

# Ứng dụng Trí tuệ nhân tạo trong Nuôi trồng thủy sản

NGUYỄN HẢI TRIỀU<sup>1</sup>

<sup>1</sup> Bộ môn Kỹ thuật phần mềm,  
Khoa Công nghệ thông tin, Trường ĐH Nha Trang

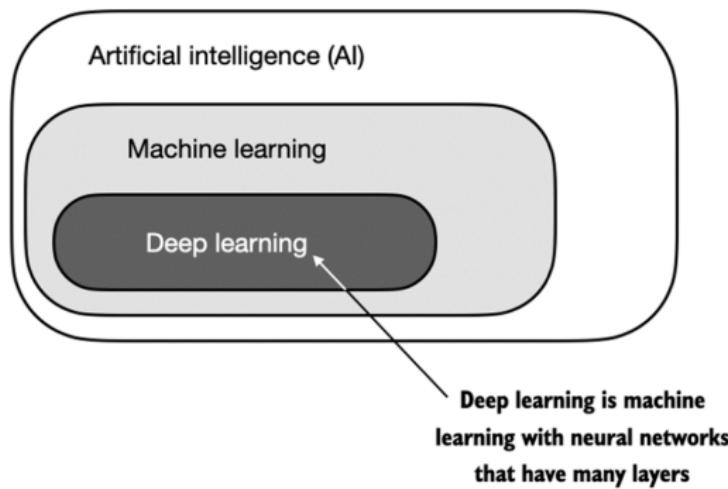
NhaTrang, September 2024

## 1 Intro to ML and DL

- Nguyên lý hoạt động của ML
- How Can We Use Machine Learning?
- The 3 Classic Categories of Machine Learning
- A Typical Machine Learning Workflow
- Common Types of Supervised Learning
- Supervised Learning Dataset

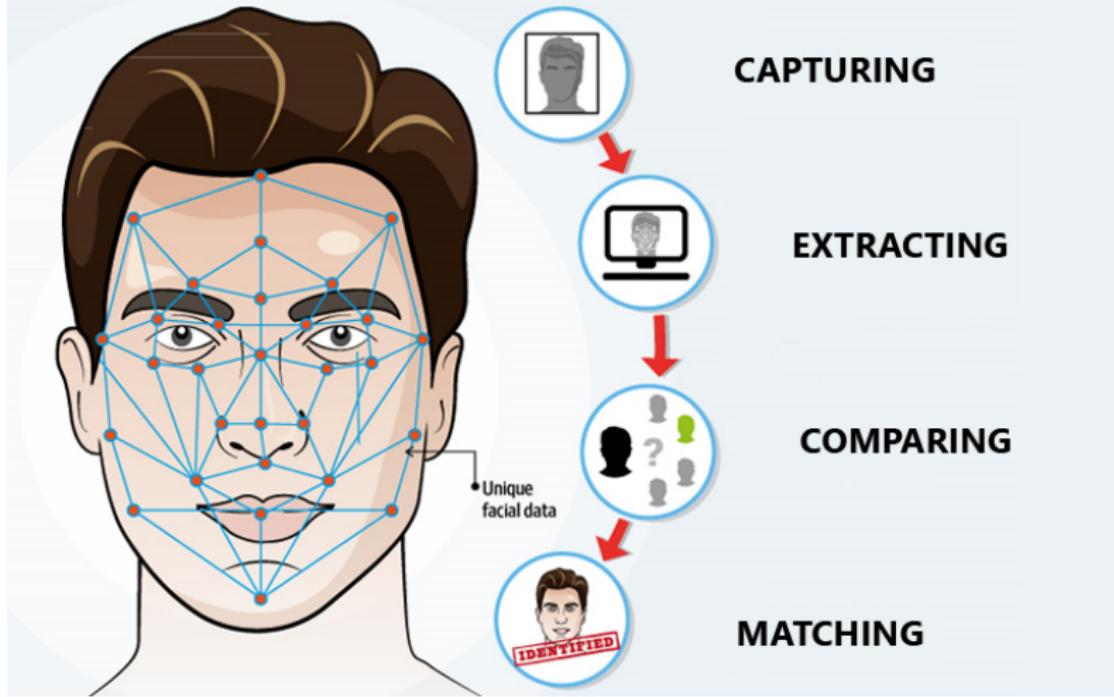
**Học máy (ML)** là một lĩnh vực con của trí tuệ nhân tạo (**AI**) liên quan đến các thuật toán tự học từ dữ liệu đầu vào để đưa ra dự đoán.

