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Samurai Sudoku-Based Space-Filling Designs

The game-board of Samurai Sudoku consists of five overlapping Sudoku grids, for each of which several entries are provided and the remaining entries must be filled subject to no row, column and three-by-three subsquare containing duplicate numbers. By exploiting these uniformity properties, we construct a new type of design, called a Samurai Sudoku-based space-filling design. This design has several attractive properties: (1) the complete design achieves attractive uniformity in both univariate and bivariate margins; (2) it can be divided into groups of subdesigns with overlaps such that each subdesign achieves maximum uniformity in both univariate and bivariate margins; (3) each of the overlaps achieves maximum uniformity in both univariate and bivariate margins. These designs are appealing for meta-analysis and cross-validation.