



Visión Computacional

Clasificación de Objetos

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- 1 Introduction to Machine Learning
- 2 Classification
- 3 K-nearest Neighbors

Machine Learning

A field of study that gives computers the ability to learn without being explicitly programmed ^a

^aArthur Samuel, 1959

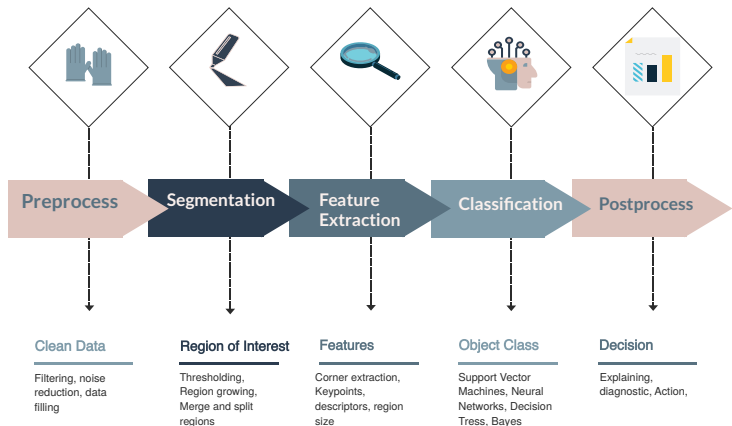
Depending on how machines learn:

- **Supervised Learning.** The machine learns from labeled data.
- **Un-supervised Learning.** The machine tries to discover the structure of input data without labels.
- **Reinforcement Learning.** The machine interacts with the environment improving its actions.

Tasks:

- **Classification.** Assigns a label to a given input. The set of classes is predefined.
- **Regression.** Finds a function that relates the input to a continuous codomain.
- **Clustering.** Automatically groups the inputs according to their features. The number of groups may be unknown.

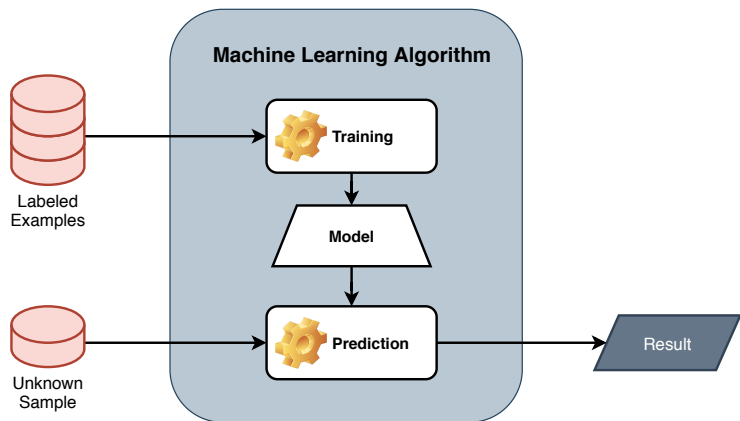
Classic Computer Vision Workflow



CREATED BY
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Supervised Learning



- "The computer program is asked to specify which of k categories some input belongs to". [Goodfellow]

$$f : \mathbb{R}^n \rightarrow \{1, \dots, k\} \quad (1)$$



Figura: Some clases

Features (Input)

- Feature space

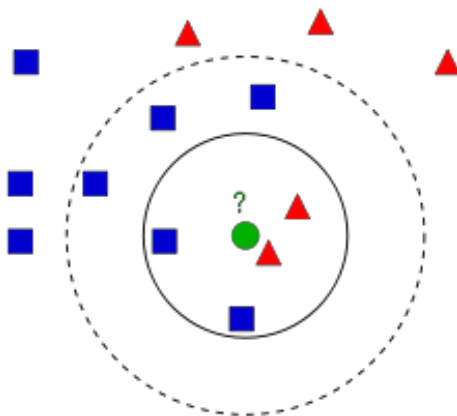


Figura: Feature space. Fig from OpenCV.

Some Machine Learning Methods

- K-nearest neighbors
- Support Vector Machines
- Bayes Classifier
- Neural Networks

K-nearest Neighbors

- Simply Nearest Neighbour. Select the closest already classified example.

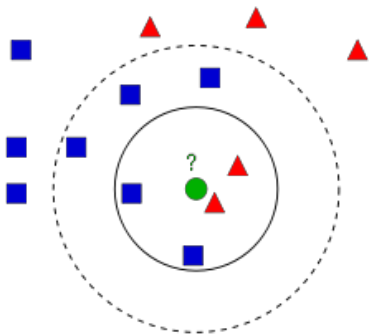


Figura: Feature space. Fig from OpenCV.

K-nearest Neighbors

- We check some k nearest labeled samples
- Then, whoever is majority in them, the new guy belongs to that family.
- Lets, try some examples, $k = 3$, $k = 5$.

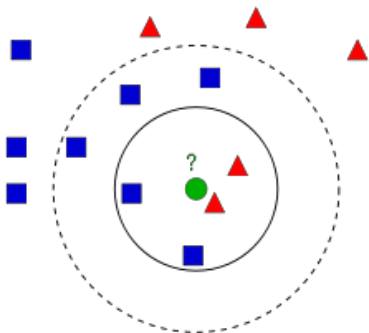


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