ICRAMCS 2026

THE EIGHTH EDITION OF THE INTERNATIONAL CONFERENCE ON RESEARCH IN APPLIED MATHEMATICS AND COMPUTER SCIENCE

April 23-24-25, 2026 | Marrakech, Morocco

Riemannian optimization for low-rank matrix completion

Communication Info

Authors:
Abdeslem Hafid BENTBIB[1]
Asma EL-YAAKOUBY [1]

[1] *Faculty of Science and Techniques, Marrakech, Morocco*

Keywords:
(1) Matrix completion
(2) Riemannian optimization
(3) Singular Value Decomposition

Abstract

In today's digital world, data is everywhere, powering social media, business decisions, and scientific discoveries. However, data is rarely perfect: noise, corruption, and missing entries are common, limiting its usefulness. Low-rank matrix completion [2] addresses this challenge by recovering missing or corrupted information, making it a cornerstone of modern data analysis. Among the available approaches [4, 6], Riemannian optimization [3, 1] stands out by exploiting the geometric structure of low-rank matrices, providing algorithms that are both accurate and efficient. In particular, the Riemannian conjugate gradient method [5] has proven effective across a wide range of applications. In this work, we present the design of these algorithms and demonstrate its performance through numerical experiments

References

[1] P.-A. Absil, R. Mahony, and R. Sepulchre, Optimization Algorithms on Matrix Manifolds, Princeton University Press, 2008.

[2] L. T. Nguyen, J. Kim, and B. Shim, Low-rank matrix completion: A contemporary survey, IEEE Access, 7, 2019, 94215–94237. [3] Authors, Title Journal, Volume, Year, Pages.

[4] H. Sato, Riemannian Optimization and Its Applications, Springer Cham, 2021.

[5] J. Tanner and K. Wei, Low rank matrix completion by alternating steepest descent methods, Applied and Computational Harmonic Analysis, 40(2), 2016, 417–429.

[6] B. Vandereycken, Low-rank matrix completion by riemannian optimization, SIAM Journal on Optimization, 23(2), 2013, 1214–1236.

[7] Z. Wen, W. Yin, and Y. Zhang, Solving a low-rank factorization model for matrix completion by a nonlinear successive over-relaxation algorithm, Mathematical Programming Computation, 4(4), 2012, 333–361.