

Đồ án nhận diện kiểu khuôn mặt

Đồ án CS231
Giảng viên: TS.Mai Tiến Dũng

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1

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Hữu Nam

Nội dung

1

**Giới thiệu tổng quan
về bài toán**

2

Tiền xử lý dữ liệu

3

Áp dụng thuật toán

4

Demo

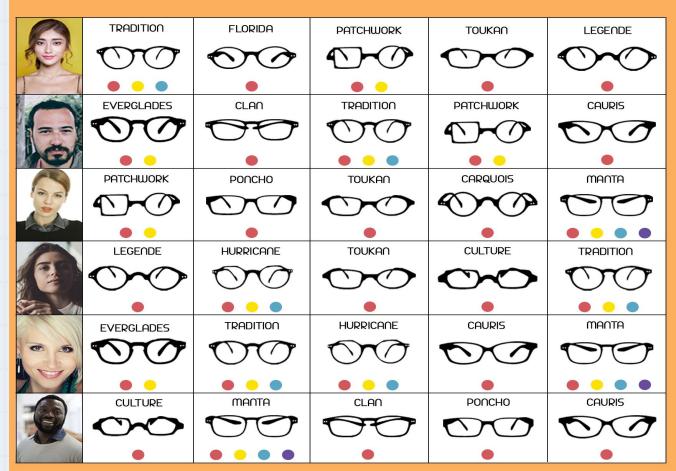
1

Giới thiệu tổng quan về bài toán

Lý do thực hiện bài toán

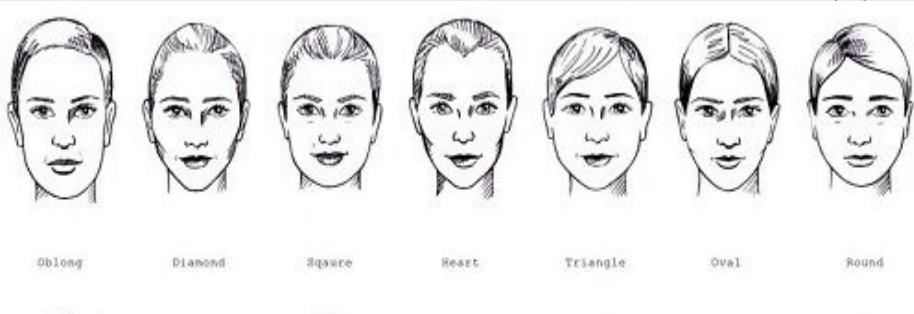
1

Về mặt thẩm mỹ



2

Về nghiên cứu
nhân tướng học



Phát biểu bài toán



Input

- **Ảnh khuôn mặt chính diện của 1 người lấy phần trên cơ thể.**
- **Không có mắt kính, thấy rõ trán.**



Output

- **Kiểu khuôn mặt được dự đoán (Heart, Oval, Round, Square)**



Face Shape Dataset



Data Card Code (12) Discussion (4) Suggestions (0)

