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Hyper-parameter optimization based nonlinear multistate deterioration modeling for deterioration level assessment and remaining useful life prognostics

Gaige Chen , Jinglong Chen , Yanyang Zi , Huihui Miao

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Highlights

- A general solution is presented to nonlinear multistate deterioration modeling for deterioration level assessment and remaining useful life prognostics under no-label lifetime data including multi signals.
- In the solution, a three layer nonlinear multistate deterioration model of complex equipment is established based on hyper-parameter optimization.
- Hyper-parameter I and M , which determine the first two layers, are optimized by the proposed unsupervised extraction method based on greedy kernel principal components analysis and the improved Mann-Kendall criterion, respectively.
- As determinant of the third layer, hyper-parameter N is optimized by the improved Bayesian information criterion to obtain optimized model, when parameters have been estimated under each alternative model structure at different N .

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