Statement of Purpose

As a prospective candidate for the Joint Doctoral Program between IIT Kharagpur and University of Manchester, I am excited at the opportunity to contribute to research on cavitation, an undesirable phenomenon which is responsible for failure in many engineering applications. The proposed research work aims to develop a better understanding of the processes that lead to cavitation, with the objective of providing design solutions using both numerical methods and experimental techniques, which enables a complete validation of the proposed solutions and methodologies. Ever since my first exposure to numerical methods during my undergraduate studies, I have been fascinated by the wide scope that these provide in terms of their ability to provide cost efficient solutions to complex engineering problems in a relatively short amount of time. Smoothed Particle Hydrodynamics (SPH) offers several advantages in simulations of cavitation over other numerical methods such as Finite Element Method (FEM) in that it is a "meshless" technique, which avoids the complexity of mesh reconstruction, and it enables the capture of both fluid and solid behaviour using the same numerical method, which means that a common solver (or code) can be used. I have always had the desire to work on the application of numerical techniques to solving engineering challenges and this led to my working as a CAE Engineer, and later as a Lead CAE Analyst, at reputed multi-national companies in India for more than 7 years. Since academic research constitutes the purest form of research, I was motivated to pursue opportunities for doctoral studies, with the long-term objective of continuing research in thermo-fluids at a leading university/research institute. A dual PhD degree from reputed and world-class academic institutions such as IIT Kharagpur and University of Manchester will significantly aid my pursuit. Moreover, the scope of doctoral research also permits an in-depth study of the chosen problem and allows for generation of independent ideas that can then be validated by domain experts and shared publicly, leading to a wider outreach.

As the first step towards achieving my objective, I completed a standalone **MPhil** degree from **Newcastle University, UK**, where I worked on Direct Numerical Simulations (DNS) of turbulent combustion. The research work I undertook as part of this degree has produced four publications in reputed international journals and one presentation at an international conference (ETMM13, September 2021). A further two submissions are currently in the review stage. I was also awarded a second prize in the audio-visual category for my presentation at the United Kingdom Consortium on Turbulent Reacting Flows (UKCTRF) annual conference held in March 2021. During my MPhil research work I gained valuable expertise in the usage of High-Performance Computing (HPC) systems, having extensively used the UK super-computing facility "ARCHER" and the Newcastle University HPC system "ROCKET" for carrying out numerical simulations. I also gained experience in writing and publishing technical papers in world class research journals, which I believe will prove valuable while pursuing doctoral studies. In my aforementioned roles in the industry, I was part of several challenging and business-critical projects, which included fluid flow, heat transfer, solid mechanics and vibration simulations using Computational Fluid Dynamics (CFD) and FEM. I also worked on projects which required the use of SPH. I had the opportunity to interact with colleagues and clients from around the world and I performed well, both at individual settings and within teams. In projects involving teams, I worked both as a member and as a lead, proving myself productive

and successful in both roles. These exposures have refined my communication skills, leadership qualities and teamwork, which I believe would be valuable facets during my pursuit of a PhD. I also completed a **MTech** degree in **Thermal Sciences** in the year 2012 from **National Institute of Technology Calicut, India**. Due to my keen interest in numerical simulations, as part of my thesis I successfully simulated the corona discharge phenomenon for a point-plane configuration using the finite difference method. This work was later published as a SAE technical paper.

I sincerely hope that this statement endorses my application and strengthens my chances of being considered for the Joint Doctoral program, which would provide me with the opportunity to work in a dynamic and well-established research environment, mentored by outstanding faculty and peers. I also believe that I bring the added advantage of not needing an English language qualification since I have a UK Masters degree. I look forward to beginning the next phase of my research career as part of two world-class research institutions.