Low global warming potential R1234yf in a mobile air-conditioning system: a study on performance prediction using different machine learning approaches

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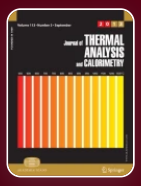

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Abstract

Machine learning (ML) approaches have admirable potential to forecast the performance of the mobile air-conditioning (MAC) system with low global warming potential R1234yf instead of conventional mathematical and simulation approaches. In this work, three different ML algorithms —artificial neural network (ANN), simple recurrent neural network (SRNN), and extreme gradient boosting (XGB)—have been employed for predicting the energy and exergy performance. Compressor speed, condenser-side air velocity/temperature, and evaporator-side air flow rate/temperature were considered as influencing input parameters. In energy analysis, performance indexes, namely refrigerant flow rate, cooling capacity, compressor power, and coefficient of performance (COP), were considered as output parameters, while total exergy destruction and exergy efficiency (η_{ex}) were accounted for as exergy metrics. First, the heat mapping method was