

# CE784 - MACHINE LEARNING AND DATA ANALYTICS FOR CIVIL ENGINEERING APPLICATIONS

Group No. - 8

Group members -

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Project Topic -

Driver Distraction Detection using Visual Language Models

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!git clone https://github.com/zahid-isu/DriveCLIP.git

%cd DriveCLIP
!ls # List files in the repo

!pip install -r requirements.txt
# Step 1: Install required libraries
!pip install -q pandas matplotlib seaborn scikit-learn tensorflow

# Step 2: Import libraries
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.model_selection import train_test_split
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Conv2D, MaxPooling2D, Flatten, Dense, Dropout
from tensorflow.keras.utils import to_categorical
from sklearn.metrics import classification_report, confusion_matrix

# Step 3: Simulate a dummy dataset (replace with real dataset later)
classes = ['Normal Driving', 'Texting', 'Phone Call', 'Eating', 'Reaching', 'Talking to Passenger']
num_samples = 1200
img_size = 64 # small for quick training

# Random images and labels
X = np.random.rand(num_samples, img_size, img_size, 3)
y = np.random.randint(0, len(classes), num_samples)
y_cat = to_categorical(y, num_classes=len(classes))

# Step 4: Train-test split
X_train, X_test, y_train, y_test = train_test_split(X, y_cat, test_size=0.2, random_state=42)

# Step 5: Define a simple CNN model
model = Sequential([
    Conv2D(32, (3,3), activation='relu', input_shape=(img_size, img_size, 3)),
    MaxPooling2D((2,2)),
    Conv2D(64, (3,3), activation='relu'),
    MaxPooling2D((2,2)),
    Flatten(),
    Dense(128, activation='relu'),
    Dropout(0.3),
    Dense(len(classes), activation='softmax')
])

model.compile(optimizer='adam', loss='categorical_crossentropy', metrics=['accuracy'])
model.summary()

# Step 6: Train the model
model.fit(X_train, y_train, epochs=5, validation_split=0.1, batch_size=32)

# Step 7: Predict and show output in a table format
y_pred = model.predict(X_test)
y_pred_classes = np.argmax(y_pred, axis=1)
y_true = np.argmax(y_test, axis=1)

# Step 8: Classification Report as Table
report = classification_report(y_true, y_pred_classes, target_names=classes, output_dict=True)
report_df = pd.DataFrame(report).transpose()
display(report_df.round(2)) # Displaying in a clean table

# Step 9: Confusion Matrix Visualization
plt.figure(figsize=(8,6))
sns.heatmap(confusion_matrix(y_true, y_pred_classes), annot=True, fmt='d',
            xticklabels=classes, yticklabels=classes, cmap='Blues')
plt.title("Confusion Matrix")
plt.xlabel("Predicted")
plt.ylabel("Actual")
plt.show()

```

```

Cloning into 'DriveCLIP'...
remote: Enumerating objects: 403, done.
remote: Counting objects: 100% (17/17), done.
remote: Compressing objects: 100% (13/13), done.
remote: Total 403 (delta 6), reused 11 (delta 3), pack-reused 386 (from 1)
Receiving objects: 100% (403/403), 6.27 MiB | 9.33 MiB/s, done.
Resolving deltas: 100% (168/168), done.
/content/DriveCLIP/DriveCLIP/DriveCLIP/DriveCLIP
CLIP      frame.py  LICENSE  notebooks  results
data      img      Linear.py  README.md  runfiles
driverprofile inference model_ckpt requirements.txt train
Collecting git+https://github.com/openai/CLIP.git (from -r requirements.txt (line 7))
  Cloning https://github.com/openai/CLIP.git to /tmp/pip-req-build-d4icjhk0
  Running command git clone --filter=blob:none --quiet https://github.com/openai/CLIP.git /tmp/pip-req-build-d4icjhk0
  Resolved https://github.com/openai/CLIP.git to commit dcba3cb2e2827b40d2701e7e1c7d9fed8a20ef1
  Preparing metadata (setup.py) ... done
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Requirement already satisfied: scipy>=1.6.0 in /usr/local/lib/python3.11/dist-packages (from scikit-learn->-r requirements.txt (line 6)) (1.14.1)
Requirement already satisfied: joblib>=1.2.0 in /usr/local/lib/python3.11/dist-packages (from scikit-learn->-r requirements.txt (line 6)) (1.4.2)
Requirement already satisfied: threadpoolctl>=3.1.0 in /usr/local/lib/python3.11/dist-packages (from scikit-learn->-r requirements.txt (line 6)) (3.5.0)
Requirement already satisfied: packaging in /usr/local/lib/python3.11/dist-packages (from clip==1.0->-r requirements.txt (line 7)) (25.0)
Requirement already satisfied: MarkupSafe>=2.0 in /usr/local/lib/python3.11/dist-packages (from Jinja2->torch->-r requirements.txt (line 4)) (3.0.2)
/usr/local/lib/python3.11/dist-packages/keras/src/layers/convolutional/base_conv.py:107: UserWarning: Do not pass an `input_shape`
  super().__init__(activity_regularizer=activity_regularizer, **kwargs)
Model: "sequential"

```

Layer (type)	Output Shape	Param #
conv2d (Conv2D)	(None, 62, 62, 32)	896
max_pooling2d (MaxPooling2D)	(None, 31, 31, 32)	0
conv2d_1 (Conv2D)	(None, 29, 29, 64)	18,496
max_pooling2d_1 (MaxPooling2D)	(None, 14, 14, 64)	0
flatten (Flatten)	(None, 12544)	0
dense (Dense)	(None, 128)	1,605,760
dropout (Dropout)	(None, 128)	0
dense_1 (Dense)	(None, 6)	774

Total params: 1,625,026 (6.28 MB)