Data-Driven Robust Design of an Aeroelastic Wing

Andrew Cooper, Luis Crespo, and Bret Stanford

What’s one takeaway from this talk?

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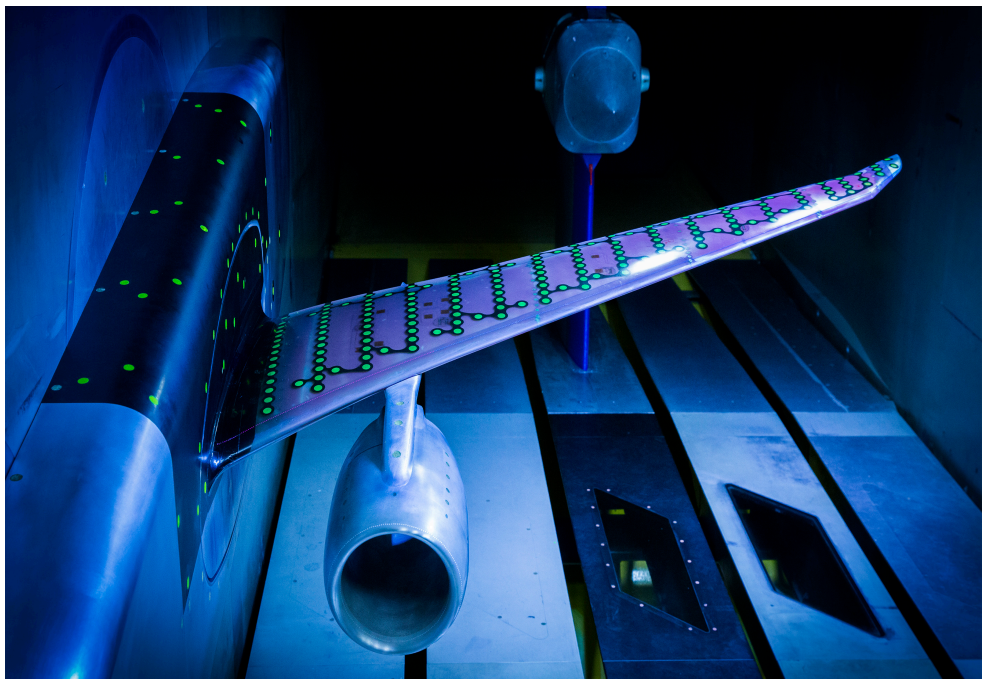
Identifying robust designs with simulators is a challenging task, but Bayesian Optimization methods can be an effective approach.

Wing design problem



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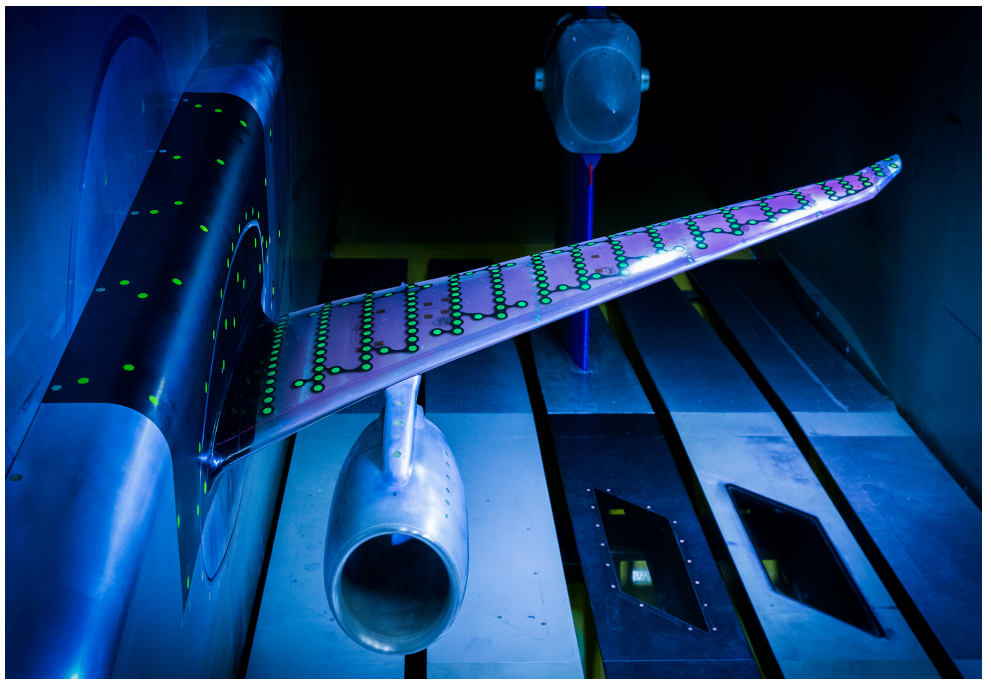

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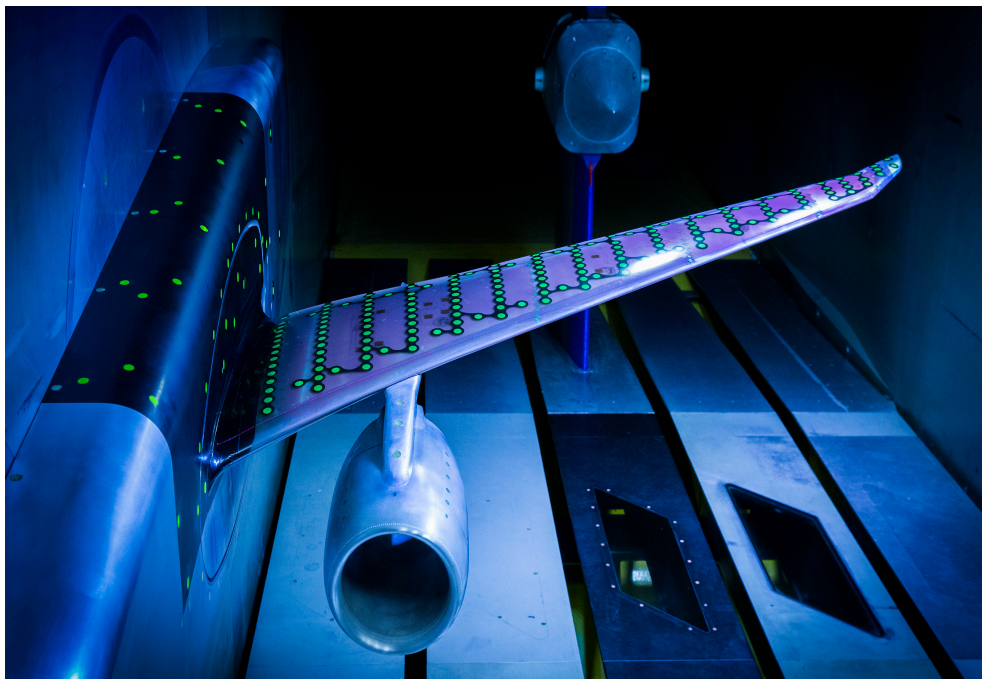

