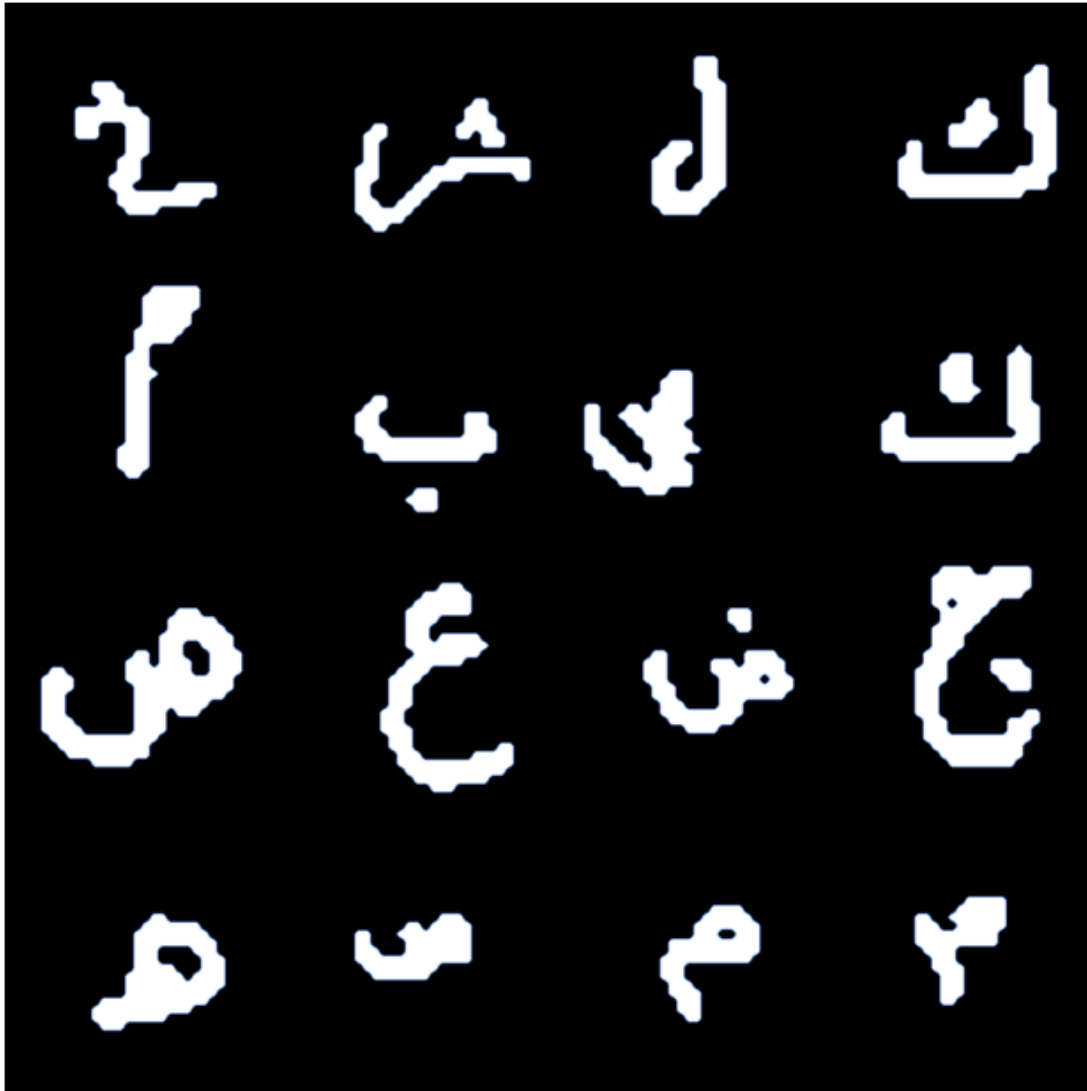
plt.figure(figsize=(8, 8))
plt.imshow(grid.permute(1, 2, 0))
plt.axis('off')
plt.show()
else:
    logging.error("training data loader not created.")

```

Class to Index Mapping (based on unique labels found):

```
{'0': 0, '1': 1, '2': 2, '3': 3, '4': 4, '5': 5, '6': 6, '7': 7, '8': 8, '9': 9,
'10': 10, '11': 11, '12': 12, '13': 13, '14': 14, '15': 15, '16': 16, '17': 17,
'18': 18, '19': 19, '20': 20, '21': 21, '22': 22, '23': 23, '24': 24, '25': 25,
'26': 26, '27': 27}
```

WARNING:matplotlib.image:Clipping input data to the valid range for imshow with RGB data ([0..1] for floats or [0..255] for integers). Got range [-2.117904..2.64].



### 1.0.6 Core Training and Evaluation Functions