**Học sâu (DL)** là một tập hợp con của ML tập trung vào việc sử dụng mạng nơ-ron nhiều lớp (còn được gọi là mạng nơ-ron sâu) để mô hình hóa các mẫu và tính trừu tượng phức tạp trong dữ liệu.

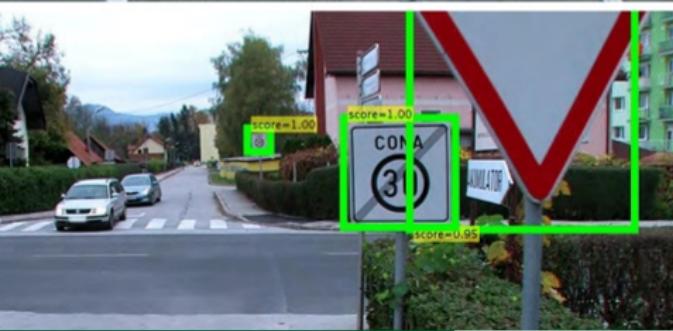
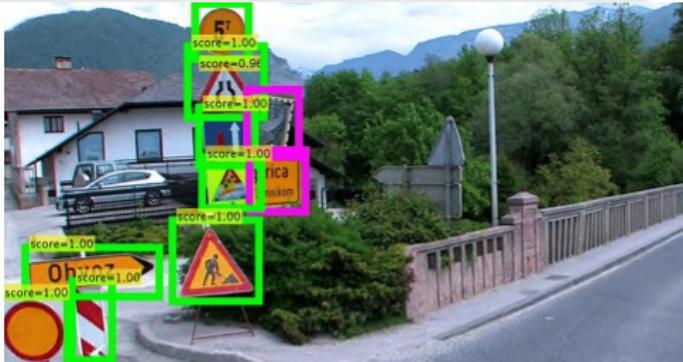


Where do we see Machine Learning being used in the real world?

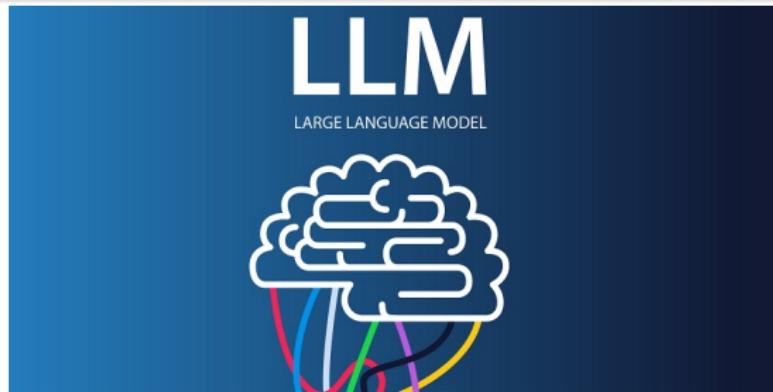
## Biometrics Face Recognition - How does it Work?



# Where do we see Machine Learning being used in the real world?



Where do we see Machine Learning being used in the real world?  
ChatGPT, Gemini...



Bài toán phân loại các bệnh phổ biến trên cá nước ngọt ở khu vực Nam Á dựa trên ảnh chụp da, vẩy cá.

