**MANIKANTAM GADDAM**

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**SUMMARY**

* Ph.D. in Mechanical with 8+ years of biomedical research (R&D) experience in Product Design and Development- 3D CAD Modeling, and Numerical Simulations (CFD/FEA) in Biomedical devices.
* Skilled Biodesign fellow with expertise in Clinical Need Identification and Prototype development, aiming to bring innovative solutions to market.
* Proficient in collaborating with cross-functional teams comprising Surgeons, Clinicians, Engineers, and Microbiologists.
* Possess comprehensive and interdisciplinary knowledge in Biomedical, Fluid Mechanics, CFD, Biomechanics, Anatomy, and Physiology, with specialized focus in cardiovascular, urology, and respiratory fields.
* Hands-on experience in Design of Experiments (DOE), CAD Design ([SOLIDWORKS](https://cv.virtualtester.com/qr/?b=SLDWRKS&i=C-F4GT5Y9BMX)), Commercial CFD solver (ANSYS) and MATLAB scripting with Graphical User Interface (GUI) development.

**WORK EXPERIENCE**

**Research Engineer,** *Urology***,** *Stanford University – Palo Alto, CA* **Jun 2022 - present**

**Stanford Biodesign Fellow & Member of Pediatric Device Consortium, Stanford**

Design and development of Medical Devices, and Biotechnologies. Prototype medical devices to address the urological clinical needs. Summarizing the experimental procedures, results of Data Analysis, and investigations into clear concise complaint documentation, presentations, reports and journals for peers, cross functional teams and stored according to Good Documentation Practices.

Development of Medical devices- Kidney stone removal device (scope-retriever) design, Ureteral Stents, and Urinary catheters to reduce catheter induced trauma.

AI- programming: Developing technology for hydronephrosis detection technology using Machine Learning.

**Roles and Responsibilities**

* Research and Development (R&D) of medical devices/products; prototyping and testing benchtop models; maintaining technical documentation.
* Worked closely with clinicians to get the experimental protocols and Operating Room observations.
* Writing Grants, and provisional patents, working closely with IP strategics and Regulatory work (510K, Combined Product).
* Attending Operating rooms for observation and clinical need finding.
* Critically analyze data and present to internal and external groups including but not limited to clinicians and cross-functional team members.

**Scientist,** *Cardiovascular Research***,** *Spectrum Health – Grand Rapids, MI* **Aug 2021 - Jun 2022**

**Collaborator,** *Cardiovascular Research***,** *Spectrum Health – Grand Rapids, MI* **Jun 2022 - present**

Developed a semi-automated MATLAB program to generate a point cloud from clinical data of Ovine heart model to generate heart model for tricuspid valve regurgitation analysis. Sonometric crystals were installed on heart by clinicians and data was tracked to obtain distance to generate basic details for geometry reconstruction. Multi-scale dimensioning model was used to reconstruct the geometry including tricuspid valve leaflets. Graphical User Interface was later developed for user-friendliness for clinicians. The program decreased analysis run time by 90% from originally provided SONOMETRIC software.

Cardiovascular structural changes and Tricuspid leaflet kinematics were studied during pulmonary hypertension.

**Roles and Responsibilities**

* Worked closely with clinicians to get the experimental protocols.
* Contributed ideas for effective data experimental tissue extraction.
* Critically analyze data and present to internal and external groups including but not limited to clinicians and cross-functional team members.
* Handled and analyzed Clinical and Laboratory data and successfully implemented MATLAB program in designing and developing right ventricular chamber.
* Developed efficient MATLAB program with user friendly Graphical User Interface for data analysis.
* Summarizing the experimental procedures, results of Data Analysis, and investigations into clear concise complaint documentation, presentations, reports and journals for peers, cross functional teams and stored according to Good Documentation Practices.

**Research Assistant,** *Oklahoma State University - Stillwater, OK* **Aug 2014 - Jul 2021**

**Cardiovascular flows**

* Quantified diastolic vortex alterations with [reduced left ventricular volume](https://asmedigitalcollection.asme.org/biomechanical/article/142/12/121006/1084897), [increased atrial pressures](https://meetings.aps.org/Meeting/DFD17/Event/306355), and [high aortic blood pressure](https://meetings.aps.org/Meeting/DFD17/Event/306354) using particle image velocimetry (PIV) techniques. Increased left ventricular wall confinement decreased end diastolic volume and decayed the rate of peak circulation of diastolic vortex.
* R&D of left ventricle 3D point cloud using photogrammetry technique during PIV and MRI scanning. Successfully reconstructed left ventricular wall using Segment (MATLAB image analysis) and SOLIDWORKS for CFD simulations.

**Biomechanics**

* Characterized drag forces of solid and bristled [insect wings](https://iopscience.iop.org/article/10.1088/1748-3190/ab1a00/meta) and found that bristled wings constitute lower drag forces over solid wings by ~80%.
* Characterized [flow surrounding jellyfish](https://shareok.org/handle/11244/300342), obtained morphometrics and kinematics for suspension-feeding behavior using image analysis, particle image velocimetry, laser induced fluorescence and computational techniques.
* Programmed predator-prey model using 2D PIV data and quantified suspension feeding efficiency vs prey speed, and prey escape efficiency vs prey speed in MATLAB computational modeling. A graphical user interface (GUI) was developed for visualization of results. Feeding efficiency was 55% at prey speed of 2.5 cm s­-1.
* Quantified marine flow around sea fans and feather duster worms for suspension feeding.

