Harish Jai Ganesh – Engineering Portfolio

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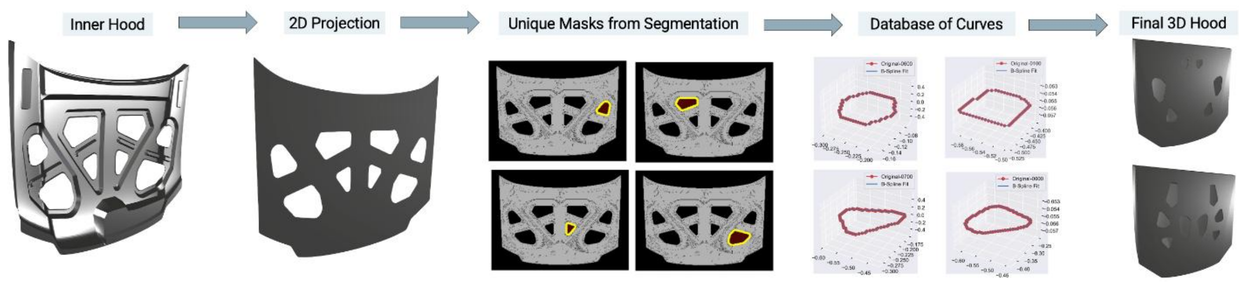
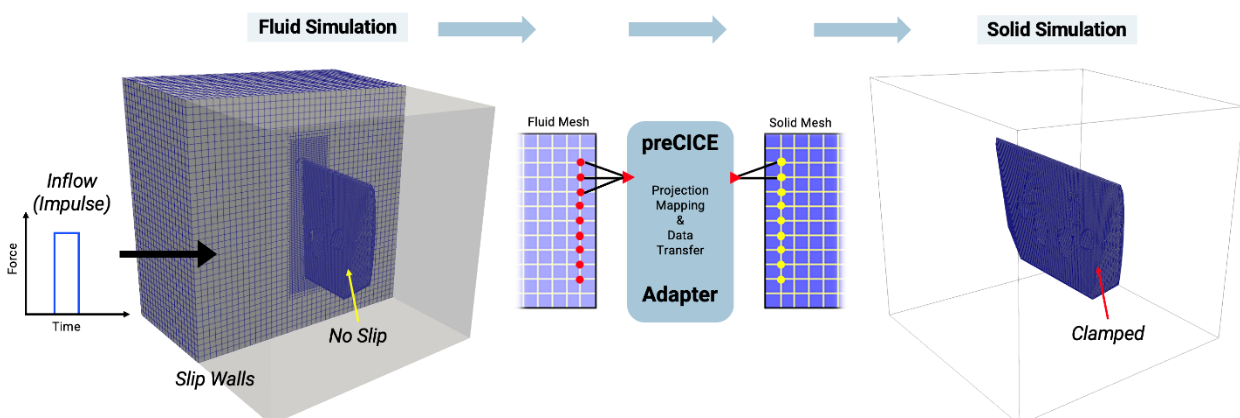
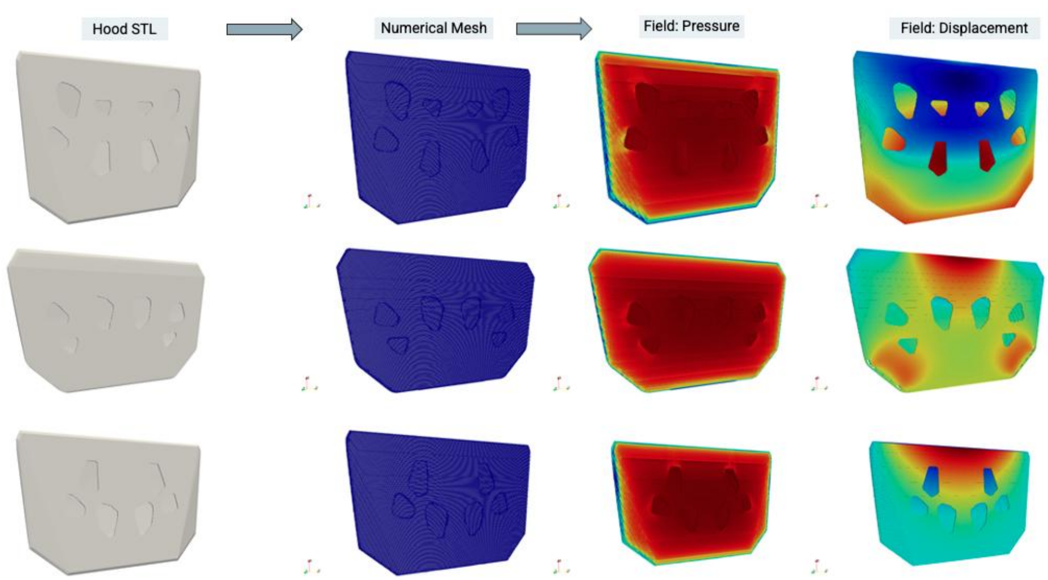
Advanced Propulsion Concepts Lab | Ford Research and Innovation Center

