

# Sreeparna Majee

## Postdoctoral Research Associate

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## PROFILE

- An enthusiastic, adaptive and innovative person with a broad and acute interest in mathematical modelling and computational simulation of fluid dynamics.
- Strong interpersonal and presentation skill.
- Rich experience in modelling and computer simulation, using MATLAB, Mathematica, Fortran, Ansys Fluent and Python.
- Computer Skills: MS office, C, C++ language, DBMS (SQL), Latex, Techplot, MATLAB, Python.

## EDUCATION

- 2014 – Jan 2020  
PhD (DST INSPIRE) (CGPA-10.00/10.00)  
**Jadavpur University**  
Department of Mathematics
- 2011 – 2013  
**Indian School of Mines (IIT) Dhanbad**  
Masters in Mathematics and Computing (CGPA – 9.17/10.00)  
Department of Applied Mathematics  
(Gold Medalist)
- 2008 – 2011  
Lady Brabourne College  
**University of Calcutta**  
Bachelor in Science (Honours)  
Major in Mathematics

## RESEARCH METHODS

- Team lead in experimental and mathematical study of flow dynamics and bacterial deposition pattern in an evaporating sessile droplet.
- Mathematical modelling of the trajectory and evaporation dynamics of spherical droplet dynamics moving in air having internal vortex flow.
- Experimental expertise in micro-PIV, fluorescence microscopy of sessile droplet.
- Mathematical modelling of deposition of bacteria in a sessile droplet by smoluchowski equation.
- CFD modelling by SIMPLE method (FVM) in arteries carrying blood considering porous media.
- Modelling drug delivery system in blood stream infused with magnetic nanoparticles.
- Hyperthermic treatment to cardiovascular diseases.
- CFD modelling of human arterial geometry and finding symptoms and solutions for cardiovascular diseases.
- 2D Flow simulation with Matlab 8.0, 14.0a, Fortran 77, Ansys Fluent.
- Internal and external boundary layer simulation.
- Geometry building, Meshing with Ansys Fluent, Matlab.
- Heat Flow Simulation.
- Finite difference method using Crank-Nicolson/Alternating Direction Implicite scheme.
- Analysis of flow streamlines and simulation using Techplot 10.
- Literature review and writing of research papers.

## RESEARCH EXPERIENCE

### **Department of Mechanical Engineering, Indian Institute of Science- *Research Associate***

JANUARY 2020 – APRIL 2022

- CFD investigation of vortex interaction with spherical droplet moving in the air ejected due to respiratory actions.
- Numerical investigation of trajectory and heat and mass transfer of droplet dynamics moving in air having aerodynamic drag.
- Team lead in computational and experimental investigation of the flow of bacteria in a sessile droplet and predicting its pathogenesis.

### **Department of Mathematics, Jadavpur University- *Senior Research Fellow***

NOVEMBER 2016 – JANUARY 2020

- CFD investigation of blood considered as porous media in a wavy channel by SIMPLE technique.
- Working with magnetic nanoparticles combined with drugs which are injected in the human artery which is directed to the diseased part through external magnetic field.
- Heat transfer is induced in the cancer affected tissue to enhance the heat to result in coagulative necrosis.

- Studied the magnetic interaction with blood flow in minimizing the disturbance in wall shear stress in diseased artery having abdominal aortic aneurysm.
- CFD simulation of a non-Newtonian fluid with porous boundary walls having external magnetic effect using Fortran 77 and Matlab 8.0, 2016a.
- Studied the flow phenomenon and heat transfer in the bifurcated artery especially in the regions of deposition of cholesterol.
- Participate in Project discussion and Presentations in different international conferences.