```
[11]: def train_model(model, model_name, config, train_dataloader, val_dataloader):  
    loss_fn = nn.CrossEntropyLoss()  
    optimizer = torch.optim.Adam(model.parameters(), lr=config["learning_rate"])  
  
    best_model_path = os.path.join(config["checkpoints_dir"],  
    ↪ f"{model_name}_best_model.pth")  
    early_stopper = EarlyStopping(patience=config["early_stopping_patience"],  
    ↪ checkpoint_path=best_model_path)  
  
    start_time = time.time()
```

```

for epoch in range(config["num_epochs"]):
    model.train()
    train_loss, train_acc = 0, 0
    train_pbar = tqdm(train_dataloader, desc=f"Epoch {epoch+1}/
↪{config['num_epochs']} [Train]", leave=False)
    for X, y in train_pbar:
        X, y = X.to(DEVICE), y.to(DEVICE)
        y_pred = model(X)
        loss = loss_fn(y_pred, y)
        train_loss += loss.item()
        optimizer.zero_grad()
        loss.backward()
        optimizer.step()
        y_pred_class = torch.argmax(torch.softmax(y_pred, dim=1), dim=1)
        train_acc += (y_pred_class == y).sum().item() / len(y_pred)

    train_loss /= len(train_dataloader)
    train_acc /= len(train_dataloader)

    model.eval()
    val_loss, val_acc = 0, 0
    val_pbar = tqdm(val_dataloader, desc=f"Epoch {epoch+1}/
↪{config['num_epochs']} [Val]", leave=False)
    with torch.no_grad():
        for X, y in val_pbar:
            X, y = X.to(DEVICE), y.to(DEVICE)
            y_pred = model(X)
            val_loss += loss_fn(y_pred, y).item()
            y_pred_class = torch.argmax(torch.softmax(y_pred, dim=1), dim=1)
            val_acc += (y_pred_class == y).sum().item() / len(y_pred)

    val_loss /= len(val_dataloader)
    val_acc /= len(val_dataloader)

    print(f"Epoch: {epoch+1} | Train Loss: {train_loss:.4f} | Train Acc:
↪{train_acc:.4f} | Val Loss: {val_loss:.4f} | Val Acc: {val_acc:.4f}")

    early_stopper(val_loss, model)
    if early_stopper.early_stop:
        logging.info("Early stopping triggered.")
        break

total_time = time.time() - start_time
logging.info(f"Training completed for {model_name} in {total_time:.2f}
↪seconds.")

```



### 1.0.7 Visualization Functions

```
[12]: train_loader_arabic, val_loader_arabic, test_loader_arabic =  
    ↪ create_arabic_dataloaders(CONFIG)  
  
if train_loader_arabic and val_loader_arabic:  
    for model_name in CONFIG["models_to_evaluate"]:  
        logging.info(f"\n{'='*80}\nstarting pretraining for :  
    ↪ {model_name}\n{'='*80}")  
  
        model = timm.create_model(  
            model_name,  
            pretrained=True,  
            num_classes=CONFIG["num_classes"]  
        ).to(DEVICE)  
  
        train_model(model, model_name, CONFIG, train_loader_arabic,  
    ↪ val_loader_arabic)  
  
        logging.info(f"\n{'='*80}\npre-training done for : {model_name}. best_  
    ↪ weights saved.\n{'='*80}")  
  
        logging.info("pre-training done.")  
else:  
    logging.error("Could not create Arabic data loaders. Halting pre-training.")
```

Class to Index Mapping (based on unique labels found):

```
{'0': 0, '1': 1, '2': 2, '3': 3, '4': 4, '5': 5, '6': 6, '7': 7, '8': 8, '9': 9,  
'10': 10, '11': 11, '12': 12, '13': 13, '14': 14, '15': 15, '16': 16, '17': 17,  
'18': 18, '19': 19, '20': 20, '21': 21, '22': 22, '23': 23, '24': 24, '25': 25,  
'26': 26, '27': 27}
```

Epoch 1/50 [Train]: 0%| | 0/179 [00:00<?, ?it/s]

Epoch 1/50 [Val]: 0%| | 0/32 [00:00<?, ?it/s]

Epoch: 1 | Train Loss: 1.0193 | Train Acc: 0.7027 | Val Loss: 0.2915 | Val Acc:  
0.9082

Epoch 2/50 [Train]: 0%| | 0/179 [00:00<?, ?it/s]

Epoch 2/50 [Val]: 0%| | 0/32 [00:00<?, ?it/s]

Epoch: 2 | Train Loss: 0.2287 | Train Acc: 0.9296 | Val Loss: 0.2053 | Val Acc:  
0.9365

Epoch 3/50 [Train]: 0%| | 0/179 [00:00<?, ?it/s]

Epoch 3/50 [Val]: 0%| | 0/32 [00:00<?, ?it/s]

Epoch: 3 | Train Loss: 0.1408 | Train Acc: 0.9605 | Val Loss: 0.2074 | Val Acc:  
0.9404

```

Epoch 4/50 [Train]:  0%|          | 0/179 [00:00<?, ?it/s]

Exception ignored in: <function _MultiProcessingDataLoaderIter.__del__ at
0x7d1d8c3fd120>
Exception ignored in: <function _MultiProcessingDataLoaderIter.__del__ at
0x7d1d8c3fd120>Traceback (most recent call last):
  File "/usr/local/lib/python3.12/dist-packages/torch/utils/data/dataloader.py",
line 1664, in __del__

