

**PROFESSIONAL EXPERIENCE****AIAA Space Automation and Robotics Technical Committee (SARTC)****Chair***November 2023 – Present*

- Lead of the AIAA SARTC, responsible for organizing and conducting biannual committee meetings, steering the committee's activities, and communicating to AIAA about SARTC's annual outputs.

**Treasurer/Secretary***November 2021 – November 2023*

- Executive team member for the AIAA technical committee responsible for writing the annual Aerospace America review article, recording meeting notes, and maintaining the committee's budget.

**ROBOSAM LLC****Boston, MA****Founder & CEO***July 2020 – June 2023*

- I founded a company, ROBotic On-orbit Servicing, Assembly, and Manufacturing LLC (ROBOSAM LLC), to consult on in-Space Servicing, Manufacturing, Assembly, Robotics, and Transportation (SMART) endeavors.
- Consulting as an organizer of the Space SMART Think Tank focused on answering the following questions: "What would the future of space look like with in-space SMART?", "Why would it look like that?", and "How do we get there?"
- Defense Innovation Unit: Consulting as an Operations Research Analyst to aid in selection of companies for various solicitations. Co-chaired the In-Space Transportation & Logistics working group for the State of the State Industrial Base 2022 workshop and wrote corresponding section of the final report.

**NASA Goddard Space Flight Center****Greenbelt, MD****Internship - Science Applications International Corporation***May – August 2022***On-Orbit Servicing, Assembly, and Manufacturing-1 (OSAM-1)**

- Exhaustive literature review of ISAM space telescope concepts spanning 4 decades and 141 papers.

**U.S. Naval Research Laboratory****Washington, DC****Internship - Naval Center for Space Technology, Robotics and Machine Learning Section***May – August 2021***Robotic Servicing of Geosynchronous Satellites (RSGS)**

- Developing a MATLAB data processing and plotting system for RSGS integration and testing.
- Aiding in operational testing of flight and engineering development robotics, including force torque sensor calibration and verification, compliance control, anomaly resolution, and functional checkout testing.
- Programing a KUKA industrial robot to perform repeated paths for visual servoing testing of a Marman ring to aid capture for rendezvous proximity operations.

**NASA Jet Propulsion Lab****Pasadena, CA****Co-op – Robotic Vehicles and Manipulators Group***September – December 2019***Persistent Robotically Operated Platform for Science (PROPS)**

- Created controls system for an active precision pointing system, comprised of four linear actuators connecting the top and bottom plates of the pallet, to maintain instrument attitude within  $\pm 3$  millidegrees while counteracting disturbances under 1 Hz.
- Conducted testing and created sequences for robotic arm maneuvers including end over end walking, instrument manipulation, and the complete autonomous assembly of a 2.5-meter starshade mockup.

**Internship – Robotic Vehicles and Manipulators Group***June – August 2018***Persistent Robotically Operated Platform for Science (PROPS)**

- Designed and tested components for a hybrid passive isolation and active pointing system for a modular satellite's pallet. Designed, computationally validated, and created experimental testing plans for passive loop flexures used to mitigate high frequency motion.
- Designed electrical motor controller system with encoder feedback for four pointing stepper linear actuators and prototyped an attitude measurement system using a commercially available camera and AprilTag markers as proxy for a star tracker and stars, respectively.

## National Academies' 2020 Astronomy & Astrophysics Decadal Survey

### NASA in-Space Assembled Telescope (iSAT) Study Member

October 2018 – July 2019

- The iSAT Study was chartered to answer the question: “When is it advantageous to assemble space telescopes in space rather than to build them on the Earth and deploy them autonomously from individual launch vehicles?”
- Succinctly summarized weekly telecon and face to face meeting discussions and organized progress from subsystem teams (robotics, structures, optical, spacecraft, etc.) to assuring any requirements were conveyed between teams.
- Wrote 200-page internal study report, collecting all the study findings, insights, and recommendations.