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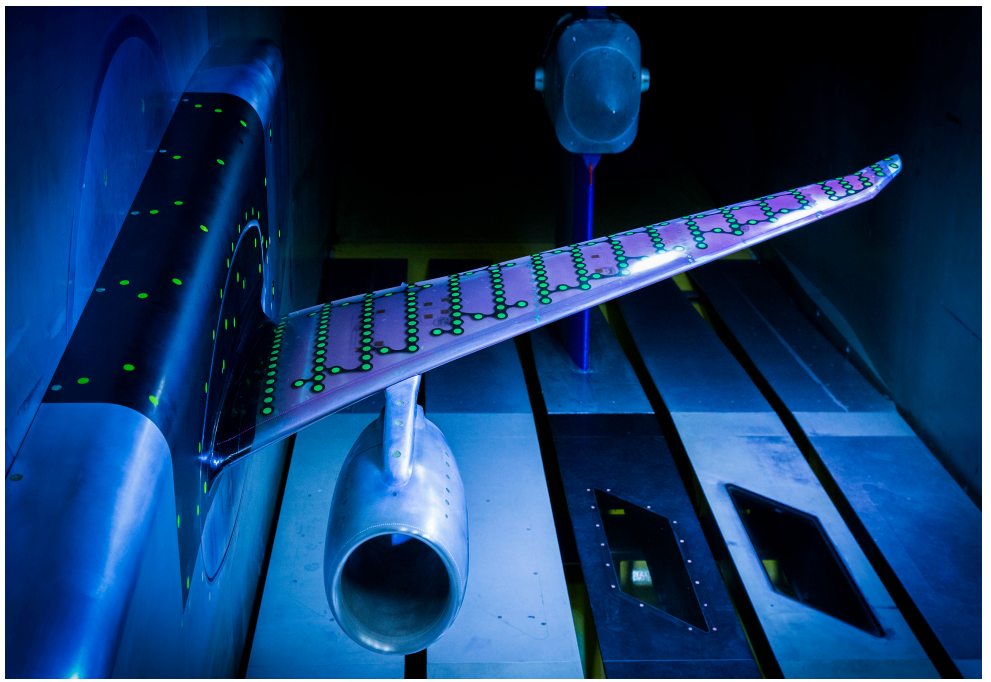
- Wing behavior depends on complex aeroelastic properties.



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- Gradient-based methods can struggle (Robert B. Gramacy 2020).

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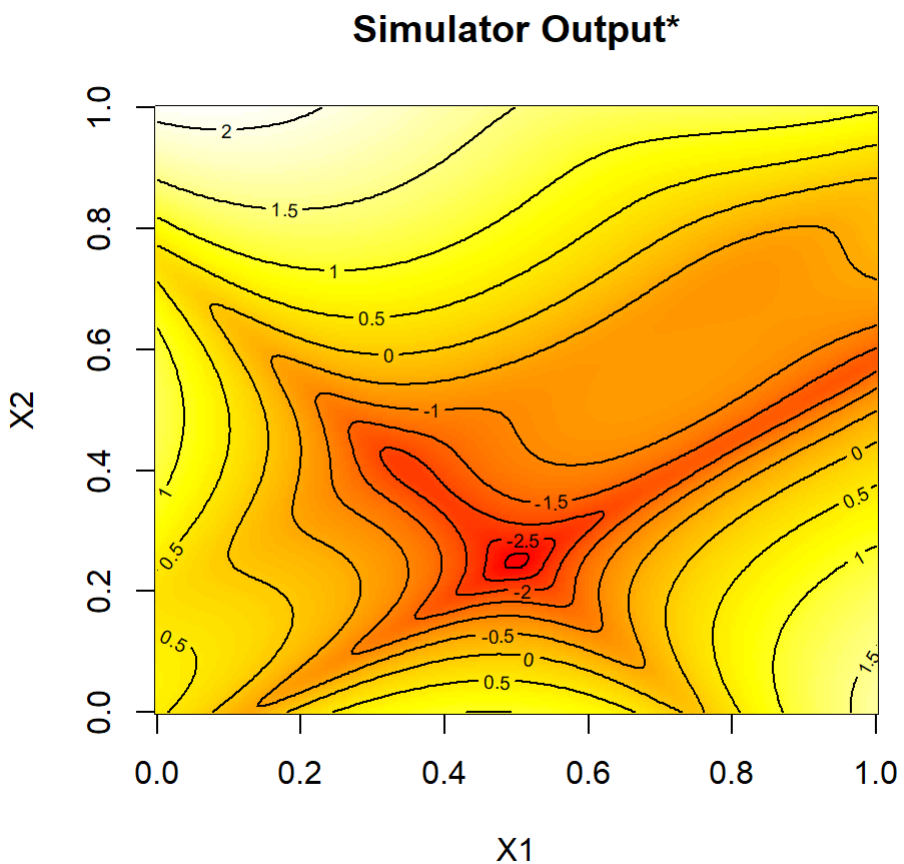

