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Non-parametric Data-based Maintenance Optimization Using Machine Learning Algorithms

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In this paper, a multi-component series system is considered. The system is periodically inspected, where at inspection times the failed components are replaced by a new one. Therefore, this maintenance action is perfect corrective maintenance for the failed component, and it can be considered as imperfect corrective maintenance for the system. The inspection interval is considered as a decision parameter, and the maintenance policy is optimized using the long-run cost rate function based on the renewal reward theorem.
It is assumed that there is a historical data storage for the system that includes information related to past repairs. It is considered that there is no information related to components' lifetime distributions and their parameters. The optimal decision parameter is derived considering historical data using density estimation and some machine learning algorithms like the random forest, KNN and Naïve Bayes. Eventually, the efficiency of the proposed optimal decision parameter according to available data is compared to the one derived where all information on the system is available.

Keywords

Maintenance Optimization, Nan-parametric Estimation, Machine Learning Algorithms

Primary authors: MISAII, HASAN (University of TEHRAN and University of Technology of TROYES); FOULADIRAD, MITRA (Aix Marseille Université et Université de Technologie de Troyes); Dr HAGHIGHI, Firoozeh (School of Mathematics, Statistics and Computer Science, College of Science, University of Tehran, Tehran, Iran)

Presenter: MISAII, HASAN (University of TEHRAN and University of Technology of TROYES)

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