

# Assignment - 7

## Classification Examples

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1. Classification is a type of supervised learning problem in machine learning and statistics. In a classification problem, we are given a set of features (also known as predictors, independent variables, or inputs) and a target (also known as the response, dependent variable, or output).

The goal is to construct a model (or classifier) that can predict the target class from the features. The target in a classification problem is a categorical variable, meaning it can take on a limited number of discrete values, each representing a different class.

The features are the measurable properties or characteristics of the phenomenon we're trying to understand. They could be anything from the color of a fruit, the height of a person, to the words in a document. These features are used as input for our model.

The target, on the other hand, is what we're trying to predict. In a classification problem, the target is a set of categories or classes. For instance, if we're trying to classify emails, our classes could be 'spam' and 'not spam'. If we're classifying fruits based on color and size, our classes could be 'apple', 'banana', 'cherry', etc.

The model we build, often called a classifier, is like a detective. It takes in the clues (features) and tries to figure out the suspect (target class). The classifier is trained using a dataset where we already know the 'suspect' for each set of 'clues'. This is known as the training phase.

Once the model is trained and we believe it understands the patterns in the data, we test it. We give it new 'clues' where we know the 'suspect', but the model doesn't. This is the test phase. The model makes its predictions and we compare those to the actual 'suspects'. This gives us a measure of how well our model performs.

2. Some of the examples of classification problems are as follows:

- **Music Genre Classification:** This is an interesting application of machine learning in the field of digital signal processing and musicology. Here, the features could be various characteristics of a music track extracted from its digital signal such as tempo, rhythm patterns, melody, harmony, timbre, etc.

The target classes are the genres of music like rock, classical, jazz, country, pop, etc. The goal is to build a model that can accurately classify a music track into one of these genres based on its features. This can be particularly useful for music streaming services that aim to provide personalized recommendations to their users.

- **Astronomical Object Classification:** In the vast expanse of space, astronomers often need to classify observed celestial bodies into categories such as stars, galaxies, nebulae, etc. The features in this case could be measurements from telescopes like color, brightness, size, shape, spectral class, redshift, etc.

The target classes are the types of astronomical objects. The goal is to build a model that can accurately classify an observed celestial body into one of these classes based on its features. This can help in understanding the composition of the universe and in the search for specific types of astronomical objects.

These examples illustrate how classification problems are not just confined to traditional fields like finance or healthcare, but span across diverse domains, each with its unique set of features and classes. The key to solving these problems lies in choosing the right features that can effectively discriminate between the classes, and in training a model that can capture the underlying patterns in the data.