**Project statement : Technical interview**

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**I - Description of the problem and its challenges.**

The problem at hand is an optimization challenge, specifically a variant of the cutting stock or knapsack problem, with the goal of maximizing profit by cutting a single roll of dough into various biscuit types. The problem is one-dimensional, as it involves cutting along the length of the dough only.

Problem Description:

A biscuit factory has a roll of dough of a fixed length, from which it wants to produce biscuits. The dough has defects scattered along its length, and different types of biscuits can be produced, each with a specific size, value, and tolerance for the number of defects of each class it can contain. A solution involves assigning biscuits to positions on the roll in such a way that maximizes the total value of produced biscuits while adhering to the constraints of defect tolerance and avoiding overlap.

Challenges :

1. Defect Management :
   * Identification: Determining the positions and classes of defects within the dough.
   * Allocation: Assigning biscuits in a way that the number of defects within the size of each biscuit does not exceed the biscuit's defect threshold.
2. Size and Value Optimization:
   * Maximization: Selecting biscuits to maximize total value without exceeding the dough's length.
   * Combination: Finding the optimal mix of biscuits that fits within the dough length while considering the sizes and values to maximize profit.
3. Spatial Allocation :
   * Non-Overlap: Ensuring that no biscuits overlap in placement, which requires careful calculation and tracking of assigned positions.
   * Integer Positioning: Placing biscuits at integer positions, adding a constraint to the cutting process that might complicate the optimization.
4. Waste Minimization:
   * Utilization: Any unutilized part of the roll is considered a loss, as it carries a value of 0. The goal is to minimize this waste.

Goals of the Project :

* Efficient Use of Resources: The primary goal is to make the most efficient use of the roll of dough by minimizing waste and maximizing the total value of biscuits produced.
* Defect Accommodation: The solution must consider the defect positions and classes, ensuring that the produced biscuits meet quality standards.
* Profit Maximization: Ultimately, the factory aims to maximize profit, which is achieved by creating the highest value of biscuits from the roll of dough.