Undergraduate Researcher

Showcasing the multiphysics simulation pipeline. This project was undertaken to model manufacturing defects in the Ford production line. Project goal later evolved to create a machine learning model in which engineers could make changes to physical model through natural language input, although my work mainly focused on the simulation workflow. This paper is published on NeurIPS 2025. 3D hood geometries (16000+ geometric variants) generated using a separate dataset as the base set. Meshes are generated for each of the hoods in the range of 750K cells for the complete fluid domain, and 400K for the solid domain. This coupled simulation is run in parallel using custom versions of OpenFOAM's pimpleFoam and solidDisplacementFoam. Projection mapping and data transfer are done through preCICE. The STL to displacement field pipeline is automated on HPC to have many instances running simultaneously. This massively reduces actual runtime. Total CPU runtime is reduced through cell-count and time domain optimization.



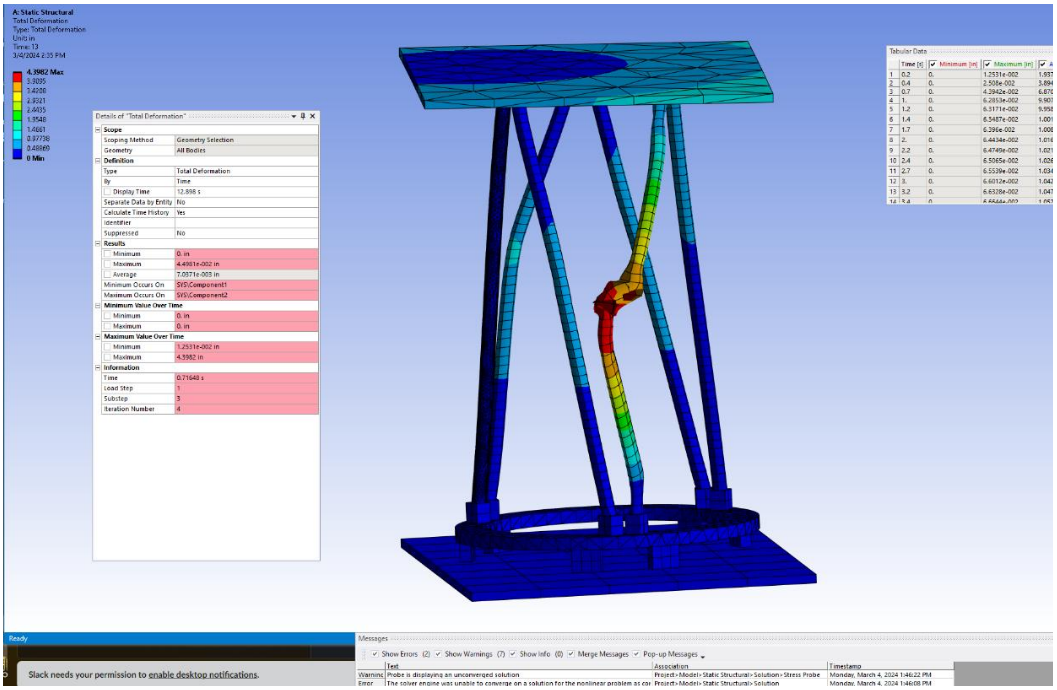


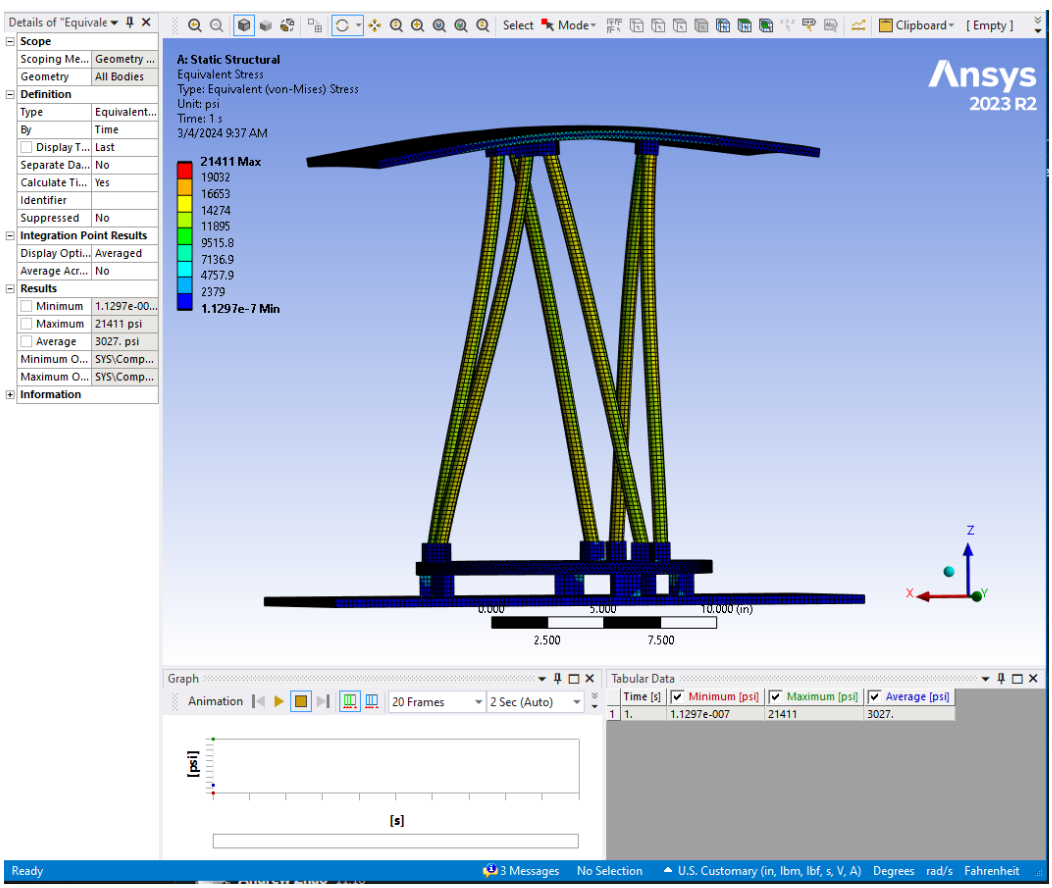


Michigan Aeronautical Science Association (MASA) | Rocketry Team

Thrust Transfer Structure (TTS) Project Lead

Led the thrust transfer structure subteam to optimize and develop and new TTS to accommodate a 15% increased thrust while also creating a 3% weight reduction. Created analytical solutions to determine performance and verified using ANSYS FEA. Utilized Siemens Teamcenter for PLM, and NX for CAD. Failure stress is also determined by buckling failure mode analysis. Made sure to incorporate DFM principles and collaborated with propulsion and fuel tanks teams' lead engineers to ensure proper compatibility with engine plumbing.





Adaptive Camber Aircraft Wing

Simulations and Testing Lead

Led simulations and wind tunnel testing for a model aircraft wing, as part of a senior design-build-test lab course at the University of Michigan. Created a 3D aircraft wing model, then reduced dimensions to a 2D model to conduct CFD using ANSYS Fluent. Mesh was created to ensure high refinement in airflow regions closer to the airfoil, defined as a function of chord length. Additional refinement at the leading and trailing edge of the airfoil. Simulations conducted at three distinct camber modes and three angles of attack to find lift and drag coefficients, as well as visualize any flow separation. Wind tunnel testing was conducted for the same nine possible configurations, although improvements in lift-to-drag ratio were found to the lower in the wind tunnel due to lack of better material for the airfoil skin.