MADHAV SEHGAL

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EDUCATION

University of Michigan — Ann Arbor, MI
M.S.E. Aerospace Engineering — 2024 - 2026 (Expected)

Amity University — Uttar Pradesh, India
B. Tech Aerospace Engineering — 2020 - 2024

PUBLICATIONS

Published & Accepted

Sehgal, M. (2024, March 8). Revolutionizing Space Infrastructure: Lagrangian Bases for Sustainable Satellite Operations, Refueling Hubs, and Multiplanetary Mission Support Base Establishment. *2023 AIAA Regional Student Conferences*. https://doi.org/10.2514/6.2023-77024

Sehgal, M., Trikha, S., & Tripathi, S. (2024, April 27). Comparative Study of Natural Frequency of a C-141a-il Airfoil Wing and Cantilever Beam: Simulation and Experimental Investigation. In: Singh, S., Ramulu, P. J., & Gautam, S. S. (Eds.), *Recent Advances in Aerospace Engineering. MRAE 2023.* Lecture Notes in Mechanical Engineering. Springer, Singapore.
https://doi.org/10.1007/978-981-97-1306-6_28

Sehgal, M. (2019). Engineering using wireless sensor network to study dynamic discovery and avoidance using position verification method in code cloning. *International Journal of Inventions in Electronics & Electrical Engineering*, **5**(1-12), Article 10.
https://doi.org/10.13140/RG.2.2.23473.61280

Sehgal, M. (2018). RFID Adaptor For Detecting And Handling Data/Occasions In The Internet Of Things. *International Journal of Innovations in Applied Sciences & Engineering*, **4**, 196.
https://doi.org/10.13140/RG.2.2.36816.74245

Sehgal, M., Trikha, S., Gaur, V., Gahlot, N. K., Saluja, R. K., & Singh, N. (2024). Study of Shock-Wave Boundary-Layer Interaction Utilizing Hybrid Control. *Journal of Aeronautics, Astronautics and Aviation* (In Press)

Sehgal, M., Trikha, S., Gaur, V., Gahlot, N. K., Saluja, R. K., & Singh, N. Study of Shock-Wave Boundary-Layer Interaction Control using Dynamic Device with Variable Pressure and Inlet size. *International Conference on Future Learning Aspects of Mechanical Engineering.* (Accepted)

Bagri, G. P., **Sehgal, M.**, Sahoo, D., Singh, N., Saluja, R. K., & Gahlot, N. K. Numerical Study of Shock Train Effects on Mixed Compression Air Intake Performance. *International Conference on Future Learning Aspects of Mechanical Engineering.* (Accepted)

In Review

Vijay, A., Dsouza, L. F., **Sehgal, M.**, Saxena, B., Gahlot, N. K., Saluja, R. K., & Singh, N. Effect of Repeated Backward Facing Steps on Shock Wave Boundary Layer Interaction Control in a Rectangular Duct. *2025 AIAA SciTech.*

Sehgal, M., Trikha, S., Gaur, V., & Gahlot, N. K. Comparative Analysis of effects of Active and Passive Device Methodologies on Shockwave Boundary Layer Interaction Control. *Journal of Fluid Engineering*

In Preparation

Saluja, R. K., & **Sehgal, M.** Development of Advanced Hydrogen Storage Systems for Aerospace Applications and Integration with Hydrogen-Powered Propulsion Systems.

CONFERENCE PRESENTATIONS

American Institute of Aeronautics & Astronautics (AIAA) 2024 Region VII Student Conference *"Revolutionizing Space Infrastructure: Lagrangian Bases for Sustainable Satellite Operations, Refueling Hubs, and Multiplanetary Mission Support Base Establishment."* November 2023, University of New South Wales, Australia

The International Conference on Advancements in Aerospace Engineering 2024 (ICAAE - 2024) *"Study of Shock-Wave Boundary-Layer Interaction Utilizing Hybrid Control"* April 2024, Lovely Professional University, India

2nd International Conference on Modern Research in Aerospace Engineering (MRAE) 2024 *"Comparative Study of Natural Frequency of a C-141a-il Airfoil Wing and Cantilever Beam: Simulation and Experimental Investigation."* September 2023, Amity University, India

RESEARCH AND WORK EXPERIENCE

Centre for Airborne Systems, Defence Research and Development Organisation (DRDO)
Research Intern May 2023 - June 2023

- Conducted comprehensive literature analysis to identify best practices in the design and development of air-to-air refueling pod systems, resulting in a suggested design plan that increased efficiency.
- Collaborated with the engineering team to create a detailed implementation strategy for manufacturing AAR Pods in IL-78MKI for India, which would result in high-cost savings.
- Designed and 3D modeled AAR pod and analyzed CFD and vibrational characteristics of the pod.

Advanced Systems Laboratory, Defence Research and Development Organisation (DRDO)
Research Intern May 2022 - June 2022

- Developed an intricate 3D model of a space launch vehicle using SolidWorks, resulting in a more accurate and detailed representation for testing and evaluation.
- Conducted extensive modal analysis of a space launch vehicle and developed a report on the findings, identifying critical modes and providing recommendations for optimization using ANSYS APDL and MATLAB.
- Compared natural frequency results from experimental data and simulation models using ANSYS software, resulting in a 15% improvement in accuracy.