About Dataset

Usability ⓘ
6.88

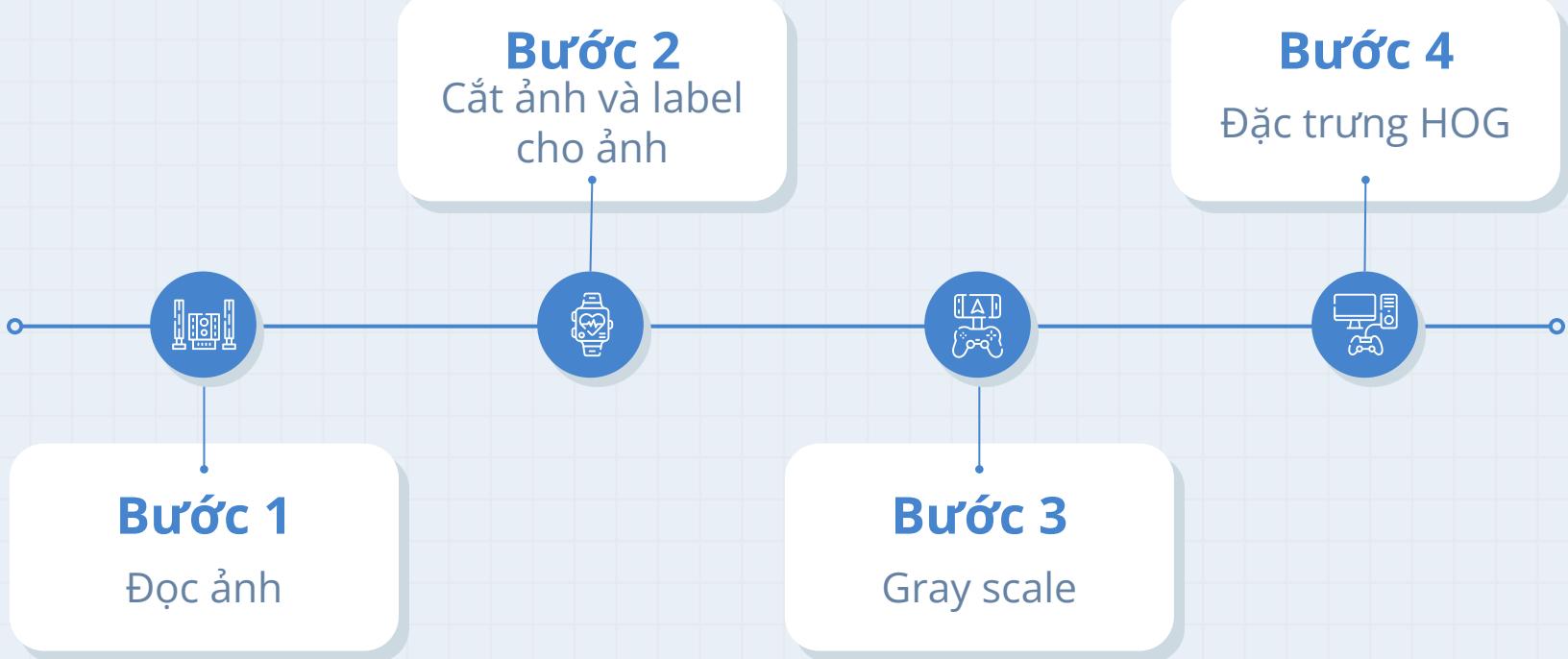


Dataset

2

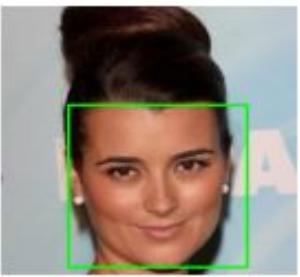
Preprocessing

Các bước thực hiện





Đọc ảnh



Detect
khuôn mặt



Cắt ảnh

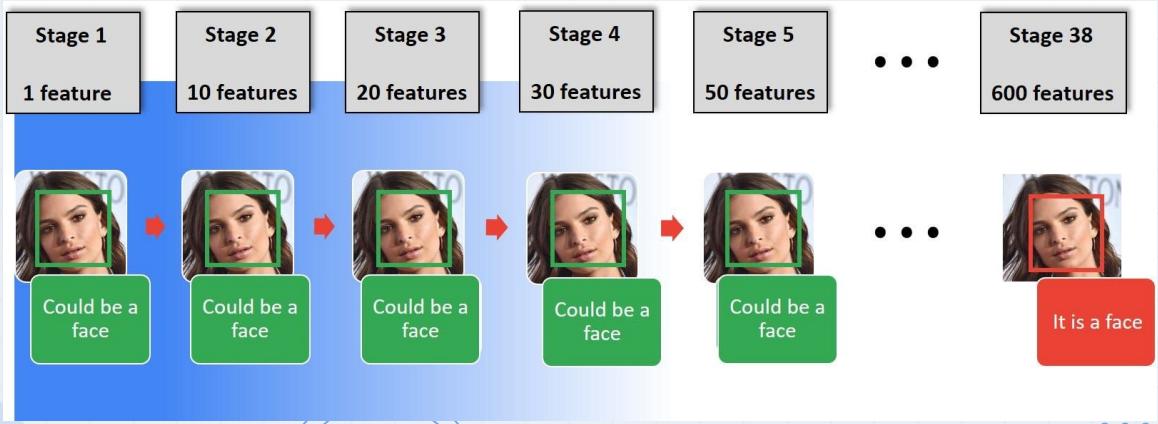


Grayscale



HOG

Haar Cascade



Haar Cascade: Parameters

scaleFactor:

Window size scales on each stage on percentage depends on the “scaleFactor”, range (1.1, 2.0). The larger the “scaleFactor”, the larger the window size, there will be few computing steps, detection will be faster, we might miss the details

minNeighbors

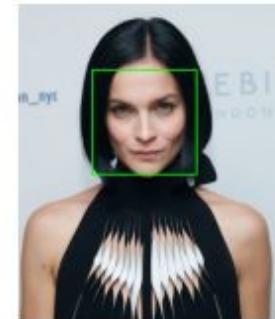
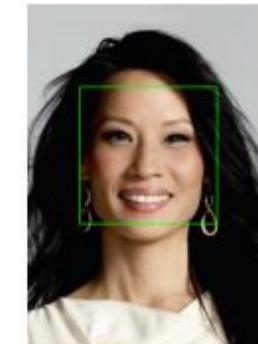
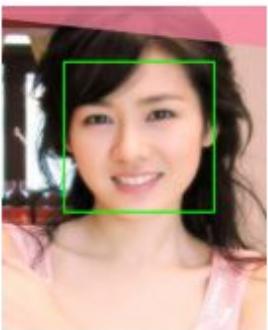
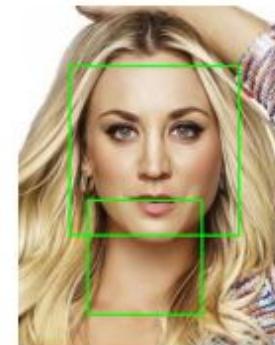
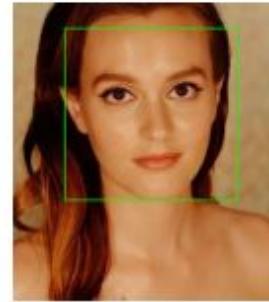
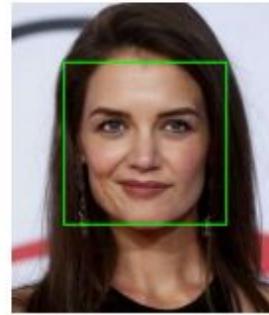
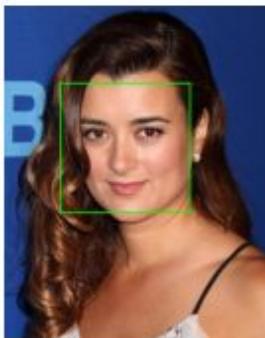
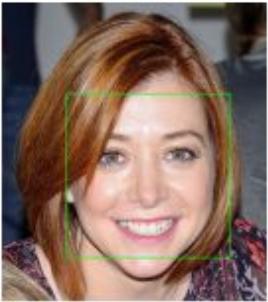
controls the minimum number of neighboring windows required for a potential face to be considered a face. The larger the parameters, the less of false positives, but may lose true positives as well.

