

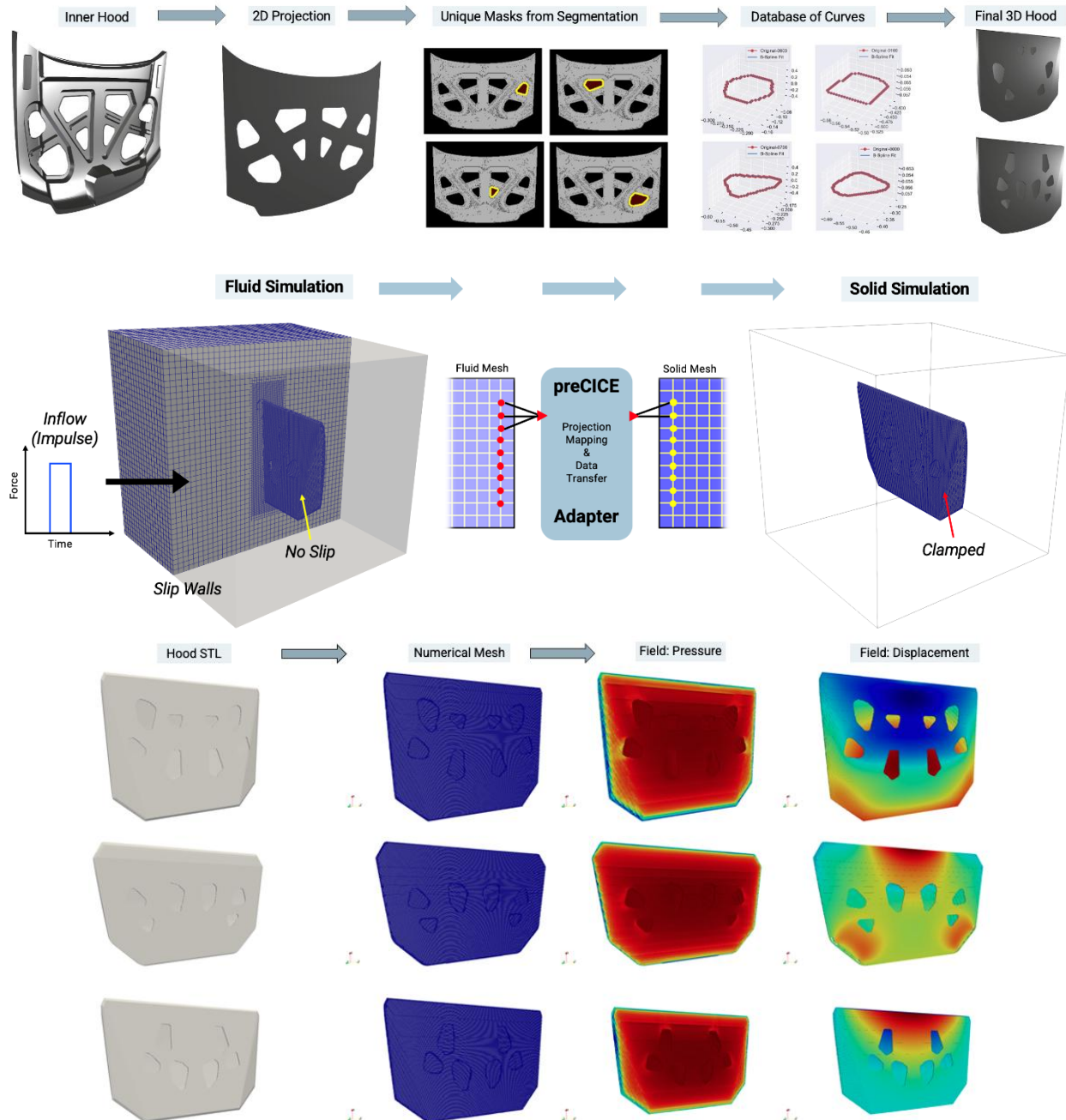
# Harish Jai Ganesh – Engineering Portfolio

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## Advanced Propulsion Concepts Lab | Ford Research and Innovation Center

