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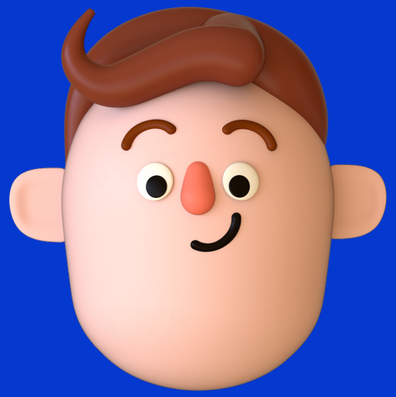
Universitas Kristen Krida Wacana

MACHINE LEARNING

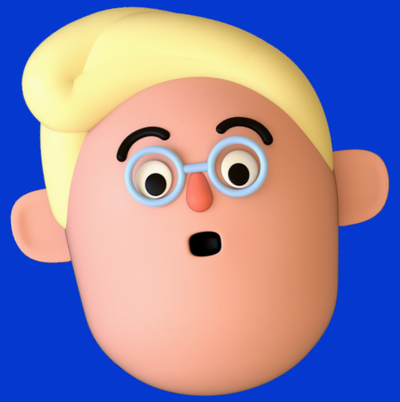
HW#1 - Indonsesian Street Food Classification

KELOMPOK 4



ALBERT SAPUTRA ZEBUA

412020012

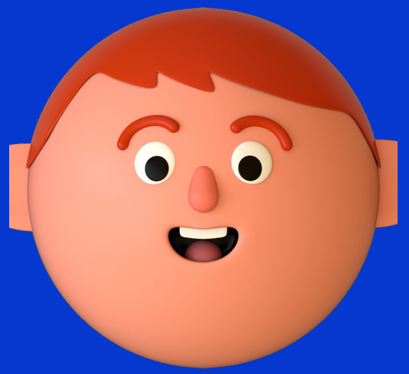


MAHESA RAFIAN SYAH

412020016

JONATAN SIANTURI

412020027



CALVIN JEDI NUGRAHA

412020030

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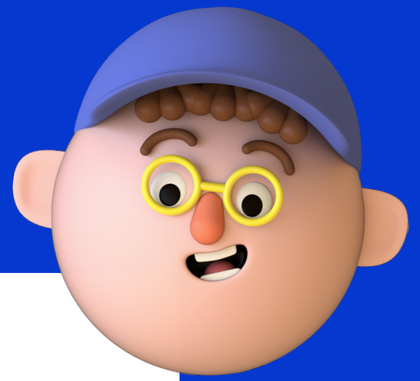
DATASET



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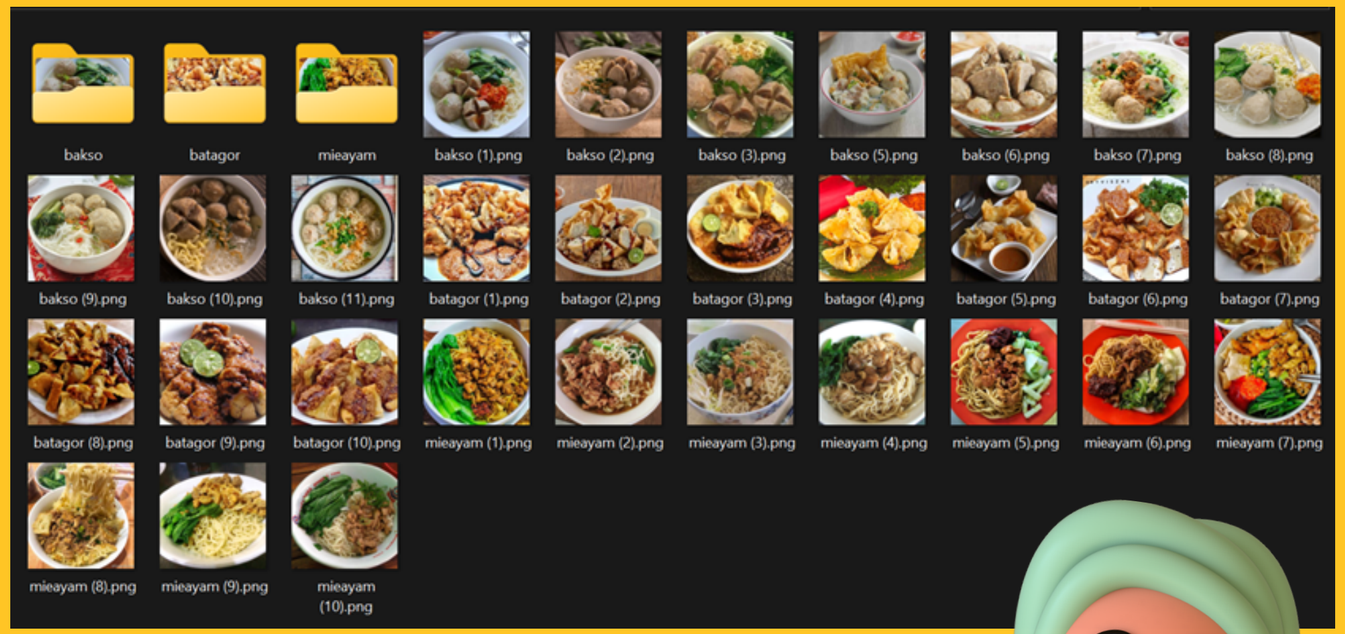
DATASET

