

# Package ‘mixedfact’

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**Type** Package

**Title** Generate and Analyze Mixed-Level Blocked Factorial Designs

**Version** 0.1.1

**Description** Generates blocked designs for mixed-level factorial experiments for a given block size. Internally, it uses finite-field based, collapsed, and heuristic methods to construct block structures that minimize confounding between block effects and factorial effects. The package creates the full treatment combination table, partitions runs into blocks, and computes detailed confounding diagnostics for main effects and two-factor interactions. It also checks orthogonal factorial structure (OFS) and computes efficiencies of factorial effects using the methods of Nair and Rao (1948) <[doi:10.1111/j.2517-6161.1948.tb00005.x](https://doi.org/10.1111/j.2517-6161.1948.tb00005.x)>. When OFS is not satisfied but the design has equal treatment replications and equal block sizes, a general method based on the C-matrix and custom contrast vectors is used to compute efficiencies. The output includes the generated design, finite-field metadata, confounding summaries, OFS diagnostics, and efficiency results.

**License** GPL-3

**Encoding** UTF-8

**RoxygenNote** 7.3.3

**Suggests** rmarkdown, testthat (>= 3.0.0)

**Config/testthat/edition** 3

**NeedsCompilation** no

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**Repository** CRAN

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**Description**

Constructs blocked designs for mixed-level factorial experiments for a given block size using finite-field based, collapsed, and heuristic methods. The procedure creates the full treatment combination table, partitions runs into blocks, and computes detailed confounding diagnostics for main effects and two-factor interactions. The analyzer normalizes blocks into canonical labels, checks balance and Orthogonal Factorial Structure (OFS), and computes efficiencies of factorial effects. When OFS does not hold but the design has equal treatment replications and equal block sizes, a general method based on the C-matrix and custom contrast vectors is used to compute efficiencies. The output includes GF-related metadata (when applicable), confounding summaries, OFS diagnostics, and efficiency results.

**Usage**

```
mixedfact(levels_vec, block_size, method = "auto", verbose = TRUE)
```

**Arguments**

levels_vec	Integer vector of factor levels (e.g., c(2, 3, 4) for a $2 \times 3 \times 4$ design).
block_size	Integer giving the number of runs per block. Must divide the total number of treatment combinations.
method	Character string specifying the generator method: <ul style="list-style-type: none"> <li>• "auto" (default): try GF, then collapsed, then heuristic.</li> <li>• "gf": finite-field based optimized generator.</li> <li>• "collapsed": random collapsed blocks.</li> <li>• "heuristic": heuristic ordering and blocking.</li> </ul>
verbose	Logical; if TRUE, prints progress, summaries, and efficiency output.

**Details**

Internally, the algorithm:

- Generates candidate block structures (GF-based, collapsed, or heuristic).
- Computes confounding summaries for main effects and two-factor interactions.
- Normalizes blocks and checks balance and OFS.
- Computes efficiency factors for main and interaction effects.

**Value**

A list with components:

**code1** Output from the generator, including blocks, confounding, and (if applicable) gf\_info.

**code2** Output from the analyzer, including OFS and efficiency results.

**factor\_levels** The vector levels\_vec supplied.

**block\_size** The block size used.

**blocks\_numeric** List of blocks with numeric factor values F1, F2, ...

**blocks\_labels** List of blocks as character labels (e.g., "012").

**References**

K. R. Nair and C. R. Rao (1948). *Confounding in Asymmetrical Factorial Experiments*. Journal of the Royal Statistical Society: Series B (Methodological), **10**(1), 109-131.

Gupta, S. and Mukerjee, R. (1989). *A Calculus for Factorial Arrangements*. Lecture Notes in Statistics, Volume 59. Springer-Verlag.

**Examples**

```
out <- mixedfact(c(2, 3, 4), block_size = 12)
str(out$code1)
str(out$code2)
```

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