**Filtration Device**

* Designed and developed aerosols filtration device for indoor spaces using SOLIDWORKS to mitigate the spread of COVID-19. 3D printed and assembled the parts with integration of electronic components.

**Roles and Responsibilities**

* Conducting research which includes Product Design and Development of Respiratory and Cardiovascular experiments.
* Conducting verification and validation (V&V) of Product Design and Experimental setup using FEA, SOLIDWORKS, and CFD simulations.
* Handled and analyzed Clinical MRI and Laboratory data and successfully implemented photogrammetry method in designing cardiovascular chamber.
* Summarizing the experimental procedures, results of Data Analysis, and investigations into clear concise complaint documentation, presentations, reports and journals for peers, cross functional teams and stored according to Good Documentation Practices.
* Responsible for jellyfish Animal Care, Feeding, and Tank Maintenance for suspension feeding studies.
* Presented at American Physics Society, Ocean Science Meetings, and Society of Integrated Biology conferences regarding respiratory, cardiovascular, and marine biology fluid dynamics.
* Documented Standard Operations Procedures (SOP), Lab Safety Manuals, Material Data Sheets (MDS) and ensured their compliance with Environmental Health and Safety (EHS) in a timely manner.
* Acted as a liaison between advisor and senior design team in analyzing and solving problems related to contradictions on project data collection and evaluation.
* Mentored graduates, undergraduates, and high school students on multiple interdisciplinary projects.

**SKILLS**

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| --- | --- | --- | --- |
| * SOLIDWORKS
* ANSYS
* MATLAB/ Python
 | * GD&T
* OpenSim
* C++
 | * AutoCAD
* CFD
* Scientific Computing
 | * 3D printing
* Subtractive Machining
* Medviso-Segment
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**PUBLICATIONS**

* Iwasieczko A, Jazwiec T, **Gaddam MG**, Gaweda B, Piekarska M, Solarewicz M, Rausch M and Timek T (2023). Septal Annular Dilation in Chronic Ovine Functional Tricuspid Regurgitation. The Journal of Thoracic and Cardiovascular Surgery.
* Iwasieczko A, **Gaddam MG**, Gaweda B, Goodyke A, Mathur M, Lin C, Zagorski J, Solarewicz M, Cohle S, Rausch M and Timek T (2023). Valvular Complex Remodeling in Ovine Functional Tricuspid Regurgitation. European Journal of Cardio-Thoracic Surgery.
* Gaweda B, Iwasieczko A, **Gaddam MG**, Bush J, MacDougall B and Timek T (2022). Chronic ovine model of right ventricular failure and functional tricuspid regurgitation. Paper accepted, *Journal of Visualized Experiments*.
* Battista N, **Gaddam MG**, Hamlet CL, Hoover AP, Miller LA and Santhanakrishnan A (2022). The presence of a substrate strengthens the jet generated by upside down jellyfish. *Frontiers in Marine Science*.
* **Gaddam MG** and Santhanakrishnan A (2021). Effect of inhalation time in a normal and HFOV breathing. Physics of Fluids.
* Samaee M, Nelson NH, **Gaddam MG** and Santhanakrishnan A (2020). Diastolic vortex alterations with reducing left ventricular volume: an in vitro study. *Journal of Biomechanical Engineering*.
* Ford MP, Kasoju VT, **Gaddam MG** and Santhanakrishnan A (2019). Aerodynamic consequences of varying solid surface area of bristled wings performing clap and fling. *Bioinspiration and Biomimetics*.
* Gaweda B, Jazwiec T, **Gaddam MG**, Bush J, MacDougall B, Widenka K, and Timek T (2023). Effect of Papillary Muscle Approximation on Acute Ovine Functional Tricuspid Regurgitation. Abstract accepted, *European Journal of Cardio-Thoracic Surgery* (in review).

**CERTIFICATION**

Certified SOLIDWORKS Associate in Mechanical Design ([CSWA](https://cv.virtualtester.com/qr/?b=SLDWRKS&i=C-F4GT5Y9BMX)), Dassault Systèmes, Issued on Oct 2020.

**EDUCATION**

**Ph. D. in Mechanical and Aerospace Engineering Jan 2017 – Jul 2021**

Oklahoma State University *- Stillwater, OK*

*Fluid dynamics of unsteady airflow through human airways (Dissertation)***.** Designed and developed an electronically controlled syringe pump and respiratory system for laboratory experiments at low manufacturing costs and validated respiratory flows using a commercial RANS solver (ANSYS Fluent). Developed New flow regime map and characterized respiratory flow for all breathing patterns.

**M. S. in Mechanical and Aerospace Engineering Aug 2014 - Dec 2016**Oklahoma State University *- Stillwater, OK*

*Currents Generated by Upside-down Jellyfish: Implications for Suspension-Feeding and Pore Water Pumping (Thesis).*Conducted experiments using particle image velocimetry and flow visualization techniques on live animals. Quantified suspension-feeding mechanism and pore water pumping using MATLAB image analysis and computational modeling techniques. Simulations revealed Feeding efficiency and prey speed are inversely proportional and measured ~50% feeding efficiency at optimal prey speeds of 3 mm s-1.

**B. E. in Mechanical Engineering Oct 2010 - May 2014**
Osmania University *- Hyderabad, IN*