Applying Multi-Class Support Vector Machines for performance assessment of shipping operations: The case of tanker vessels

Energy efficient operations are a key competitive advantage for modern shipping companies. During the operation of the vessel, improvements in energy use can be achieved by not only by technical upgrades, but also through behavioural changes in the way the crew on board is operating the vessels. Identifying the potential of behavioural savings can be challenging, due to the inherent difficulty in analysing the data and operationalizing energy efficiency within the dynamic operating environment of the vessels. This article proposes a supervised learning model for identifying the presence of energy efficient operations. Positive and negative patterns of energy efficient operations were identified and verified through discussions with senior officers and technical superintendents. Based on this data, the high dimensional parameter space that describes vessel operations was first reduced by means of feature selection algorithms. Afterwards, a model based on Multi-Class Support Vector Machines (SVM) was constructed and the efficacy of the approach is shown through the application of a test set. The results demonstrate the importance and benefits of machine learning algorithms in driving energy efficiency on board, as well as the impact of power management on energy costs throughout the life cycle of the ships.