

# Introduction

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- What is image analysis?
- What are the objectives of this course?
- Which are the involved techniques and applications?
- More details about the course.

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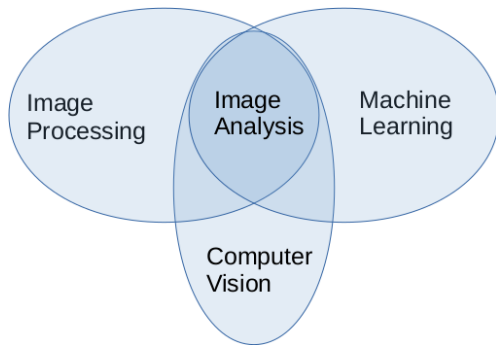
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- The measurements are converted into discrete values and stored in an array that we call **digital image**.

# What is image analysis?

Image analysis is the area of Computer Science that detects, extracts, and identifies objects from an image to support or make decisions.



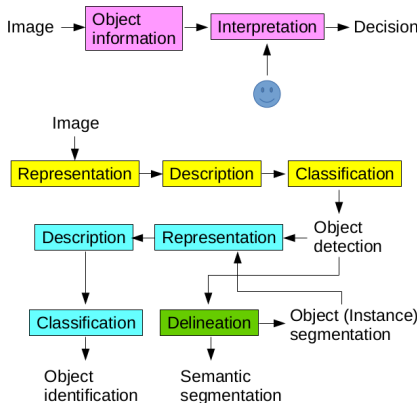
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This course covers the fundamentals of image analysis through the study of image processing and machine learning methods used to build decision-making and decision-support systems.



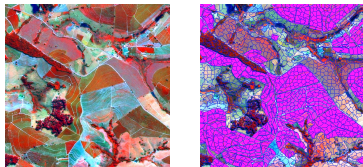
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# Representation

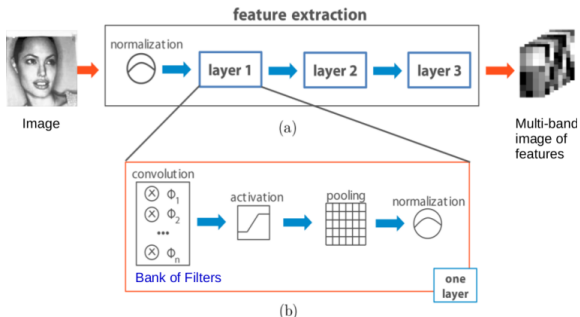
- An image may be represented by a subset of subimages (**patches**) extracted from points (**pixels**) of interest.
- Such patches may be defined at the center of connected regions with homogeneous image properties (**superpixels**).
- For the purpose of description and classification, we call them **samples**.



Connected superpixels whose patches are classified as coffee define an object (**coffee plantation**).

# Description

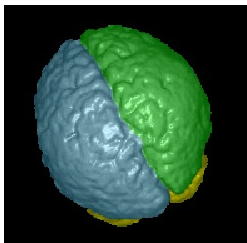
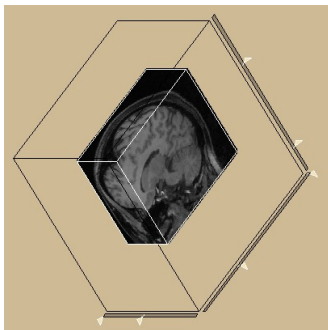
- Samples must be mathematically represented, usually by **feature vectors**.
- The algorithm that extracts such representation is named **descriptor**.



A feature vector can be obtained from the linearization (**flattening**) of a multi-band image.

# Delineation

- Object delineation is required for quantitative analysis.
- It is the most challenging task that often asks for human assistance.



The objects are the cerebellum, left and right brain hemispheres.

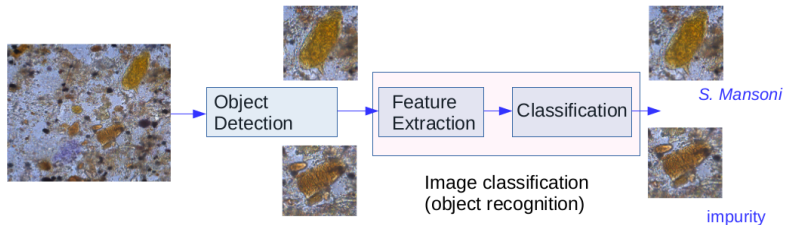
# Classification

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- It can determine object location and identification.



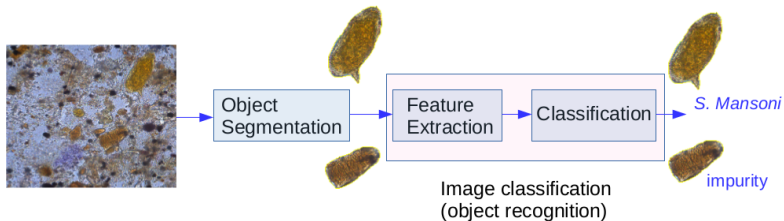
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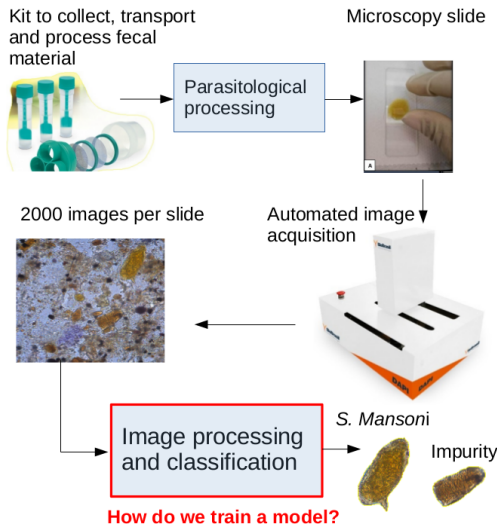
In classification, description must be good enough to distinguish similar objects among multiple categories.



Examples of intestinal parasites (left) and similar impurities (right).



# The real problem related to this example



Automated diagnosis of human intestinal parasites for the **15 most common species** in Brazil.

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- From machine learning, the course covers methods to learn features, classifiers, and object models.

# More details about the course

For more details, such as

- syllabus,
- evaluation criteria, and
- bibliography,

we will now go to `www.ic.unicamp.br/~afalcao/mo445`.