OMARS designs analysis, bridging the gap between screening and optimization experimental designs

NCS conference, 26th September 2024

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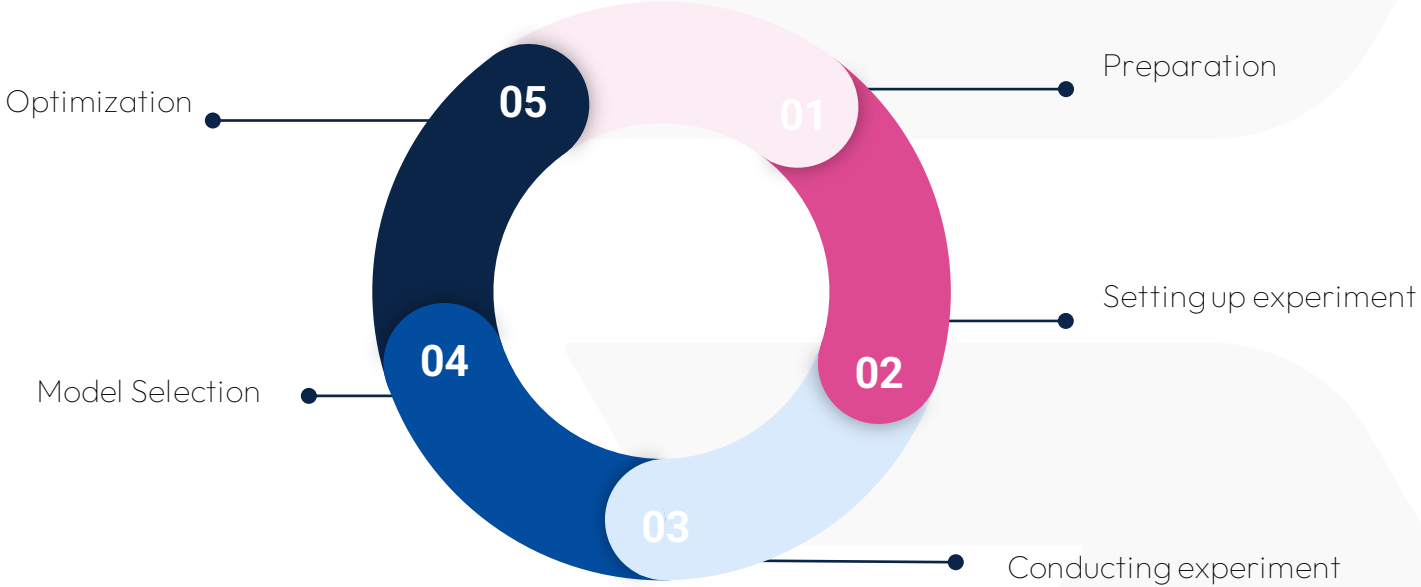
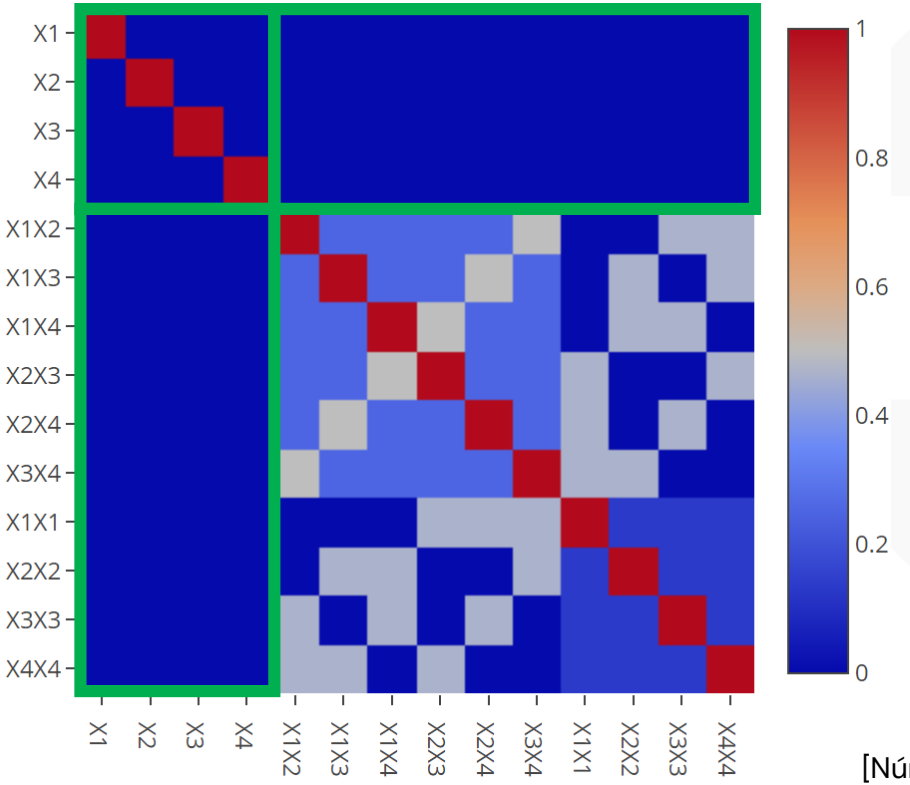
NCS Non-Clinical Statistics Conference
Wiesbaden, DE / 25-27 September, 2024

