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Low Tucker rank tensor recovery via ADMM based on exact and inexact iteratively reweighted algorithms *

Yu-Fan Li † Kun Shang‡ Zheng-Hai Huang§

Abstract

In this paper, we establish a non-convex L_p norm relaxation model for low Tucker rank tensor recovery problem, and equivalently transform it to a non-convex minimization problem with separable structure by introducing series of auxiliary variables. In particular, we propose two alternating direction method of multipliers (ADMM) based on exact and inexact iteratively reweighted algorithms to solve the obtained non-convex relaxation problem respectively, which are proved to be convergent. We implement the proposed algorithms in numerical experiments for solving low Tucker rank tensor recovery problem on simulation data and real data, and compare them with other existing state-of-art algorithms. Numerical results show the effectiveness of the proposed algorithms for solving low rank tensor recovery problem and image recovery.

Keywords Low Tucker rank tensor recovery, Tensor completion, Alternative direction method of multipliers, Iteratively reweighted algorithms, L_p norm.

AMS subject classifications 65K05, 90C26, 90C59

1 Introduction

Let $\mathcal{T} := \mathbb{R}^{I_1 \times I_2 \times \cdots \times I_N}$ denote the set of all N order $I_1 \times \cdots \times I_N$ dimensional real tensors, where N is a nonnegative integer and $I_1, \ldots, I_N$ are positive integers. Especially, a zero order tensor is a scalar, a one order tensor is a vector, and a two order tensor is a matrix.

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