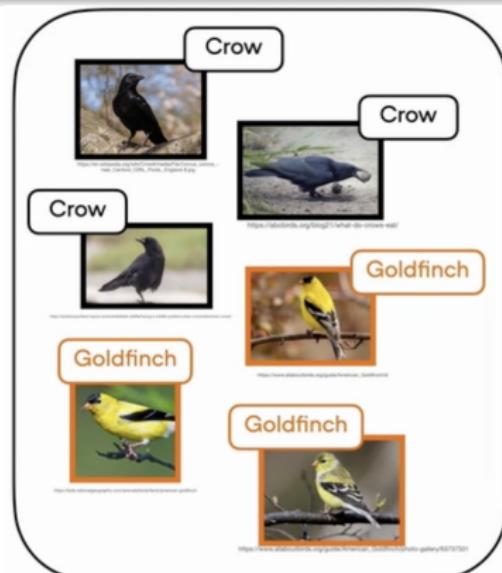
- ① Bacterial diseases - Aeromoniasis
- ② Bacterial gill disease
- ③ Bacterial Red disease
- ④ Fungal diseases
- ⑤ Healthy Fish
- ⑥ Parasitic diseases
- ⑦ Viral diseases White tail disease

## Training images



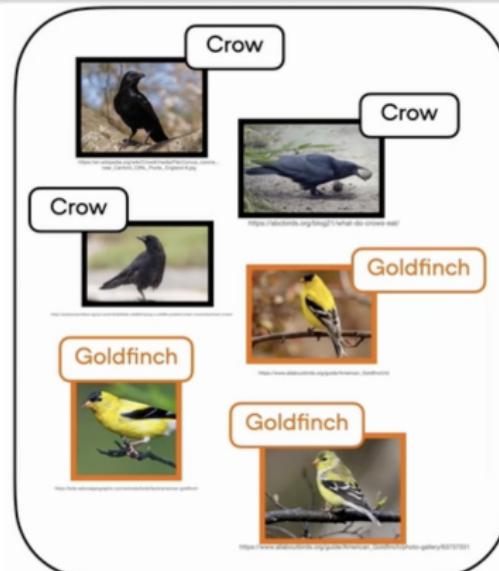
# Nguyên lý hoạt động của ML

The key ideal behind Machine Learning is that we **let computers learn from data**. So how do these computers learn from data, though?