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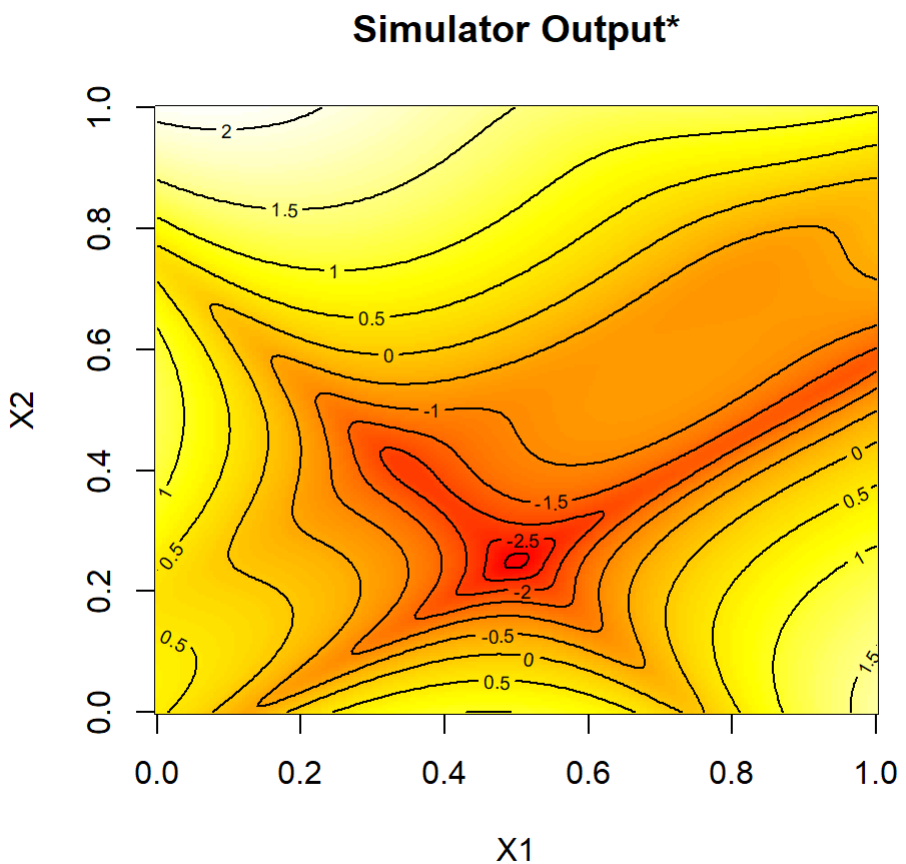

