Venkata Sai Saran Grandhe

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Education

Completion	Degree/Certificate	Institute	GPA/%
2024	B.Tech, Mechanical Engineering (Micro Specilisation in AI)	Indian Institute of Technology, Kharagpur	9.22/10
2020	Class 12	Pinegrove Junior College, Hyderabad	98%
2018	Class 10	Montessori High School, Kurnool	10/10

Preprint publications

- **Venkata Sai Saran**, Olivier Bochet, Alain Crave and Olivier Bour. **Low-Cost Flowmeter for Subsurface Fluxes**, Water Resources Research, To be published, 2024 [Draft]
- **Venkata Sai Saran**, Aditya Bandopadhyay, **XY Traverse Stage for Automated Microscopy using Compliant Mechanism** , arXiv-physics.ins-det, 2023 [Preprint]

Research Projects

Traverse Compliant Stage for Automated Microscopy **Aug 2023 – Nov 2023**
Guide: Prof. Aditya Bandyopadhyay *IIT Kharagpur*

- Developed Compliant mechanisms for traverse stage of microscope using **FACT** and **topology optimization**
- Conducted non-linear **FEA** to validate the performance of compliant mechanisms, ensuring their structural integrity
- Successfully engineered compliant mechanisms, achieving a remarkable **520 μm** output motion with just 1 degree of input rotation, demonstrating precision and ingenuity in mechanical design

Designing of Low-Cost Flowmeter for Subsurface Fluxes **May 2023 – Aug 2023**
Guide: Prof. Alain Crave (Observatorie des Sciences de l'Univers de Rennes, France) *Université of Rennes, France*

- Pioneered a groundbreaking flowmeter utilizing innovative Mechatronics, incorporating a **metal-ceramic heater**
- Constructed highly realistic experimental setup replicating underground conditions, varying flow and conductivity
- Validated the precision through **COMSOL**, successfully demonstrating its practicality using Lost point installation

Oil Droplet Tracking in Oil Spills [Files] **May 2022 – Aug 2022**
Guide: Prof. Prasanta Kumar Das and Prof. Aditya Bandyopadhyay *MicroFluidics Lab, IIT Kharagpur*

- Aimed to predict path of oil droplets on water surface, using a wedge body model of solid mechanics
- Examined the droplet trajectory by performing the ripple tank experiment and used image processing techniques
- Evaluated the Droplet Dynamics under different conditions, solving **coupled ODE** and validated using COMSOL
- Achieved development of the final model with factors mimicking the **viscosity** and **radiation pressure** validated by experimental results

Projects

Continuum Robotic Manipulator [Video] | *Bio Robotics Research Group* **Sep 2023 – Present**

- Developed a prototype for a **tendon-actuated** continuum robot with two **independent extensible sections** and floating magnetic spacer discs. Used **bowden tube** and brake wires for backbone and nylon wires as tendons
- Performed a kinematic analysis for **vision-based control** using a Piecewise Constant Curvature model

3-DoF Robot Arm [Video] | *Bio Robotics Research Group* **Jun 2022 – Aug 2022**

- Designed a high reduction ratio back drivable Eccentric Cycloidal Actuator for robot joints, driven by DC Motor
- Implemented **PID Control** on actuator and obtained fast angular position seeking response, robust to disturbances
- Developed a 3D printed arm prototype modelled by a **Five-Bar Linkage** with Servo, replicating larger scale model
- Implemented Forward Kinematics and iterative Inverse Kinematics for arm mechanism and made a driver code

Smart Particle Image Velocimetry [Code] **Sep 2022 – Oct 2022**

- Developed a simple, smartphone scalable software to predict flow velocities of 2D flows with continuous laser
- Analyzed two consecutive frames of flow video using **Cross-Correlation** and Optical Flow to determine the velocity
- Achieved an accuracy of 92.5% in comparison to Conventional Particle Image Velocimetry, providing alternative

Electric Stethoscope | *DIY Lab* **Apr 2021**

- Designed **low-cost**, portable electric stethoscope with components – IC 741, capacitors and resistors
- Modelled the casing, with LED indication, volume adjustment, printed using **Fused Deposition Modelling**
- Used a rechargeable battery and Battery Management System as the power source for stethoscope

