

CONTENTS

Chapter 1. Introduction	1
PART I. GEOMETRICAL STRUCTURES OF A FAMILY OF PROBABILITY DISTRIBUTIONS	11
Chapter 2. Differential Geometry of Statistical Models	11
2.1. Manifold of statistical model	11
2.2. Tangent space	16
2.3. Riemannian metric and Fisher information	25
2.4. Affine connection	32
2.5. Statistical α -connection	38
2.6. Curvature and torsion	43
2.7. Imbedding and submanifold	49
2.8. Family of ancillary submanifolds	54
2.9. Notes	63
Chapter 3. α -Divergence and α -Projection in Statistical Manifold	66
3.1. α -representation	66
3.2. Dual affine connections	70
3.3. α -family of distributions	73
3.4. Duality in α -flat manifolds	79
3.5. α -divergence	84
3.6. α -projection	89
3.7. On geometry of function space of distributions	93
3.8. Remarks on possible divergence, metric and connection in statistical manifold	96
3.9. Notes	102

Chapter 4. Curved Exponential Families and Edgeworth Expansions	104
4.1. Exponential family	104
4.2. Curved exponential family	108
4.3. Geometrical aspects of statistical inference	115
4.4. Edgeworth expansion	120
4.5. Notes	127
Chapter 5. Asymptotic Theory of Estimation	128
5.1. Consistency and efficiency of estimators	128
5.2. Second- and third-order efficient estimator	131
5.3. Third-order error of estimator without bias correction	141
5.4. Ancillary family depending on the number of observations	145
5.5. Effects of parametrization	148
5.6. Geometrical aspects of jacknifing	156
5.7. Notes	159
Chapter 6. Asymptotic Theory of Tests and Interval Estimators	161
6.1. Ancillary family associated with a test	161
6.2. Asymptotic evaluations of tests: scalar parameter case	171
6.3. Characteristics of widely used efficient tests: Scalar parameter case	181
6.4. Conditional test	190
6.5. Asymptotic properties of interval estimators	193
6.6. Asymptotic evaluations of tests: general case	197
6.6. Notes	208

7.1.	Conditional information, asymptotic sufficiency and asymptotic ancillarity	210
7.2.	Conditionl inference	217
7.3.	Pooling independent observations	231
7.4.	Complete decomposition of information	236
7.5.	Notes	241

Chapter 8. Statistical Inference in the Presence of Nuisance
Parameters

244

8.1.	Orthogonal parametrization and orthogonalized information	244
8.2.	Higher-order efficiency of estimators	255
8.3.	The amount of information carried by knowledge of nuisance parameter	257
8.4.	Asymptotic sufficiency and ancillarity	261
8.5.	Reconstruction of estimator from those of independent samples	268
8.6.	Notes	273

REFERENCES

276

SUBJECT INDICES

287