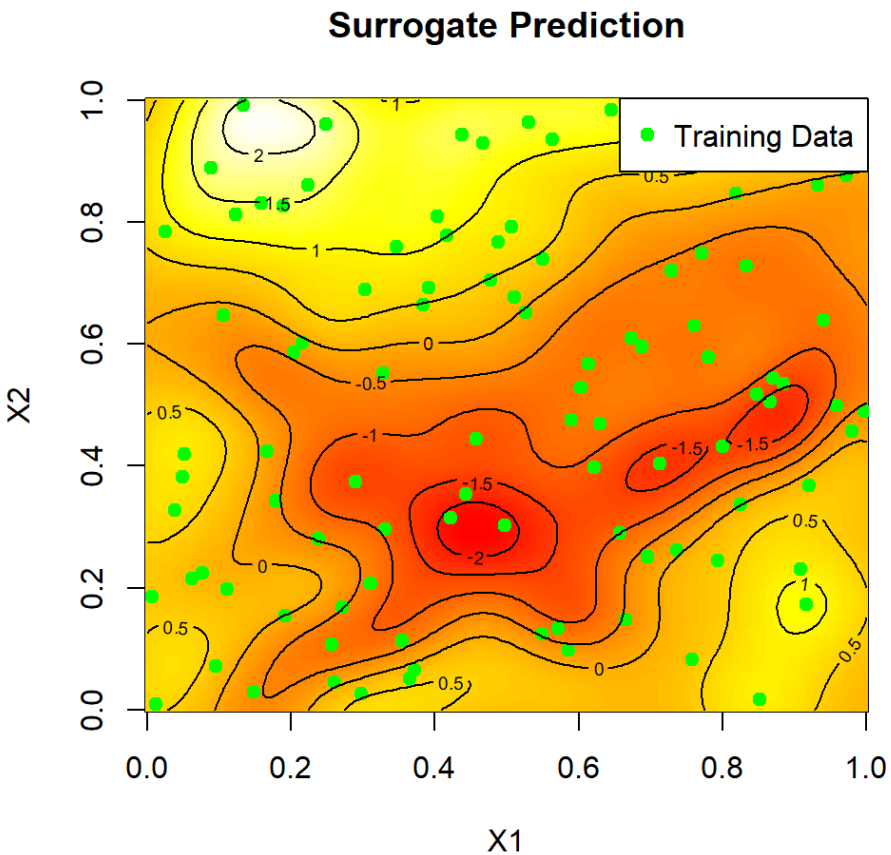

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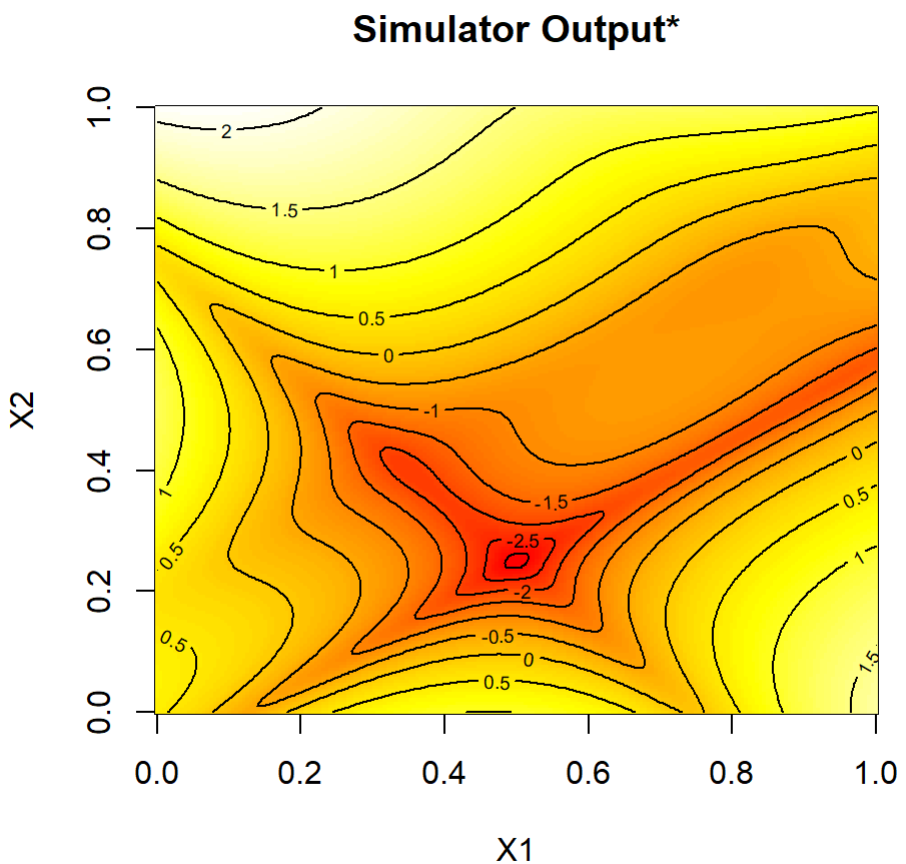

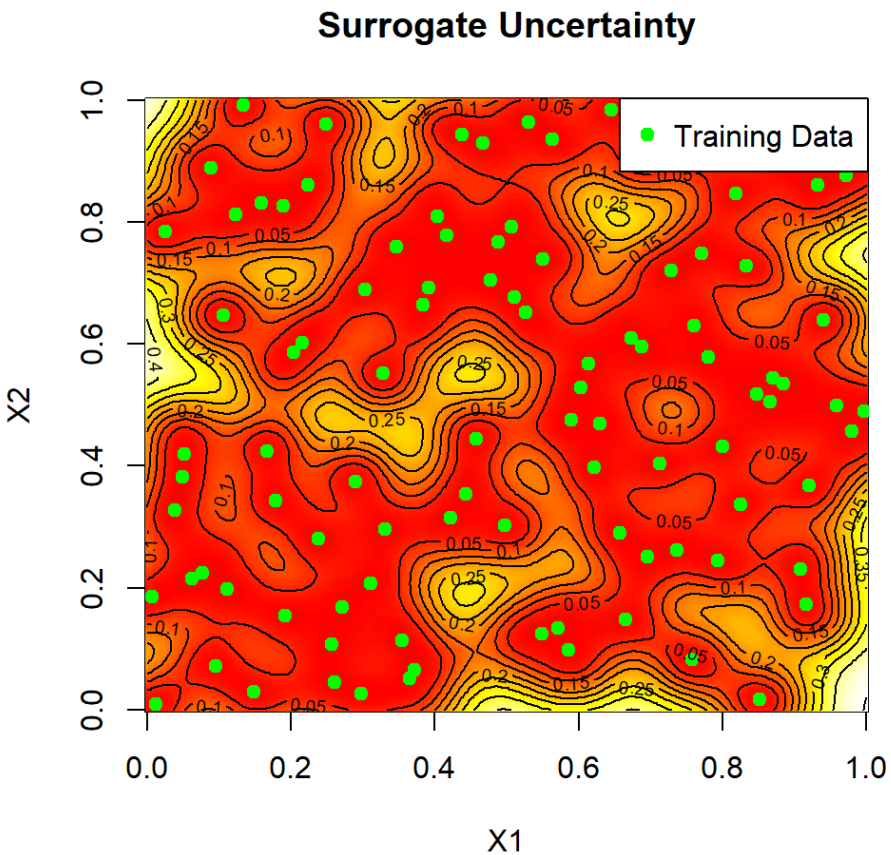

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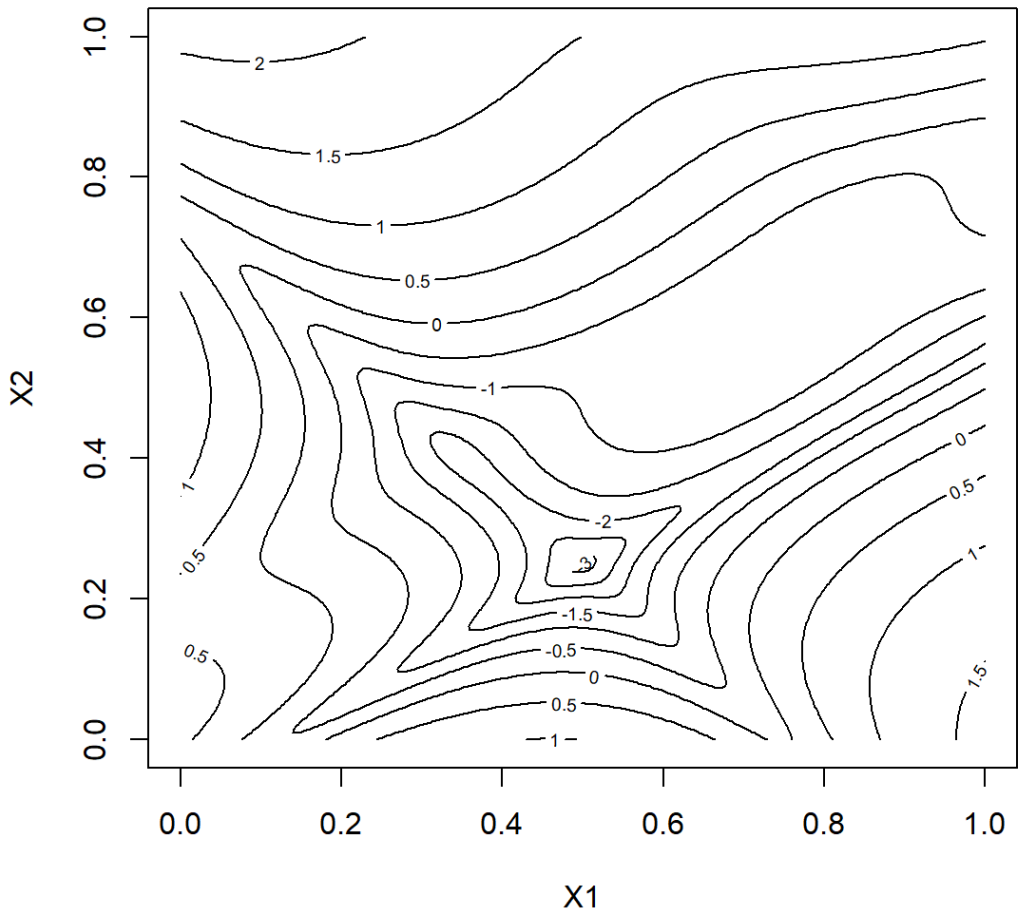
- How can we use surrogate models to find an optimal wing design?
- Sequential design algorithm known as “Bayesian Optimization”.

