For our 2nd year large project, our group was tasked with designing the convertible roof mechanism for a Fiat 595 Abarth. This involved a comprehensive design to meet stringent performance, safety, and cost specifications. The main objective was to develop a fully convertible roof mechanism that retracts and deploys efficiently while adhering to weight limitations and structural safety requirements. The mechanism was constrained to use rotational joints only and was powered by a single DC motor, incorporating a gearbox without needing to address the canvas folding mechanism or its attachment to the car frame directly. My role within the group was to design the product virtually within CAD, perform FEA analysis and to play a pivotal role in concept generation.

The process began with an extensive conceptual design phase where multiple initial designs were generated using LEGO models and Linkage software. These concepts were evaluated through a controlled convergence process, considering various mechanical and design metrics such as swept height, mass, number of members and joints, and extended versus collapsed dimensions.

The final design was subjected to a series of evaluations against the Product Design Specifications to ensure all criteria were met. This included ensuring the mechanism’s compatibility with the vehicle’s dimensions, its operational speed, and the ease of maintenance and installation. The final mechanism was capable of deploying and retracting within the target time of 10 seconds, significantly faster than initially required, showcasing the efficiency of the design.

Skills used:

Fusion 360

Finite Element Analysis

Technical Drawing

Concept Generation

Linkage