

Beyond Balanced Incomplete Block Designs: Addressing challenges, connections, applications and R

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Experimental Designs have been widely used, among others, in agricultural, industrial and computer experiments, in order to reduce experimental cost and to provide efficient parameter estimation. Balanced Incomplete Block Designs (BIBD) play a key role in this context: in addition to their optimal properties and to the possible applications in various areas of science, these designs present extremely relevant links, highlighted in branches of Statistics like Sampling Theory. Some literature review is presented exploiting the combinatorial properties of various BIBD to construct controlled sampling designs with minimum number of distinct blocks, as well the most relevant methods on the construction of BIBD with repeated blocks (BIBDR). An application of BIBDR in the area of Education was performed using software R, with the aim of comparing five fields of algebraic thinking in a sample consisting of students in the 1st year of higher education in Cape Verde.

Key Words: Experimental Design, Sampling, Education, BIBD