Bayesian optimization algorithm



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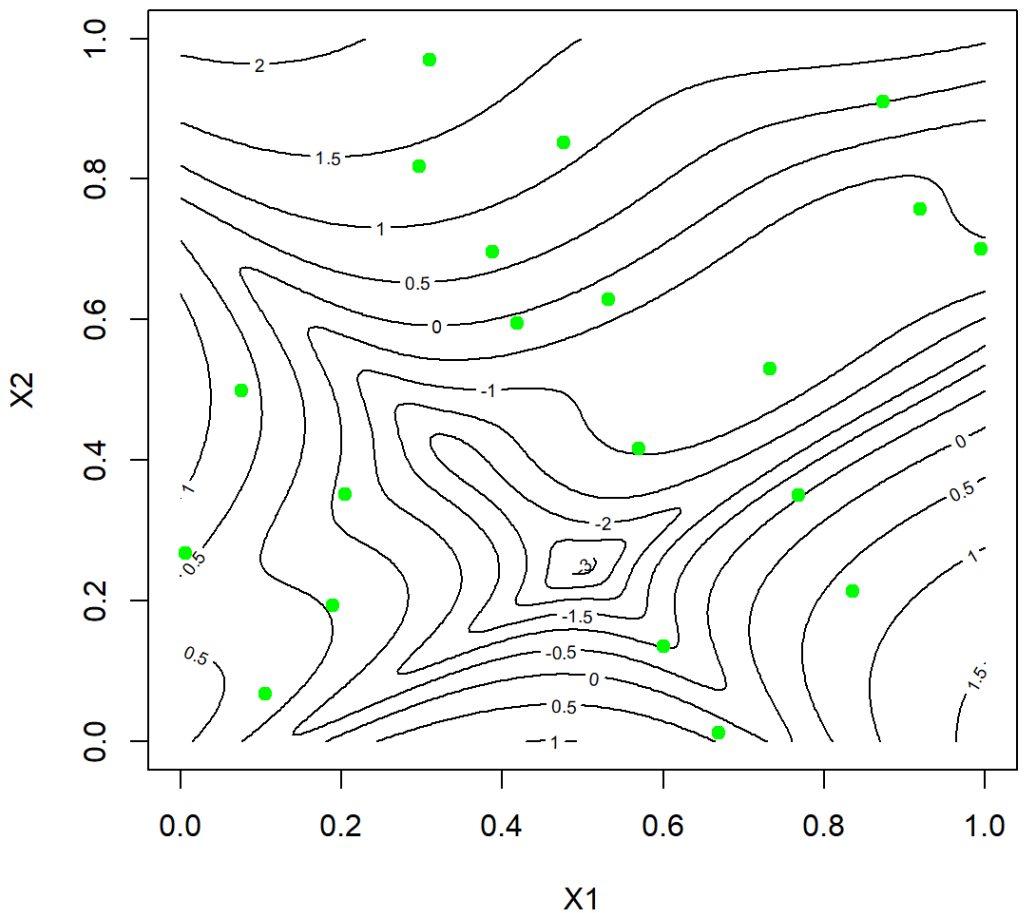

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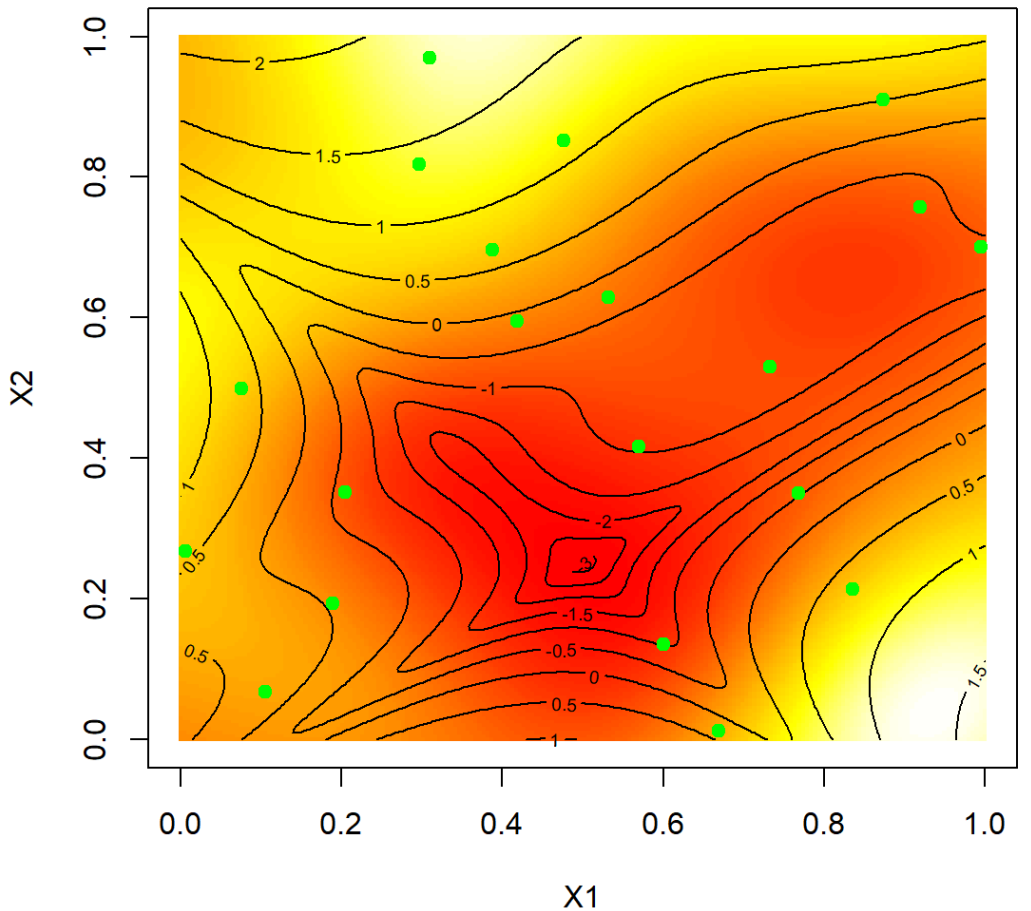

