Suppose we have a task T that we wish to automate and are given some data points on which the task T has already been carried out and may be the output of carrying out the task T on those data points. The data is such that some values called the input variables affect some other value called the output. Our goal is to make the computer program, using the given data and knowledge, to be able to learn the relation between the input and output in order to carry out the task T on data that was not given. If the program is able to carry out the task T with an amount of error which is tolerable, we say that the program has learned to carry out the task T.

Depending on how much knowledge is provided along with the data, the problem of learning can be classified as **supervised learning**, or **unsupervised learning**, or **reinforcement learning**.

In **supervised learning**, the program is provided with the data points on which the task has been carried out as well as the results of carrying out the task on those data points and the program is to carry out the task on other data points.For example, a program may be malicious or benign. Now given data about some programs which are known to be malicious or benign as well the knowledge whether each program is malicious or benign, if a computer program is able to determine whether some unknown program is malicious or benign with tolerable amount of error, then the program has learned to carry out the task of classifying whether a program is malicious or benign.

In **unsupervised learning**, the program is provided only with the data points on which the task has been carried out and the program is to carry out the task on other data points. For example, in the case of classifying the computer program given just the data about programs which are known to be malicious or benign, if a computer program is

In **reinforcement learning**, the program is provided with the data points on which the task has been carried out and additionally on predicting output using current chosen relation, the program is provided with whether the prediction was correct or not.
Additionally, if the output is continuous valued, the learning problem is called the **regression** problem and if the output values belong to a finite set of discrete values, the learning problem is called the **classification** problem.

From the above discussion, we can identify the following **components** of a learning task:
1- The **input variable x**
2- The **output variable y**
3- The unknown relation relating the input variable to the output variable called the **target function**
4- An algorithm called the **learning algorithm** to output the final relation learned from the data
5- The learned relation

Additionally, in practice the learning algorithm is provided with a predetermined set of candidate relations called the **Hypothesis set** from which the learning algorithm chooses one of the relations as the final output. However, the relation is not chosen randomly but the algorithm is provided with a measure of discrepancy between the currently chosen relation and the actual relation called the **error measure** and the algorithm chooses the relation so as to minimize the error measure. Thus, we add two more components:
6- **Hypothesis set**
7- **Error Measure**
The learning algorithm together with the Hypothesis set is known as the **learning model**