### **NASA Langley Research Center**

**Hampton, VA**

### Internship – Robotic In-Space Assembly Research and Development

June – August 2019

#### Highly Organized Multi-agent Enclosures (HOME)

- Worked with 2 other interns to develop 2 soft robot modules that could change their shape, translate via rolling motion produced by sequential bladder inflation, join together, and rigidize into a final shape by cooling embedded thermoplastic.

#### Lunar Crane, Lander Payload Manipulation, and Rover Changing Demonstration

- Lead team of 7 interns and contractors in completing a demonstration where a miniature version of the Lightweight Surface Manipulation System (LSMS-mini), small lunar crane, was mounted to the platform of a mock-lunar lander and performed tasks such as unloading payloads onto the back of a rover, swapping end effectors, charging the rover, and deploying ground solar panels.

### Co-op – Robotic Assembly of Space Structures

May – December 2017

#### Commercial Infrastructure for Robotic Assembly and Servicing (CIRAS)

- Lead team in conducting a successful demonstration of NINJAR 2.0 in which it precisely positioned eight truss joints then team members attached struts between the joints to complete the truss bay. Precision of assembled truss was within 5-mm and 3-deg of the reference truss.
- Conducted a more advanced demo – a tele-operated trial in which a truss bay was constructed by a team of three robots: NINJAR, the Strut Assembly, Manufacturing, Utility & Robotic Aid (SAMURAI), and the Lightweight Surface Manipulation System (LSMS). Team members operated the robots with controllers: SAMURAI was an end effector of LSMS and handed off truss joints and struts to NINJAR.

#### Assembly of Space SystemS By using Locomotion and Error-correction for Robustness (ASSEMBLERS)

- Designed and made renders for in-space robotic assembly concepts using Creo Parametric - optimized Stewart platform robot and cut weight by 65% from previous designs by using lightweight materials such as carbon fiber and plastic 3D printed components.
- Lead team of interns and contractors in building two robots, each comprised of four Stewart platform units stacked on top of each other.

### Internship – Robotic Assembly of Solar Array Modules by a Team of Robots

May – August 2016

- Designed, built, and tested components for a teleoperated trial in which a team of robots, consisting of LSMS (a long reach manipulator) and an Intelligent Precision Jigging Robot (IPJR), assembled solar array modules onto a backbone truss.
- Rapidly prototyped designs for the interfacing elements of the two robots, utilizing a MakerGear M2 3D printer, a waterjet, Arduinos, and breadboards to allow for quick iteration of hardware and software, maximizing verification time.

## **PUBLICATIONS** († = Co-First Authors)

- (Abstract Accepted, Submitting Manuscript for Review May 1, 2024) **Chapin S.**, Chapin W., and Komendera, E., "Model Informed and Fiducial Aided Simultaneous Localization and Mapping for Robotic In-Space Assembly and Servicing of Large Truss Structures" *Frontiers Robotics and AI Journal*. Semantic SLAM for Mobile Robot Navigation Topic. 2024
- (Submission in Progress) Everson, H.†, **Chapin S.**†, Chapin W., and Komendera, E., "Built On-orbit Robotically-assembled Gigatruss (BORG): Ground Robotic Demonstration" *Journal of Field Robotics*. 2024
- B. Beach, W. Chapin, **S. Chapin**, R. Hildebrand, E. Komendera. "Force-Controlled Pose Optimization and Trajectory Planning for Chained Stewart Platforms" *Frontiers in Mechanical Engineering*. 2023

