

## 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:

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

subject to the inequality constraints:

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

and equality constraints:

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

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.