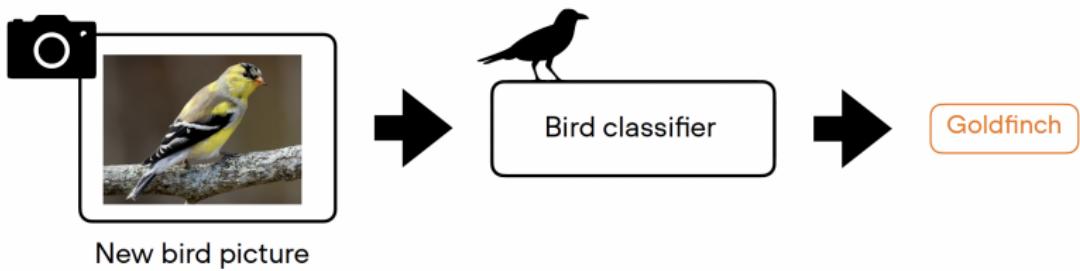
# Nguyên lý hoạt động của ML

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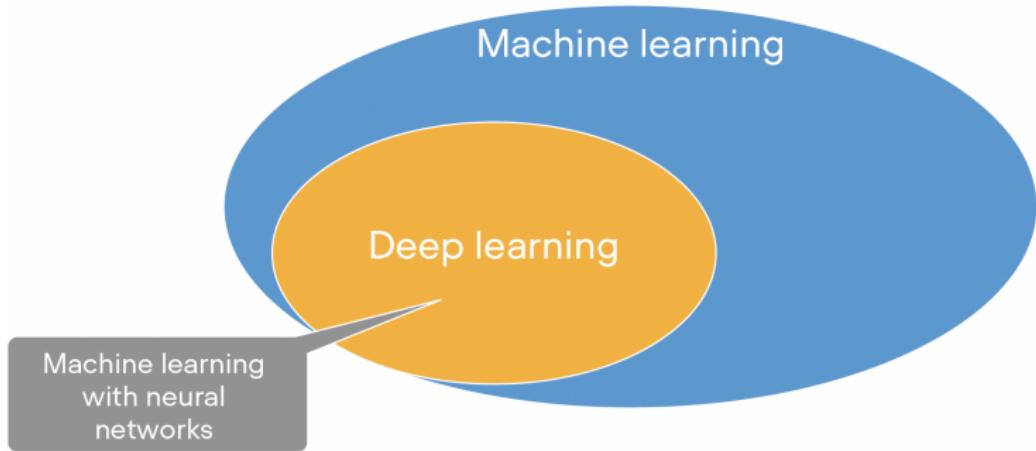
# Nguyên lý hoạt động của ML

Goal



# Mối liên hệ giữa ML và DL

How does ML relate to Deep Learning and when do we use Deep learning vs regular Machine learning?





[https://en.wikipedia.org/wiki/Crow#/media/File:Corvus\\_corone\\_-near\\_Canford\\_Cliffs,\\_Poole,\\_England-8.jpg](https://en.wikipedia.org/wiki/Crow#/media/File:Corvus_corone_-near_Canford_Cliffs,_Poole,_England-8.jpg)

# Deep learning

large datasets  
in “unstructured” form  
(e.g., images and text)



<https://usdubuquemarina.org/group-work/rehabilitate-wildlife/having-a-wildlife-problem/run-run-away-down-town-crows/>



<https://www.abcbirds.org/blog21/what-do-crows-eat/>



[https://www.allaboutbirds.org/guide/American\\_Goldfinch](https://www.allaboutbirds.org/guide/American_Goldfinch)



<https://kids.nationalgeographic.com/animals/birds/facts/american-goldfinch>



# Deep learning

large datasets  
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[https://en.wikipedia.org/w/index.php?title=Corvus\\_jonni&oldid=96400088](https://en.wikipedia.org/w/index.php?title=Corvus_jonni&oldid=96400088)



<https://abcbirds.org/blog21/what-do-crows-eat/>



<https://creativecommons.org/licenses/by-sa/4.0/>



[https://www.allaboutbirds.org/guide/American\\_Goldfinch/photo-gallery/63737331](https://www.allaboutbirds.org/guide/American_Goldfinch/photo-gallery/63737331)



<https://creativecommons.org/licenses/by-sa/4.0/>



[https://www.allaboutbirds.org/guide/American\\_Goldfinch/photo-gallery/63737331](https://www.allaboutbirds.org/guide/American_Goldfinch/photo-gallery/63737331)

(a)

# Regular machine learning

Datasets in “structured”  
form like tables

	Beak length	Wing span	Primary color	...
Bird 1	3 cm	43 cm	black	...
Bird 2	0.5 cm	19 cm	yellow	...
Bird 3	5 cm	48 cm	black	...
Bird 4	4 cm	45 cm	black	...
...	...	...	...	...

(b)

"Unstructured" data



[https://en.wikipedia.org/wiki/Crow#/media/File:Corvus\\_comune\\_-now\\_Corbis\\_Corbis\\_Photo\\_original.jpg](https://en.wikipedia.org/wiki/Crow#/media/File:Corvus_comune_-now_Corbis_Corbis_Photo_original.jpg)



<https://elabonbs.org/blog/1/what-do-crows-eat/>



[https://www.allaboutbirds.org/guide/Red-Winged\\_C牛鳴鳥](https://www.allaboutbirds.org/guide/Red-Winged_C牛鳴鳥)



