

```
clc; clear;
dsFolder = "p_dataset_26";
subFolder = ["0", "4", "7", "8", "A", "D", "H"];
categories = ["0", "4", "7", "8", "A", "D", "H"];
```

```
allData = table('Size', [0, 2], 'VariableTypes', {'cell', 'cell'}, 'VariableNames',
{'Image', 'Label'});
```

```
for i = 1:length(subFolder)
    folderPath = fullfile(dsFolder, subFolder(i));
    pngFiles = dir(fullfile(folderPath, "*.png"));

    for j = 1:length(pngFiles)
        pngFilePath = fullfile(folderPath, pngFiles(j).name);
        image = imread(pngFilePath);
        allData = [allData; {image, categories(i)}];
    end
end
```

```
% convert images to features
numImages = size(allData, 1);
imageSize = size(allData.Image{1});
features = zeros(numImages, prod(imageSize));

for i = 1:numImages
    image = allData.Image{i};
    features(i, :) = image(:)';
end

labels = categorical(allData.Label);
```

```
% split data into training and test set
cv = cvpartition(labels, 'HoldOut', 0.2);
idx = cv.test;
trainIdx = training(cv);
testIdx = test(cv);
trainFeatures = features(trainIdx, :);
trainLabels = labels(trainIdx, :);
testFeatures = features(testIdx, :);
testLabels = labels(testIdx, :);
```

```
% Train an SVM classifier
svmClassifier = fitcecoc(trainFeatures, trainLabels);
```

```
% Predict labels for the test set
predictedLabels = predict(svmClassifier, testFeatures);
```

```
% Evaluate the classifier's performance
```

```
confusionMatrix = confusionmat(testLabels, predictedLabels);  
accuracy = sum(diag(confusionMatrix)) / sum(confusionMatrix(:));
```

```
fprintf('Accuracy: %.2f%%\n', accuracy * 100);
```

Accuracy: 92.68%

```
% Calculate precision, recall, and F1-score
```

```
confusionMatrix = confusionmat(testLabels, predictedLabels)
```

```
confusionMatrix = 7×7  
45    3    0    1    2    0  
 2   48    0    0    0    0  
 0    0   51    0    0    0  
 2    1    0   46    0    2  
 0    0    0    0   47    3  
 3    1    0    0    0   47  
 1    0    1    0    1    3   45
```

```
truePositive = confusionMatrix(1, 1);  
falsePositive = confusionMatrix(2, 1);  
falseNegative = confusionMatrix(1, 2);
```

```
precision = truePositive / (truePositive + falsePositive);  
recall = truePositive / (truePositive + falseNegative);  
f1Score = 2 * (precision * recall) / (precision + recall);
```

```
fprintf('Precision: %.2f\n', precision);
```

Precision: 0.96

```
fprintf('Recall: %.2f\n', recall);
```

Recall: 0.94

```
fprintf('F1-Score: %.2f\n', f1Score);
```

F1-Score: 0.95

```
% Visualize the confusion matrix using imagesc and annotate precision
```

```
figure;  
imagesc(confusionMatrix);  
colorbar;  
colormap('jet'); % You can change the colormap as needed  
title('Confusion Matrix');  
xlabel('Predicted');  
ylabel('Actual');  
xticks(1:numel(categories));  
xticklabels(categories);  
yticks(1:numel(categories));  
yticklabels(categories);
```

```

% Calculate and annotate precision for each class
for i = 1:numel(categories)
    for j = 1:numel(categories)
        precision = confusionMatrix(i, i) / sum(confusionMatrix(:, i));
        text(j, i, sprintf('%.2f', precision), 'HorizontalAlignment', 'center',
'VerticalAlignment', 'middle', 'Color', 'k', 'FontWeight', 'bold');
    end
end
end

```

