

ONLINE DYNAMIC MODE DECOMPOSITION: AN ALTERNATIVE APPROACH FOR LOW RANK DATASETS*

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Dedicated to Dr. Dan Tiba on the occasion of his 70th anniversary

Abstract

In this study, we provide an alternative approach for computing the dynamic mode decomposition (DMD) in real-time for streaming datasets. It is a low-storage method that updates the DMD approximation of a given dynamic as new data becomes available. Unlike the standard online DMD method, which is applicable only to overconstrained and full-rank datasets, the new method is applicable for both overconstrained and underconstrained datasets. The method is equation-free in the sense that it does not require knowledge of the underlying governing equations and is entirely data-driven. Several numerical examples are presented to demonstrate the performance of the method.

MSC: 65P99, 37M02, 37L65

keywords: DMD method, Online Dynamic mode decomposition, Koopman operator, Singular value decomposition, Equation-free.

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