### **Department of Mathematics, Jadavpur University- *Junior Research Fellow***

NOVEMBER 2014 - OCTOBER 2016

- Computational simulation of blood in a sinusoidally oscillating wavy walled artery having magnetohydrodynamic effect.
- Direct Numerical Simulation of magnetohydrodynamic flow of blood and heat transfer and study the streamline and isothermal contours done in Techplot 10.
- Studied the flow pattern and wall shear stress of pulsatile, magnetohydrodynamic blood taking viscosity to be temperature dependent under whole body vibration.

### **Department of Mathematics, Jadavpur University- *Post Graduate Summer Intern***

MAY 2012 - JULY 2012

- Simulation of Hydromagnetic flow of water with non-uniform viscosity in a stretching sheet with a particular angle having the effects of thermal radiation and chemical reaction with the help of finite difference scheme.
- Published a paper on the above mentioned topic.

## **TEACHING EXPERIENCE**

### **Sri Shikshayatan College, University of Calcutta**

#### **Lecturer**

November 2019- January 2020

Bachelor Degree in Mathematics

### **Jadavpur University, Department of Metallurgical Engineering**

#### **Teaching Assistant**

Differential Calculus, First semester, 2015-2016

Differential Calculus, First semester, 2016-2017

## **CERTIFICATIONS**

### **Python Basics, University of Michigan**

Coursera

July2021

## PUBLICATIONS

### Journals

- **Sreeparna Majee**, A. Saha, S. Chaudhuri, D. Chakraborty, S. Basu, Two-dimensional mathematical framework for evaporation dynamics of respiratory droplets, **published in Physics of Fluids** (AIP) 33(10) 103302.
- **Sreeparna Majee**, A.R. Chowdhury, R. Pinto, A. Chattopadhyay, A.N. Agharkar, D. Chakraborty, S. Basu, Spatiotemporal evaporating droplet dynamics on fomites enhances long term bacterial pathogenesis, **published in Communications Biology**(Nature) 4, 1173 (2021).
- **Sreeparna Majee**, S. Maity, G.C. Shit, D.K. Maity, Spatio-temporal evolution of magnetohydrodynamic blood flow and heat dynamics through a porous medium in a wavy-walled artery, **published in Computers in Biology and Medicine** (Elsevier) 135(2021) 104595.
- **Sreeparna Majee**, G C Shit: Modeling and Simulation of Blood Flow with Magnetic Nanoparticles as Carrier for Targeted Drug Delivery in the Stenosed Artery, **published in European Journal of Mechanics/ B Fluids**.(Elsevier) 83(2020) 42-57.
- G C Shit, **Sreeparna Majee**: Magnetic field interaction with blood flow and heat transfer through diseased artery having Abdominal Aortic Aneurysm, **published in European Journal of Mechanics/ B Fluids** (Elsevier) 71(2018) 1-14.
- G C Shit, **Sreeparna Majee**: Computational modelling of MHD blood flow and heat transfer enhancement in a slowly varying arterial segment, **published in International Journal of Heat and Fluid Flow** (Elsevier) Vol 70, 2018, Pages 237-246.
- G C Shit, **Sreeparna Majee**: Computational Modeling of MHD Flow of Blood And Heat Transfer In The Overlapping Stenosed Arterial Segment, **published in Indian Society for Heat and Mass Transfer, digital library**, 2017, DOI: 10.1615/IHMTC-2017.160, Pages 103-110.
- **Sreeparna Majee**, G C Shit: Numerical investigation of MHD flow of blood and heat transfer in a stenosed arterial segment, **Published in Journal of Magnetism and Magnetic Materials** (Elsevier) Vol 424, 2017, Pages 137–147.
- G C Shit, **Sreeparna Majee**: Pulsatile flow of blood and heat transfer with variable viscosity under magnetic and vibration environment, **Published in Journal of Magnetism and Magnetic Materials** (Elsevier) Vol 388, 2015, Pages 106–115.
- G C Shit, **Sreeparna Majee**: Hydromagnetic flow over an inclined non-linear stretching sheet with variable viscosity in the presence of thermal radiation and chemical reaction, **Published in Journal of Applied Fluid Mechanics** Vol 7, No. 2, 2013, pp-239-247.