Berikut adalah dataset Indonesian Street Food, terdiri atas Batagor, Bakso, dan Mie Ayam.

Sumber dataset sebagian besar diambil menggunakan foto asli dari makanan-makanan yang dipilih



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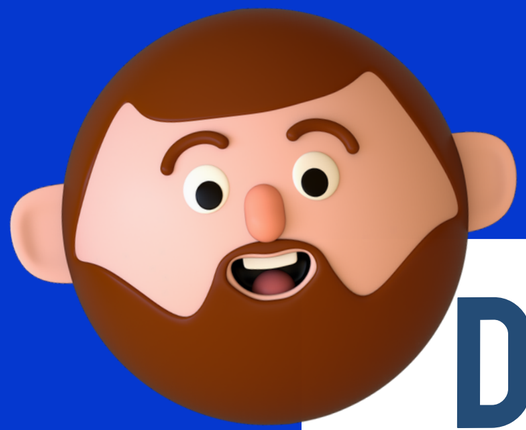


DATALOADER

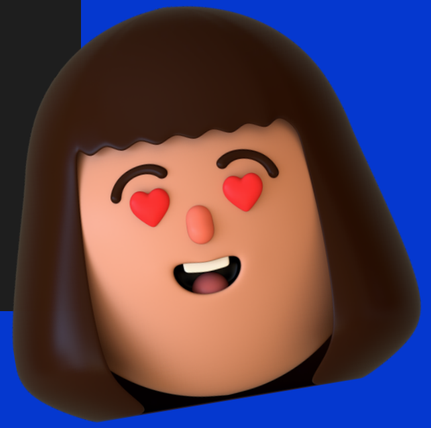
INF-UKKW-2023-ML-DL > MyUtils > MyDatasets.py > ...

```python
import numpy as np
import os
from PIL import Image
import torch
from torch.utils.data import Dataset, DataLoader
import torchvision.transforms as transforms
import albumentations as A
from albumentations.pytorch import ToTensorV2

both_transform = A.Compose(
    [A.Resize(width=512, height=512),], additional_targets={"image0": "image"},
)

transform_only_input = A.Compose(
    [
        A.HorizontalFlip(p=0.5),
        A.ColorJitter(p=0.2),
        A.Normalize(mean=[0.5, 0.5, 0.5], std=[0.5, 0.5, 0.5], max_pixel_value=255.0,),
        ToTensorV2(),
    ]
)

transform_only_mask = A.Compose(
    [
        A.Normalize(mean=[0.5, 0.5, 0.5], std=[0.5, 0.5, 0.5], max_pixel_value=255.0,),
        ToTensorV2(),
    ]
)
```



