





# Siril Teja Dukkupati

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## EDUCATION

### McGill University

Montreal, CA

*Ph.D. in Mechanical Engineering*

*Jan. 2022 – Present*

*Master of Science in Mechanical Engineering; Fast-track; CGPA: 4.0/4.0*

*Sep. 2020 – Dec. 2021*

- *Research Interests:* Biomechanics, System Modeling, Mechanical Design
- *Thesis:* Biomechanical design and validation of a benchtop robotic spine with applications in chronic low back pain research

### Manipal University

Manipal, IN

*Bachelor of Technology in Mechanical Engineering; CGPA: 9.17/10.0*

*Aug. 2016 – May 2020*

- *Specialization:* Mechanical Design
- *Thesis:* 3D-Printing of Self-Healing Soft Robots. *Done at Vrije Universiteit Brussel, Belgium.*

## EXPERIENCE

### Musculoskeletal Biomechanics Research Lab, McGill University

Montreal, CA

*Graduate Student*

*Sep. 2020 – Present*

- Development of a benchtop robotic spine model with focus on clinical validation of IDP and IMP under different loading scenarios and future applications in new spine prosthetics testing and validation.
- Develop the control system with GUI for the spine in MATLAB and LABVIEW for stabilization and testing. Integrated pressure, position, force sensors through NI-cDAQ system.
- Exploring ways to test new spine stability theories with the developed spine model.

*SURE Award Research Assistant*

*May 2019 - Aug 2019*

- Pneumatic Artificial Muscle modeling and integration on the robotic spine with muscle pressure control in MATLAB and LABVIEW for stabilization

### Department of Mechanical Engineering, McGill University

Montreal, CA

*Teaching Assistant - MECH 262, 290, 360*

*Sept 2020 – APR 2022*

- Responsible for conducting regular tutorials for a section of 40 students in the subject of Statistics and Measurements lab (262), Computer Aided Designing (290), Principles of Manufacturing (360)
- Delivering tutorial classes, developed course material, exercises, assignments.

*Vice President of Academics, GAMES*

*June 2022 - June 2023*

- **Graduate Association of Mechanical Engineering Students (GAMES)** represents all the Mechanical Engineering graduate students at McGill University.

### R&MM Research Group, Vrije Universiteit Brussel - VUB

Brussels, BE

*Research Assistant*

*DEC 2019 – APR 2020*

- Worked on ways to achieve 3D Printing of Self-healing soft robotic grippers.
- Developed and prototyped a custom print head to facilitate 3D printing with temperature sensitive polymers like DPBM-FGE-FT5000.
- Developed and prototyped a hybrid soft gripper with self healing capability against any cuts due to sharp payloads.

### Design and Analysis Lab, Manipal University

Manipal, IN

*Research Assistant*

*Sep 2019 – Dec 2019*

- Worked on 3D Reconstruction of Human Skull through patient specific CT imagery
- Finite element analysis of the effect of dental implants on skull sutures. Analysed the stress distribution at sutures of interest.

### Mars Society South Asia

IN

*Technical Director*

*May 2019 – Apr 2021*

- Responsible for all the technical and space advocacy activities in all the 8 South Asian countries under MSSA.
- Responsible for the organization of yearly international space technology competitions like Indian Rover Challenge (IRC), International Planetary Areal Systems Challenge (IPAS) etc. under MSSA.

*Advisory committee*

*Apr 2019 - Present*

- Part of the Advisory committee to oversee various activities of the organization.

## PROJECTS

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### Mars Rover Manipal

Dec 2016 – May 2019

- Worked as a Research lead for the team of 2019 leading a team of 4 undergraduate students in two robotic exploration related research projects - Autonomous bicycle, underactuated robotic gripper.
- Developed a Mars Rover Prototype with autonomous navigation, equipment servicing, astronaut assistance capabilities.
- Secured 1st place worldwide in the inaugural Indian Rover Challenge - IRC 2017, Vellore, India.
- Secured 7th place worldwide and 2nd in Asia at University Rover Challenge - URC 2018, Utah, USA.

### Crawler Bot | *Perma Liner LLC*.

May 2019 – Aug 2019

- Developed a crawler bot to navigate through pipeline systems with map based exploration and repair capabilities.
- Designed a novel drive system inspired by snake movements for the robot to be dexterous to negotiate tight bends.
- Managed a team of 12 undergraduate students throughout the project dealing with company negotiations, technical discussions etc.

