John "Jack" Sullivan

✉ sullivan.1041@osu.edu 🔗 linkedin.com/jacksullivan

EDUCATION

Ohio State University — May 2026
Ph.D. Aerospace Engineering — *Current GPA: 3.94/4.0*

Ohio State University — August 2021
B.S. Aerospace Engineering. Magna Cum Laude, with Honors Research Distinction — *GPA: 3.76/4.0*

COURSEWORK

Courses: Advanced Computational Fluid Mechanics, Fluid Mechanics, Numerical Methods for Hyperbolic Conservation Laws, Non-linear Systems Theory, Linear Systems Theory, Linear Mathematics in Finite and Infinite Dimensions, Hypersonics

SKILLS

Languages: Fortran 90, Matlab, Bash, LaTeX
Tools: Implicit Large Eddy Simulation, MPI Programming, Data-Driven and Operator Based Modal Decompositions, Time-Frequency Analysis, Statistical Analysis, Linux

PROJECTS

Simulation of Normal Shock Trains | *iLES, F90, MPI, Matlab, Linux* — May 2023 – Present
- Primary Ph.D. Thesis Project, using scale resolving simulations to analyze shock train unsteadiness.
- Augmenting existing iLES code by adding necessary boundary conditions, time marching, and damping procedures and creating suites of analysis routines to quantify shock-boundary layer interaction dynamics for internal flow configurations.
- Characterize the evolution of near wall turbulence, quantify the wall pressure fluctuations, and describe streamwise shock oscillations occurring in a spanwise homogeneous shock train.

Effect of Duct Aspect Ratio on Shock Train Interaction | *iLES, F90, MPI, Matlab, Linux* — May 2024 – Present
- Secondary Ph.D. Thesis Project, using scale resolving simulations to analyze effect of duct aspect ratio on structure of a Mach 2.0 shock train.
- Characterize the mean flow structure, with emphasis given to how separation and shock topology change as a function of aspect ratio.
- Also characterize the wall pressure signature, specifically focusing on changes to space time correlations and the scaling of observed frequency content

Pressure Fluctuations in a Transonic Diffuser | *iLES, F90, MPI, Matlab, Linux* — May 2024 – Present
- Tertiary Ph.D. Thesis Project, using DNS level simulations to quantify dynamics of a shocked transonic diffuser.
- Attention is given to the generation and propagation of pressure fluctuations by the unsteady normal shock/boundary layer interaction, by using statistical analyses and invoking an aeroacoustic analogy.

Analysis of Moving STBLIs | *iLES, F90, MPI, Matlab, Linux* — August 2020 – November 2023
- Developed a data-driven technique to improve model order reduction and system identification for problems dominated by wave translation.
- Method allows for frequency domain analysis of propagating shock wave/boundary layer interactions, with one possible application being analysis of scramjet unstart.
- Completed as first graduate school project, this was also a continuation of work started during my bachelor's thesis.

Parallelized mrDMD | *F90, MPI, Linux* — Spring 2022
- Developed a parallelized code capable of performing multi-resolution Dynamic Mode Decomposition.
- Used the TSQR matrix algorithm for efficient singular value decomposition across an arbitrary number of processors.
- Extracted tonal frequency content of a Mach 2 cavity flow at recursively finer time scales.

Experience

High-Fidelity Computational Multi-Physics Laboratory | *Graduate Research Associate*   Aug. 2021 – Present
Graduate student position in Ohio State's Mechanical and Aerospace Engineering Department.
Conducting research using high fidelity CFD methods and advanced post-processing techniques.
Advised by Professor Datta V. Gaitonde.

Air Force Research Laboratory | *Computational Science Intern*   Summers 2021 – Present
Performed computational research for the Air Force, focusing on high speed flow configurations
such as hypersonic cavities and scramjet isolators.

Air Force Research Laboratory | *Data Analysis Intern*   Summer 2019
Analyzed experimental data for turbine engine fluid-thermal systems.

B&B Landscaping | *Crew Chief*   2015 – 2019
Crew chief for neighborhood landscaping company.

Publications

Journal Articles

- Sullivan, Jack. "A Modal Decomposition Method for Non-Stationary Phenomena: Application to Evolving Shock Trains." Under Review.

Conference Papers

- Sullivan, John R., and Datta V. Gaitonde. "Mean Flow and Turbulent Statistics of a Spanwise Homogeneous Shock Train." AIAA SCITECH 2025 Forum. 2025.

- Sullivan, Jack, and Datta Gaitonde. "Model Order Reduction of Scramjet Isolator Shock Dynamics During Unstart." ASME International Mechanical Engineering Congress and Exposition. Vol. 86656. American Society of Mechanical Engineers, 2022.

- Sullivan, John R., Erika Nosal, and Datta V. Gaitonde. "Application of Modal Decomposition to the Non-Stationary Scramjet Unstart Problem." ASCEND 2021. 2021. 4095.

Conference Proceedings

- Sullivan, Jack, and Datta Gaitonde. "A Shift Procedure for Identifying Low Rank Behavior from Non-Stationary Dynamical System Data." Bulletin of the American Physical Society (2023).

Miscellaneous

Interests and Activities
Soccer, Squash, Chess, Biking, Ancient and Classical History