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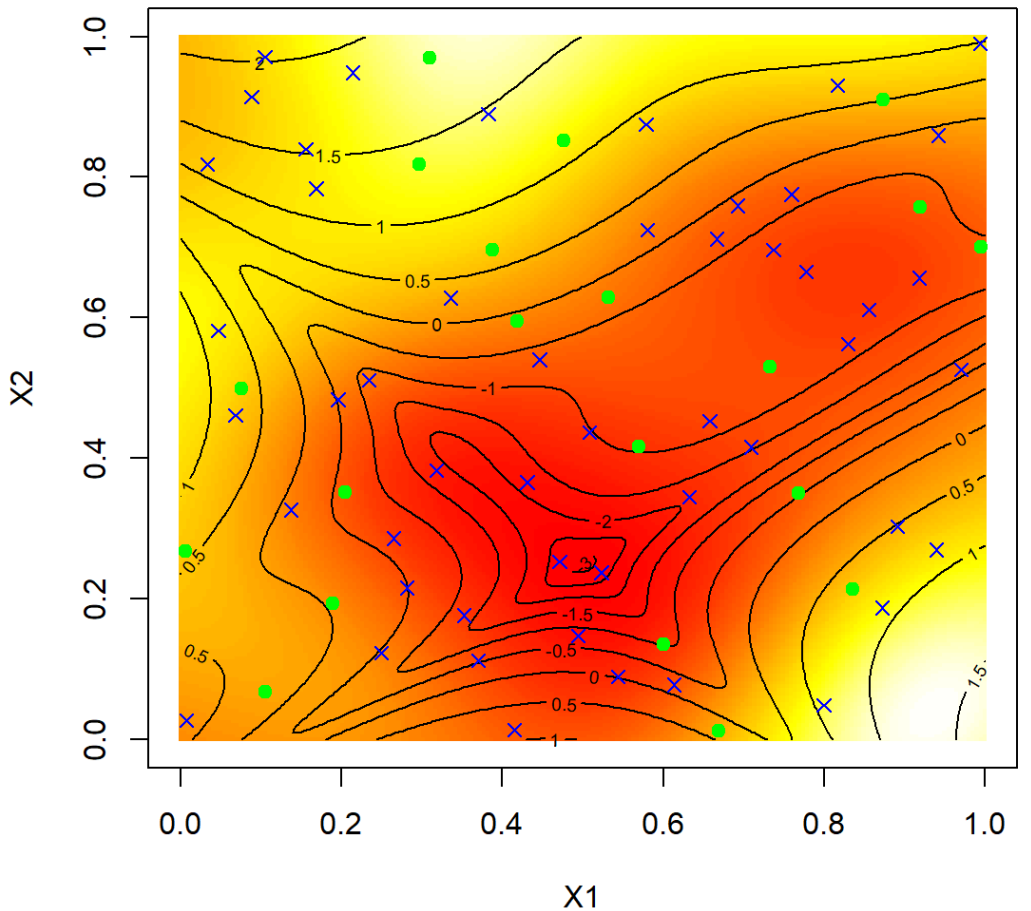

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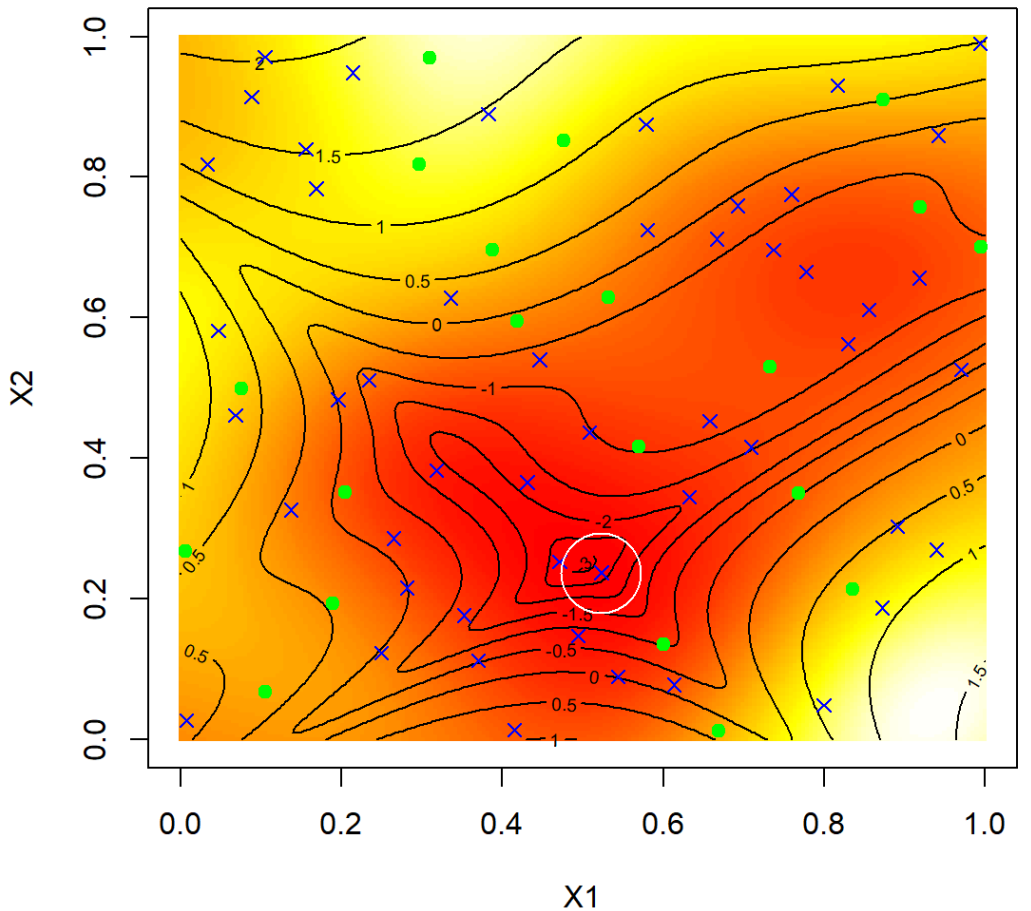

