

## Statement of Purpose

When I was twelve, I remember rushing home after school to watch the animated series Robot Boy who uses sci-fi technologies to save other's life. I also observed that people who had access to technologies had a better life than those who did not. Hence, I intend to use all my abilities to learn and build technologies that improve living quality. These realities developed my passion for finding solutions through technology. So after completing high school, I took mechanical engineering, where I saw a scientific core to uplift society. I have an engineering background and have acquired a bachelor's degree in Mechanical Engineering and a masters degree (with University First Rank) in Technology Management from the University of Kerala, Kerala, India, in 2021. I did this interdisciplinary master to learn more about policy analysis, scenario building, managing technology, forecasting, data analytics, machine learning, innovation management, and strategic decision making.

During my undergraduate studies, I founded A.P.J Abdul Kalam Forum for Innovation to unify and motivate students to be social innovators and participate in philanthropic activities. Under the forum, we volunteered to prototype solar trees, started organic farming, designed solar energy generation, organised cleanup activities, technical activities, cultural festivals, and sustainable development summits. The forum was also a platform for students to present their startup ideas and get guidance for public funding for implementation. I always wanted to give back to the community, and I mentored my juniors to develop socially relevant ideas that helped pepper farmers to harvest quickly and cool houses with less energy and sustainable air coolers. I have taught design engineering to mechanical engineering undergraduate students, and also, I have contributed to a workbook on design engineering that is now a part of the state technical university curriculum. I have also volunteered to be a student energy conservator, where I educated people about energy conservation.

My past work experience at Sriram Industries have been at once engaging and instilled in me a resolute desire to improve myself. Here, I worked on modelling an expert system to predict the causes of product quality reduction. The model helped the industry to improve quality and enhance sustainable manufacturing. This gave me new ways of thinking to increase productivity through sustainability. Later, my experiences at Kerala Automobiles Limited and Helping Hands Organisation (NGO) inspired me to design (using AUTOCAD, SOLIDWORKS, and CREO software), analysis (using ANSYS software) and prototype a low-cost vehicle for differently-abled people from recycled parts. This partially helped address their transportation problems and aided to move freely without much dependence on others. As an intern at the Indian Institute of Technology and Management-Kerala, I helped farmers using data analysis and network science to identify the condition of their land and its competence with different crops. This may help them to increase their productivity and thus earnings. All this proved my perspective that accessibility to technology can have a more significant impact on the lives of many. I worked with robotics projects like developing a robotic arm and a 2d plotter capable of artistic painting using 3d printed parts. I also developed swarm robots using radio frequency control, a simple humanoid robot, android botix, i-sensorbotz and a small scale food printer. During my masters, I learned computer programing languages like Python, MATLAB and R, and I later used my programing knowl-

edge in a materials informatics project to propose new organic materials for solar cells using symbolic regression and deep learning models that can increase the efficiency of solar panels and also used machine learning models (support vector machine) for cancer detection based on Raman spectral data collected from normal, tumorous and cancerous cells. I have also road-mapped Industry4.0 technologies using citation network analysis and submitted a research paper entitled Blockchain Technology in Smart Manufacturing: The Evolution and Prospects to the journal Technological Forecasting and Social Change. I have attended and presented my research at national and international conferences, and I have paper publications in indexed journals, conference proceedings, and book chapters. Recently, two research papers that I co-authored in genetic algorithms, end of life vehicles, and decision support systems are under review in the Journal of Cleaner Production. I have also worked with five doctoral students to conduct their literature review in 5 different domains using citation network analysis, knowledge graphs, and science mapping. I have also completed 53 online certification courses (on Coursera) offered by various international universities and companies on various topics like Digital manufacturing, intelligent machining, Generative designs for industrial applications & additive manufacturing, Advanced manufacturing process analysis, Fusion 360, Artificial Intelligence, Robotics, Philosophy of science, Psychology, Arts, Cognition, Music for wellness, and Sustainable development.

Growing population, climate change, and unemployment are some of the most discussed matters of concern of our time, and from my past experiences, I believe that engineering technologies can provide solutions for all these problems; this is the reason for my interest to take up advanced studies in the field of engineering to be a part of new technological revolutions that can create new job opportunities, sustainable living, and save the lives of millions. Currently, I want to pursue research into materials informatics, and sustainable engineering to use that knowledge to help build a better life for many. Given an opportunity, I will do my best to research and bring results individually and in a group. I strongly hope that every bit of new information I come across in this stream will inspire me to evolve and extend my skills for the ongoing research activities and future proposals. Pursuing research at the IIT Kharagpur and University of Manchester will establish an ideal foundation for my future role as a researcher and an engineer.

Manikantan R Nair