Experience

Engineering Intern | *Engineer's India Limited* **Dec 2022 – Jan 2023**

- Received comprehensive training in key industrial management fundamentals like planning and scheduling
- Collaborated with Engineers India Limited (EIL) as a PMC consultant, showcasing strong project oversight skills

Teaching Assistant | *NPTEL Swayam* **Jul 2022 – Sep 2022**

- Teaching Assistant for Concepts of Thermodynamics Course on NPTEL, a scheme of Govt of India
- Mentored the Students by clarifying their doubts and preparing assignments, tutorials and question papers

Competitions

Bio-Inspired Robot for Borewell Rescue [**Report**] | *Smart India Hackathon* **Aug 2023 – Present**

- Selected to the National Level round of Smart India Hackathon being among the top 25 teams from IIT Kharagpur
- Developed a patentable **bio-inspired Robot** for Borewell Rescue operation inspired by a caterpillar's propagation
- Utilized advanced sensory technology, including RGB-D camera, to create a 3D map for precise child location
- Designed an inflatable balloon gripper for gentle and safe child extraction from the borewell

Knee Actuator [**Report**] | *Interhall Competition, IIT Kharagpur* **Jul 2022 – Sep 2022**

- Executed the design and architecture of a Knee Actuator consisting of Waist belt, MR Actuator & sensors
- Improved actuator's ergonomics and achieved a Power to Weight ratio of 7:2 to get higher design efficiency
- Participated in market research to reduce cost by 49.7 % compared to Quantum Knee Brace using design analysis

Achievements

- Holding Department Rank 1 among 170 B. Tech students in the Mechanical Engineering Department
- Earned the Academic Excellence Scholarship from Bharat Sanchar Nigam Limited, India in 2022 and 2023
- Secured a Department Change, ranking within the top 5 % of all students at IIT Kharagpur in 2021
- Achieved a rank of 4266(out of 11,74,000 sutdents) in IIT-Joint Entrance Examination, Advanced in 2020
- Secured 5th Position at State Level in Universal Concept of Mental Arithmetic System Abacus Competition in 2017
- Attained 1st Position at "State Level in the Society for Advancement in Science and Technology Talent Test"-2013
- Maintaining an exceptional 1000+ day streak in learning German on Duolingo, demonstrating consistent dedication

Technical Skills

Languages: Python, C++, MATLAB, LaTeX, HTML/CSS
Tools: Finite Element Analysis, Computational Fluid Dynamics, 3D Modelling
Fabrication: 3D Printing, CNC Machining, Laser Cutting, Design of Experiments

Leadership

Undergraduate Council **Sep 2023 – Present**

Undergraduate Department Representative *IIT Kharagpur*

- Elected as the Academic Representative for Department of Mechanical Engineering among 1600+ students
- Leading the student body of undergraduate students, taking care of academic and non-academic problems

Mechanical Engineering Society **Dec 2021 – Jun 2023**

Coordinator *Mekanika, IIT Kharagpur*

- Selected as the Coordinator for Mechanical Engineering Society, IIT Kharagpur for academic session 2021-23
- Initiated a Blog Series named "Core Expedition" to create awareness among students about opportunities

Relevant Coursework

- Engineering Design
- Applied Thermodynamics
- Fluid Mechanics
- Manufacturing Automation
- Mechatronics
- Artificial Intelligence
- Machine Learning
- Data Driven Methods
- Non-Traditional Manufacturing Processes
- Machine tools and machining

Extracurricular Activities

- Active Student Member of the Institution of Mechanical Engineers (IMechE), community of Mechanical Engineers
- Member of Silver Winning Inter Hall Data Analytics, solving Time Series Forecasting Problem - IIT Kharagpur
- Designed a Self - Balancing, Battery powered Unicycle for Bharat Cycle Design Challenge 2023
- **Hobbies**: Reading books, Writing blogs, Dance and Choreography, Sketching and Painting, Playing Field Hockey
- **Volunteering**: Student Mentor at Student Welfare Group- IIT Kharagpur, Member of Indian Red Cross Society