Marco Nanni

West Lafayette, 47906 - USA | mnanni@purdue.edu | +1 765 (715) 0879 | LinkedIn profile | Portfolio

Experience

Thermal and CFD Engineer, Purdue Space Program – West Lafayette, IN May 2024 – present

- Refined cooling channel geometry to reduce pressure drop by 10%, mitigating losses from high surface roughness of 3D-printed materials and ensuring sufficient tank pressure for sustained rocket flight.
- Led the redesign of a 3D-printed injector manifold—integrating test data, CAD revisions, and conducting ANSYS Fluent CFD analysis, achieving improved mixing and velocity distribution validated by water testing.
- Conducted Finite Element analysis of an F1 engine nozzle bolted assembly in ANSYS Workbench, verifying thermal/structural results within 2% of analytical predictions and 5% of experimental stress/expansion data.

Graduate Research Assistant, Herrick Laboratories – West Lafayette, IN Jan. 2024 – present

- Developed a validated multi-physics Simulink model of an Aerospike engine's thermal management system, integrating mechanical and thermal subsystems—including pumps, valves, cooling channels, and combustion chamber—to simulate transient behavior and assess system robustness under off-nominal conditions.
- Designed centrifugal pump components, achieving performance maps with 1%–5% accuracy compared to experimental data. Used key design parameters—such as blade geometry and velocity triangles—to generate the detailed CAD model.
- Engineered nozzle cooling channels to maintain wall temperatures within acceptable limits by optimizing aspect ratio along the nozzle length and adjusting the heat transfer coefficient to account for 3D-printed surface roughness.
- Conducted Fault Tree Analysis to identify potential failure modes in the thermal management system. Simulated these scenarios using the Simulink model to quantify their impact on system performance and analyze failure propagation across components.
- Improved system robustness by 10% through Simulink-driven evaluations of internal hardware failures. Implemented fault-tolerant control strategies with dynamic coolant mass flow adjustments to ensure thermal performance remained within mission-critical thresholds.

Teaching Assistant, Purdue University – West Lafayette, IN Aug. 2023 – May 2024

- Provided academic support and practical guidance in Thermodynamics, Fluid Dynamics, and Computational Fluid Dynamics (CFD), assisting students with applied engineering problem-solving.

Co-founder & Engineering Lead, Red Propulsion – Firenze, Italy Sep. 2022 – Aug. 2023

- Co-founded and led a 50-member multidisciplinary team in the complete design, construction, and testing of a solid rocket launcher. Developed medium- to long-term timelines, successfully launching the engine within 12 months of the team's formation.

Education

Purdue University, Master of Science in Aeronautical and Astronautical Engineering Expected May 2025
GPA: 3.9

Politecnico di Milano, Bachelor of Science in Aerospace Engineering March 2022
Final degree grade: 100/110

Publications

- Nanni, M., et al. *Development of a Damageable Numerical Engine Cooling System for Resilient Aerospike Rockets.* In preparation for submission to **International Conference on Environmental Systems**, 2025.

Skills

Programming & Simulation: MATLAB/Simulink, Python, ANSYS Fluent, ANSYS Workbench, Thermal Desktop

CAD & Modeling: SolidWorks, Fusion 3D, SpaceClaim, Autodesk Inventor