

# Methodology

This section presents the methodological approach used in this research project, demonstrating various mathematical concepts and notation.

## Mathematical Framework

We establish a rigorous mathematical foundation for our analysis. Consider the general optimization problem:

$$\min_{x \in \mathbb{R}^n} f(x) \tag{1}$$

subject to the inequality constraints:

$$g_i(x) \leq 0, \quad i = 1, \dots, m \tag{2}$$

and equality constraints:

$$h_j(x) = 0, \quad j = 1, \dots, p \tag{3}$$

where  $f : \mathbb{R}^n \rightarrow \mathbb{R}$  denotes the objective function, and  $g_i, h_j : \mathbb{R}^n \rightarrow \mathbb{R}$  represent the constraint functions.