ABHINAV SHARMA

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EDUCATION

University of Michigan, Ann Arbor, MI
PhD in **Aerospace Engineering** with a focus on **Rotorcraft Aeromechanics,** GPA: 3.76/4.00 — Sep 2019
- Topic: **Development and application of a comprehensive simulation for modeling helicopter ship landing**
- Adviser: Prof. Peretz P. Friedmann

University of Michigan, Ann Arbor, MI
M.S.E. in **Aerospace Engineering** with a focus on **Structures,** GPA: 3.76/4.00 — Dec 2016

The University of Iowa, Iowa City, IA
B.S.E in **Mechanical Engineering** with focus on **Design**, GPA: 4.04/4.00 — May 2015
Minor: **Mathematics**

CONTRACTS / HONORS

DOD FY 2022 STTR Phase I, Contract W911NF-22-P-0083 — Sep 2022 – March 2023
- Title: Rapid Optimization and Trade Space Framework for Adapting Aero-Structures
- Award Amt: $172,730.00
- Research Institute Partner: Prof. Joaquim R. R. A. Martins, University of Michigan
- https://www.sbir.gov/node/2319853

NASA FY 2021 SBIR Phase I, Contract 80NSSC21C0396 — May 2021 – Nov 2021
- Title: Multidisciplinary Design Optimization Framework for DEP Aircraft Including Flight Controls
- Award Amt: $124,984.00
- https://www.sbir.gov/node/2116627

Rackham International Student Fellowship, University of Michigan, Ann Arbor — Jan 2017
- $10,000.00 award to support outstanding international students
- Nomination submitted by Department of Aerospace Engineering

Graduation with highest distinction, The University of Iowa — May 2015
- Requirement: Graduate with a GPA that places you in top 2% of graduating class

Student Employee of the Year Certificate of Appreciation, The University of Iowa — April 2014
- Nomination submitted by research supervisor

Best Research Open House Student Poster Award, The University of Iowa — April 2014

Best Supporting Undergraduate Research Assistant, Virtual Soldier Research — Dec 2013

Mechanical Engineering Undergraduate Leadership Award, The University of Iowa — April 2013

President's List, The University of Iowa — May 2012, Dec 2012, May 2013, Dec 2014
- Requirement: Achieve 4.00 GPA for two consecutive semesters

Dean's List, The University of Iowa — Every semester from Fall 2011 – Spring 2015
- Requirement: Achieve GPA of 3.5 or higher during a semester

National Scholars Award, The University of Iowa — Every semester from Fall 2011 – Spring 2015
- Scholarship awarded upon admission based on high school academic performance

John C. Tonkinson Engineering Scholarship, Alumni Donor Jane Tonkinson — Aug 2013

Thomas Farms Scholarship Fund, The University of Iowa College of Engineering — Aug 2012

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PROFESSIONAL AFFILIATIONS

Vertical Flight Society (VFS)
- Modeling & Simulation Technical Committee   May 2021 - Present
- Reviewer for Journal of American Helicopter Society   April 2021 - Present
- General Member   Oct 2017 - Present

American Institute of Aeronautics and Astronautics (AIAA)
- General Member   Oct 2013 - Present

EXPERIENCE

Research and Development in Rotorcraft, Fixed-Wing and eVTOL Aeromechanics   **Feb 2020 – Present**
Staff Associate, Continuum Dynamics, Inc., Ewing, NJ
- Perform R&D in rotorcraft and fixed-wing aeromechanics with a focus on flight dynamic modeling, simulation, control and multidisciplinary design optimization
- Prepare deliverables for government and industry clients including software, presentations, reports, publications
- Prepare, submit, and lead R&D proposal efforts in response to solicitations from government agencies

Design and Development of Electric Vertical Take-Off and Landing (eVTOL) Aircraft   **Nov 2019 – Jan 2020**
Lead Aerodynamics, Controls and Simulations Engineer, Airspace Experience Technologies, Inc., Detroit, MI
- Prepared detailed plan for flight dynamic and control simulation framework for full-scale MOBi-One eVTOL aircraft
- Performed conceptual sizing of full-scale demonstrator aircraft
- Coordinated with electric vehicle part suppliers on requirements and identified applicable solutions

Modeling and Simulation of Rotary Wing Vehicles in Maritime Environments   **Jan 2017 – Sep 2020**
Graduate Research Assistant, University of Michigan, Ann Arbor, MI
- Developed expert understanding of high-fidelity physics-based helicopter flight mechanics code written in Fortran
- Integrated CFD based aerodynamic model for wind-over-deck into fuselage, empennage, main and tail rotor models
- Implemented LQR based flight control system to stabilize vehicle dynamics and maintain prescribed trajectory
- Simulated actual touchdown of UH-60A Blackhawk on moving deck by introducing landing gear model
- Incorporated finite-state ground effect model into simulation to investigate influence of inclined and moving decks
- Uncovered decrease of 17% in main rotor power requirements near moving ship decks

Numerical and Experimental Testing of Morphing Concepts   **July 2015 – Aug 2016**
Graduate Research Assistant, University of Michigan, Ann Arbor, MI
- Performed numerical finite element modal sensitivity analysis on bio-inspired feather shaft using ANSYS APDL
- Carried out frequency sweeps and wind tunnel tests to characterize frequencies of piezoelectric morphing trialing edge concept
- Completed tests to isolate noise sources in experimental setup
- Successfully demonstrated usefulness of DSPACE MicroLabBox control unit through proof of concept