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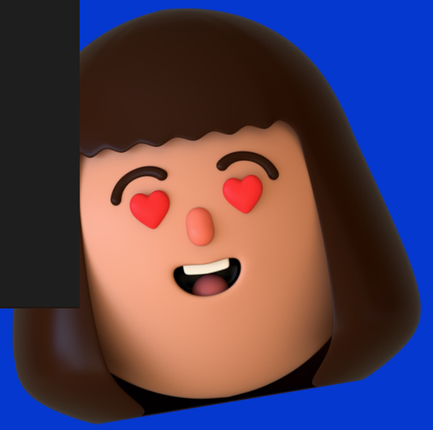
INF-UKKW-2023-ML-DL > MyUtils > MyDatasets.py > ...

```python
class UkridaDataset(Dataset):
    def __init__(self, root_dir):
        self.root_dir = root_dir
        self.list_files = os.listdir(self.root_dir)
        self.list_files = [i for i in self.list_files if i.endswith(".png")]

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

    def __getitem__(self, index):
        img_file = self.list_files[index]
        img_path = os.path.join(self.root_dir, img_file)
        image = np.array(Image.open(img_path))
        image = image[:, :, :3]  # Convert RGBA to RGB

        w_img = image.shape[1]
        w_img_half = w_img // 2
        input_image = image[:, :w_img_half, :]
        target_image = image[:, w_img_half:, :]

        augmentations = both_transform(image=input_image, image0=target_image)
        input_image = augmentations["image"]
        target_image = augmentations["image0"]

        input_image = transform_only_input(image=input_image)["image"]
        target_image = transform_only_mask(image=target_image)["image"]

        return input_image, target_image
```



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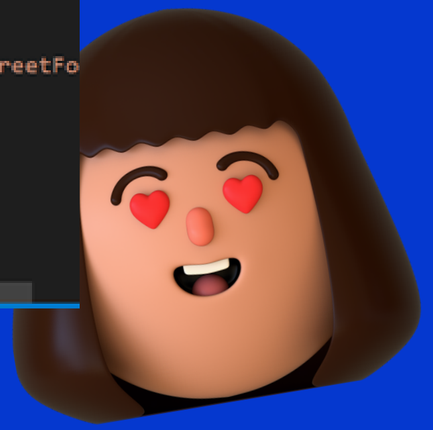
INF-UKKW-2023-ML-DL > MyUtils > MyDatasets.py > ...

```
56
57          return input_image, target_image
58
59
60  class CustomDataLoader:
61      def __init__(self, root_dir, batch_size=1, shuffle=True):
62          self.dataset = UkridaDataset(root_dir)
63          self.dataloader = DataLoader(
64              self.dataset,
65              batch_size=batch_size,
66              shuffle=shuffle
67          )
68
69      def __iter__(self):
70          return iter(self.dataloader)
71
72      def __len__(self):
73          return len(self.dataloader)
74
75
76  # test case
77  if __name__ == "__main__":
78      dataloader = CustomDataLoader("C:/Users/Asus/ML-2023/INF-UKKW-2023-ML-DL/data/IndonesianStreetFo
79      for x, y in dataloader:
80          print(x.shape)
81          import sys
82          sys.exit()
83
```



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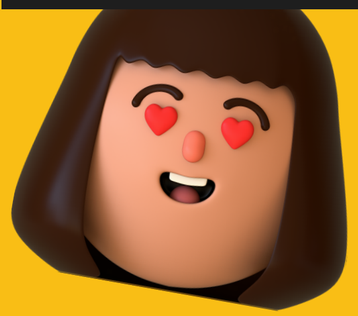
OUTPUT

```
PROBLEMS 62   OUTPUT   TERMINAL   COMMENTS   DEBUG CONSOLE

(base) PS C:\Users\Asus\ML-2023\INF-UKKW-2023-ML-DL\MyUtils> python MyDatasets.py
torch.Size([1, 3, 512, 512])
(base) PS C:\Users\Asus\ML-2023\INF-UKKW-2023-ML-DL\MyUtils>
```



- In PyTorch, tensors are multi-dimensional arrays that can hold numerical data.
- So, the given tensor shape indicates a single batch of RGB images with a resolution of 512x512 pixels.