Traceback (most recent call last):
  File "/usr/local/lib/python3.12/dist-
packages/torch/utils/data/dataloader.py", line 1664, in __del__
self._shutdown_workers()
  File "/usr/local/lib/python3.12/dist-
packages/torch/utils/data/dataloader.py", line 1647, in _shutdown_workers
self._shutdown_workers()
  File "/usr/local/lib/python3.12/dist-
packages/torch/utils/data/dataloader.py", line 1647, in _shutdown_workers
if w.is_alive():
if w.is_alive():
    ~ ~~~~~
  File "/usr/lib/python3.12/multiprocessing/process.py", line 160, in is_alive

  File "/usr/lib/python3.12/multiprocessing/process.py", line 160, in is_alive
    assert self._parent_pid == os.getpid(), 'can only test a child process'
assert self._parent_pid == os.getpid(), 'can only test a child process'
    ~~~~~
^AssertionError:
can only test a child process^^^
Exception ignored in: <function _MultiProcessingDataLoaderIter.__del__ at
0x7d1d8c3fd120>AssertionError: can only test a child process

Traceback (most recent call last):
  File "/usr/local/lib/python3.12/dist-packages/torch/utils/data/dataloader.py",
line 1664, in __del__
Exception ignored in:      self._shutdown_workers()<function
_MultiProcessingDataLoaderIter.__del__ at 0x7d1d8c3fd120>

  File "/usr/local/lib/python3.12/dist-packages/torch/utils/data/dataloader.py",
line 1647, in _shutdown_workers
  Traceback (most recent call last):
    File "/usr/local/lib/python3.12/dist-packages/torch/utils/data/dataloader.py",
line 1664, in __del__
if w.is_alive():
    self._shutdown_workers()
  File "/usr/local/lib/python3.12/dist-
packages/torch/utils/data/dataloader.py", line 1647, in _shutdown_workers
if w.is_alive():

```

```

~ ~ ~ ~ ~~~~~
~ File "/usr/lib/python3.12/multiprocessing/process.py", line 160, in is_alive
~   ~assert self._parent_pid == os.getpid(), 'can only test a child process'
~ ~

File "/usr/lib/python3.12/multiprocessing/process.py", line 160, in is_alive
    assert self._parent_pid == os.getpid(), 'can only test a child process'
    ~ ~ ~ ~ ~ ~ ~ ~~~~~

^AssertionError^: ^can only test a child process^
Exception ignored in: ^<function _MultiProcessingDataLoaderIter.__del__ at
0x7d1d8c3fd120>^^^
^Traceback (most recent call last):
^^ File "/usr/local/lib/python3.12/dist-
packages/torch/utils/data/dataloader.py", line 1664, in __del__
    ^self._shutdown_workers()^
~

File "/usr/local/lib/python3.12/dist-packages/torch/utils/data/dataloader.py",
line 1647, in _shutdown_workers
AssertionError      : if w.is_alive():
can only test a child process
Exception ignored in: <function _MultiProcessingDataLoaderIter.__del__ at
0x7d1d8c3fd120>
Traceback (most recent call last):
File "/usr/local/lib/python3.12/dist-
packages/torch/utils/data/dataloader.py", line 1664, in __del__
    ^self._shutdown_workers()^
~
File "/usr/local/lib/python3.12/dist-
packages/torch/utils/data/dataloader.py", line 1647, in _shutdown_workers
    ^if w.is_alive():^
~ ~ ~ ~ ~ ~ ~

File "/usr/lib/python3.12/multiprocessing/process.py", line 160, in is_alive
~ ~   ^assert self._parent_pid == os.getpid(), 'can only test a child process'^
~ ~ ~ ~ ~ ~ ~ ~

File "/usr/lib/python3.12/multiprocessing/process.py", line 160, in is_alive
    assert self._parent_pid == os.getpid(), 'can only test a child process'
    ~ ~ ~ ~ ~ ~ ~ ~~~~~

AssertionError^: can only test a child process^
^Exception ignored in: ^^<function _MultiProcessingDataLoaderIter.__del__ at
0x7d1d8c3fd120>^^
^Traceback (most recent call last):
~ File "/usr/local/lib/python3.12/dist-
packages/torch/utils/data/dataloader.py", line 1664, in __del__

AssertionErrorself._shutdown_workers(): can only test a child process

File "/usr/local/lib/python3.12/dist-packages/torch/utils/data/dataloader.py",
line 1647, in _shutdown_workers
Exception ignored in: if w.is_alive():
<function _MultiProcessingDataLoaderIter.__del__ at 0x7d1d8c3fd120>

```