minSize

Minimum size of the object in our image. If our object is smaller than the minSize, it will be ignored

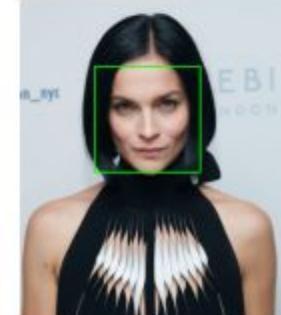
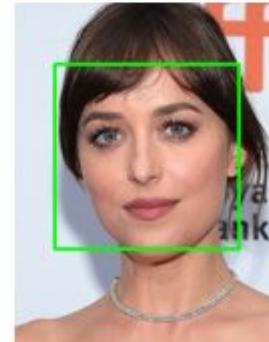
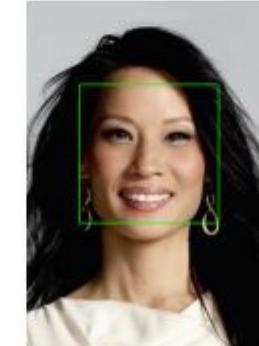
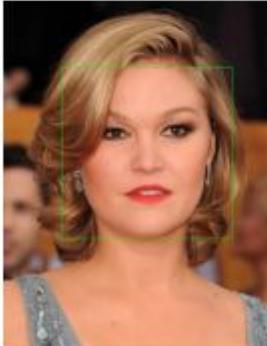
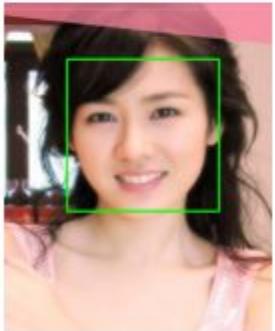
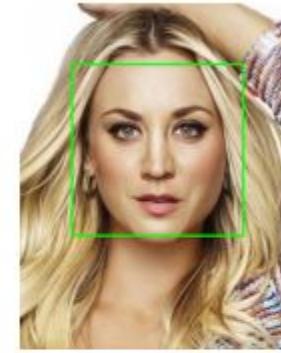
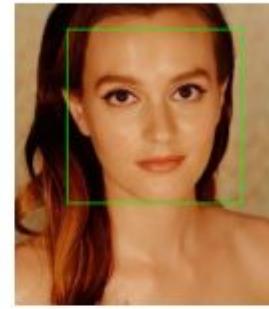
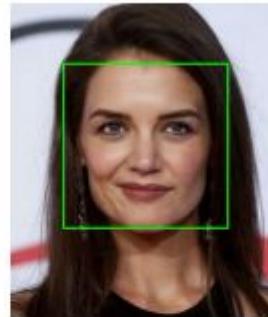
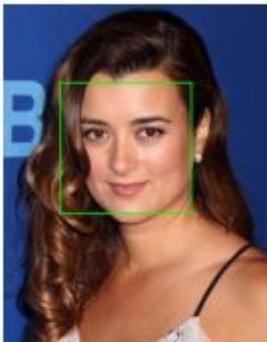
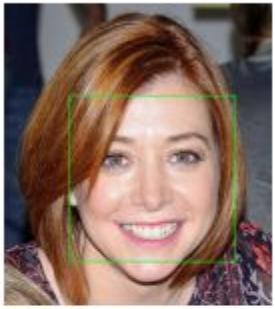
Haar Cascade: Parameters

