Full Factorial Design

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Full Factorial Design

Setting:

- k many factors / parameters (e.g. A, B, C)
- each with a (different) number of levels

$$(\text{e.g. } \mathrm{A} = (a_1, a_2, a_3),\ \mathrm{B} = (b_1, b_2),\ \mathrm{C} = (c_1, c_2, c_3))$$

Full Factorial Design

- includes all combinations

	A	B	C
1	1	1	1
2	1	1	2
3	1	1	3
4	1	2	1
5	1	2	2
6	1	2	3

	A	B	C
7	2	1	1
8	2	1	2
9	2	1	3
10	2	2	1
11	2	2	2
12	2	2	3

	A	B	C
13	3	1	1
14	3	1	2
15	3	1	3
16	3	2	1
17	3	2	2
18	3	2	3

Full Factorial Design

Calculation:

- in the example with A $= (a_1, a_2, a_3)$, B $= (b_1, b_2)$, C $= (c_1, c_2, c_3)$
  $\Rightarrow \; 3 \cdot 2 \cdot 3 = 18$

- in general with:
  - k factors $F_1, F_2, ..., F_k$
  - each factor F_i with p_i levels

  $F_1 = (1, 2, ..., p_1), F_2 = (1, 2, ..., p_2), ..., F_k = (1, 2, ..., p_k)$
  $\Rightarrow \; p_1 \cdot p_2 \cdot ... \cdot p_k$

$\rightarrow$ it's called a p^k-design, if $p_1 = p_2 = ... = p_k = p$

Full Factorial Design

Advantages:

- easy procedure
- all interactions are estimable (in contrast to e.g. fractional factorial design)

Disadvantages:

- leads very fast to a high number
- the design is for discret variables

  $\rightarrow$ continous factors must be converted into discrete levels (e.g. 2^k-/3^k-design)

Literatur/Quellen

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