## PUBLICATIONS

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### *Journal articles*

- [1] **Dukkipati, S.**, Driscoll, M., (2023) Development and biomechanical evaluation of a 3D printed analogue lumbar spine motion segment. (under review)
- [2] **Dukkipati, S.**, Driscoll, M., (2023) Design improvements and validation of a novel fully 3D printed analogue lumbar spine motion segment. (under review)

### *Talks*

- [1] **Dukkipati, S.**, Driscoll, M., (2024) 3D Printable Analogue Spine Models: Towards Cost and Time Effective Spinal Biomechanical Research, IMAC-XLII, Society of Experimental Mechanics, Orlando, Florida, USA. (upcoming)
- [2] **Dukkipati, S.**, Driscoll, M., (2024) Effect of Ligaments on Lumbar Spinal Stiffness: A Systematic Investigation Using Novel 3D-Printed Analogue Spine Models, IMAC-XLII, Society of Experimental Mechanics, Orlando, Florida, USA. (upcoming)
- [3] **Dukkipati, S.**, Driscoll, M., (2023) Analogue models of the Thoracolumbar Fascia, Summer school on Fascial Anatomy, Montreal, Canada.
- [4] **Dukkipati, S.**, Driscoll, M., (2022) Viscoelastic Properties of a 3D Printed Analogue of Thoracolumbar Fascia, 6th International Fascia Research Congress, Montreal, Canada.
- [5] **Dukkipati, S.**, Driscoll, M., (2022) Design and validation of 3D printed analogous lumbar model for use in a robotic benchtop spine model, 11th European Solid Mechanics Conference (ESMC), Galway, Ireland. *GREAT Travel Award*
- [6] **Dukkipati S.** et al., (2018) Design and analysis of underactuated gripper using Chebyshev lambda mechanism with slip preventive strategy for fragile objects, Second International Conference on Advancements in Automation, Robotics and Sensing (ICAARS) 2018, Coimbatore, India.

### *Posters*

- [1] **Dukkipati, S.**, Driscoll, M., (2024) Ligament damage models in the lumbar spine: Modeling using a novel 3D printable analogue model, 24rd Annual Scientific Conference of The Canadian Spine Society, Whistler, British Columbia, Canada. (upcoming)
- [2] Coltoff, E.C., Loss, J.G., **Dukkipati, S.**, Driscoll, M., et. al. (2024) Composite Lumbar Spine Surrogate Biomechanical Variability During Multi-Laboratory Collaborative Testing, ORS 2024 Annual Meeting, Long Beach, California, USA. (upcoming)
- [3] Coltoff, E.C., Loss, J.G., **Dukkipati, S.**, Driscoll, M., et. al. (2024) Temporal Variation in Artificial Composite Spinal Surrogates through Inter-laboratory Spine Biomechanics Testing, ORS 2024 Annual Meeting, Long Beach, California, USA. (upcoming)
- [4] **Dukkipati, S.**, Driscoll, M., (2023) Rotational stiffness in a fully 3D printed biomechanical analogue of the lumbar spine, Global Spine Congress 2023, Prague, Czech Republic.

- [5] **Dukkipati, S.**, Driscoll, M., (2023) Effect of ligaments on spinal stiffness by systematic construction of an L1-S1 analogue spine model, Global Spine Congress 2023, Prague, Czech Republic.
- [6] **Dukkipati, S.**, Driscoll, M., (2023) On the effect of thoracolumbar fascia on lumbar spine stiffness under loading in an analogue spine setup, Global Spine Congress 2023, Prague, Czech Republic.
- [7] **Dukkipati, S.**, Driscoll, M., (2023) Pure bending stiffness in a fully 3D printed L1-S1 lumbar spine model, 4th International workshop on spinal loading and deformation, Berlin, Germany.
- [8] **Dukkipati S.**, (2020) A hybrid soft gripper with self-healing capability, Robotics, Intelligent Automation and Control Technologies (RIACT) 2020, Vellore, India. *Best Paper Award*
- [9] **Dukkipati S.**, (2020) Self-Healing Soft Robotics: Design & Prototyping of a Self-Healing Soft Gripper, Thesis work for Bachelors degree in Mechanical Engineering at Manipal Institute of Technology, India.
- [10] **Dukkipati, S.**, Driscoll, M. (2019) Implementation of the control system on a robotic spine & Validation of the benchtop model, SURE 2019, McGill University, Canada.

## TECHNICAL SKILLS

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**Languages:** MATLAB, LABVIEW, Python, C/C++, HTML

**Design:** Catia, SOLIDWORKS, AutoCAD, Fusion 360

**Analysis:** Ansys Mechanical APDL & Workbench, Adams

**CAM:** Fusion 360 Machining, MasterCAM; Cura, Prusa & FormLabs printers for 3D Printing

## AWARDS & ACHIEVEMENTS

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- Fonds de recherche du Québec–Nature et Technologies (FRQNT) Doctoral Research Scholarship 2024, Montreal, CA.
- GREAT Travel Award 2022, McGill University, Montreal, CA.
- Fonds de recherche du Québec–Nature et Technologies (FRQNT) Masters Research Scholarship 2022, Montreal, CA.
- McGill Engineering Doctoral Award (MEDA) 2022, McGill University, Montreal, CA.
- Graduate Excellence Award 2020, McGill University, Montreal, CA.
- Best Paper Award - RIACT 2020 Conference, Vellore, IN.
- Rubin Gruber SURE Award 2019, McGill University, Montreal, CA.
- Manipal Scholar Award-2016-17, Manipal University, IN.

## CERTIFICATIONS

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- Workplace hazards - WHMIS 2015 Certified.
- English proficiency - IELTS Certified.