```

0.9453
Epoch 5/50 [Train]:  0%|          | 0/179 [00:00<?, ?it/s]
Epoch 5/50 [Val]:   0%|          | 0/32 [00:00<?, ?it/s]
Epoch: 5 | Train Loss: 0.0750 | Train Acc: 0.9762 | Val Loss: 0.1903 | Val Acc:
0.9487
Epoch 6/50 [Train]:  0%|          | 0/179 [00:00<?, ?it/s]
Epoch 6/50 [Val]:   0%|          | 0/32 [00:00<?, ?it/s]
Epoch: 6 | Train Loss: 0.0703 | Train Acc: 0.9787 | Val Loss: 0.2761 | Val Acc:
0.9336
Epoch 7/50 [Train]:  0%|          | 0/179 [00:00<?, ?it/s]
Epoch 7/50 [Val]:   0%|          | 0/32 [00:00<?, ?it/s]
Epoch: 7 | Train Loss: 0.0623 | Train Acc: 0.9801 | Val Loss: 0.2634 | Val Acc:
0.9414
Epoch 8/50 [Train]:  0%|          | 0/179 [00:00<?, ?it/s]
Epoch 8/50 [Val]:   0%|          | 0/32 [00:00<?, ?it/s]
Exception ignored in: <function _MultiProcessingDataLoaderIter.__del__ at
0x7d1d8c3fd120>
Traceback (most recent call last):
  File "/usr/local/lib/python3.12/dist-packages/torch/utils/data/dataloader.py",
line 1664, in __del__
    self._shutdown_workers()
  File "/usr/local/lib/python3.12/dist-packages/torch/utils/data/dataloader.py",
line 1647, in _shutdown_workers
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0x7d1d8c3fd120>
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    ^self._shutdown_workers()
^^  File "/usr/local/lib/python3.12/dist-
packages/torch/utils/data/dataloader.py", line 1647, in _shutdown_workers
^^    ^if w.is_alive():^
~ ~ ~ ~ ~
    File "/usr/lib/python3.12/multiprocessing/process.py", line 160, in is_alive
        assert self._parent_pid == os.getpid(), 'can only test a child process'^^~
~ ~ ~ ~ ~
    File "/usr/lib/python3.12/multiprocessing/process.py", line 160, in is_alive
        assert self._parent_pid == os.getpid(), 'can only test a child process'^
~ ~ ~ ~ ~
AssertionError: ^can only test a child process
^^^^Exception ignored in: <function _MultiProcessingDataLoaderIter.__del__ at

```

```

0x7d1d8c3fd120>
^Traceback (most recent call last):
^^ File "/usr/local/lib/python3.12/dist-
packages/torch/utils/data/dataloader.py", line 1664, in __del__

    self._shutdown_workers()AssertionError
File "/usr/local/lib/python3.12/dist-packages/torch/utils/data/dataloader.py",
line 1647, in _shutdown_workers
:     if w.is_alive():can only test a child process

Exception ignored in: <function _MultiProcessingDataLoaderIter.__del__ at
0x7d1d8c3fd120>^
^^Traceback (most recent call last):
^ File "/usr/local/lib/python3.12/dist-
packages/torch/utils/data/dataloader.py", line 1664, in __del__
^     ^self._shutdown_workers()^
^ File "/usr/local/lib/python3.12/dist-
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^^     if w.is_alive():^
^
File "/usr/lib/python3.12/multiprocessing/process.py", line 160, in is_alive
    assert self._parent_pid == os.getpid(), 'can only test a child process'
    ^  ^  ^  ^^^^^^^^^^^^^^^^^^^^^
^^ File "/usr/lib/python3.12/multiprocessing/process.py", line 160, in is_alive
^^     ^^assert self._parent_pid == os.getpid(), 'can only test a child process'
^ ^  ^ ^  ^ ^  ^ ^  ^ ^  ^ ^  ^ ^  ^ ^  ^ ^  ^ ^  ^ ^  ^ ^  ^ ^  ^ ^  ^ ^  ^ ^
^^AssertionError: ^can only test a child process^
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^     ^self._shutdown_workers()^^
^ File "/usr/local/lib/python3.12/dist-
packages/torch/utils/data/dataloader.py", line 1647, in _shutdown_workers

File "/usr/lib/python3.12/multiprocessing/process.py", line 160, in

```









Epoch: 11 | Train Loss: 0.0470 | Train Acc: 0.9855 | Val Loss: 0.2050 | Val Acc: 0.9604

Epoch 12/50 [Train]: 0%| | 0/179 [00:00<?, ?it/s]

Epoch 12/50 [Val]: 0%| | 0/32 [00:00<?, ?it/s]

Epoch: 12 | Train Loss: 0.0376 | Train Acc: 0.9887 | Val Loss: 0.2021 | Val Acc: 0.9585

Epoch 13/50 [Train]: 0%| | 0/179 [00:00<?, ?it/s]

Epoch 13/50 [Val]: 0%| | 0/32 [00:00<?, ?it/s]

Epoch: 13 | Train Loss: 0.0307 | Train Acc: 0.9908 | Val Loss: 0.2354 | Val Acc: 0.9482

model.safetensors: 0%| | 0.00/23.7M [00:00<?, ?B/s]

Epoch 1/50 [Train]: 0%| | 0/179 [00:00<?, ?it/s]

Epoch 1/50 [Val]: 0%| | 0/32 [00:00<?, ?it/s]

Epoch: 1 | Train Loss: 1.0820 | Train Acc: 0.7146 | Val Loss: 0.3528 | Val Acc: 0.9019

Epoch 2/50 [Train]: 0%| | 0/179 [00:00<?, ?it/s]

Exception ignored in: <function \_MultiProcessingDataLoaderIter.\_\_del\_\_ at 0x7d1d8c3fd120>

Traceback (most recent call last):

