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Motivation Letter

for MSc. Artificial Intelligence and Engineering Systems

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AI-enabled robotic systems have the potential to revolutionize the world and require a collaborative effort to develop. I, Akshay Ballal, wish to join your prestigious university's MSc. Artificial Intelligence and Engineering Systems Program to contribute to developing cutting-edge robotic systems. I wish to specialize in the field of Hi-Tech Systems and Robotics. Robotics has been at the core of my academic and career interests; it has enthralled me since I visited the Volkswagen factory, where I saw robotic arms in manufacturing. Witnessing these arms construct the perfect car before my eyes made me realize machines' superiority in terms of speed and accuracy. Since that visit, I have been driven to build industrial robots that do what humans usually cannot do safely and efficiently. With the qualification of this course, I aim to work in leading robotics companies across the Brainport Hi-Tech District to create cutting-edge products.

I am currently working as Chief Product Officer at a leading industrial 3D-Printer manufacturer, Fabheads, where I build 3D printing machines that print high-strength continuous carbon fiber parts more reliably and efficiently than any other traditional manual process. I have spent five years at Fabheads and am the co-inventor of 7 process patents. While the 3D printers I build are mainly software driven electro-mechanical systems, I realized how AI could make these machines perform even better, which has driven me to learn and explore more about AI. It is essential to have interdisciplinary knowledge and exceptional research skills to be good in robotics; hence I have carefully structured my portfolio around research and practical projects as well as internships.

My journey gained pace during my second year at Birla Institute of Technology's Bachelor's degree in mechanical engineering when I joined the BAJA team for our institute's Firebolt Racing team, as I was interested in cars at the time. It is one of the top ATV teams in BAJA Student India and BAJA SAE events. I was mainly responsible for Chassis Design and Vehicle Integration. Using algorithms like Genetic Optimization to find ideal tube thicknesses and Fast Fourier Transforms for Structural Vibration Analysis, we made the lightest car in the team's history, weighing less than 160 KGs. This experience helped me learn a lot about design optimization, reading research papers, and how to use findings from previous research. In addition, I had to take multiple other disciplines into account when designing the perfect product when simulating the models; for example, I had to undertake ergonomic studies for the driver's safety, comfort, and convenience. I also designed a regenerative shock absorber, simulated the entire system using Matlab and Simulink, and built a prototype using 3D printing.

To gain more practical, hands-on, industrial experience, I worked at a couple of companies as an intern, leading to my current job. I spent my 3rd-year summer break at Fabheads, where I worked on designing an industrial tape-slitting machine. My role in this internship included process research, embedded system development, and mechanical design. Then I interned at an IIT Bombay spin-off IoT company – Carnot Technologies, for six months as a Product Design

intern, where I first used AI to find the engaged gear in a car based on real-time RPM and Torque data of the engine using KNN Classifiers.

TU Eindhoven is one of the premier institutes in the field of AI-enabled robotics, and also its proximity to Brainport will provide great industrial exposure. I aim to base my research around computer vision, use generative AI for 3D world mapping, and work on new diffusion models to generate 3D worlds for robot simulation and VR applications. Your institution will equip me with the appropriate skills to build advanced robots that are more intelligent, collaborative, and ethical. I am looking forward to studying with like-minded and driven pupils.

Regards,
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