Default parameters



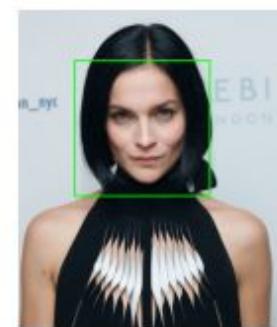
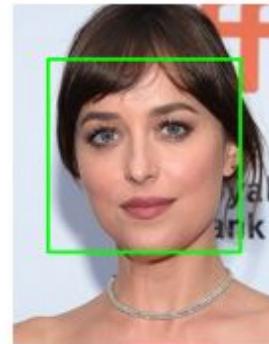
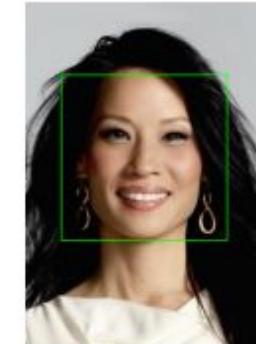
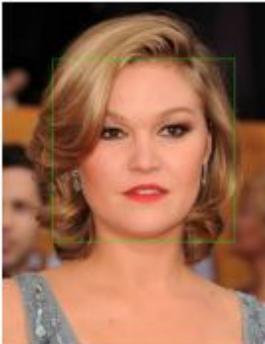
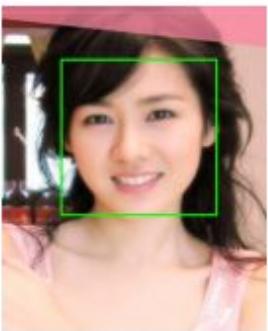
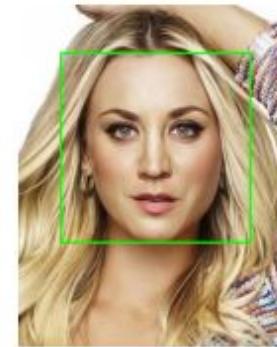
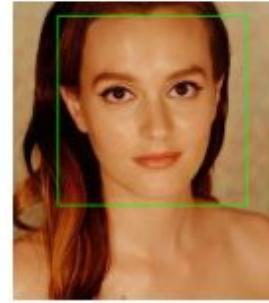
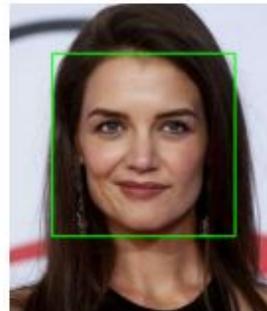
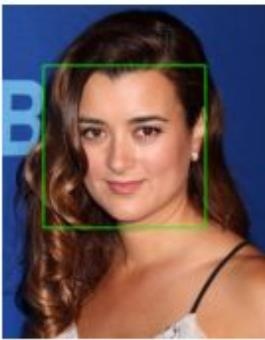
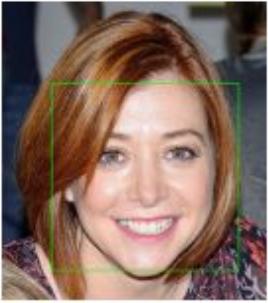
Haar Cascade: Parameters

scaleFactor=1.1, minNeighbors=9



Haar Cascade: Parameters

scaleFactor=1.3, minNeighbors=6, minSize



Sử dụng đặc trưng cạnh HOG (các ảnh được resize về 128x128)

Orientations

9

Cells per block

4x4

HOG

Pixels per cell

8x8

Block norm

L2

3

Model

Đánh giá model

	POSITIVE	NEGATIVE
POSITIVE	TP	FN
NEGATIVE	FP	TN

$$Precision = \frac{TP}{TP + FP}$$

$$Recall = \frac{TP}{TP + FN}$$

$$Accuracy = \frac{TP + TN}{TP + FP + FN + TN}$$

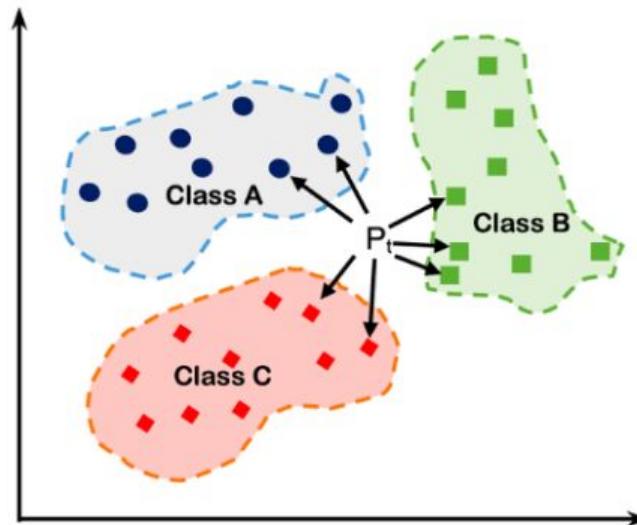
$$F1\ Score = 2 \times \frac{Precision \times Recall}{Precision + Recall}$$

K-nearest neighbor (KNN)

Đặc điểm

KNN là một trong những thuật toán supervised-learning đơn giản nhất, thuật toán này không học một điều gì từ dữ liệu training, mọi tính toán được thực hiện khi nó cần kết quả của dữ liệu mới. Có thể dùng cho Classification và Regression.

K Nearest Neighbors



Tham số sử dụng trong KNN

weights	n_neighbors	Mean cross-validation score
---------	-------------	-----------------------------

uniform	1	0.660
distance	6	0.661

```
{'n_neighbors': 10, 'weights': 'distance'} mean cross-validation score: 0.656595126486654
{'n_neighbors': 10, 'weights': 'uniform'} mean cross-validation score: 0.6374722039282531
Best parameters: {'n_neighbors': 6, 'weights': 'distance'}
Best cross-validation score: 0.6618950399669418
```