```
File "/usr/local/lib/python3.12/dist-packages/torch/utils/data/dataloader.py", line 1664, in __del__
    self._shutdown_workers()
File "/usr/local/lib/python3.12/dist-packages/torch/utils/data/dataloader.py", line 1647, in _shutdown_workers
    Exception ignored in: if w.is_alive():<function
_MultiProcessingDataLoaderIter.__del__ at 0x7d1d8c3fd120>
```

Traceback (most recent call last):

```
File "/usr/local/lib/python3.12/dist-packages/torch/utils/data/dataloader.py", line 1664, in __del__
    self._shutdown_workers()
File "/usr/local/lib/python3.12/dist-packages/torch/utils/data/dataloader.py", line 1647, in _shutdown_workers
    if w.is_alive():~
~ ~ ~ ~ ~
^ File "/usr/lib/python3.12/multiprocessing/process.py", line 160, in is_alive
^   ~^assert self._parent_pid == os.getpid(), 'can only test a child process'~
~ ~ ~ ~ ~
File "/usr/lib/python3.12/multiprocessing/process.py", line 160, in is_alive
    assert self._parent_pid == os.getpid(), 'can only test a child process'
~ ~ ~ ~ ~
^AssertionError: ^can only test a child process^
```

```

~~~~~
AssertionError: can only test a child process
Epoch 2/50 [Val]:  0%|          | 0/32 [00:00<?, ?it/s]
Epoch: 2 | Train Loss: 0.2395 | Train Acc: 0.9312 | Val Loss: 0.2772 | Val Acc:
0.9209
Epoch 3/50 [Train]:  0%|          | 0/179 [00:00<?, ?it/s]
Epoch 3/50 [Val]:  0%|          | 0/32 [00:00<?, ?it/s]
Epoch: 3 | Train Loss: 0.1305 | Train Acc: 0.9630 | Val Loss: 0.2172 | Val Acc:
0.9395
Epoch 4/50 [Train]:  0%|          | 0/179 [00:00<?, ?it/s]
Epoch 4/50 [Val]:  0%|          | 0/32 [00:00<?, ?it/s]
Epoch: 4 | Train Loss: 0.1028 | Train Acc: 0.9697 | Val Loss: 0.2198 | Val Acc:
0.9370
Epoch 5/50 [Train]:  0%|          | 0/179 [00:00<?, ?it/s]
Epoch 5/50 [Val]:  0%|          | 0/32 [00:00<?, ?it/s]
Epoch: 5 | Train Loss: 0.0683 | Train Acc: 0.9807 | Val Loss: 0.1980 | Val Acc:
0.9438
Epoch 6/50 [Train]:  0%|          | 0/179 [00:00<?, ?it/s]
Epoch 6/50 [Val]:  0%|          | 0/32 [00:00<?, ?it/s]
Exception ignored in: <function _MultiProcessingDataLoaderIter.__del__ at
0x7d1d8c3fd120>
Traceback (most recent call last):
  File "/usr/local/lib/python3.12/dist-packages/torch/utils/data/dataloader.py",
line 1664, in __del__
    self._shutdown_workers()
  File "/usr/local/lib/python3.12/dist-packages/torch/utils/data/dataloader.py",
line 1647, in _shutdown_workers
    if w.is_alive():
    ~~~~~
  File "/usr/lib/python3.12/multiprocessing/process.py", line 160, in is_alive
    assert self._parent_pid == os.getpid(), 'can only test a child process'
    ~~~~~
AssertionError: can only test a child process
Exception ignored in: <function _MultiProcessingDataLoaderIter.__del__ at
0x7d1d8c3fd120>
Traceback (most recent call last):
  File "/usr/local/lib/python3.12/dist-packages/torch/utils/data/dataloader.py",
line 1664, in __del__
    self._shutdown_workers()
  File "/usr/local/lib/python3.12/dist-packages/torch/utils/data/dataloader.py",
line 1647, in _shutdown_workers

```

```

    if w.is_alive():
        ~~~~~
File "/usr/lib/python3.12/multiprocessing/process.py", line 160, in is_alive
    assert self._parent_pid == os.getpid(), 'can only test a child process'
        ~~~~~
AssertionError: can only test a child process
Exception ignored in: <function _MultiProcessingDataLoaderIter.__del__ at
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Traceback (most recent call last):
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    if w.is_alive():
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        ~~~~~
AssertionError: can only test a child process
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  File "/usr/local/lib/python3.12/dist-packages/torch/utils/data/dataloader.py",
line 1664, in __del__
    self._shutdown_workers()
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    if w.is_alive():
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Exception ignored in: <function _MultiProcessingDataLoaderIter.__del__ at
0x7d1d8c3fd120>
Traceback (most recent call last):
  File "/usr/local/lib/python3.12/dist-packages/torch/utils/data/dataloader.py",
line 1664, in __del__
    self._shutdown_workers()
  File "/usr/local/lib/python3.12/dist-packages/torch/utils/data/dataloader.py",
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    if w.is_alive():
        ~~~~~

File "/usr/lib/python3.12/multiprocessing/process.py", line 160, in is_alive
    assert self._parent_pid == os.getpid(), 'can only test a child process'
        ~~~~~
AssertionError: can only test a child process