[https://www.allaboutbirds.org/guide/American\\_Goldfinch](https://www.allaboutbirds.org/guide/American_Goldfinch)



[https://www.allaboutbirds.org/guide/American\\_Goldfinch](https://www.allaboutbirds.org/guide/American_Goldfinch)



[https://www.allaboutbirds.org/guide/American\\_Goldfinch](https://www.allaboutbirds.org/guide/American_Goldfinch)

Manual feature extraction



## Regular machine learning

Datasets in "structured" form like tables

Beak length	Wing span	Primary color ...	
Bird 1	3 cm	43 cm	black ...
Bird 2	0.5 cm	19 cm	yellow ...
Bird 3	5 cm	48 cm	black ...
Bird 4	4 cm	45 cm	black ...
...	...	...	...

# How Can We Use Machine Learning?

1

Making predictions

Is this email **spam** or not?



<https://computingwhich.co.uk/hc/en-gb/articles/115002560340-Common-email-mistakes-that-lead-to-spam>

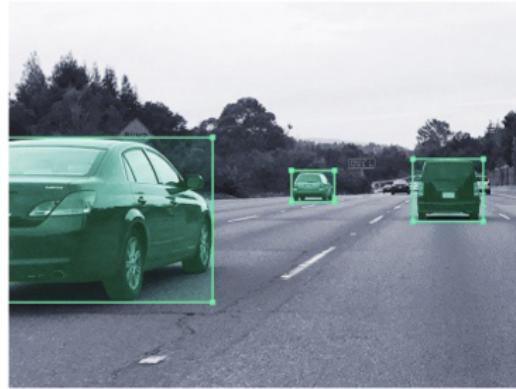
A label prediction task

# How Can We Use Machine Learning?

1

Making predictions

## Where are the **cars** located?



<https://medium.com/@harishbuilding-a-state-of-the-art-autonomous-vehicle-program-in-java-and-python-using-tiny-yolo-2bd7307e66ac>

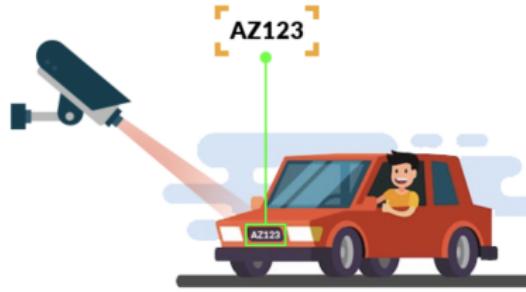
Predicting the bounding boxes

# How Can We Use Machine Learning?

1

Making predictions

## What is the license plate code?



<https://www.innومinds.com/connected-devices-and-iot/humix-video-analytics-solutions/arip>

Recognizing or predicting letters and digits

# How Can We Use Machine Learning?

## Compressing large datasets

Compressing  
data

2



<https://ben-eclectic.medium.com/hubble-space-telescope-science-research-january-2022-a-summary-from-astronomy-data-system-3-9ac0fbc2f0>