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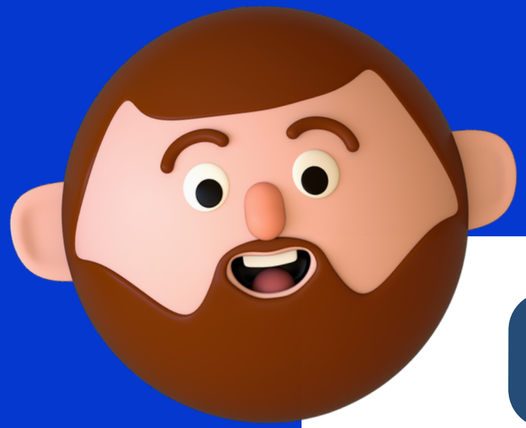

CNN MODEL

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```
        return x


def train(model, train_loader, criterion, optimizer):
    model.train()
    running_loss = 0.0
    for i, data in enumerate(train_loader, 0):
        inputs, labels = data
        optimizer.zero_grad()
        outputs = model(inputs)
        loss = criterion(outputs, labels)
        loss.backward()
        optimizer.step()
        running_loss += loss.item()
    train_loss = running_loss / len(train_loader)
    return train_loss


def test(model, test_loader):
    model.eval()
    correct = 0
    total = 0
    with torch.no_grad():
        for data in test_loader:
            images, labels = data
            outputs = model(images)
            _, predicted = torch.max(outputs.data, 1)
            total += labels.size(0)
            correct += (predicted == labels).sum().item()
```

INF-UKKW-2023-ML-DL > core_model > part_1_model.py > main

```
        return x


def train(model, train_loader, criterion, optimizer):
    model.train()
    running_loss = 0.0
    for i, data in enumerate(train_loader, 0):
        inputs, labels = data
        optimizer.zero_grad()
        outputs = model(inputs)
        loss = criterion(outputs, labels)
        loss.backward()
        optimizer.step()
        running_loss += loss.item()
    train_loss = running_loss / len(train_loader)
    return train_loss


def test(model, test_loader):
    model.eval()
    correct = 0
    total = 0
    with torch.no_grad():
        for data in test_loader:
            images, labels = data
            outputs = model(images)
            _, predicted = torch.max(outputs.data, 1)
            total += labels.size(0)
            correct += (predicted == labels).sum().item()
```

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INF-UKKW-2023-ML-DL > core_model > part_1_model.py > main

```
                total += labels.size(0)
                correct += (predicted == labels).sum().item()
        test_accuracy = correct / total
        return test_accuracy


def main():
    # Set random seed for reproducibility
    torch.manual_seed(2023)

    # Define transformations for the dataset
    transform = transforms.Compose([
        transforms.Resize((128, 128)),
        transforms.ToTensor(),
        transforms.Normalize((0.5, 0.5, 0.5), (0.5, 0.5, 0.5))
    ])

    # Load the training dataset
    train_dataset_path = "C:/Users/Asus/ML-2023/INF-UKKW-2023-ML-DL/data/IndonesianStreetFood/train"
    train_dataset = torchvision.datasets.ImageFolder(train_dataset_path, transform=transform)
    train_loader = torch.utils.data.DataLoader(train_dataset, batch_size=30, shuffle=True, num_workers=2)

    # Load the test dataset
    test_dataset_path = "C:/Users/Asus/ML-2023/INF-UKKW-2023-ML-DL/data/IndonesianStreetFood/test"
    test_dataset = torchvision.datasets.ImageFolder(test_dataset_path, transform=transform)
    test_loader = torch.utils.data.DataLoader(test_dataset, batch_size=30, shuffle=False, num_workers=2)

    # Create the model
    model = YourOwnCNN()
```

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INF-UKKW-2023-ML-DL > core_model > part_1_model.py > main

```python
    train_loader = torch.utils.data.DataLoader(train_dataset, batch_size=30, shuffle=True, num_workers=2)