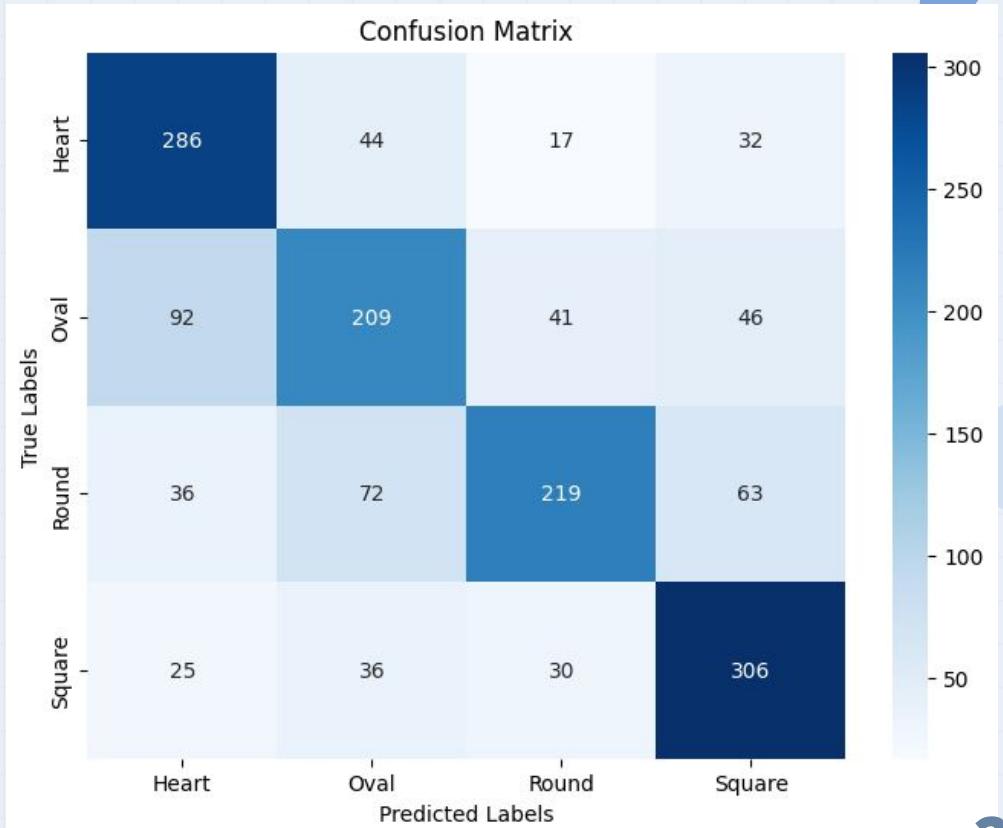
Accuracy: 0.65

```
from sklearn.metrics import confusion_matrix
y_pred = model.predict(x_test)
cm = confusion_matrix(y_test, y_pred)
print(cm)
accuracy_score(y_test, y_pred)
```

✓ 6.6s

```
[[286  44  17  32]
 [ 92 209  41  46]
 [ 36  72 219  63]
 [ 25  36  30 306]]
```

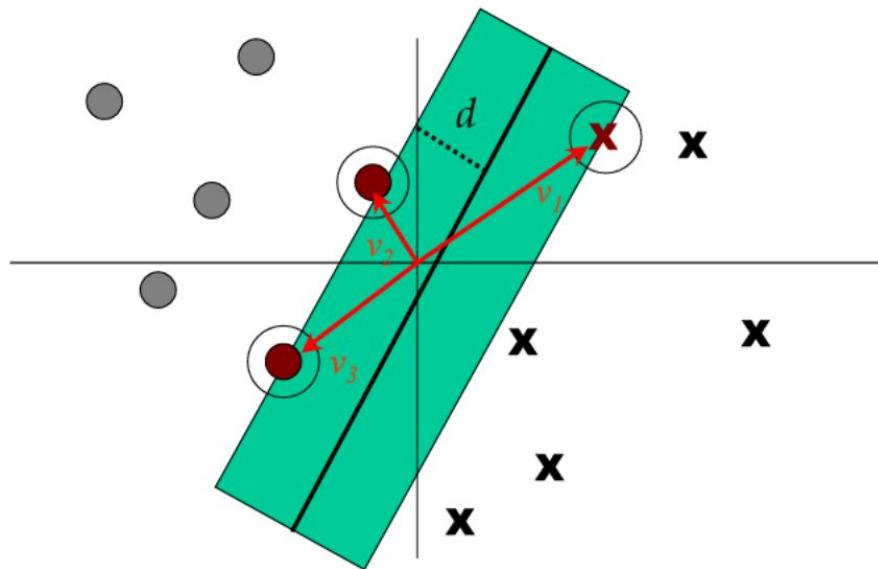
0.6563706563706564



SVM classification

Đặc điểm

- SVM là thuật toán học có giám sát dùng để phân loại bằng cách chia các điểm bằng siêu phẳng N chiều thành các lớp khác nhau



