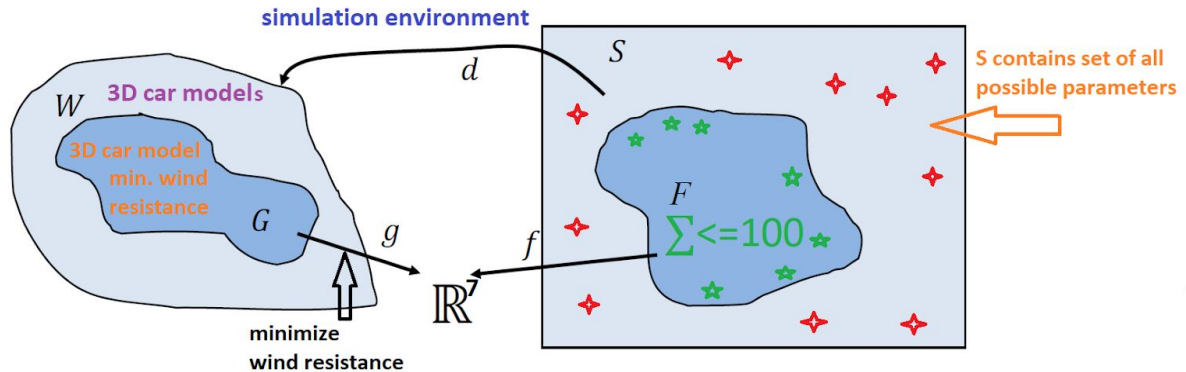


Assignment 9 Problem Formulation

Assume you work in a car manufacturing company, and your task is to design the structure of a new car. Your goal is to minimize the wind resistance of the car, while at the same time using only a fixed amount of material. The 3-D model of the car can be described by 7 positive real-valued parameters. Because there is the restriction of using at most a fixed amount of material, the sum of these parameters cannot be higher than 100. To test the wind resistance of a concrete assignment of these parameters, the values first have to be transformed into a 3-D model of a car. Then, using a simulation environment, the wind resistance can be determined.

- You have decided to use an Evolutionary Algorithm to solve this optimization problem. Please indicate which parts in the above description correspond to (1) the search space S , (2) the feasible search space F , (3) the decoded search space W , (4) the solution space G , (5) the decoding function d and (6) the cost function g of this problem.



- Describe a suitable representation of solutions and the optimization problem mathematically.
What is the fitness function?

$$\begin{aligned} \min f(\vec{x}) \\ \vec{x} \in \mathbb{R}^7 \left\{ \begin{array}{l} \sum_{i=1}^7 x_i \leq 100 \\ x_i > 0; \forall i \end{array} \right. \end{aligned}$$

fitness function:

$$f: S \rightarrow \mathbb{R}^7$$

- What could be a possible neighborhood function that does not leave the feasible space F when starting from a solution in F .

$$N(x) \subseteq F$$