- **Chapin S.**, Everson, H., Chapin W., Quartaro A., and Komendera, E., "Built On-orbit Robotically-assembled Gigatruss (BORG): Mixed Assembly Architecture Trade Study" *Frontiers Robotics and AI Journal. Robotic In-Space Servicing, Assembly and Manufacturing Topic*. 2023
- C. Henshaw, **S. Glassner**, B. Naasz, B. Roberts. *Grappling Spacecraft*. *Annual Review of Control, Robotics, and Autonomous Systems* 2022 5:1, 137-159
- **S. Glassner**, L. Farah, D. Fisher, W. Spencer, E. Traini, M. Minus, 2020. *International Space Station Servicing Robot*. *International Space Station Research and Development Conference*. Online Series.
- H. Everson, J. Moser, A. Quartaro, **S. Glassner**, E.E. Komendera, 2020. *Autonomous Multi-Robot Assembly of Solar Array Modules: Experimental Analysis and Insights*. 2020 IROS
- Moser J, Cooper J, Neilan J., Chapin W., **Glassner S.**, Komendera E. A Reinforcement Learning Approach for the Autonomous Assembly of In-Space Habitats and Infrastructures in Uncertain Environments. 22<sup>nd</sup> IAA Symposium on Human Exploration of the Solar System. *International Astronautical Conference*. 2019
- R. Mukherjee et. al., "When is it Worth Assembling Observatories in Space?," White Paper Submitted to the National Academies' 2020 Decadal Survey on Astronomy and Astrophysics, 2019.  
[https://exoplanets.nasa.gov/exep/technology/in-space-assembly/iSAT\\_study/](https://exoplanets.nasa.gov/exep/technology/in-space-assembly/iSAT_study/)
- E. E. Komendera, S. Adhikari, **S. Glassner**, A. Kishen and A. Quartaro, "Structure assembly by a heterogeneous team of robots using state estimation, generalized joints, and mobile parallel manipulators," *2017 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Vancouver, BC, pp. 4672-4679.
- Dumond D.; **Glassner S.**; Holmes A.; Petty D.C.; Awiszus T.; Bicks W.; Monagle R. "Pay it forward: Getting 3D printers into schools," *Integrated STEM Education Conference*, Princeton, NJ, 2014 IEEE
- Geyer A.; Sidman J.; Dumond D.; Rousseau J.; Monagle R.; Awiszus T.; Petty D.; **Glassner S.** "Promoting STEM education through local school-industry collaboration: An example of mutual benefits," *Integrated STEM Education Conference (ISEC)*, Princeton, NJ, 2014 IEEE

## **WORKSHOPS**

- J. Olson, S. Butow, E. Felt, T. Cooley et. al., "STATE OF THE SPACE INDUSTRIAL BASE 2022 FINAL REPORT: Winning the New Space Race for Sustainability, Prosperity and the Planet", Defense Innovation Unit. August 2022. Karl Stolleis and **Samantha Glassner** Co-Chairs and Authors of "IN-SPACE TRANSPORTATION & LOGISTICS" section Pages 58-65.
- R. Mukherjee, **S. Glassner**, J. Grunsfeld, J. Parrish, H. Thronson. *In-Space Servicing, Manufacturing, Assembly, Robotics, and Transportation (SMART)*. IAC 2021.
- **S. Glassner**, G. Raiola, R. Mukherjee, S. Backus, A. Brinkman, T. Setterfield, 2020. *Starshade Analog Robotic Assembly Demonstration*. *Robotic In-Situ Manufacturing, Structural Assembly and Servicing (RISMSAS)* ICRA 2020 Workshop
- Komendera, E.E., **Glassner, S.**, 2017. *Autonomous In-Space Manipulation and Assembly with Task Distribution, Parallel Manipulation, and Error Correction*. *Robotics: Science and Systems (RSS 2017)*, Workshop: Bridging the Gap in Space Robotics, Cambridge, MA.
- Komendera, E.E., **Glassner, S.**, 2017. *Addressing Communication Lapses During Collaborative Manipulation in Autonomous Assembly and Deployment*. *Robotics: Science and Systems (RSS 2017)*, Workshop: Robot Communication in the Wild, Cambridge, MA.

## **ARTICLES**

- **S. Chapin**, E. Komendera, J. Shi, "Space Robotic Arms and Rovers Push the Limits of Lunar Exploration" *Aerospace America Year In Review*, AIAA SARTC. 2023
- **S. Glassner**, E. Komendera, J. Shi, "Robotics for in-space servicing, assembly and manufacturing is key for sustainable space infrastructure" *Aerospace America Year In Review*, AIAA SARTC. 2022