<https://buildings.honeywell.com/what-is-a-data-center>

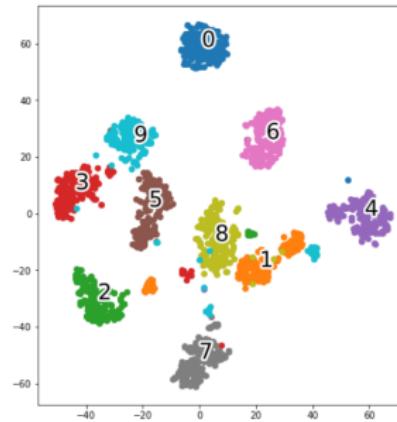
Extracting interesting data for storage

# How Can We Use Machine Learning?

## Exploring datasets

Compressing  
data

2



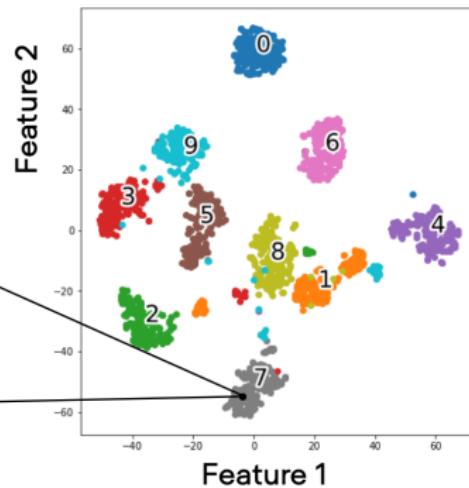
Reducing dimensionality for visualization & clustering

# How Can We Use Machine Learning?

## Exploring datasets

Compressing  
data

2



Compressing 28x28 (=784) dimensional images to 2 dimensions

# How Can We Use Machine Learning?

3

Generating new  
data



This Person Does Not Exist



This Cat Does Not Exist



This Rental Does Not Exist

# How Can We Use Machine Learning?

## TEXT PROMPT

an armchair in the shape of an avocado....

## AI-GENERATED IMAGES



Edit prompt or view more images↓

Source: <https://openai.com/blog/dall-e/>

DALL-E, Parti, Imagen, and Others

# How Can We Use Machine Learning?

Learning a series  
of actions

4

## Performing moves to **win** a game



<https://www.stocksy.com/1040575/first-move-of-a-chess-game--e4>

# How Can We Use Machine Learning?

Learning a series  
of actions

4

## Moving a robot



<https://news.mit.edu/2019/robots-track-moving-objects-unprecedented-precision-0219>

# The 3 Classic Categories of Machine Learning

Supervised  
learning

Data with  
answers (targets, labels)  
available

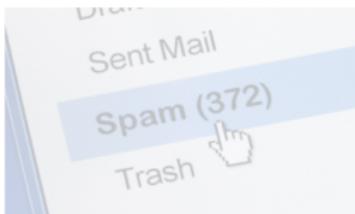
Prediction tasks



## Supervised learning

Data with answers (targets, labels) available

Prediction tasks

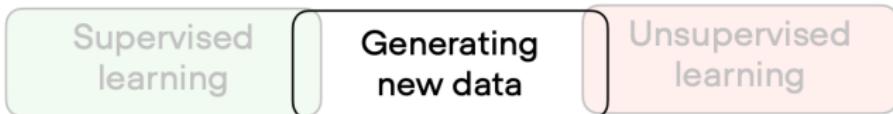


## Unsupervised learning

Data without available answers

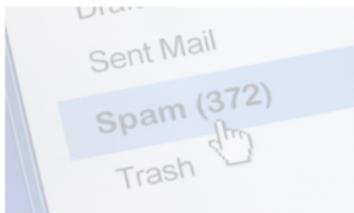
Clustering & most data compression tasks





Data with  
answers (targets, labels)  
available

Prediction tasks



Data without  
available  
answers

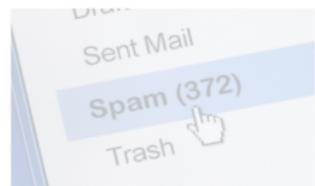
Clustering  
& most data  
compression tasks



### Supervised learning

Data with answers (targets, labels) available

Prediction tasks



### Reinforcement learning

Series of steps & a goal

Learning a series of actions



### Unsupervised learning

Data without available answers

Clustering & most data compression tasks



# A Typical Machine Learning Workflow

We will see **how a typical machine learning workflow for making predictions looks like**. In supervised learning in general



[https://commons.wikimedia.org/wiki/File:145378-050-448\\_17760\\_Death-cap-mushroom.jpg](https://commons.wikimedia.org/wiki/File:145378-050-448_17760_Death-cap-mushroom.jpg)