```

```

Exception ignored in: <function _MultiProcessingDataLoaderIter.__del__ at
0x7d1d8c3fd120>
Traceback (most recent call last):
  File "/usr/local/lib/python3.12/dist-packages/torch/utils/data/dataloader.py",
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    self._shutdown_workers()
  File "/usr/local/lib/python3.12/dist-packages/torch/utils/data/dataloader.py",
line 1647, in _shutdown_workers
    if w.is_alive():
    ~~~~~~

  File "/usr/lib/python3.12/multiprocessing/process.py", line 160, in is_alive
    assert self._parent_pid == os.getpid(), 'can only test a child process'
    ~~~~~~

AssertionError: can only test a child process
Exception ignored in: <function _MultiProcessingDataLoaderIter.__del__ at
0x7d1d8c3fd120>
Traceback (most recent call last):
  File "/usr/local/lib/python3.12/dist-packages/torch/utils/data/dataloader.py",
line 1664, in __del__
    self._shutdown_workers()
  File "/usr/local/lib/python3.12/dist-packages/torch/utils/data/dataloader.py",
line 1647, in _shutdown_workers
    if w.is_alive():
    ~~~~~~

  File "/usr/lib/python3.12/multiprocessing/process.py", line 160, in is_alive
    assert self._parent_pid == os.getpid(), 'can only test a child process'
    ~~~~~~

AssertionError: can only test a child process

Epoch: 6 | Train Loss: 0.0626 | Train Acc: 0.9805 | Val Loss: 0.2395 | Val Acc:
0.9307

Epoch 7/50 [Train]:  0%|          | 0/179 [00:00<?, ?it/s]
Epoch 7/50 [Val]:   0%|          | 0/32 [00:00<?, ?it/s]

Epoch: 7 | Train Loss: 0.0616 | Train Acc: 0.9812 | Val Loss: 0.2112 | Val Acc:
0.9443

Epoch 8/50 [Train]:  0%|          | 0/179 [00:00<?, ?it/s]
Epoch 8/50 [Val]:   0%|          | 0/32 [00:00<?, ?it/s]

Epoch: 8 | Train Loss: 0.0454 | Train Acc: 0.9865 | Val Loss: 0.1844 | Val Acc:
0.9487

Epoch 9/50 [Train]:  0%|          | 0/179 [00:00<?, ?it/s]
Epoch 9/50 [Val]:   0%|          | 0/32 [00:00<?, ?it/s]

Epoch: 9 | Train Loss: 0.0426 | Train Acc: 0.9873 | Val Loss: 0.2239 | Val Acc:
0.9424

```



```

packages/torch/utils/data/dataloader.py", line 1647, in _shutdown_workers
    if w.is_alive():
AssertionError : can only test a child process
Exception ignored in: <function _MultiProcessingDataLoaderIter.__del__ at
0x7d1d8c3fd120>
Traceback (most recent call last):
  File "/usr/local/lib/python3.12/dist-packages/torch/utils/data/dataloader.py", line 1664, in __del__
    self._shutdown_workers()

  File "/usr/local/lib/python3.12/dist-packages/torch/utils/data/dataloader.py",
line 1647, in _shutdown_workers
    File "/usr/lib/python3.12/multiprocessing/process.py", line 160, in is_alive
        if w.is_alive():assert self._parent_pid == os.getpid(), 'can only test a
child process'

~ ~ ~ ~ ~~~~~
  File "/usr/lib/python3.12/multiprocessing/process.py", line 160, in is_alive
    assert self._parent_pid == os.getpid(), 'can only test a child process'
~ ~ ~ ~ ~~~~~
AssertionError: can only test a child process
Exception ignored in: <function _MultiProcessingDataLoaderIter.__del__ at
0x7d1d8c3fd120>
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  File "/usr/local/lib/python3.12/dist-packages/torch/utils/data/dataloader.py", line 1664, in __del__
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  File "/usr/local/lib/python3.12/dist-packages/torch/utils/data/dataloader.py", line 1647, in _shutdown_workers
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  File "/usr/local/lib/python3.12/dist-packages/torch/utils/data/dataloader.py", line 1647, in _shutdown_workers
    File "/usr/lib/python3.12/multiprocessing/process.py", line 160, in is_alive
        if w.is_alive():assert self._parent_pid == os.getpid(), 'can only test a
child process'

~ ~ ~ ~ ~~~~~
  File "/usr/lib/python3.12/multiprocessing/process.py", line 160, in is alive

