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# Partial Orthogonal Rank-One Decomposition of Complex Symmetric Tensors Based on the Takagi Factorization

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**Abstract**

This paper is devoted to the computation of rank-one decomposition of complex symmetric tensors. Based on the Takagi factorization of complex symmetric matrices, we derive algorithm for computing the partial orthogonal rank-one decomposition of complex symmetric tensors with an order being a power of two, denoted by *CSTPOROD*. We consider the properties of this decomposition. We design a strategy (tensor embedding) to computing the partial orthogonal rank-one decomposition of complex symmetric tensors, whose order is not the power of two. Similar to the case of complex symmetric tensors, we consider how to compute the partial orthogonal rank-one decomposition of general complex tensors. We illustrate our algorithms via numerical examples.

**Keywords:** Complex symmetric tensor; complex tensor; rank-one decomposition; partial orthogonality; Takagi factorization; tensor embedding; least squares

**AMS subject classifications:** 15A18, 15A69, 65F15, 65F10

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