The five phases of Design of Experiments



OMARS designs



***O**rthogonal*

main effects estimated independently from each other

***M**inimally **A**liased*

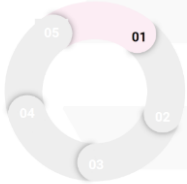
main effects estimated independently from all second-order effects

R**esponse **S**urface **Designs

allow the estimation of a partial or complete second-order effects model

[Núñez Ares, Goos 2020, 2023 & Núñez Ares, Schoen, Goos 2023]

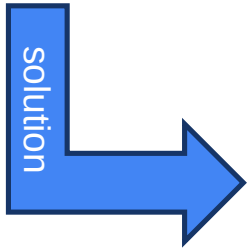
Advantages of using OMARS designs



- Include more factors at a reduced cost (screening + optimization in one design)
- The catalog offers much flexibility in choosing a design.
- Balance power for estimating effects and prediction quality of the design.
- Solution to novel problems like a screening design in blocks with high power to detect quadratic effects.

Challenges of model selection

1. Identify the most important effects
2. Balance estimation/prediction quality of the model
3. Respect heredity
4. Avoid multicollinearity of effects in the model
5. Include knowledge of subject matter experts

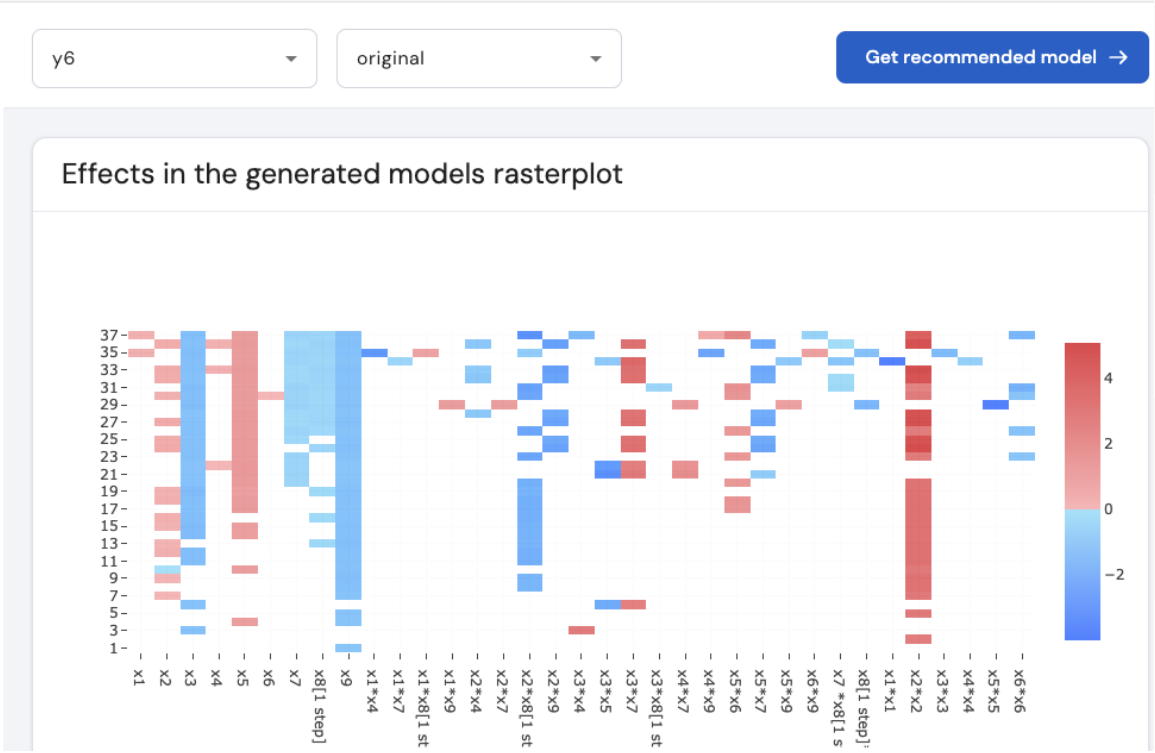


All subset multiple linear regression

+

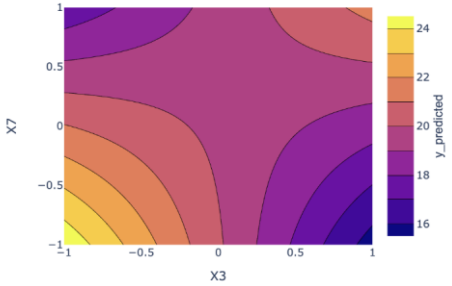