```





[illegible]

```

        self._shutdown_workers()~
~ File "/usr/local/lib/python3.12/dist-
packages/torch/utils/data/dataloader.py", line 1647, in _shutdown_workers
~     ~if w.is_alive():
~     ~~~~~~
File "/usr/lib/python3.12/multiprocessing/process.py", line 160, in is_alive
    assert self._parent_pid == os.getpid(), 'can only test a child process'~
~
AssertionError: can only test a child process
Exception ignored in:      <function _MultiProcessingDataLoaderIter.__del__ at
0x7d1d8c3fd120>
Traceback (most recent call last):
  File "/usr/local/lib/python3.12/dist-packages/torch/utils/data/dataloader.py",
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    self._shutdown_workers()
  File "/usr/local/lib/python3.12/dist-
packages/torch/utils/data/dataloader.py", line 1647, in _shutdown_workers
    ~if w.is_alive():~
~ ~~~~~~
File "/usr/lib/python3.12/multiprocessing/process.py", line 160, in is_alive
    assert self._parent_pid == os.getpid(), 'can only test a child process'
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packages/torch/utils/data/dataloader.py", line 1664, in __del__
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~     ~~~~~~
~AssertionError~: ~can only test a child process~

File "/usr/lib/python3.12/multiprocessing/process.py", line 160, in is_alive
    Exception ignored in: assert self._parent_pid == os.getpid(), 'can only test
a child process'<function _MultiProcessingDataLoaderIter.__del__ at
0x7d1d8c3fd120>

Traceback (most recent call last):
  File "/usr/local/lib/python3.12/dist-
packages/torch/utils/data/dataloader.py", line 1664, in __del__
    self._shutdown_workers()
  File "/usr/local/lib/python3.12/dist-
packages/torch/utils/data/dataloader.py", line 1647, in _shutdown_workers
    if w.is_alive():
    ~~~~~~

```

```

~ File "/usr/lib/python3.12/multiprocessing/process.py", line 160, in is_alive
^^     assert self._parent_pid == os.getpid(), 'can only test a child process'^^
~ ~ ~ ~ ~ ~ ~ ~ ~ ~

AssertionError : can only test a child process^^
~~~~Exception ignored in: ~~~~~<function
_MultiProcessingDataLoaderIter.__del__ at 0x7d1d8c3fd120>~
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~ File "/usr/local/lib/python3.12/dist-
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~~~ File "/usr/local/lib/python3.12/dist-
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~     if w.is_alive():^^

File "/usr/lib/python3.12/multiprocessing/process.py", line 160, in is_alive
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    ~ ~ ~ ~ ~ ~ ~ ~ ~ ~
~ File "/usr/lib/python3.12/multiprocessing/process.py", line 160, in is_alive
~~~     ^^assert self._parent_pid == os.getpid(), 'can only test a child
process'~~~~
~ ~ ~ ~ ~ ~ ~ ~ ~ ~
~AssertionError~: ^^can only test a child process^
~~~~~

AssertionError: can only test a child process

Epoch 12/50 [Val]:  0%|          | 0/32 [00:00<?, ?it/s]

Exception ignored in: <function _MultiProcessingDataLoaderIter.__del__ at
0x7d1d8c3fd120>
Exception ignored in: Traceback (most recent call last):
<function _MultiProcessingDataLoaderIter.__del__ at 0x7d1d8c3fd120>
File "/usr/local/lib/python3.12/dist-packages/torch/utils/data/dataloader.py",
line 1664, in __del__
Traceback (most recent call last):
File "/usr/local/lib/python3.12/dist-
packages/torch/utils/data/dataloader.py", line 1664, in __del__
    self._shutdown_workers()
self._shutdown_workers() File "/usr/local/lib/python3.12/dist-

```

```

packages/torch/utils/data/dataloader.py", line 1647, in _shutdown_workers
    if w.is_alive():

File "/usr/local/lib/python3.12/dist-packages/torch/utils/data/dataloader.py",
line 1647, in _shutdown_workers
    if w.is_alive():
    ^ ^ ^ ~~~~~~

^
File "/usr/lib/python3.12/multiprocessing/process.py", line 160, in is_alive
File "/usr/lib/python3.12/multiprocessing/process.py", line 160, in is_alive
    assert self._parent_pid == os.getpid(), 'can only test a child process'
assert self._parent_pid == os.getpid(), 'can only test a child process'
    ^ ^ ~~~~~~

AssertionError~~~~: ^can only test a child process^
^^Exception ignored in: ^^<function _MultiProcessingDataLoaderIter.__del__ at
0x7d1d8c3fd120>^

Traceback (most recent call last):
AssertionError File "/usr/local/lib/python3.12/dist-
packages/torch/utils/data/dataloader.py", line 1664, in __del__
:     self._shutdown_workers()can only test a child process

File "/usr/local/lib/python3.12/dist-packages/torch/utils/data/dataloader.py",
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File "/usr/local/lib/python3.12/dist-
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    ^if w.is_alive():^^
^ ^ ^ ^ ^ ^ ~~~~~~
^ File "/usr/lib/python3.12/multiprocessing/process.py", line 160, in is_alive
^^     ^assert self._parent_pid == os.getpid(), 'can only test a child process'^
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AssertionError^: ^can only test a child process^
~~~~Exception ignored in: ^<function _MultiProcessingDataLoaderIter.__del__ at
0x7d1d8c3fd120>^
^

Traceback (most recent call last):
AssertionError File "/usr/local/lib/python3.12/dist-
packages/torch/utils/data/dataloader.py", line 1664, in __del__

