# Introduction

* It is called “supervised” because of the presence of the outcome vari- able to guide the learning process.
* In the unsupervised learning problem, we observe only the features and have no measurements of the outcome.
* We recommend that Chapters 1–4 be first read in sequence. Chapter 7 should also be considered mandatory, as it covers central concepts that pertain to all learning methods. With this in mind, the rest of the book can be read sequentially, or sampled, depending on the reader’s interest.
* The Introduction has no more constructive messages, just give some example (not explicitly explain).

# 2. Overview of Supervised Learning

* a set of inputs that has been measured or labelled + one or more outputs = supervised learning
* Statistical Literature: inputs == predictors == independent variables == features ; Outputs == responses == dependent variables
* Quantitative value is lesser important than Qualitative variables .
* In fact, often descriptive labels rather than numbers are used to denote the classes. Qualitative variables are also referred to as categorical or discrete variables as well as factors.
* *regression* when we predict quantitative outputs, and *classification* when we predict qualitative outputs.
* A third variable type is o*rdered categorical,* such as small, medium and large, where there is an ordering between the values, but no metric notion is appropriate (the difference between medium and small need not be the same as that between large and medium). These are discussed further in Chapter 4.
* The most useful and commonly used coding is via *dummy variables*. Here a K-level qualitative variable is represented by a vector of K binary variables or bits, only one of which is “on” at a time. Although more compact coding schemes are possible, dummy variables are symmetric in the levels of the factor.
* Input variable is X, and if X is a vector , its components can be accessed by *Xj* . quantitative outputs is *Y* and qualitative outputs is G (for group).

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