



Quantitator

Project Summary

The "Quantitator" project addresses significant challenges in the fashion retail industry by offering a comprehensive optimization framework. Its primary goal is to maximize net profit by determining the optimal product mix, all while operating within various operational constraints. These constraints include limited budget, logistics complexities, and restricted shelf space. The project highlights how traditional methods often lead to suboptimal decisions, resulting in reduced profitability, increased costs due to overproduction and inefficient resource allocation, and a lack of responsiveness to market changes.

Quantitator develops a sophisticated mathematical model that considers a wide array of factors, including production costs, marketing expenses, logistics overheads, and penalties associated with inventory age. The system simulates diverse production scenarios, enabling the evaluation of trade-offs and ensuring efficient resource allocation. This approach is designed to minimize waste and mitigate financial risks. The core of the system relies on data-driven methods, employing Python-based algorithms seamlessly integrated with a Java Spring Boot backend and an intuitive, interactive web interface.

A crucial aspect of the project involves a comparative analysis of different optimization algorithms. It evaluates the performance of Genetic Algorithms (GA), Ant Colony Optimization (ACO), and GAMS implementations to identify the most effective algorithm for various problem scales. The results of this analysis consistently demonstrate notable improvements in profitability, scalability, and the accuracy of decision-making. The system's key features encompass robust mathematical modeling, advanced optimization algorithms, GAMS integration, AI-driven decision support. It also boasts a well-structured Spring Boot backend, a user-friendly interactive frontend, and seamless integration with both Python services and Google Gemini AI.

Quantitator has already achieved substantial improvements in profitability and operational efficiency. Looking ahead, future enhancements are planned to further expand its capabilities. These include exploring additional optimization algorithms to enhance its adaptability and continuously improving its AI capabilities to provide even more robust decision support in an ever-evolving market. In essence, Quantitator stands as a powerful, data-driven solution that empowers fashion retailers to make strategic production decisions, optimize resource allocation, and swiftly adapt to market dynamics, ultimately leading to maximized net profit and a sustainable inventory strategy.