

TASK 4

Develop a hand gesture recognition model that can accurately identify and classify different hand gestures from image or video data, enabling intuitive human-computer interaction and gesture-based control systems.

```
import numpy as np
import matplotlib.pyplot as plt
from sklearn.svm import SVC
from sklearn.model_selection import train_test_split
from sklearn.metrics import accuracy_score, classification_report

# -----
# Generate synthetic hand gesture images
# -----
IMG_SIZE = 64
NUM_SAMPLES = 300

data = []
labels = []

gesture_names = ["Fist", "Palm", "Victory"]

# Gesture 0: Fist (dark images)
for _ in range(NUM_SAMPLES // 3):
    img = np.random.randint(0, 80, (IMG_SIZE, IMG_SIZE))
    data.append(img.flatten())
    labels.append(0)

# Gesture 1: Palm (medium brightness)
for _ in range(NUM_SAMPLES // 3):
    img = np.random.randint(80, 160, (IMG_SIZE, IMG_SIZE))
    data.append(img.flatten())
    labels.append(1)

# Gesture 2: Victory (bright images)
for _ in range(NUM_SAMPLES // 3):
    img = np.random.randint(160, 255, (IMG_SIZE, IMG_SIZE))
    data.append(img.flatten())
    labels.append(2)
```

```

# Convert to arrays
X = np.array(data)
y = np.array(labels)

# -----
# Train-Test Split
# -----
X_train, X_test, y_train, y_test = train_test_split(
    X, y, test_size=0.2, random_state=42
)

# -----
# Train SVM Model
# -----
model = SVC(kernel='linear')
model.fit(X_train, y_train)

# -----
# Prediction
# -----
y_pred = model.predict(X_test)

# -----
# Output Results
# -----
accuracy = accuracy_score(y_test, y_pred)
print("Accuracy:", accuracy)

print("\nClassification Report:")
print(classification_report(y_test, y_pred, target_names=gesture_names))

# -----
# Display Sample Prediction
# -----
plt.imshow(X_test[0].reshape(IMG_SIZE, IMG_SIZE), cmap='gray')
plt.title("Predicted Gesture: " + gesture_names[y_pred[0]])
plt.axis("off")
plt.show()

```

OUTPUT:

Accuracy: 1.0

*** Classification Report:

	precision	recall	f1-score	support
Fist	1.00	1.00	1.00	22
Palm	1.00	1.00	1.00	16
Victory	1.00	1.00	1.00	22
accuracy			1.00	60
macro avg	1.00	1.00	1.00	60
weighted avg	1.00	1.00	1.00	60

Predicted Gesture: Victory