Tham số sử dụng trong SVM

C	Gamma	Mean cross-validation score
5	scale	0.548

```
best_params = search.best_params_
best_score = search.best_score_

print(f"Best parameters: {best_params}")
print(f"Best cross-validation score: {best_score}")

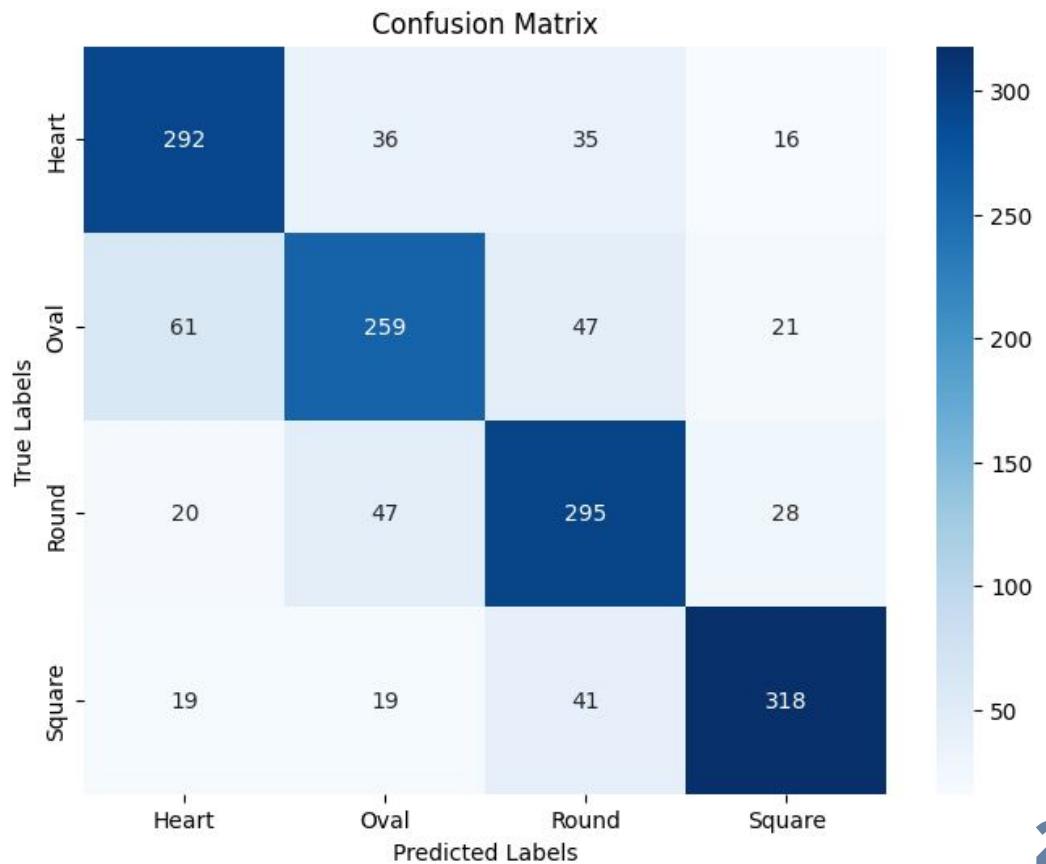
Best parameters: {'C': 5, 'gamma': 'scale'}
Best cross-validation score: 0.5479999999999999
```

Accuracy: 0.75

```
from sklearn.metrics import confusion_matrix,  
y_pred = model.predict(x_test)  
cm = confusion_matrix(y_test, y_pred)  
print(cm)  
accuracy_score(y_test, y_pred)
```

[8]

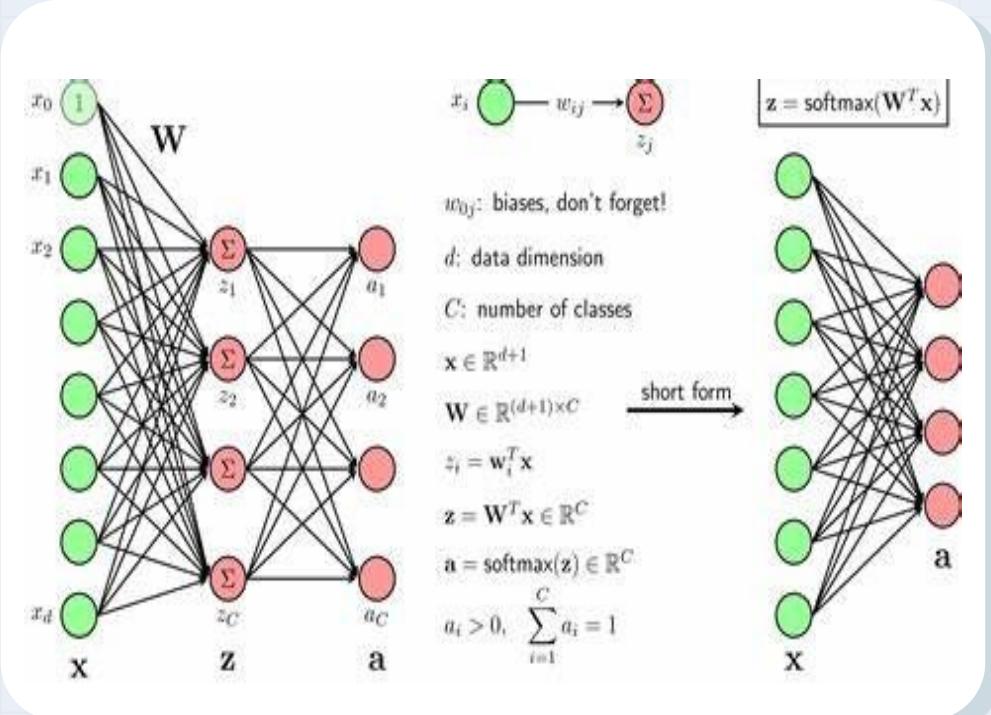
```
... [[292  36  35  16]  
 [ 61 259  47  21]  
 [ 20  47 295  28]  
 [ 19  19  41 318]]  
... 0.749034749034749
```



Soft-max classification

Đặc điểm

Một softmax classifier (hay còn được gọi là logistic classifier đa lớp) là một mô hình phân loại thường được sử dụng trong các bài toán có nhiều lớp nhãn khác nhau.