Example



[https://www.chip.edu/science/faculty/w\\_d\\_smeal/public/poisonous-mushroom-16x16.jpg?ts=161020](https://www.chip.edu/science/faculty/w_d_smeal/public/poisonous-mushroom-16x16.jpg?ts=161020)

Example



<https://www.wildfooduk.com/mushroom-guides/destroying-angel-mushroom/>

Example

Supervised Learning: training examples

# A Typical Machine Learning Workflow

Label: poisonous



<https://i.ytimg.com/vi/t4Q23T9-050/-/480x360/deault/cap-mushroom.jpg>

Example

Label: poisonous



[https://www.cs.cmu.edu/~miles/teaching/ML/fall05/10\\_3\\_mush/public/poisonous\\_mushroom\\_160x160.jpg?Expires=167308](https://www.cs.cmu.edu/~miles/teaching/ML/fall05/10_3_mush/public/poisonous_mushroom_160x160.jpg?Expires=167308)

Example

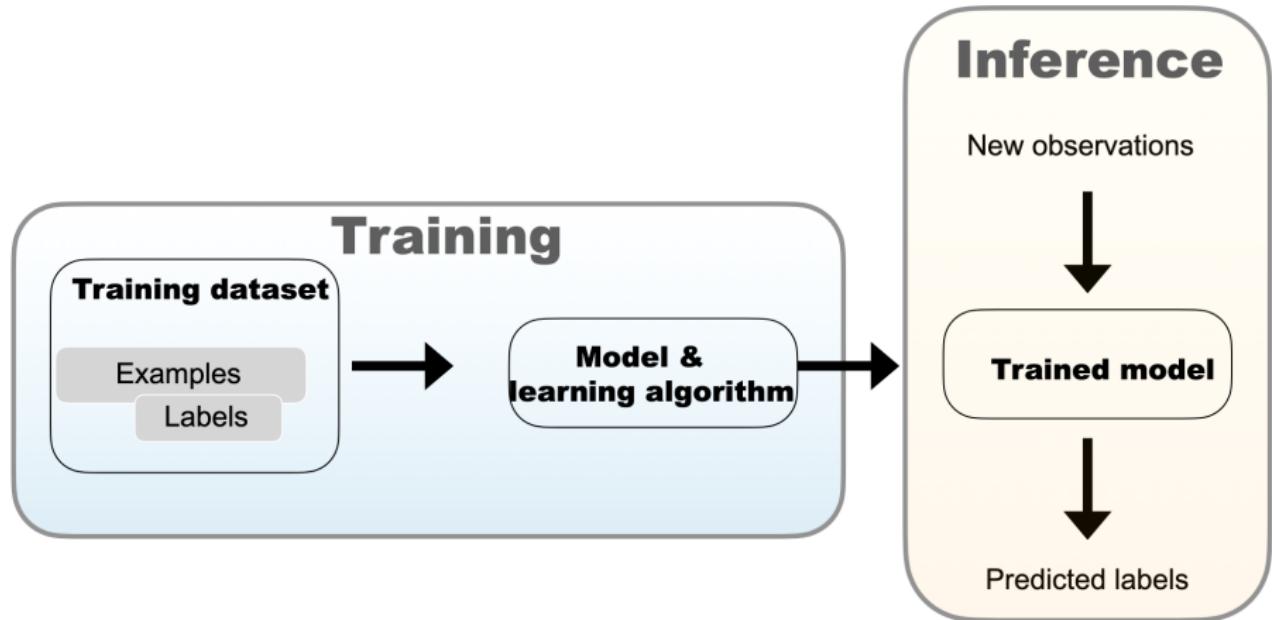
Label: edible



<https://www.wildfooduk.com/mushroom-guides/destroying-angel-mushroom/>

Example

One key aspect of supervised learning is that for the training data, **we have labels. So we know the true answers here!!!!**



Supervised Learning Workflow

# Common Types of Supervised Learning

## Classification

Predicting a class label.



