Personal Statement

Machine learning as a subset of artificial intelligence encompasses different types of computational algorithms and numerical models which can be used in data science for diverse purposes. Since my undergraduate studies, I have been intrigued by environmental data science with machine learning applications, and the combination of both presented a powerful model to contribute to the understanding of ambiguities and uncertainties inherent in environmental data. Based on the automatically analysed environmental datasets, I believe the researchers could identify strategies, solutions or interventions that realise co-benefits for human society and the environment, as well as evaluate the cross-sectional or conflicting goals of decision-makers. I was specifically inspired by a research study titled "Robots with Vision", which exposed me to how data science and machine learning were integrated into developing a model to predict climate change and environmental crises. From data interpretation to visualisation, the system model illustrated the impacts of climate change on land use, marine biology, vector-borne diseases and other phenomena. In line with the rapidly evolving technological advancements, I recognised the huge potential to incorporate machine learning in environmental data science analytics for huge data collection, systematic information programming, effective system processing and accurate trend forecasting of environmental developments.

Being a high-achieving undergraduate with a background in Applied Engineering, I have a strong passion for developing my expertise in data science and machine learning with specific applications in the environmental sectors, which is why I am attracted to the MSc in Environmental Data Science and Machine Learning programme being offered by your prestigious Imperial College London (ICL). This MSc programme perfectly suits my academic interests in gaining a comprehensive understanding of the interrelationship between environmental data science and machine learning associated with computational technologies and engineering applications. By working in areas such as climate change, sustainability, future cities, air quality and renewable energies, in addition to applications such as modelling, simulation, inversion and optimisation, I believe I will acquire the practical techniques to apply the advanced knowledge to diverse industries in which the industrial operations rely heavily on automated environmental data analytics.

For example, the MSc modules *Modern programming methods and Cloud Computing* and *Advanced Programming* would acquaint me with data analytics skills over a variety of temporal and spatial scales. These skills include but are not limited to computational algorithms, programme coding, environmental modelling and remote sensing with respective applications to develop high-

performance cloud computing and software programming systems for environmental data analytics of uncertain, unstructured or intermittent datasets. On the other hand, I would like to study the modules *Machine Learning* and *Environmental Data*, in which I will learn the approaches to critically applying machine learning to reduce the uncertainty of environmental models. Additionally, I anticipate using the deep learning technique for model super-resolution, from which the process could visualise the environmental trends based on raw data obtained. By integrating machine learning with simulations of regional environmental elements such as climate phenomenon and atmospheric turbulence, I will have the chance to construct new models from 2D satellite images to 3D scalar fields, which will be used to track air pollutants or geospatial components in characterising pollution scale with continual predictions of environmental changes.

During my undergraduate studies, I participated in many research projects with topics relevant to environmental protection, conservation and enhancement. Among the numerous research projects, I would like to highlight my experience in the Integrated Design Project: Future Direct Air Capture (DAC) Facility, in which our team carefully designed and established a DAC facility that would fulfil the future industrial demands for carbon dioxide (CO_2) extraction in terms of the sustainable operational framework with high energy efficiency properties to achieve CO_2 removal. In detail, we developed a transportation pipe and control system for the CO_2 capturing facility by using Simscape software, followed by real-time automated average energy efficiency analysis and simulation, which included a three-phase power source, converter, and loading and unloading systems. Through this research, I developed a series of computer engineering and data analytical skills. I also explored the possible research pathways of environmental data science following future technological growth.

On the other hand, I took the initiative to augment my theoretical and applied foundations of machine learning by partaking in several online courses offered by ICL, mainly *Mathematics for Machine Learning: Linear Algebra* and *Mathematics for Machine Learning: Multivariate Calculus*. Studying these courses enriched my insight into how mathematical knowledge and formulae are related and implemented in machine learning, ranging from vectors and matrices to eigenvalues and eigenvectors with respective applications for data-driven algorithm coding and operations. Additionally, I also learned the multivariate calculus essential to build a set of tools calculating vectors in multidimensional surfaces and put these into action to generate approximations and functions. With the support vector algorithm, I used multivariate calculus to find the maximal margin, in conjunction with utilising the multiple variables with linear algorithms to establish multiple linear regression models. Combining the linear algebra and multivariate calculus of mathematics, I

consolidated the skills to process the implementation of algorithms in code and optimise the operation of machine learning models in achieving reduced analytical errors.

With my aforementioned academic and practical experiences, I am confident that in taking on new challenges through this MSc programme. Nevertheless, I firmly believe that this MSc programme will push me beyond my current limits and bridge the gap between my vision and execution for career development. Upon graduating with this MSc degree, I aspire to become an environmental data analyst and work in a multinational environmental engineering and consulting firm. By critically putting the MSc knowledge into practice, I would help clients or organisations to study the anthropological impacts and human effects in determining the overall environmental condition of specific regions, as well as develop automated systems to carry out site assessments and trend monitoring for large-scale environmental data collections and analyses. Honing my professional expertise, I hope to further study at the PhD level in the field of environmental data science and analytics after accumulating enough practical experience, from which I could substantially contribute to invaluable research findings in pioneering the innovation of a sustainable model for modern transformations.