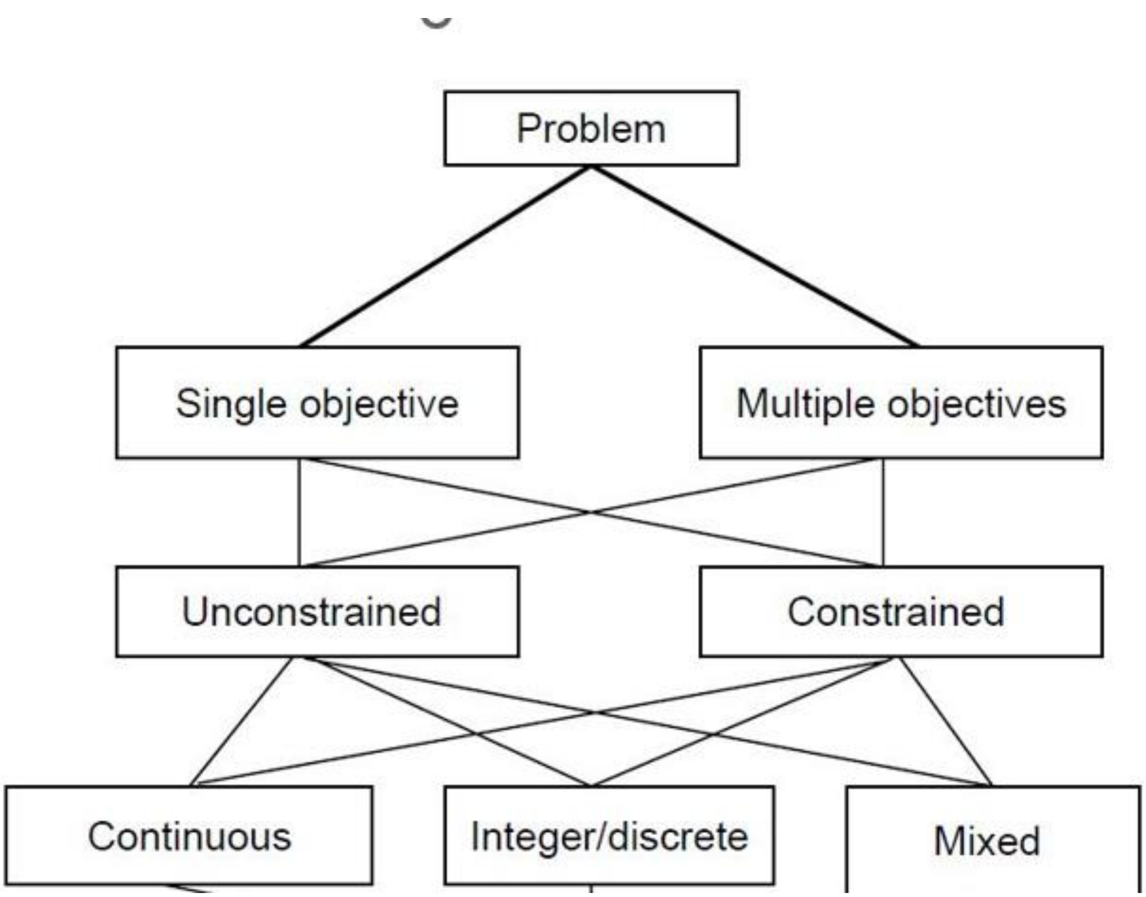
Introduction

Optimization is everywhere, from engineering design to financial markets, from our daily activity to planning our holidays, and computer sciences. We always intend to maximize or minimize something, the Many mathematical and statistical methods are essentially a different form of optimization. For example, in data processing, in aircraft design.

The kinds of optimization



Basic Definitions:

1- Optimization means finding the best solution in some sense to a given problem. Mathematically, this means finding the minimum or maximum value of a function of n variables,$f(x_1, x_2, \dots, x_n)$ where n may be any integer greater than zero.

2- Constrained optimization is means to minimize or maximize the objective function with requirement on constraints

3- Any point satisfying all of the constraints is said to be feasible, otherwise is said to be infeasible.

4- An inequality constraint $g_j(x) \leq 0$ is said to be active at x^* if $g_j(x^*) = 0$. It is inactive at x^* if $g_j(x^*) < 0$.

5- **Local minimum:** A point x* is called a local minimum of f if there exists $\in > 0$ such that

$$f(x*) < f(x), \text{ for all } \|x - x*\| \leq \in.$$

The point is local optimal but no guarantees that one will not find a better point if one looks far away.

Global minimum: A point x* is called a global minimum of f if

$$f(x^*) \leq f(x), \forall x \in R^n .$$