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MACHINE LEARNING APPROACH FOR SPECTRAL SHAPE DETERMINATION FROM LIMITED SUMMARY PARAMETERS

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Recent developments in Marine Renewable Energy Technology, coupled with increased commercial activity in the sector, have driven a need for a greater understanding of the distribution of energy within sea-states. This information is crucial for characterizing the available energy resource, and the performance of devices within the wave climate; but such information is often absent from modelled data which is commonly used in industry analysis. These analyses are typically conducted with limited summary statistics, which often leads to inaccurate results.

A typical approach to determining the spectral energy content of a sea-state involves the use of relationships based on defined empirical spectra, such as the Bretschneider or JONSWAP spectra. Given that significant variations from these shapes can be seen, especially in the case of multi-modal seas, the current methods are found to be lacking, and the need for an accurate determination of spectral energy distribution has become increasingly apparent.

This work addresses the determination of spectral shape from limited summary parameters using a neural network approach, outlining a Machine Learning framework for recreating wave spectral density information at a given site using summary parameters. This approach will provide the ability to train the model to re-create the "lost" spectral energy detail using the summary parameters at a given site. This will be trained at sites on the west coast of the US and Ireland.

The aim of this work is to highlight the utility of a Machine Learning based approach in improving the accuracy of energy production predictions for Marine Renewable Energy.

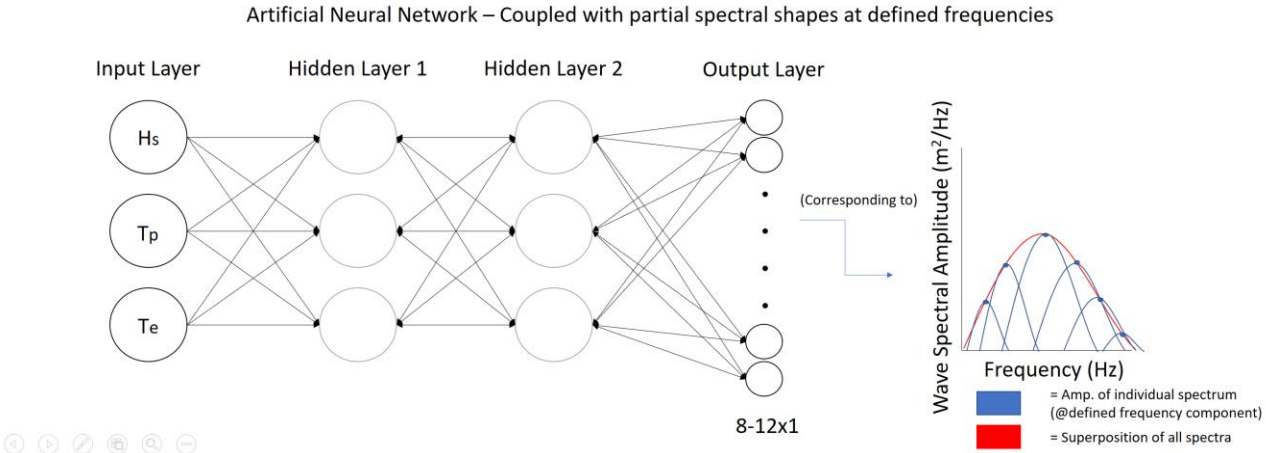

FIGURE 1. ARTIFICIAL NEURAL NETWORK TOPOLOGY FOR PREDICTION OF SPECTRAL SHAPE FROM SUMMARY WAVE PARAMETERS

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