Adarsh Somayaji

(612) 735-2763 adarshs33@gmail.com Minneapolis, MN 55414 adarsh-somayaji

Aspiring R&D engineer with extensive experience in 3D printing, robotics, and biomechanics, eager to contribute to the development of next-generation medical devices that enhance surgical precision and patient outcomes

EDUCATION

University of Minnesota, Twin Cities *Minneapolis, MN*

PhD in Mechanical Engineering, GPA: 3.8/4.00 Sep 2020 - Jul 2025

Thesis: 3D Printing High-Fidelity Human Tissue Simulants for Medical Simulation Training

Relevant Courses: 3D Computer Vision, Advanced Control Systems Design, Feedback Control Systems

Indian Institute of Technology, Madras (IIT-M) *Chennai, India*

B.Tech & M.Tech in Biomedical Engineering Design, GPA: 9.1/10.00 Aug 2015 - May 2020

Thesis: Design & Analysis of a Variable Stiffness Soft Robotic Grasper for Medical Applications

SKILLS

Programming	C, Python, MATLAB, Wolfram Mathematica, VBA, Arduino
CAD/ FEA	Solidworks, Autodesk Inventor, Autodesk 3ds Max, Abaqus
Experimental Techniques	3D Printing - FDM, SLA, DIW; Characterization - Mechanics, Rheology, DLS, Microscopy

PUBLICATIONS

1. (Under review at Science Advances) **Somayaji, A.** et al., 2025. 3D Printed Tissue Simulants with Embedded Fluid Capsules for Medical Simulation and Training.
2. Chandrasekaran, K., **Somayaji, A.** and Thondiyath, A., 2021, April. Design of a Flexure-Based Compliant Grasper for the Master Arm of a Surgical Robot. In Frontiers in Biomedical Devices (Vol. 84812, p. V001T12A007). American Society of Mechanical Engineers. DOI: 10.1115/DMD2021-1037
3. Chandrasekaran, K., **Somayaji, A.** and Thondiyath, A., 2021. A Novel Design for a Compliant Mechanism Based Variable Stiffness Grasper Through Structure Modulation. Journal of Medical Devices, 15(1), p.014501. DOI: 10.1115/1.4049309
4. Chandrasekaran, K., **Somayaji, A.** and Thondiyath, A., 2018, April. Realization of a statically balanced compliant planar remote center of motion mechanism for robotic surgery. In Frontiers in Biomedical Devices (Vol. 40789, p. V001T07A011). American Society of Mechanical Engineers. DOI: 10.1115/DMD2018-6911

PATENTS

- **Somayaji, A.**, Chandrasekaran, K., and Thondiyath, A., A compliant mechanism-based variable stiffness soft robotic grasper, Patent No: 506953 (Indian Patent Office)

GRADUATE RESEARCH EXPERIENCE

Extrusion 3D Printing of Microcapsules for Payload Delivery Jan 2024 - Nov 2024

- Analyzed the rheology of capsule-gel suspensions and the mechanics of capsule shells to refine extrusion properties
- Devised a 3D printing methodology for embedding fluid-laden capsules within tissue simulants to simulate bleeding

3D Printing High Fidelity Human Tissue Simulants with Directional Anisotropy Aug 2021 - Aug 2024

- Developed a comprehensive workflow from CAD modeling to physical production for conformal 3D printing of macroscale tissue simulants, enhancing predictive anisotropic mechanics through microstructural manipulation
- Performed extensive characterization of polymer rheology to create ink formulations that maintain near-identical printability while achieving a 100-fold variation in post-cure elastic modulus
- Conducted a usability study in a surgical training environment, that demonstrated superiority of 3D printed tissue simulants compared to existing solutions

Dynamic Slicing & Toolpathing Algorithm for 3D Printing Organ Models May 2022 - Dec 2022

- Engineered a slicing algorithm for creating non-planar 3D printing slices tailored to the geometry of target objects
- Developed a histology-based toolpathing algorithm using recursive depth-first search, enabling layers to be filled with cellular microstructures that replicate the directional mechanics of human tissue

Direct Ink Writing on Non-Planar Substrates Aug 2021 - May 2022

- Investigated the shape and micro-dimensions of extrusion 3D-printed structures on inclined and curved substrates
- Developed and validated an empirical model to adjust 3D printing parameters based on local substrate gradients and material rheology, enhancing deposition accuracy on non-planar surfaces

UNDERGRADUATE RESEARCH EXPERIENCE

Design & Analysis of a Variable Stiffness Soft Robotic Grasper Jun 2019 - May 2020

- Designed a compact, fully self-contained variable stiffness grasper, offering fine, rapid, and continuous jaw stiffness control via a simple mechanical input
- Conducted extensive bench testing to validate FEA models and assess grasping capabilities for performing both force and form grip closure

Monolithic Remote Centre of Motion Mechanism for Robotic Surgery May 2017 - Nov 2017

- Developed a flexure-based, statically balanced compliant mechanism to achieve a remote center of motion, enhancing precision in robot-assisted surgeries

PROFESSIONAL EXPERIENCE

Product Development Intern, Shira MedTech Pvt. Ltd. Dec 2018 - May 2019

- Identified unmet clinical needs through immersion, market analysis, and interviews with medical professionals
- Prototyped a device to facilitate prone position ventilation therapy in diverse settings with minimal training

HONORS & AWARDS

- One of 10 nationwide recipients of the Indian National Academy of Engineering (INAE) Innovative Projects Award 2020
- Recipient of R Singaperumal Endowment Award for best Masters thesis project in Engineering Design 2020
- Winner of the Indian Rover Challenge 2019