Tham số sử dụng trong Softmax

Solver	C	Mean cross-validation score
lbfgs	0.1	0.515

```
{'C': 1, 'solver': 'sag'} mean cross-validation score: 0.505
{'C': 1, 'solver': 'saga'} mean cross-validation score: 0.505
Best parameters: {'C': 0.1, 'solver': 'lbfgs'}
Best cross-validation score: 0.515
```

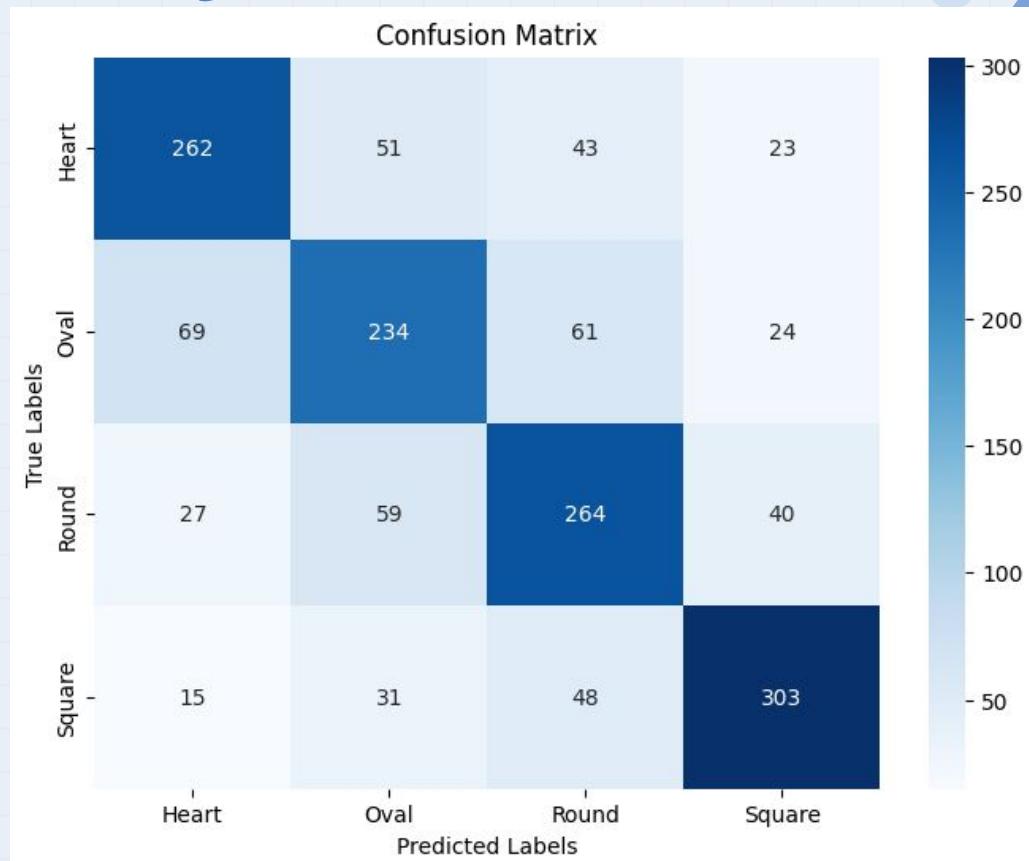
Accuracy: 0.68

```
from sklearn.metrics import accuracy_score
y_pred = model.predict(x_test)
cm = confusion_matrix(y_test, y_pred)
print(cm)
accuracy_score(y_test, y_pred)
```

✓ 0.1s

```
[[262  51  43  23]
 [ 69 234  61  24]
 [ 27  59 264  40]
 [ 15  31  48 303]]
```

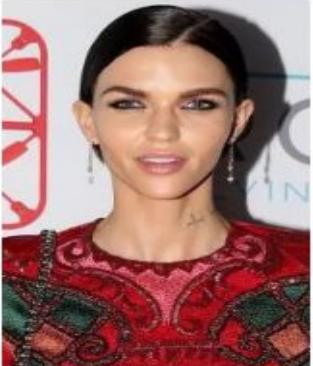
0.6840411840411841



4

Demo

Label: Heart
Predicted: Heart



Label: Round
Predicted: Round



Label: Oval
Predicted: Heart



Label: Square
Predicted: Square



Label: Square
Predicted: Square



Label: Round
Predicted: Round



THANKS FOR LISTENING

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6 tips to be happier on Wednesday

01

Do exercise

It's the biggest planet
in the Solar System

02

Drink water

Saturn is the ringed
one and a gas giant

03

Eat fruit

Neptune is a farthest
planet from the Sun

04

Laugh

Mercury is the closest
planet to the Sun

05

Sleep 8 hours

Venus has a beautiful
name, but it's hot

06

Read a book

Despite being red,
Mars is a cold place

Saturday

Buy meat

It's the biggest planet
in the Solar System

Buy milk

Mercury is the closest
planet to the Sun



Shopping Day!

Buy fish

Saturn is the ringed
one and a gas giant

Buy water

Venus has a beautiful
name, but it's hot

See a movie on Sunday

You can replace the image on the screen with your own work. Right-click on it and then choose "Replace image" (in Google Slides) or "Change Picture" (in PPT) so you can add yours



...