<https://en.wiktionary.org/wiki/cat#/media/File:Cat03.jpg>



<https://static01.nyt.com/images/2021/08/14/science/RTCAT-STRIPES/07CAT-STRIPES-jumbo.jpg?quality=75&auto=format>



<https://imageio.forbes.com/specials-images/imageserve/5db4c7b164b4a0007e9dfac/Photo-of-Maltese-dog/960x0.jpg?fit=bounds&format=jpg&width=960>

Cat

Cat

Dog

Which animal is this?

# Common Types of Supervised Learning

## Classification

Predicting a class label.



<https://en.wiktionary.org/wiki/cat#/media/File:Cat03.jpg>



<https://static01.nyt.com/images/2021/08/14/science/RTCAT-STRIPES/07CAT-STRIPES-jumbo.jpg?quality=75&auto=format>



<https://imageio.forbes.com/specials-images/imageserve/5db4c7b164b4a0007e9dfac/Photo-of-Maltese-dog/960x0.jpg?fit=bounds&format=jpg&width=960>

Cat

Cat

Dog

Which animal is this?

# Common Types of Supervised Learning

## Regression

Predicting a continuous value.



[https://photos.zillowstatic.com/fp/efe9a1aa53ad401ca70e45e82fa933d3-cc\\_ft\\_384.webp](https://photos.zillowstatic.com/fp/efe9a1aa53ad401ca70e45e82fa933d3-cc_ft_384.webp)

**\$399,500**

[https://www.zillow.com/homedetails/4530-W-Manitoba-St-Milwaukee-WI-53219/40496249\\_zpid/](https://www.zillow.com/homedetails/4530-W-Manitoba-St-Milwaukee-WI-53219/40496249_zpid/)

**\$189,900**

[https://photos.zillowstatic.com/fp/2b7864ad2767f21808409da4d152d876-cc\\_ft\\_768.webp](https://photos.zillowstatic.com/fp/2b7864ad2767f21808409da4d152d876-cc_ft_768.webp)

**\$235,400**

How expensive is this?

# Supervised Learning Dataset

Input:



[https://en.wikipedia.org/wiki/Iris\\_setosa#/media/File:Irissetosa1.jpg](https://en.wikipedia.org/wiki/Iris_setosa#/media/File:Irissetosa1.jpg)

Label: Iris-setosa

Unstructured data

# Supervised Learning Dataset

## Inputs:

Input:



<https://en.wikipedia.org/w/index.php?title=Iris&oldid=113000111>

Label:

Iris-setosa

(c) Unstructured data

Sepal length	Sepal width	Petal length	Petal width
5.1	3.5	1.4	0.3
4.9	3.0	1.4	0.2
5.9	3.0	5.1	1.8
...	...	...	...

(d) Structured data

# Supervised Learning Dataset

“Manual” feature engineering



Sepal length	Sepal width	Petal length	Petal length
5.1	3.5	1.4	0.3
4.9	3	1.4	0.2
5.9	3	5.1	1.8
...	...	...	...

# Supervised Learning Dataset

Deep learning



“Traditional” machine learning

Sepal length	Sepal width	Petal length	Petal length
5.1	3.5	1.4	0.3
4.9	3	1.4	0.2
5.9	3	5.1	1.8
...	...	...	...

# Tài liệu tham khảo

-  **Sebastian Raschka, Yuxi (Hayden) Liu, Vahid Mirjalili**  
Machine Learning with PyTorch and Scikit-Learn: Develop machine learning and deep learning models with Python (2022). Published by Packt Publishing Ltd, ISBN 978-1-80181-931-2.
-  **Sebastian Raschka**  
MACHINE LEARNING Q AND AI: 30 Essential Questions and Answers on Machine Learning and AI (2024). ISBN-13: 978-1-7185-0377-9 (ebook).
-  **LightningAI**  
LightningAI: PyTorch Lightning (2024) .