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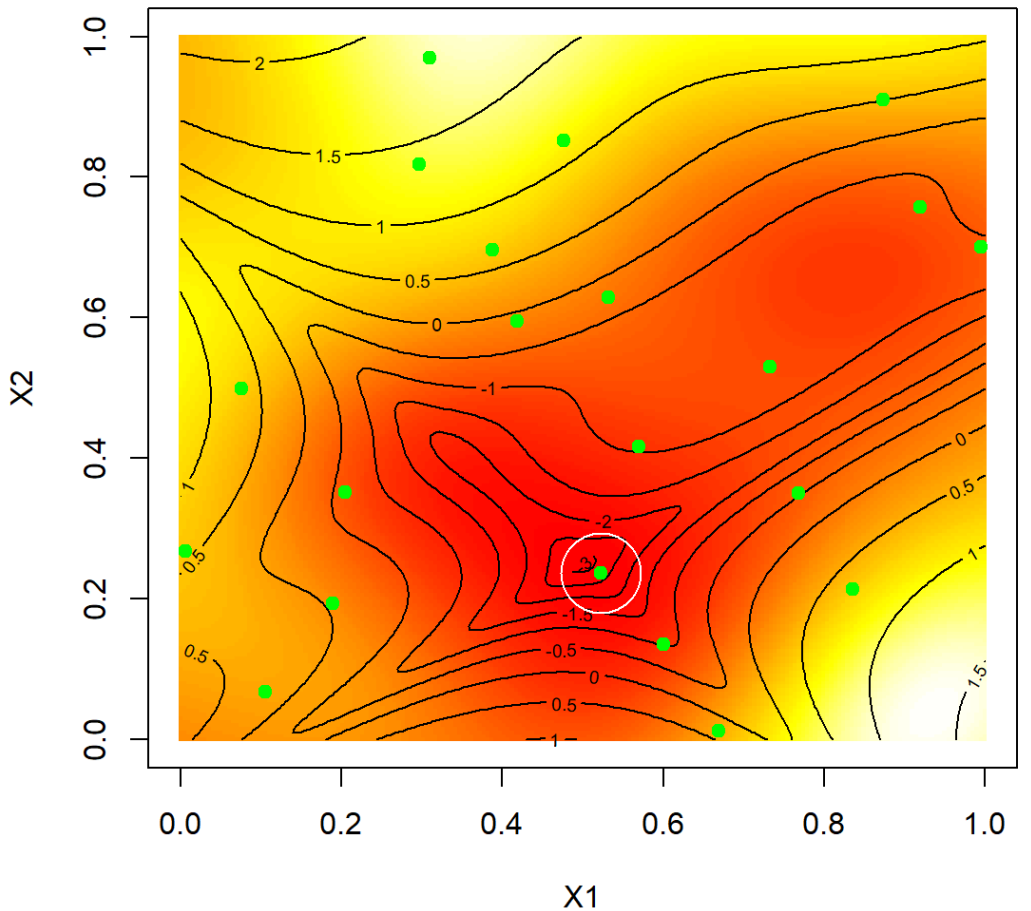

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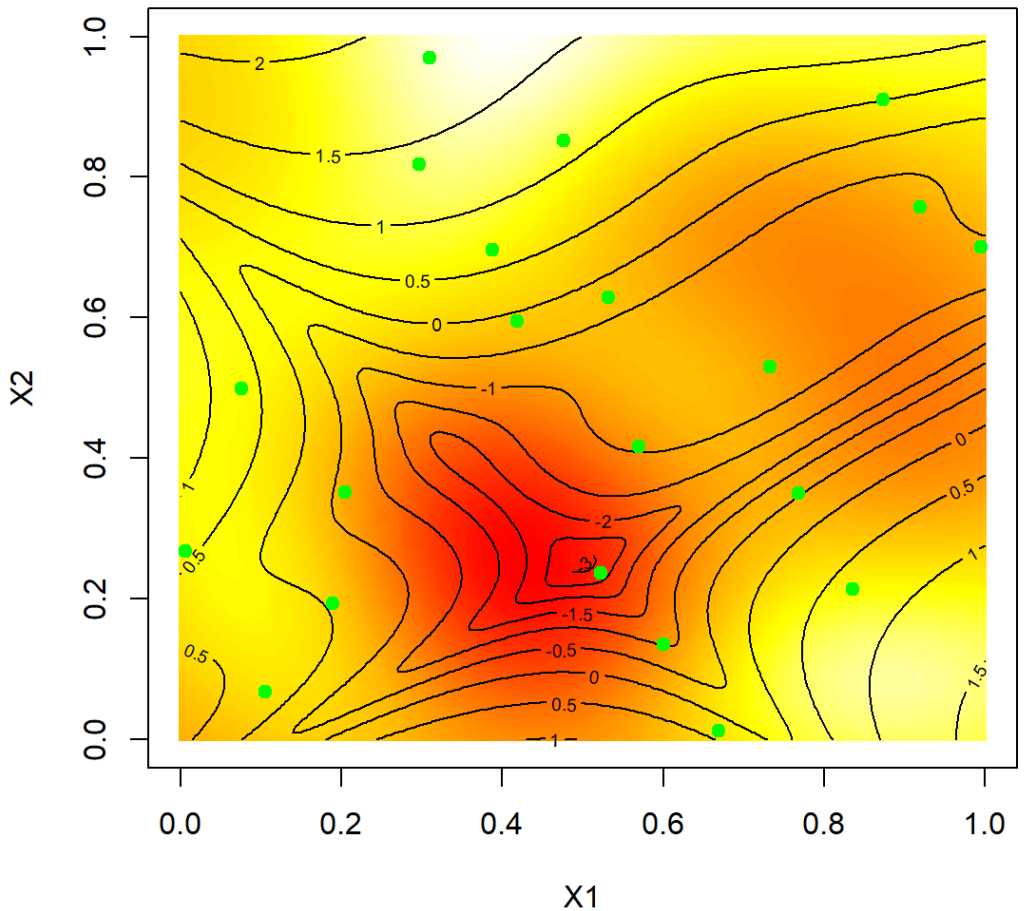