OrbitX India Pvt Ltd Aug 2022 - Nov 2023
Student Researcher

- Conducted Aerodynamic research on Reusable Launch Vehicles to simulate laminar flow over boosters of India's 1st Rocket, 'Atalyaan' during take-off and landing of boosters.
- Extracted 3.5% drag reduction by stimulating turbulence modeling, compared 3 different geometrical variations of booster at Mach 2, and concluded an optimal design for aerofoils.

Brahmastra Aerospace Systems July 2021 - Aug 2021
Industrial Intern

- Reviewed literature and conducted Computational Fluid Dynamics (CFD) Analysis of different aerofoils using ANSYS Fluent and compared the simulation results to that of experimental results from Wind Tunnel Testing.
- Concluded by performing CFD Analysis and Aerodynamic stability of custom-designed re-entry vehicle.

JarWiz Sep 2020 - Present
Founder/ Team Lead

- Founder-JarWiz Edtech: Currently developing an intelligent platform to interconnect students' co-curricular with academics using ANN for the overall development of the student. (Pre-Seed stage)
- Microsoft partnered startup getting incubation assistance and seeding from Microsoft.
- Team Lead: Led Team JarWiz to the victory of the Safety Award at NASA Human Exploration Rover Challenge (HERC) 2021, 1st runner-up in social media at HERC 2022, Winners of the Special Appreciation Award at NASA Space Apps Challenge 2020 and 2022, and participants in HERC 2023.
- Team Lead: NASA's Artemis Great Lunar Expedition for Everyone (GLEE) team to develop Lunar Satellites (LUNASAT) to be sent to the moon.

TECHNICAL SKILLS

Programming
C/C++, MATLAB, Python, Kotlin, R

Simulation
ANSYS (Mechanical APDL, Workbench, Fluent), ABAQUS, TecPlot, Origin

Modelling
SolidWorks, Fusion 360, AutoCAD, Gambit

Languages (R/W/S)
English, Hindi, German, Punjabi

PROJECTS

1. **NASA Human Exploration Rover Challenge**
As Team lead, designed and fabricated lunar rovers, winning Safety Award in 2021 and first runner-up for Social Media/STEM Engagement in 2022.

2. **NASA's Artemis Great Lunar Expedition for Everyone (GLEE)**
Team Lead for the project at the University and responsible for project completion and analysis of the LUNASAT to be placed in Lunar Orbit during the Artemis mission. (Colorado Space Grant Consortium)

3. **Miniature Amity Satellite System (MASS)**
Team Lead to design and deploy 3U CubeSat for space debris analysis and ozone layer imagery.

4. **NASA Space Apps Challenge**
Received Special Appreciation Certificates in 2020 and 2022 for development of web projects on satellite history and climate change.

5. **Shell e4 Net Zero Challenge**
Secured national runner-up position for business plan using UAVs, drones, and OceanBots to clean microplastics and convert them into fuel.

6. **AIAA Student Competitions 2023**
Participant in Single Aisle Aircraft Design, Mars Lander Designing, and Engine Design Competitions.

7. **World Robotics Championship 2023**
Participant for the Water Rocketry Challenge.

8. **IIT Kanpur Techkriti**
Participant in the Boeing Hovermania Challenge 2023.

9. **International Youth Math Challenge 2022**
Achieved Bronze Medalist for excellence in mathematical problem-solving.

10. **International Space and Astronomy Olympiad 2020**
Achieved 54th rank globally in the Olympiad.

11. **Additional Achievements**
Received Special Scholarship from Amity University, attained Silver Medalist status in Softball, served as student Organizing Secretary and Editor for conference abstract book of MRAE 2023.

POSITIONS OF RESPONSIBILITY

Founder-President/ Team Leader . . . . . JarWiz (2020-Present)
President . . . . . Airbenders: Rocketry Club (2023-2024)
Student Organizing Secretary Int. Conference on Modern Research in Aerospace Engineering (2023)
Class Representative . . . . . Amity University (2020-2024)
Student Placement Co-Ordinator . . . . . Amity University (2023-2024)
Member-Secretary . . . . . International Students Club, Amity University (2020-2021)
Professional Development Leader . . . . . Rotaract Club of Today's Young Leaders (2018-2019)
Head-Boy . . . . . Lancer's Convent School (2019-2020)

PROFESSIONAL MEMBERSHIPS

American Institute of Aeronautics & Astronautics (AIAA)
Royal Aeronautical Society (RAeS)
Institute of Electrical and Electronics Engineers (IEEE)

CONFERENCES ATTENDED

Modern Research in Aerospace Engineering (2023) . . . . . Student Organizing Secretary
HPAIR Harvard University Conference (2023) . . . . . Delegate/ Presenter
Science 20 (S20), During the G20 India Summit (2023) . . . . . Delegate
IUCN World Conservation Congress, Mersailles, France (2021) . . . . . Delegate

REFERENCES

Prof. M. S. Prasad
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Amity University Noida
Uttar Pradesh - 201313
India
Email: *msprasad@amity.edu*
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Dr. Rajesh Kumar Saluja
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