

To be able to innovate is something that seems to be inherent in human being. Necessity is the mother of invention and it can only be achieved by research and development. My passion for science, technology, research, and innovation encouraged me to enter the field of engineering. Recently, I have submitted my Master of Science (by Research) thesis in the Department of Mechanical Engineering, Indian Institute of Technology Kharagpur, and aspire to pursue a Ph.D. degree in the field of bio-fluid mechanics precisely on the cardiovascular fluid mechanics.

According to the World Health Organization, cardiovascular diseases (CVD) are one of the major causes of death in the world with a death rate of 17.9 million per year. WHO's report suggests that developing, middle-income countries are the worst sufferers of CVD. Though heart attack is the most common symptom of CVDs, different types of other cardiac diseases co-exist. Malfunctions of the native heart valves are the forerunner of them. Implantation of the prosthetic heart valve is probably the best treatment for the end-stage failure of the heart valves. Though successful heart valve transplantation can improve the quality of the patient's lifestyle, the mortality rate is higher for the post-implantation cases. In a long run, the thrombus and pannus may be deposited at the periphery of the prosthetics heart valve and that obstruct the movement of the blood. These certainly augment the chances of cardiac arrest. In the interest of eliminating these shortcomings of the mechanical heart valves, research communities are improving the existing design of the valve from the fluid dynamics aspects and also trying to come up with completely new designs of the valves.

As a young researcher from a fluid-mechanics background, I am looking forward to perusing my Ph.D. in the field of artificial heart valves to understand its post-operation hemodynamic complexity and life risk due to it.

I have completed my Bachelor of Technology (B.Tech) from MCKV Institute of Engineering in Mechanical Engineering with a CGPA of 9 out of 10. In my undergraduate study, I was research enthusiastic and successfully completed several innovative projects. I was awarded **Best Innovative Project** in Eastern India Engineering and Science Fair 2016 and **third-best project award** in industry-academia conclave by West Bengal University of Technology 2017. In the final year of my undergraduate, I have submitted my B.Tech project thesis entitled "**Transport Phenomena of Flow around Bluff Bodies**" under the guidance of Dr. Suvanjan Bhattacharyya.

After B.Tech gaining a year of experience in the industry, I have joined the Department of Mechanical Engineering, Indian Institute of Technology Kharagpur, for MS (by research). I have submitted my MS thesis titled "**Study of Typical Cardiovascular Ailments and Malfunctioning of Artificial Heart Valve through Experimentation and Analysis**". During my Masters' I have worked on three problems in the field of bio-fluid mechanics and heat transfer.

In the first problem, I have developed a unique Cardiovascular Replicator which is an electromechanical representation of the human heart. Studies of different cardiac ailments like stenosis and ventricular septal defect were conducted in the system.

Statement of Purpose

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In the second problem, I have developed an analytical model of the human thermoregulation system and clubbed it with a human cardiovascular model to predict cardiac behavior under different ambient temperatures.

In the final problem, a comprehensive computational fluid dynamics study of the defective bi-leaflet mechanical aortic valve has been done. Blood flow characteristics like velocity, pressure, turbulent kinetic energy, vorticity have been studied with different levels of valve dysfunctions. Furthermore, an effort has also been made to see the valve opening dynamics under different levels of leaflet blockage.

In parallel, I have also worked in a multi-institutional Govt. sponsored project on "**Development of a Cost-Effective Left Ventricular Assist Device (LVAD) with Centrifugal Mechanical Circulator, Drive System and Associated Control**"

It was a challenging yet interesting task to work on a developmental project along with the masters' study. During this tenure, I have filled one patent on "**Electro-Mechanical Analogue for Systemic and Pulmonic Circulation**", IPR (Filled: Application No: 202031036431), and was awarded one of the prestigious national **SITARE-GYTI** awards for the work of "**An Automated Cardiovascular Replicator for Online Assessment of Cardiac Assist Devices, Prosthetics, and Beyond**" with a financial grant from BIRAC (Under Department of Biotechnology Govt. of India). Simultaneously, I have communicated one Journal and published four conference articles.

I found the joint doctoral degree with two prestigious institutes like the IIT Kharagpur and the University of Manchester is a wonderful opportunity for me. Moreover, the project "Hydrodynamics of prosthetic mechanical heart valves" matches my domain of research. I strongly believe that with my previous experience and knowledge I can pursue Ph.D. in the mentioned project.

It would be an honor for me to work under the joint guidance of Professor P.K Das and Dr. Amir Keshmiri at the IIT Kharagpur and the University of Manchester.