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Original Article

ON THE ANALYTICAL STUDY OF THE SERVICE QUALITY OF INDIAN RAILWAYS UNDER SOFT-COMPUTING PARADIGM

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Highlights:

- 7 vital attributes of the most popular trains of Indian Railways are considered;
- the overall performance of the trains is rated based on 7 important related attributes;
- a rough set decision support system based on several rules is put into place to analyse the importance of train attributes and assign a performance rating;
- a comparative analysis based on seven performance metrics is conducted, which eventually predicts the overall train rating by employing 3 ML estimators – the ETC, SVMC, and MNBC.

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Abstract. Indian Railway Catering and Tourism Corporation (IRCTC) is among the busiest railways reservation systems since the Indian Railways (IR) is the vital and economical mode of transportation in India. Hence, rating of the trains seems to be critical aspect for selecting an appropriate train for travelling. In this study, we have considered 7 vital attributes of 500 popular trains and rate their performance based on 7 important related attributes. For this purpose, we have employed 2 different approaches to analyse of the train attributes, which eventually contribute to the overall performance of the trains. Here, we have developed a rule based rough set decision support system to analyse the criticality of the train attributes while rating the train performance. Furthermore, we have also used 3 Machine Learning (ML) model estimators: Extra Trees Classifier (ETC), Support Vector Machine Classifier (SVMC) and Multinomial Naive Bayes Classifier (MNBC) and perform their comparative analysis with respect to 7 performance metrics while predicting the overall train rating based.

Keywords: rough set theory, extra trees classifier, support vector machine classifier, multinomial naive Bayes classifier, performance metrics.

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Notations

ANP – analytic network process;
AUROCCS – area under the receiver operating characteristic curve score;
DEMATEL – decision making trial and evaluation laboratory;
DMS – data mining scaffolding;
ETC – extra trees classifier;
HL – hamming loss;
HL–RF – Hasofer Lind and Rackwitz Fiessler;
IR – Indian Railways;
IRCTC – Indian Railway Catering and Tourism Corporation;
IRRS – Indian Railway Reservation System;
MCC – Matthew's correlation coefficient;
ML – machine learning;
MNBC – multinomial naive Bayes classifier (MNBC);