    # Load the test dataset
    test_dataset_path = "C:/Users/Asus/ML-2023/INF-UKKW-2023-ML-DL/data/IndonesianStreetFood/test"
    test_dataset = torchvision.datasets.ImageFolder(test_dataset_path, transform=transform)
    test_loader = torch.utils.data.DataLoader(test_dataset, batch_size=30, shuffle=False, num_workers=2)

    # Create the model
    model = YourOwnCNN()

    # Define the loss function and optimizer
    criterion = nn.CrossEntropyLoss()
    optimizer = optim.SGD(model.parameters(), lr=0.001, momentum=0.9)

    # Train the model
    for epoch in range(10):
        train_loss = train(model, train_loader, criterion, optimizer)
        print(f"Epoch {epoch+1}/{10}, Training Loss: {train_loss}")

    # Test the model
    test_accuracy = test(model, test_loader)
    print(f"Test Accuracy: {test_accuracy}")


if __name__ == '__main__':
    main()
```

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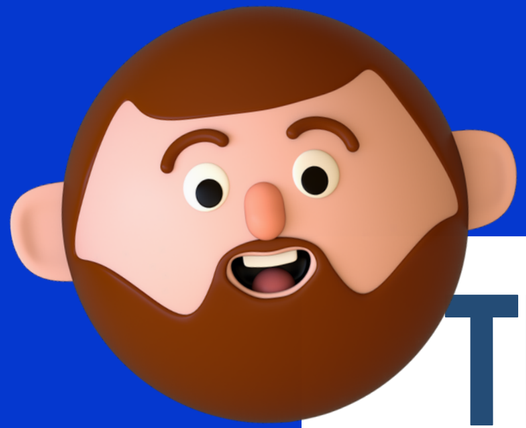

TRAIN & TEST

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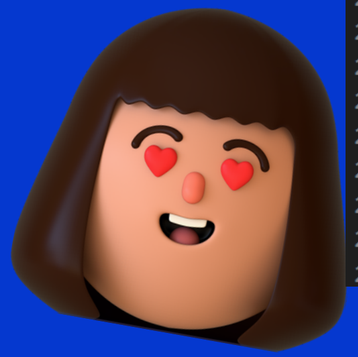

NF-UKKW-2023-ML-DL > train_CNN.py > YourOwnCNN > __init__

```python
import torch
import torch.nn as nn
import torch.optim as optim
import torchvision
import torchvision.transforms as transforms


class YourOwnCNN(nn.Module):
    def __init__(self):
        super(YourOwnCNN, self).__init__()
        self.conv1 = nn.Conv2d(3, 6, 5)
        self.pool1 = nn.MaxPool2d(2, 2)
        self.conv2 = nn.Conv2d(6, 16, 5)
        self.pool2 = nn.MaxPool2d(2, 2)
        self.fc1 = nn.Linear(16 * 29 * 29, 120)
        self.fc2 = nn.Linear(120, 84)
        self.fc3 = nn.Linear(84, 3)

    def forward(self, x):
        x = nn.ReLU()(self.conv1(x))
        x = self.pool1(x)
        x = nn.ReLU()(self.conv2(x))
        x = self.pool2(x)
        x = x.view(x.size(0), -1)
        x = nn.ReLU()(self.fc1(x))
        x = nn.ReLU()(self.fc2(x))
        x = self.fc3(x)
        return x
```

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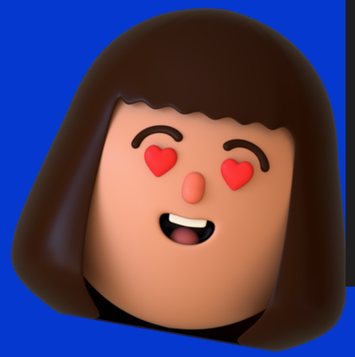

NF-UKKW-2023-ML-DL > train_CNN.py > YourOwnCNN > __init__

