Visualization Feature Requirements

1. Introduction
    a. This document details the requirements for the “visualization feature” of the Canopy Aerospace capstone project. Our capstone group is tasked with implementing a system to validate 3D part designs. Furthermore, we are working on annotating the model with additional information (such as thickness, warning areas, etc.) that need to be visualized. The visualization executable will need to be capable of visualizing additional annotation information for engineers, as well as providing suitable controls for enhanced insight.
2. Functional objectives
    a.

User Story ID	As a <type of user>	I want to <perform some task>	So that I can <achieve some goal>
1	Canopy engineer	Quickly examine issues with a 3D model	Provide timely feedback to a customer about turnaround time
2	Canopy engineer	Provide effective and accurate model feedback to customers	Foster positive customer relationships
3	Canopy engineer	Be able to see the thinnest part of the 3D model	Assess viability of problematic areas on the model
4	Canopy client	Know if my model is meets specifications	Know that the company can print my requested object
5	Canopy client	Know why the model is rejected	Make the appropriate changes so that

			the company can print my object

b. High priority
    - The system shall have a GUI to help visualize the results of the geometric analysis. This will streamline decision-making processes and reduce time spent on data interpretation.
    - The system shall have an interactive slider to make certain parts visible based on their associated thicknesses. This will make it intuitive for the engineers.
c. Medium priority
    - The system shall be able to be run on a web browser. This will increase accessibility and scalability of the overall system.
d. Low priority
    - The system shall display a detailed report summarizing critical part feedback involving part thickness, fillet radius, and hole size. This will reduce overall costs of operation by mitigating the waste of materials.

3. Non-functional objectives
    a. Reliability
        i. The system should be operational at least 95% of the time, promptly warning the user if a model could not be adequately decorated with debug information.
    b. Usability
        i. Canopy clients and engineers should be able to use the system within 10 minutes of being provided with instructions.
    c. Performance
        i. The mean time to display a 3D model and the feedback/warnings shall not exceed 2 minutes.
    d. Security
        ~~i. The visualization (as well as the rest of the service) shall provide password protected access so that they can only be used by employees.~~
    e. Interface
        i. The part thickness slider on the GUI can only accept float values between the minimum thickness and maximum thickness that were determined by the algorithm.

        ii. The system shall be able to process STL files and dynamically assign colors to the faces of 3D models based on the calculated thickness (or other algorithmically-determined values) of different parts by loading via text file.

4. Data
    a. Visualization data
        i. Visualization renders will be dynamically calculated at runtime based on a source mesh and pre-computed attributes from other parts of our validation system.
        ii. Every time a mesh is uploaded to Canopy, the attributes needed for polygon decoration will be computed and stored automatically for retrieval by the visualization system.
5. Audience
    a. The intended audience for this system includes both Canopy engineers and customers.