Engineering Design of a Construction Skid Steer Bucket   **Aug 2014 – May 2015**
Senior Design Project Sponsored by John Deere Dubuque Works, The University of Iowa, Iowa City, IA
- Proposed and tested various geometrical changes using CAD in redesign of construction skid steer bucket
- Led team efforts towards project completion on rotational basis throughout project duration
- Recommended three designs to project sponsors that maximized overfill capacity and minimized spillage

Engineering Design and Validation of an Automotive Steering Knuckle   **June 2014 – July 2014**
Design Engineer Intern, Concept 2 Reality (C2R) Engineering S.A.S, Medellin, Colombia
- Developed and validated custom steering knuckle design for Ford Fiesta R3T rally car using CAD and FEM
- Evaluated different materials for knuckle's manufacturing and investigated local availability
- Numerous uprights based on validated design have been manufactured and are actively in use on rally courses

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Software Development and 3D Visualization of Virtual Warfighters   **May 2012 – May 2014**
Undergraduate Research Assistant, Virtual Soldier Research, The University of Iowa, Iowa City, IA
- Expanded capabilities of warfighter simulation software through integration of physics engine platform
- Supervised team of two interns in project and laid out tasks for project execution
- Implemented complete real-time musculoskeletal model in commercial version of software using C++ and C#
- Developed specifications for optics and computing infrastructure for fully immersive VR environment

LEADERSHIP

University of Michigan Graduate Rackham International (GRIN)   **May 2016 – May 2019**
Served as Co-President, Vice President, Professional Development Chair, Secretary

University of Michigan Aerospace Graduate Student Advisory Committee (GSAC)   **May 2017 – April 2018**
President

The University of Iowa American Institute of Aeronautics and Astronautics (AIAA)   **Aug 2011 – May 2015**
Served as President, Project Lead, Secretary

Mortar Board National College Senior Honor Society   **April 2014 – May 2015**
Served as Chair of Mom of the Year and Huit Awards

Golden Key International Honour Society   **May 2014 – May 2015**
Vice President

National Society of Black Engineers (NSBE)   **Aug 2011 – May 2015**
Served as Fundraising Committee Chair, Webmaster

University of Iowa Dance Marathon   **Sep 2014 – May 2015**
General fundraising member

Omicron Theta Tau Engineering Fraternity   **May 2014 – May 2015**

University of Iowa Walk It Out Fashion Show   **Jan 2012 – May 2013**
Model for African Culture Group

SKILLS

- Languages (English, French, Spanish, Hindi)
- Flight controls
- Aircraft design
- Flight dynamics
- Multidisciplinary design optimization
- Modeling, simulation, and control
- Ship-helicopter dynamic interface
- CAD modeling
- FEM
- CFD
- Controls (DSPACE, Simulink, ControlDesk, LabView)
- Electrical testing (digital multimeters, oscilloscopes, bench top power supplies)
- Rapid prototyping (CNC milling, 3D printing)
- Software (MATLAB, FORTRAN, C, C++, C#, Java, Python, Linux, Mac OS, Visual Studio, XIL API, FaceFx, Unity3D, Virtools 5.0)

PUBLICATIONS AND PRESENTATIONS

- **Sharma, A.**, Keller, J. D. and Martins, J. R. R. A, "MDO Framework for DEP Aircraft Design Including Flight Controls," *Proceedings of AIAA SciTech 2023 Forum*, 23 -27 Jan, 2023, National Harbor, MD. https://doi.org/10.2514/6.2023-1364.

- Keller, J. D., **Sharma, A.**, Wachspress, D. A., Horn, J. F. and Theron, J. P., "Toward an Urban Air Mobility Ride Quality and Safety Assessment Analytical Tool," *Proceedings of 9th Biennial Autonomous VTOL Technical Meeting and 8th Annual eVTOL Symposium*, 26-28 Jan, 2021, Virtual Event.

- **Sharma, A.**, Padthe, A., and Friedmann, P. P., "Helicopter Shipboard Landing Simulation Including Wind, Deck Motion and Dynamic Ground Effect," *Journal of Aircraft*¸ Vol. 58, No. 3, May, 2021*.* https://doi.org/10.2514/1.C035973.

- **Sharma, A.**, Padthe, A., and Friedmann, P. P., "Simulation of Helicopter Hover and Landing on a Moving Ship Deck using a Dynamic Ground Effect Model," *Proceedings of AIAA SciTech 2020 Forum,* 6-10 Jan, 2020, Orlando, FL. https://doi.org/10.2514/6.2020-1137.

- **Sharma, A.**, *Development and Application of a Comprehensive Simulation for Modeling Helicopter Ship Landing,* Ph.D. Dissertation, University of Michigan, Ann Arbor, MI, Dec, 2019.

- **Sharma, A**., Xu, J., Padthe, A., Friedmann, P. P. and Duraisamy, K., "Simulation of Maritime Helicopter Dynamics During Approach to Landing with Time-Accurate Wind-Over-Deck," *Proceedings of AIAA SciTech 2019 Forum,* 7-11 Jan, 2019, San Diego, CA.

- **Sharma, A.**, Dani, A., Mathai, A., Marler, T., and Abdel-Malek, K., "Towards Implementing a Real-time Deformable Human Muscle Model in Digital Human Environments." *Proceedings of Advanced Human Factors and Ergonomics Conference,* July 2015, Las Vegas, Nevada.

- **Sharma, A.**, Dani, A., Mathai, A., Marler, T., and Abdel-Malek, K., "Incorporating a real-time Musculoskeletal System in Santos", Poster, *The University of Iowa College of Engineering Research Open House*, April 2013.

- **Sharma, A.**, Mathai, A., and Abdel-Malek, K., *"*Facial Animation and Physics Engine Integration in Virtual Soldier Software*",* Poster, *The University of Iowa College of Engineering Research Open House,* April 2012.