```
29
30
31  def train(model, train_loader, criterion, optimizer):
32      model.train()
33      running_loss = 0.0
34      for i, data in enumerate(train_loader, 0):
35          inputs, labels = data
36          optimizer.zero_grad()
37          outputs = model(inputs)
38          loss = criterion(outputs, labels)
39          loss.backward()
40          optimizer.step()
41          running_loss += loss.item()
42          if i % 100 == 99:  # Print loss every 100 mini-batches
43              print(f"Epoch {epoch+1}/{10}, Mini-batch {i+1}, Loss: {running_loss / 100}")
44              running_loss = 0.0
45      train_loss = running_loss / len(train_loader)
46      return train_loss
47
48
49  def test(model, test_loader):
50      model.eval()
51      correct = 0
52      total = 0
53      with torch.no_grad():
54          for data in test_loader:
55              images, labels = data
56              outputs = model(images)
```

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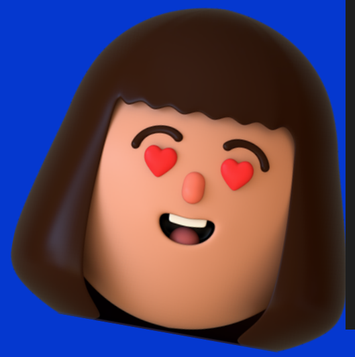

```
train_CNN.py 6, U | README.md | part_2_model.py 9+ | train_dcgan.py 9 | requirements.txt
NF-UKKW-2023-ML-DL > train_CNN.py > ...
56                  outputs = model(images)
57                  _, predicted = torch.max(outputs.data, 1)
58                  total += labels.size(0)
59                  correct += (predicted == labels).sum().item()
60      test_accuracy = correct / total
61      return test_accuracy
62
63
64  def main():
65      # Set random seed for reproducibility
66      torch.manual_seed(2023)
67
68      # Define transformations for the dataset
69      transform = transforms.Compose([
70          transforms.Resize((128, 128)),
71          transforms.ToTensor(),
72          transforms.Normalize((0.5, 0.5, 0.5), (0.5, 0.5, 0.5))
73      ])
74
75      # Load the training dataset
76      train_dataset_path = "C:/Users/Asus/ML-2023/INF-UKKW-2023-ML-DL/data/IndonesianStreetFood/train"
77      train_dataset = torchvision.datasets.ImageFolder(train_dataset_path, transform=transform)
78      train_loader = torch.utils.data.DataLoader(train_dataset, batch_size=30, shuffle=True, num_workers=2)
79
80      # Load the test dataset
81      test_dataset_path = "C:/Users/Asus/ML-2023/INF-UKKW-2023-ML-DL/data/IndonesianStreetFood/test"
82      test_dataset = torchvision.datasets.ImageFolder(test_dataset_path, transform=transform)
83      test_loader = torch.utils.data.DataLoader(test_dataset, batch_size=30, shuffle=False, num_workers=2)
84
```

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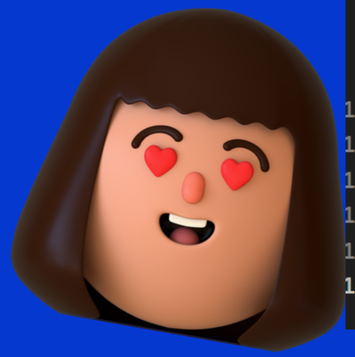

el.py 6, M | train_CNN.py 6, U | README.md | part_2_model.py 9+ | train_dcgan.py 9 | requirements.txt

NF-UKKW-2023-ML-DL > train_CNN.py > ...

```python
    # Load the test dataset
    test_dataset_path = "C:/Users/Asus/ML-2023/INF-UKKW-2023-ML-DL/data/IndonesianStreetFood/test"
    test_dataset = torchvision.datasets.ImageFolder(test_dataset_path, transform=transform)
    test_loader = torch.utils.data.DataLoader(test_dataset, batch_size=30, shuffle=False, num_workers=2)

    # Create the model
    model = YourOwnCNN()

    # Define the loss function and optimizer
    criterion = nn.CrossEntropyLoss()
    optimizer = optim.SGD(model.parameters(), lr=0.001, momentum=0.9)