## **PATENTS**

- (*Pending*) Spencer Backus, Gregory S. Agnes, Russell G. Smith, Eric T. Sunada, Blair J. EMANUEL, Rudranarayan M. MUKHERJEE, **Samantha H. GLASSNER**, Timothy P. SETTERFIELD. Precision pointing interface. US20220348359A, 2022
- (*Pending*) James H. Neilan et al. Modular and reconfigurable assembler system for autonomous in-space assembly. US20220091593A1. 2021

## **EDUCATION AND RESEARCH**

**Virginia Polytechnic Institute and State University** GPA 3.567

**Blacksburg, VA**

*Candidate for Doctor of Philosophy, Mechanical Engineering*

*August 2020 – Present*

*PhD Dissertation – Robotics for In-Space Assembly and Servicing*

*Expected Graduation: May 2024*

- Funded Graduate Research Assistant of the Field and Space Experimental Robotics (FASER) Laboratory. Conducting research for model informed and fiducial aided graph simultaneous localization and mapping (SF-GraphSLAM) for robotic in-space assembly and servicing of large truss structures.

**Northeastern University** GPA 3.336 (BS), 3.556 (MS)

**Boston, MA**

*Bachelor of Science / Master of Science in Mechanical Engineering, Concentration in Mechatronics*

*July 2015 - May 2020*

**Relevant Courses:** Advanced Control Engineering, Dynamics and Vibrations, Mechatronic Systems, Mobile Robotics, Soft Robotics, Thermal System Analysis Design, Mechanical Engineering Computation and Design, Thermodynamics, Mechanics of Materials, Power Electronics, Russian 1

*Mechatronics Masters Thesis – Soft Stewart Platform (SSP)*

*September 2018 – May 2020*

- Designed and prototype a Soft Linear Actuators (SLAs) with precision length control. Six SLAs form a SSP robot to achieve precise 6 Degrees of Freedom (DOF) position control. A soft end effector for a long reach manipulator to allow it to precisely interact with fragile materials such as Kapton used for space telescope sunshields and multiple SSPs could be stacked to form a modular mobile robot.

## **TECHNICAL SKILLS**

- Fabrication:** Mill, Lathe, Composites (Carbon Fiber/Fiberglass/Kevlar), 3D Printer, Laser Cutter, Welder
- Computer Aided Design:** SOLIDWORKS Professional Certificate (ID: C-4U5SH57BA9), Creo Parametric, Autodesk Inventor
- Software & Programming:** Python, MATLAB, Robot Operating System, KUKA Robot Language, C++, Julia, Java, Pascal

## **ORGANIZATIONS AND LEADERSHIP**

**BattleBots – Team SawBlaze**

- Team Member (Spring 2020-Present):* Contribute to design and construction of robot and annually compete at the BattleBots World Championship. 2023 World Championship VII Winners!

**For Inspiration and Recognition of Science and Technology (FIRST) Tech Challenge**

- Mentor (Fall 2021-Fall 2022):* Volunteer mentor of Team 4924: The Red Beard Pandas, built of 13 middle/high school students.

**Museum of Science, Boston**

- Tech Studio Volunteer (2012-2020):* Engaged 200+ visitors every Sunday morning in hands-on engineering/computer science activities.

**American Society of Mechanical Engineers (ASME)**

- SOLIDWORKS Instructor (2016 – 2020):* Taught weekly class, preparing 35+ students for the Certified SOLIDWORKS Associate exam.

**American Institute of Aeronautics and Astronautics (AIAA)**

- NASA Student Launch Team Leader (2016-2017):* Managed 20 students in designing/building a rocket/payload for the NASA competition.

**Institute of Electrical and Electronics Engineers (IEEE)**

- Executive Board Member - Outreach Coordinator (2017):* Ran about two STEM outreach events per month.

**Team Swinburne (Australian Electric Formula SAE Racecar Team)**

- Manufacturing Award (2015 Study Abroad):* for outstanding commitment and work constructing the ts\_15 carbon fiber/aluminum honeycomb monocoque chassis using a variety of composite techniques (pre-preg, wet lay-up, and resin infusion).

## **HOBBIES**

- BattleBots, Restoring Vintage Arcade Machines, Cosplay/Wearable Tech, Droids, and Powerlifting