Catalyst Meta Acceleration Framework: The Gist of its Theories

Hongda Li * and Xianfu Wang

November 6, 2024

Abstract

Nesterov's accelerated gradient first appeared back in the 1983 has sparked numerous theoretical and pratical advancedments in Mathematics programming literatures. The idea behind Nesterov's acceleration is universal in the convex case and it has concrete extension in the non-convex case. In this paper we survey specifically the Catalyst Acceleration that incorperated ideas from the Accelerated Proximal Point Method proposed by Guller back in 1993. We will review Nesterov's classical analysis of accelerated gradient in the convex case. We summarize key aspect of the theoretical innovations involved to achieve the design of the algorithm in convex, and non-convex case. [1].

2010 Mathematics Subject Classification: Primary 65K10, 90c25, 90C30; Secondary 65Y20. **Keywords:** Nesterov acceleration, Proximal point method.

*Department of Mathematics, I.K. Barber Faculty of Science, The University of British Columbia, Kelowna, BC Canada V1V 1V7. E-mail: alto@mail.ubc.ca.

References

[1] J. Bezanson, A. Edelman, S. Karpinski, and V. B. Shah, *Julia: A Fresh Approach to Numerical Computing*, SIAM Review, 59 (2017), pp. 65–98. Publisher: Society for Industrial and Applied Mathematics.

A Postoned proofs