

ON GENERALIZED CSISZÁR (f,g) -DIVERGENCE WITH AN APPLICATION FOR \mathbf{p} -MAJORIZATION

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Abstract. In this note, we develop some ideas from [8]. We introduce and investigate generalized Csiszár (f,g) -divergence generated by a convex function f and a concave function g . We derive a Csiszár-Körner type inequality for such (f,g) -divergences. We also study some special cases of the obtained inequality. In particular, we give a result for \mathbf{p} -majorization.

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REFERENCES

- [1] I. CSISZÁR, *Information-type measures of differences of probability distributions and indirect observations*, Studia Sci. Math. Hung., **2**, (1967), 299–318.
- [2] I. CSISZÁR AND J. KÖRNER, *Information Theory: Coding Theorems for Discrete Memory-less Systems*, Academic Press, New York, 1981.
- [3] S. S. DRAGOMIR (Ed.), *Upper and lower bounds for Csiszár f -divergence in terms of the Kullback-Leibler distance and applications*, Inequalities for the Csiszár f -divergence in Information Theory, 2000, <http://rgmia.vu.edu.au/monographs/csiszar.htm>.
- [4] P. KLUZA AND M. NIEZGODA, *On Csiszár and Tsallis type f -divergences induced by superquadratic and convex functions*, Math. Inequal. Appl., **21**, (2018), 455–467.
- [5] A. W. MARSHALL, I. OLKIN AND B. C. ARNOLD, *Inequalities: Theory of Majorization and Its Applications*, Springer, 2nd printing, New York, 2011.
- [6] M. NIEZGODA, *Vector joint majorization and generalization of Csiszár-Körner's inequality for f -divergence*, Discrete Appl. Math., **198**, (2016), 195–205.
- [7] M. NIEZGODA, *Nonlinear Sherman type inequalities*, Adv. Nonlinear Anal., **9**, 1 (2020), 168–175.
- [8] M. NIEZGODA, *Inequalities for convex and concave functions and a new concept of majorization intended for two pairs of vectors*, Results in Math., **75**, 1 (2020), article 34.
- [9] F. VOM ENDE AND G. DIRR, *The d -majorization polytope*, arXiv:1911.01061v1, 4 Nov 2019.
- [10] S. SHERMAN, *On a theorem of Hardy, Littlewood, Pólya, and Blackwell*, Proc. Nat. Acad. Sci. USA, **37**, (1957), 826–831.