

WINTGEN INEQUALITY FOR STATISTICAL SURFACES

MUHITTIN EVREN AYDIN AND ION MIHAI

Abstract. The Wintgen inequality (1979) is a sharp geometric inequality for surfaces in the 4-dimensional Euclidean space involving the Gauss curvature (intrinsic invariant) and the normal curvature and squared mean curvature (extrinsic invariants), respectively. In the present paper we obtain a Wintgen inequality for statistical surfaces.

Mathematics subject classification (2010): 53C05, 53C40, 53A40.

Keywords and phrases: Wintgen inequality, statistical manifold, statistical surface, dual connections.

REFERENCES

- [1] S. AMARI, *Differential-Geometrical Methods in Statistics*, Springer-Verlag, 1985.
- [2] M. E. AYDIN, A. MIHAI, I. MIHAI, *Some inequalities on submanifolds in statistical manifolds of constant curvature*, *Filomat* **29**, 3 (2015), 465–477.
- [3] M. E. AYDIN, A. MIHAI, I. MIHAI, *Generalized Wintgen inequality for statistical submanifolds in statistical manifolds of constant curvature*, *Bull. Math. Sci.* **7** (2017), 155–166.
- [4] B. Y. CHEN, *Geometry of Submanifolds*, New York, M. Dekker, 1973.
- [5] B. Y. CHEN, *On Wintgen ideal surfaces*, in: *Riemannian Geometry and Applications – Proceedings RIGA 2011* (Eds. A. Mihai and I. Mihai), Ed. Univ. București, Bucharest, 2011, pp. 59–74.
- [6] B. Y. CHEN, *Mean curvature and shape operator of isometric immersions in real-space-forms*, *Glasg. Math. J.* **38** (1996), 87–97.
- [7] B. Y. CHEN, *Classification of Wintgen ideal surfaces in Euclidean 4-space with equal Gauss and normal curvatures*, *Ann. Global Anal. Geom.* **38** (2010), 145–160.
- [8] P. J. DE SMET, F. DILLEN, L. VERSTRAELEN, L. VRANCKEN, *A pointwise inequality in submanifold theory*, *Arch. Math. (Brno)*, **35** (1999), 115–128.
- [9] F. DILLEN, K. NOMIZU, L. VRANCKEN, *Conjugate connections and Radon's theorem in affine differential geometry*, *Monatsh. Math.* **109** (1990), 221–235.
- [10] H. FURUHATA, *Hypersurfaces in statistical manifolds*, *Diff. Geom. Appl.* **27** (2009), 420–429.
- [11] H. FURUHATA, *Statistical hypersurfaces in the space of Hessian curvature zero*, *Diff. Geom. Appl.* **29** (2011), 586–590.
- [12] J. GE, Z. TANG, *A proof of the DDVV conjecture and its equality case*, *Pacific J. Math.* **237** (2008), 87–95.
- [13] I. V. GUADALUPE, L. RODRIGUEZ, *Normal curvature of surfaces in space forms*, *Pacific J. Math.* **106** (1983), 95–103.
- [14] S. HAESSEN, L. VERSTRAELEN, *Natural intrinsic geometrical symmetries*, *SIGMA Symmetry Integrability Geom. Methods Appl.* **5** (2009), 15, paper 086.
- [15] A.-M. LI, U. SIMON, G. ZHAO, Z. HU, *Global Affine Differential Geometry of Hypersurfaces*, 2nd revised and extended ed. (English), De Gruyter Expositions in Mathematics 11, Berlin: De Gruyter (ISBN 978-3-11-026667-2/hbk), 410 p. (2015).
- [16] R. LOPEZ, *Parabolic surfaces in hyperbolic space with constant Gaussian curvature*, *Bull. Belg. Math. Soc. Simon Stevin* **16** (2009), 337–349.
- [17] Z. LU, *Normal scalar curvature conjecture and its applications*, *J. Funct. Anal.* **261** (2011), 1284–1308.
- [18] A. MIHAI, *An inequality for totally real surfaces in complex space forms*, *Kragujevac J. Math.* **26** (2004) 83–88.

- [19] A. MIHAI, *Geometric inequalities for purely real submanifolds in complex space forms*, Results Math. **55** (2009), 457–468.
- [20] I. MIHAI, *On the generalized Wintgen inequality for Lagrangian submanifolds in complex space forms*, Nonlinear Analysis **95** (2014), 714–720.
- [21] I. MIHAI, *On the generalized Wintgen inequality for Legendrian submanifolds in Sasakian space forms*, Tohoku J. Math. **69** (2017), 43–53.
- [22] C. R. MIN, S. O. CHOE, Y. H. AN, *Statistical immersions between statistical manifolds of constant curvature*, Glob. J. Adv. Res. Class. Mod. Geom. **3** (2014), 66–75.
- [23] K. NOMIZU, T. SASAKI, *Affine Differential Geometry*, Cambridge University Press, 1994.
- [24] B. OPOZDA, *A sectional curvature for statistical structures*, Linear Algebra Appl. **497** (2016), 134–161.
- [25] B. OPOZDA, *Bochner’s technique for statistical structures*, Ann. Global Anal. Geom. **48** (2015), 357–395.
- [26] B. ROUXEL, *Sur une famille des A-surfaces d’un espace Euclidien E^4* , Österreichischer Mathematiker Kongress, Innsbruck, 1981, p. 185.
- [27] U. SIMON, *Affine Differential Geometry*, in *Handbook of Differential Geometry* (Eds. F. Dillen and L. Verstraelen), Vol. I, 905–961, North-Holland, Amsterdam, 2000.
- [28] K. UOHASHI, A. OHARA AND T. FUJII, *1-conformally flat statistical submanifolds*, Osaka J. Math. **37** (2000), 501–507.
- [29] P. W. VOS, *Fundamental equations for statistical submanifolds with applications to the Bartlett connection*, Ann. Inst. Statist. Math. **41**, 3 (1989), 429–450.
- [30] P. WINTGEN, *Sur l’inégalité de Chen-Willmore*, C. R. Acad. Sci. Paris Sér.A–B, **288** (1979), A993–A995.