```

```

:      can only test a child processself._shutdown_workers()

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```

```

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```

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AssertionError: can only test a child process

```



Epoch: 12 | Train Loss: 0.0289 | Train Acc: 0.9906 | Val Loss: 0.1947 | Val Acc: 0.9487

Epoch 13/50 [Train]: 0%| | 0/179 [00:00<?, ?it/s]

Epoch 13/50 [Val]: 0%| | 0/32 [00:00<?, ?it/s]

Epoch: 13 | Train Loss: 0.0282 | Train Acc: 0.9907 | Val Loss: 0.2509 | Val Acc: 0.9351

```
[ ]: def validate_dataloader_labels(dataloader, num_samples_to_check=10):
    dataset = dataloader.dataset

    if hasattr(dataset, 'sampler'):
        indices = list(dataset.sampler)
        samples_to_check = [dataset.samples[i] for i in indices[:
↪num_samples_to_check]]
    else:
        samples_to_check = dataset.samples[:num_samples_to_check]

    mismatch_found = False
    for i, (image_path, label) in enumerate(samples_to_check):
        folder_name = os.path.basename(os.path.dirname(image_path))

        print(f"Sample {i+1}:")
        print(f"image path: .../{folder_name}/{os.path.basename(image_path)}")
        print(f"assigned label: {label}")

        if str(label) != folder_name:
            print("mismatch!")
            mismatch_found = True
        else:
            print("ok")

    print("-" * 80)
    if mismatch_found:
        print("data pipeline is incorrect")
    else:
        print("validation passed")
    print("=" * 80)

validate_dataloader_labels(train_loader)
```

```
[9]: import matplotlib.pyplot as plt
from torchvision.utils import make_grid
import numpy as np
```

```

def show_image_batch(dataloader):
    images, labels = next(iter(dataloader))
    grid = make_grid(images, nrow=8)

    mean = np.array([0.485, 0.456, 0.406])
    std = np.array([0.229, 0.224, 0.225])

    img_unnormalized = grid.permute(1, 2, 0).numpy()
    img_unnormalized = std * img_unnormalized + mean
    img_unnormalized = np.clip(img_unnormalized, 0, 1)

    plt.figure(figsize=(20, 10))
    plt.imshow(img_unnormalized)
    plt.title("Final Sanity Check: Sample Images from the DataLoader")
    plt.axis('off')
    plt.show()

    print("="*80)
    print("Labels for the first 16 images (parsed from filenames):")
    print(labels[:16].numpy())
    print("="*80)

show_image_batch(train_loader)

```

Exception ignored in: <function \_MultiProcessingDataLoaderIter.\_\_del\_\_ at 0x7d1d8c3fd120>

Traceback (most recent call last):

File "/usr/local/lib/python3.12/dist-packages/torch/utils/data/dataloader.py", line 1664, in \_\_del\_\_

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assert self.\_parent\_pid == os.getpid(), 'can only test a child process'if w.is\_alive():

~ ~ ~ ~ ~





```

=====
Labels for the first 16 images (parsed from filenames):
[ 6  8 18 10  8 21  5  2  5 18 13  5  0 20 20 24]
=====

```

```

[ ]: import os
import shutil
from tqdm.auto import tqdm
source_train_dir = "/content/ahar/train images 13440x32x32/train"

organized_train_dir = "/content/ahar/train_organized"

os.makedirs(organized_train_dir, exist_ok=True)

for i in range(28):
    os.makedirs(os.path.join(organized_train_dir, str(i)), exist_ok=True)

print("reorganizing training files...")

image_files = [f for f in os.listdir(source_train_dir) if f.endswith('.png')]

for filename in tqdm(image_files):
    try:
        label = int(filename.split('_')[-1].split('.')[0]) - 1

        source_path = os.path.join(source_train_dir, filename)
        destination_path = os.path.join(organized_train_dir, str(label),
        ↪filename)

        # Move the file
        shutil.move(source_path, destination_path)
    except (ValueError, IndexError) as e:
        print(f"Could not parse label from {filename}. Skipping. Error: {e}")

print("file reorganization complete.")

```

```

[ ]: import os
import shutil
from tqdm.auto import tqdm

source_train_dir = "/content/ahar/test images 3360x32x32/test"

organized_train_dir = "/content/ahar/test_organized"

os.makedirs(organized_train_dir, exist_ok=True)

```

```

for i in range(28):
    os.makedirs(os.path.join(organized_train_dir, str(i)), exist_ok=True)

print("reorganizing training files...")
image_files = [f for f in os.listdir(source_train_dir) if f.endswith('.png')]
for filename in tqdm(image_files):
    try:
        label = int(filename.split('_')[-1].split('.')[0]) - 1 # This is your
        ↪logic
        source_path = os.path.join(source_train_dir, filename)
        destination_path = os.path.join(organized_train_dir, str(label),
        ↪filename)
        shutil.move(source_path, destination_path)
    except (ValueError, IndexError) as e:
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print("file reorganization complete.")

```