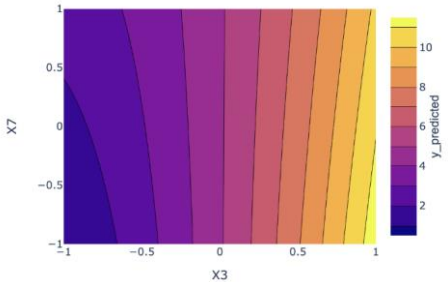
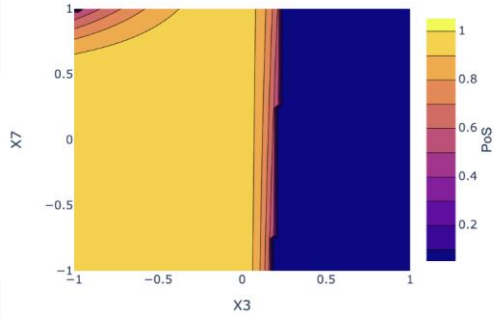
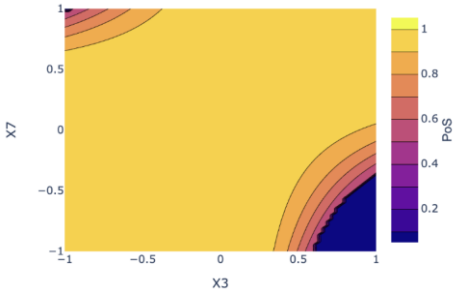
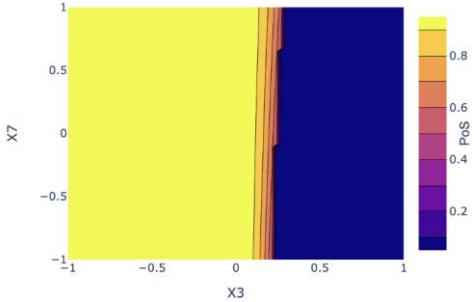
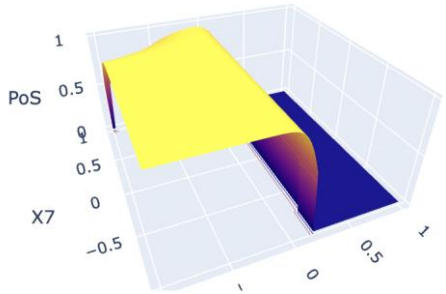
interactive graphs

Interactive interface of the modeling results



Reveals the frequency in which effects appear in the models, and their magnitude

Example of multiple-response optimization

	Response 1	Response 2	Responses 1& 2
Specifications	≥ 17.4	≤ 5.9	
Prediction			
Probability of success			

Presented at ENBIS23 in Valencia

OMARS designs for Ambr250 system (GSK)

24 bioreactors (24 runs)

6 quantitative factors

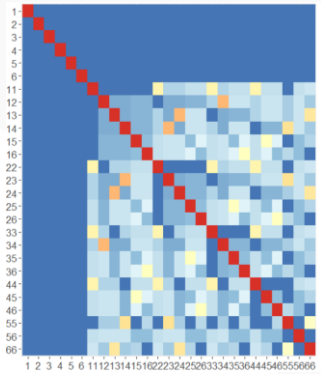
Screening + optimization at once

Selected OMARS design

3 replicate points (including the center point)

No blocks

High powers to detect two-factor interaction and quadratic effects



Orthogonality

Low average correlation

Conclusions

OMARS design allowed to screen 6 factors and optimize the productivity with just 24 tests

With the Ambr system, it was possible to do so in one week

The combination of the OMARS design and the Ambr system has saved time and resources

References

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