193,481,039

Trucks have passed in the driveway on **Thursday**

2,938,755,742

Dogs have eaten from their owner's hand on **Friday**

786.98%

People have ordered Chinese food on **Saturday**

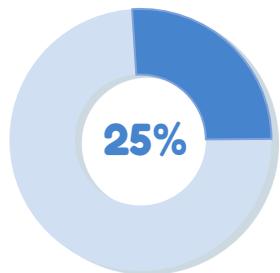
3

WEEK

Monday 15 - Sunday 21

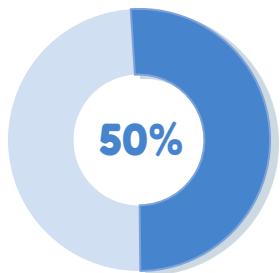
You can enter a subtitle here if you
need it

Monday



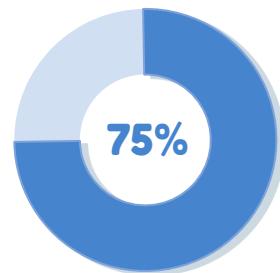
Task 1

You can describe the result here



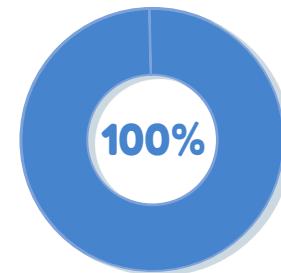
Task 2

You can describe the result here



Task 3

You can describe the result here



Task 4

You can describe the result here

"Tuesday is the most perfect day of the week. I also have words of wisdom that someone important might have said before and can make the reader get inspired."

—Someone Famous

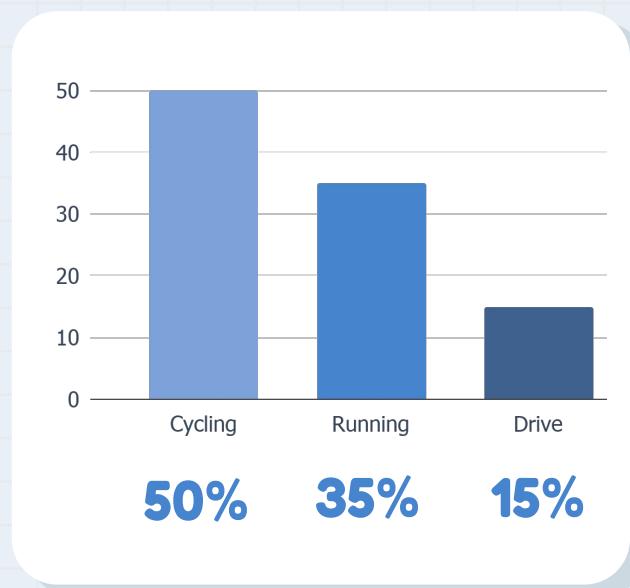
Wednesday

My tasks for today:

- Mercury is the smallest planet
- Jupiter is the biggest planet
- Despite being red, Mars is a cold place
- Neptune is the farthest planet
- Earth is the planet where we live on

Friday

What are you favorite hobbies?



Cycling

Mercury is the closest planet to the Sun and the smallest one



Running

Mars is a cold place. The planet is full of iron oxide dust



Drive

Venus has a beautiful name and is the second planet from the Sun

...

635,561,880

is the number of **weekends** I wish there was

Pamper yourself on Sunday



Just relax!



Mars is actually a cold place



Stay creative!



Jupiter is the biggest planet



Wellness time



Venus has a beautiful name

Enjoy movies on Monday

Let's watch the tutorial

You can replace the image on the screen with your own work. Right-click on it and then choose "Replace image" (in Google Slides) or "Change Picture" (in PPT) so you can add yours



Tuesday's schedule



Todays priority

- Review lesson
- Study for exam

Notes

- Mars is cold
- Jupiter is big
- Venus is hot

8:00 Math class

9:00 English class

10:00 Piano class

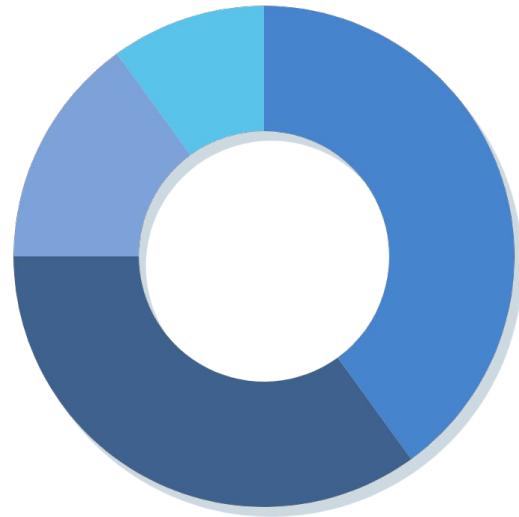
11:00 Lunch time

12:00 Free time

13:00 Meeting

Wednesday

- **Task 1** Venus is hot
- **Task 2** Jupiter is big
- **Task 3** Mars is cold
- **Task 4** Neptune is far



To modify this graph, click on it, follow the link, change the data and paste the new graph here

Sunday



Search in Google about kittens

Connect to my online classes

Read Riordan's new e-book

Lunch time

Make video for granny



Free time icon pack



...

Alternative icons



Resources

Photos:

- Smiling couple watching film on bed
- Front view smiley birthday woman holding plate with cake
- Notebook and coffee cup top view



Vectors:

- Minimal geometric landing page and memphis design

Icons:

- Free time Icon Pack
- Cultural Activities Icon Pack

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#3e628d

#4684ce

#59c3ea

#7da2d9

#d1dff3

#cdd9e1

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Pana



Amico



Bro



Rafiki



Cuate

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