    # Train the model
    for epoch in range(10):
        train_loss = train(model, train_loader, criterion, optimizer)
        print(f"Epoch {epoch+1}/{10}, Training Loss: {train_loss}")

    # Test the model
    test_accuracy = test(model, test_loader)
    formatted_accuracy = "{:.2%}".format(test_accuracy)  # Format test accuracy with two digits in front of th
    print(f"Test Accuracy: {formatted_accuracy}")


if __name__ == '__main__':
    main()

```

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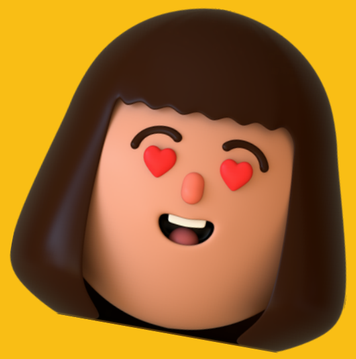
OUTPUT

```
(base) PS C:\Users\Asus\ML-2023\INF-UKKW-2023-ML-DL> python train_CNN.py
Epoch 1/10, Training Loss: 1.100756287574768
Epoch 2/10, Training Loss: 1.1006642580032349
Epoch 3/10, Training Loss: 1.1004910469055176
Epoch 4/10, Training Loss: 1.1002503633499146
Epoch 5/10, Training Loss: 1.099954605102539
Epoch 6/10, Training Loss: 1.0996112823486328
Epoch 7/10, Training Loss: 1.0992361307144165
Epoch 8/10, Training Loss: 1.0988430976867676
Epoch 9/10, Training Loss: 1.0984376668930054
Epoch 10/10, Training Loss: 1.0980299711227417
Model weights saved at: C:/Users/Asus/ML-2023/INF-UKKW-2023-ML-DL/core_model/model_weights.pth
Training completed.
```

