



2023 IMS International Conference on Statistics and Data Science (ICSDS)

December 18-21, 2023
Lisbon, Portugal

Program Book



SPE
Sociedade Portuguesa
de Estatística

CEAUL
Centro de Estatística e Aplicações
Universidade de Lisboa

fct

Fundação
para a Ciência
e a Tecnologia

Application of Information Geometry in Incomplete Block Designs: Towards Statistical Efficiency

Carla Cardoso¹, Amílcar Oliveira^{1,2}, Teresa A. Oliveira^{1,2}

¹ *Universidade Aberta*

² *Centro de Estatística e Aplicações, Faculdade de Ciências,
Universidade de Lisboa*

Abstract

Statistical Science along the time has been instrumental in crafting efficient experimental methodologies. A standout area in this regard is known as Design of Experiments (DoE), and the role of balanced incomplete block designs (BIBD) with or without block repetition is very well known. The concept of information geometry, coined by C.R. Rao, revolutionized the understanding of the structure of statistical parameter spaces. Rao (1945) introduced the concept of Riemannian spaces in statistics, establishing a field that remains fertile for research. Subsequently, Amari (1985) expanded these ideas, exploring the duality in parameter spaces and bringing new perspectives to information theory. In the context of incomplete block designs, Fisher (1935) emphasized the importance of efficiency in DoE and introduced fundamental concepts that remain the basis for many modern studies. The efficiency of incomplete block designs, as explored by Patterson and Bailey (1978), emphasizes the need for optimization in the selection and allocation of treatments within blocks. This work aims to explore the synergy between information geometry and incomplete block designs with repetition. The goal is not only theoretical understanding but also the practical applicability of these concepts, aiming to maximize the information extracted from each experiment with optimized resources, significantly contributing to the advancement of statistical methodology and opening new horizons for researchers and professionals in the field.

References

- Rao, C.R.: Information and the accuracy attainable in the estimation of statistical parameters (1945).
- Amari, S.: Differential-Geometrical Methods in Statistics (1985).
- Fisher, R.A.: The Design of Experiments (1935).
- Patterson, H.D., and Bailey, R.A.: Design and Analysis of Experiments in the Animal and Medical Sciences (1978).