### Book chapters

- A. Saha, **Sreeparna Majee**, S. Chaudhuri, S. Basu, Ch-11: Evaporation and Precipitation Dynamics of a Respiratory Droplet, in Drying of Complex Fluid Drops: Fundamentals and Applications, ed David Brutin, Khelil Sefiane, **Royal Society of Chemistry, 2022.**
- GC Shit, **Sreeparna Majee**, Effect of Magnetic Field on Blood Flow, published in Safety and Biological Effects in MRI, eMagRes, **John Wiley & Sons, Ltd**, Volume 9, Pages 133-160.

## CONFERENCES/WORKSHOPS

- Presented poster entitled “**Numerical simulation of blood flow in a straight artery under the influence of magnetic field**” at Comsol Multiphysics Conference, Bangalore, 2014.
- Presented paper entitled “**Unsteady MHD flow of blood and heat transfer with variable viscosity under the influence of periodic body acceleration**” in the National Conference on Emerging trends in physics of Fluids and Solids, 2015, Department of Mathematics, Jadavpur University.
- Presented paper entitled “**Direct Simulation of arterial blood flow and heat transfer in the presence of magnetic field**” in the National Conference on Emerging trends in physics of Fluids and Solids, 2016, Department of Mathematics, Jadavpur University.
- Attended a four day workshop on “Fluid Mechanics: Modelling, Analysis and Computation” and hands-on training on ANSYS-FLUENT which is being organized at IIT Patna from 14th-17th, July 2016.
- Presented paper entitled “**Computational modelling of blood flow and heat transfer enhancement in a slowly varying arterial segment under magnetic environment**” in International conference on Computational mathematics and statistics, January 24-26, 2017 organised by Banasthali University, Rajasthan, India and Universiti Putra Malaysia, Malaysia.
- Presented paper entitled “**Magnetohydrodynamic blood flow and heat transfer through diseased artery having abdominal aortic aneurysm**” in International conference in conjunction with 14<sup>th</sup> Biennial conference of Indian Society of Industrial and Applied Mathematics (ISIAM), February 2-4, 2018 organised by Guru Nanak Dev University, Amritsar, India.
- Presented paper entitled “**Blood flow and heat transfer simulation through artery having abdominal aortic aneurysm under magnetic condition**” in International conference in Emerging trends on Applied mathematics and Mechanics, June 18-22, 2018 organised by Jagiellonian University, Krakow, Poland.
- Presented paper entitled “**Numerical investigation of magnetohydrodynamic blood flow and heat transfer through artery having abdominal aortic**” in International conference on Applied and Computational Mathematics, November 23-25, 2018 organised by Indian Institute of Technology, Kharagpur, India.
- Presented paper entitled “**Modeling and simulation of blood flow with magnetic nanoparticles as carrier for targeted drug delivery in the stenosed artery**” in The 106<sup>th</sup> Indian Science

Congress, January 3-7, 2019 organised by Indian Science Congress Association, India for **Young Scientist Award Programme**.

## **AWARDS AND ACHIEVEMENTS**

- **Young Scientist Award 2019** in the section of Mathematical Sciences including Statistics awarded by Indian Science Congress Association in 106<sup>th</sup> Indian Science Congress.
- **Best paper presentation award** for the paper “Computational modelling of blood flow and heat transfer enhancement in a slowly varying arterial segment under magnetic environment” in International conference on Computational mathematics and statistics, January 24-26,2017 at Banasthali University, Rajasthan, India.
- **First class first** in M.Sc. Mathematics and Computing-2013.
- Awarded **scholarship** from **Govt. of India, Eastern Coalfields Limited** for excellent performance in CBSE Board exams for class X and XII.
- Successfully qualified Basic Rock Climbing Course, Jadavpur University.