

CONVERSE TO THE SHERMAN INEQUALITY WITH APPLICATIONS

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Abstract. In this paper we proved a converse to Sherman's inequality. Using the concept of f -divergence we obtained some inequalities for the well-known entropies. We also introduced a new entropy by applying the Zipf-Mandelbrot law and derived some related inequalities.

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REFERENCES

- [1] M. ADIL KHAN, S. IVELIĆ BRADANOVIĆ, J. PEČARIĆ, *Generalizations of Sherman's inequality by Hermite's interpolating polynomial*, Math. Inequal. Appl. **19** (4) (2016) 1181–1192.
- [2] R. P. AGARWAL, S. IVELIĆ BRADANOVIĆ, J. PEČARIĆ, *Generalizations of Sherman's inequality by Lidstone's interpolating polynomial*, J. Inequal. Appl. **6**, 2016 (2016).
- [3] I. BURBEA AND C. R. RAO, *On the convexity of some divergence measures based on entropy functions*, IEEE Transactions on Information Theory, **28** (1982), 489–495.
- [4] I. CSISZÁR, *Information-type measures of difference of probability functions and indirect observations*, Studia Sci. Math. Hungar, **2** (1967), 299–318.
- [5] I. CSISZÁR AND J. KÖRNER, *Information Theory: Coding Theorem for Discrete Memoryless Systems*, Academic Press, New York, 1981.
- [6] S. S. DRAGOMIR, *Other inequalities for Csiszár divergence and applications*, Preprint, RGMIA Monographs, Victoria University (2000).
- [7] P. A. KLUZA AND M. NIEZGODA, *On Csiszár and Tsallis type f -divergences induced by superquadratic and convex functions*, Math. Inequal. Appl. **21** (2) (2018) 455–467.
- [8] S. IVELIĆ BRADANOVIĆ, N. LATIF, J. PEČARIĆ, *On an upper bound for Sherman's inequality*, J. Inequal. Appl. **2016** (2016).
- [9] S. IVELIĆ BRADANOVIĆ, N. LATIF, Đ. PEČARIĆ, J. PEČARIĆ, *Sherman's and related inequalities with applications in information theory*, J. Inequal. Appl. **2018** (2018).
- [10] S. IVELIĆ BRADANOVIĆ, J. PEČARIĆ, *Extensions and improvements of Sherman's and related inequalities for n -convex functions*, Open Math. **15** (1) 2017.
- [11] S. IVELIĆ BRADANOVIĆ, J. PEČARIĆ, *Generalizations of Sherman's inequality*, Per. Math. Hung. **74** (2) 2017.
- [12] J. H. JUSTICE, *Maximum Entropy and Bayesian Methods in Applied Statistics*, Cambridge University Press, Cambridge, 1986.
- [13] J. N. KAPUR, *On the roles of maximum entropy and minimum discrimination information principles in Statistics*, Technical Address of the 38th Annual Conference of the Indian Society of Agricultural Statistics, 1984, 1–44.
- [14] S. KULLBACK, *Information Theory and Statistics*, J. Wiley, New York, 1959.
- [15] S. KULLBACK, R. A. LEIBLER, *On information and sufficiency*, The Annals of Mathematical Statistics **22** (1) (1951) 79–86.
- [16] P. LAH AND M. RIBARIĆ, *Converse of Jensen's inequality for convex functions*, Univ. Beograd Publ. Elektrotehn. Fak. Ser. Mat. Fiz. 412–460 (1973), 201–205.

- [17] M. NIEZGODA, *Remarks on Sherman like inequalities for (α, β) -convex functions*, Math. Ineqal. Appl. 17 (4) (2014) 1579–1590.
- [18] J. E. PEČARIĆ, F. PROSHAN AND Y. L. TONG, *Convex Functions, Partial Orderings and Statistical Applications*, Academic Press, Inc. (1992).
- [19] A. RENYI, *On measures of entropy and information*, in: Proceedings of the Fourth Berkeley Symposium on Mathematical Statistics and Probability, vol. 1, pp. 547–561, 1961.
- [20] C. E. SHANNON, *A mathematical theory of communication*, Bell System Technical Journal 27 (1948) 379–423.
- [21] S. SHERMAN, *On a theorem of Hardy, Littlewood, Polya and Blackwekk*, Proc. Nat. Acad. Sci. USA, 37(1) (1957), 826–831.