```
(base) PS C:\Users\Asus\ML-2023\INF-UKKW-2023-ML-DL> python test_CNN.py
Test Accuracy: 36.67%
```



Total Epochs:
10 Epoch

Test Accuracy:
36.67%

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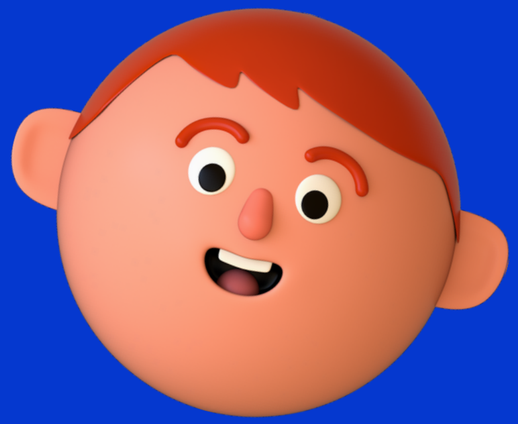
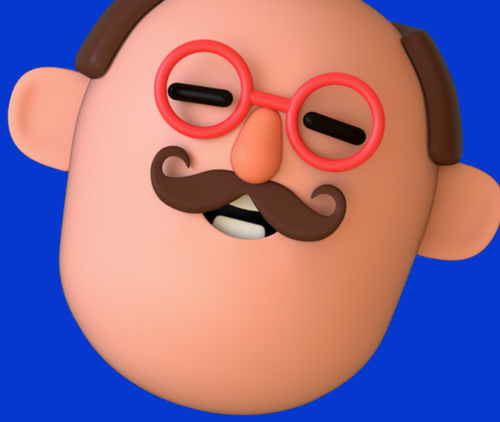
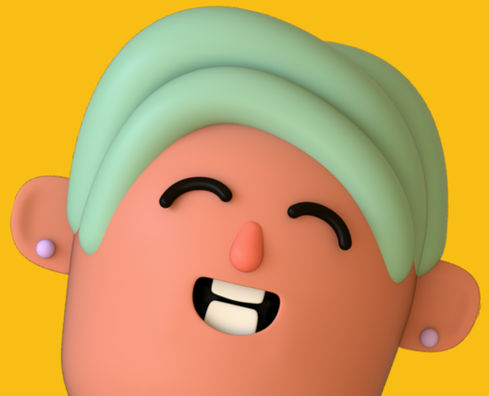
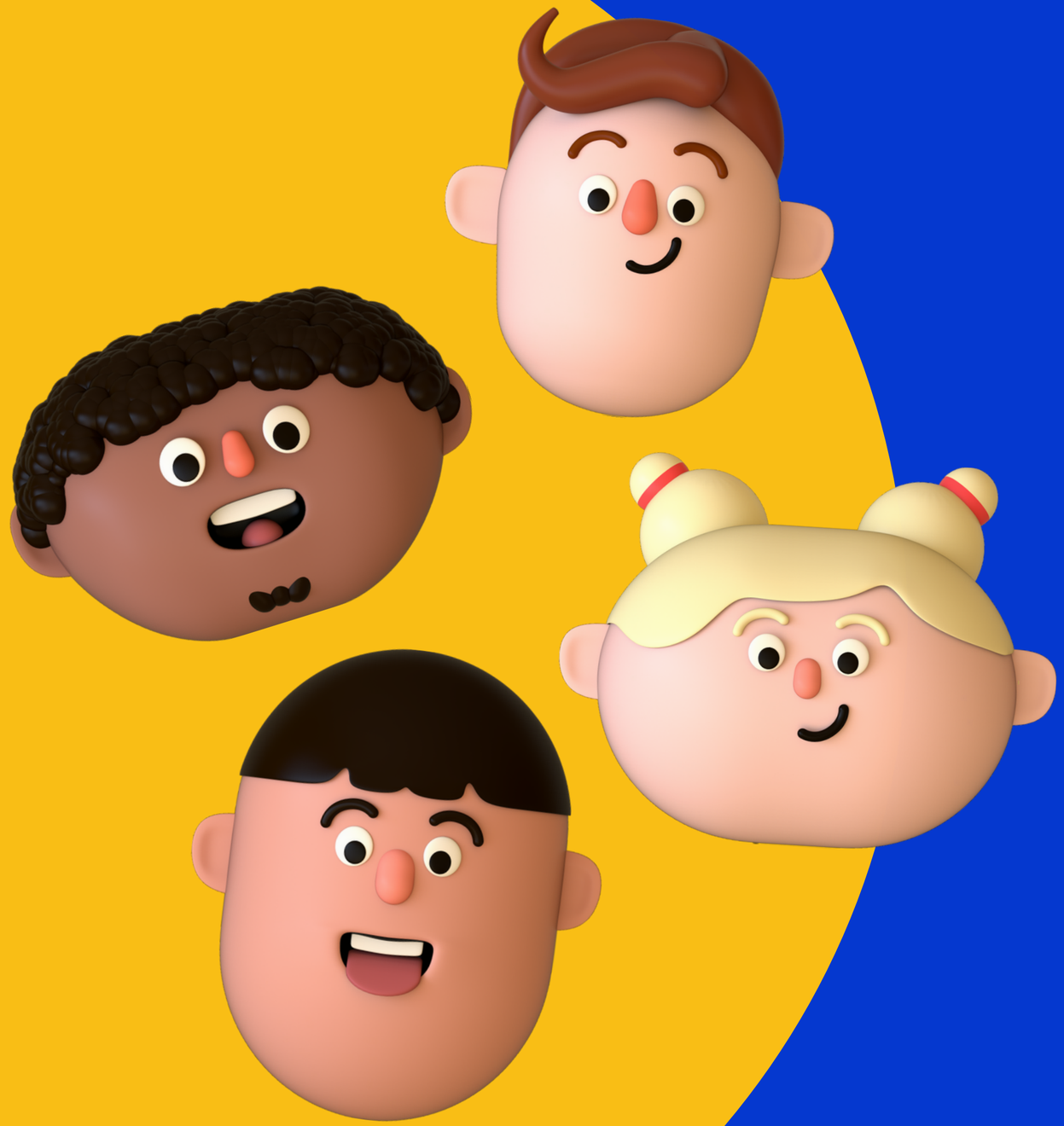
ANY QUESTION?









THANK YOU!

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