### Undergraduate Researcher

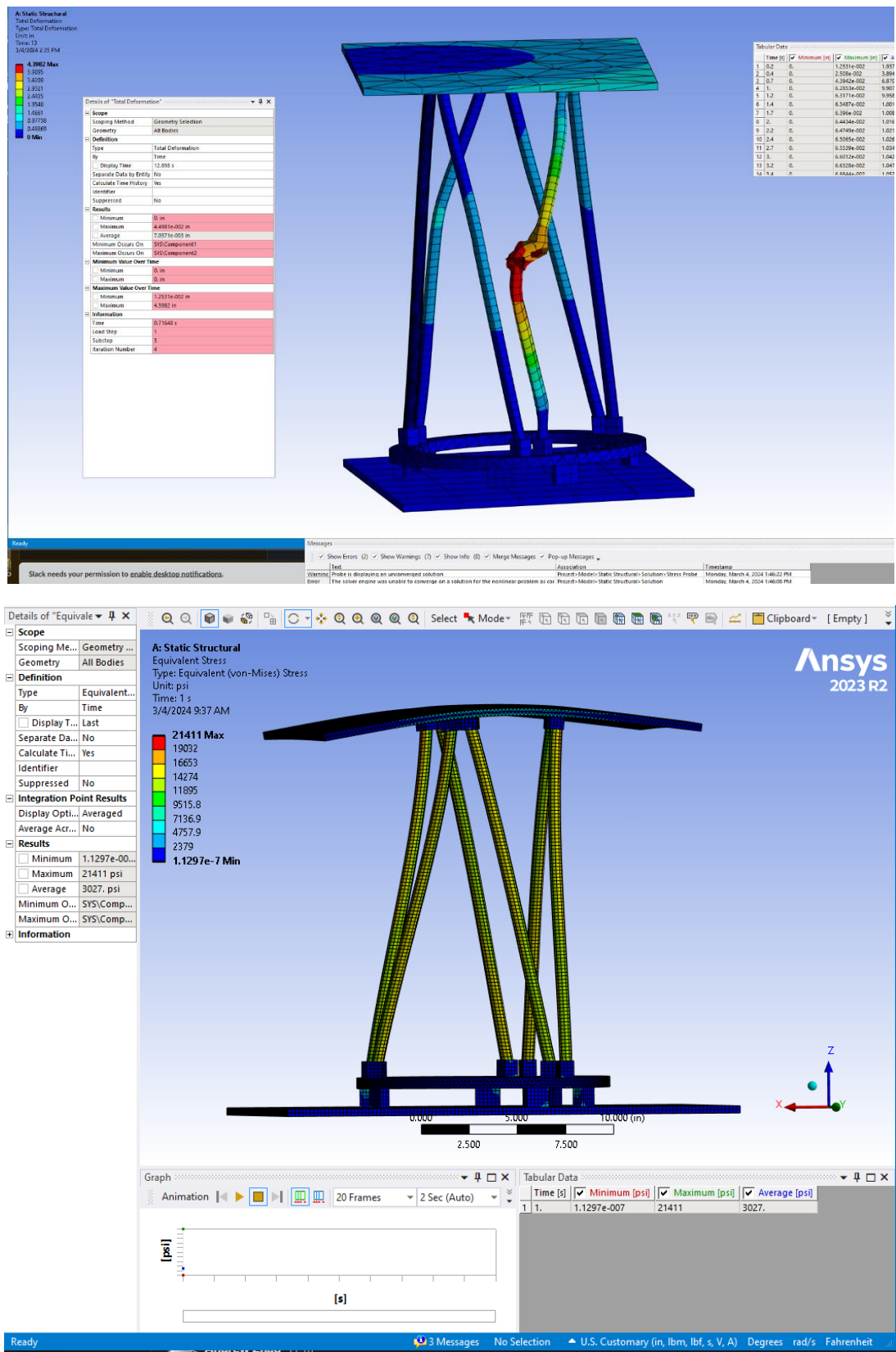
Showcasing the multiphysics simulation pipeline. 3D hood geometries (16000+ geometric variants) generated using a separate dataset as the base set. Meshes are generated for each of the hoods in the range of 750K cells for the complete fluid domain, and 400K for the solid domain. This coupled simulation 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 a new TTS to accommodate a 15% increased thrust while also creating a 3% weight reduction. Created analytical solutions to determine performance and verified using FEA. 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 the model aircraft wing. 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 be lower in the wind tunnel due to lack of better material for the airfoil skin.