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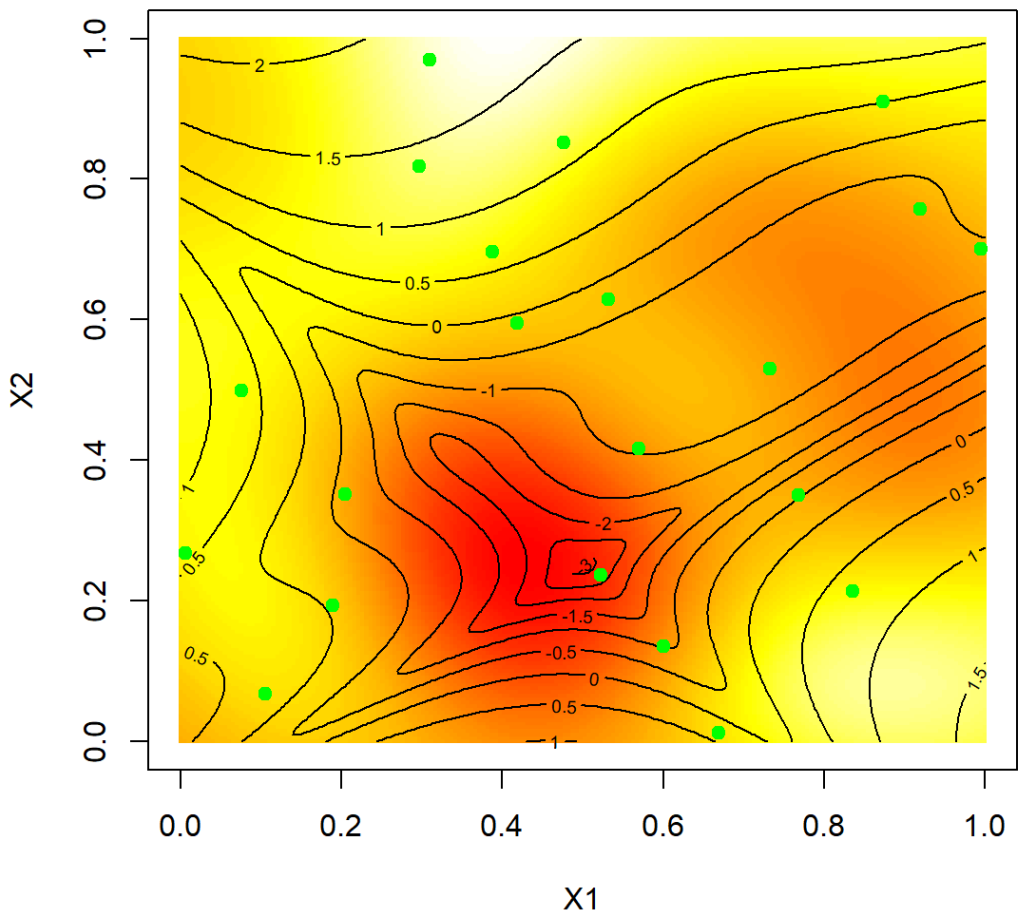
7. Repeat steps 3-6 until convergence (or budget runs out).



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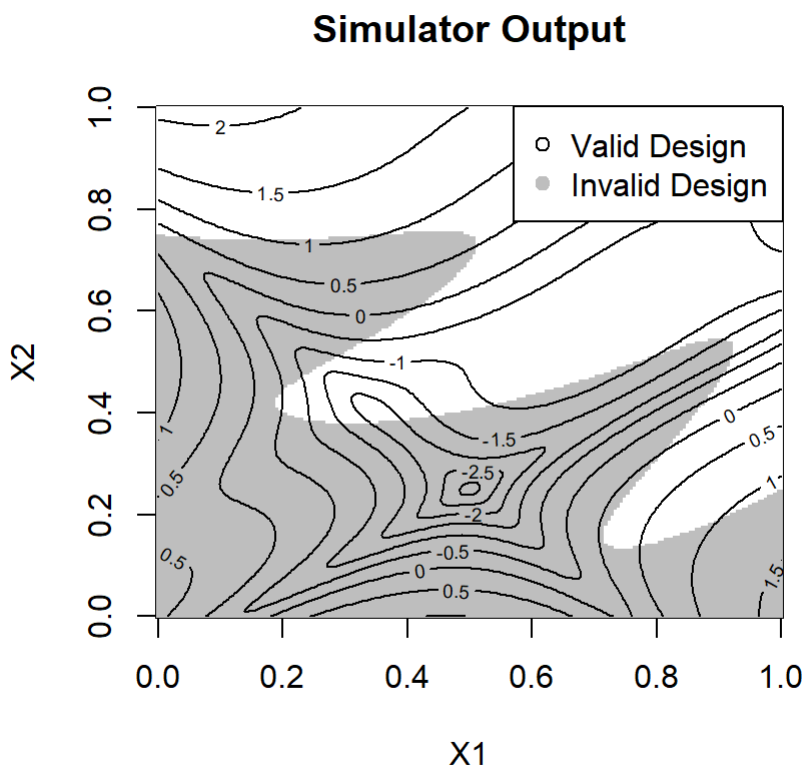

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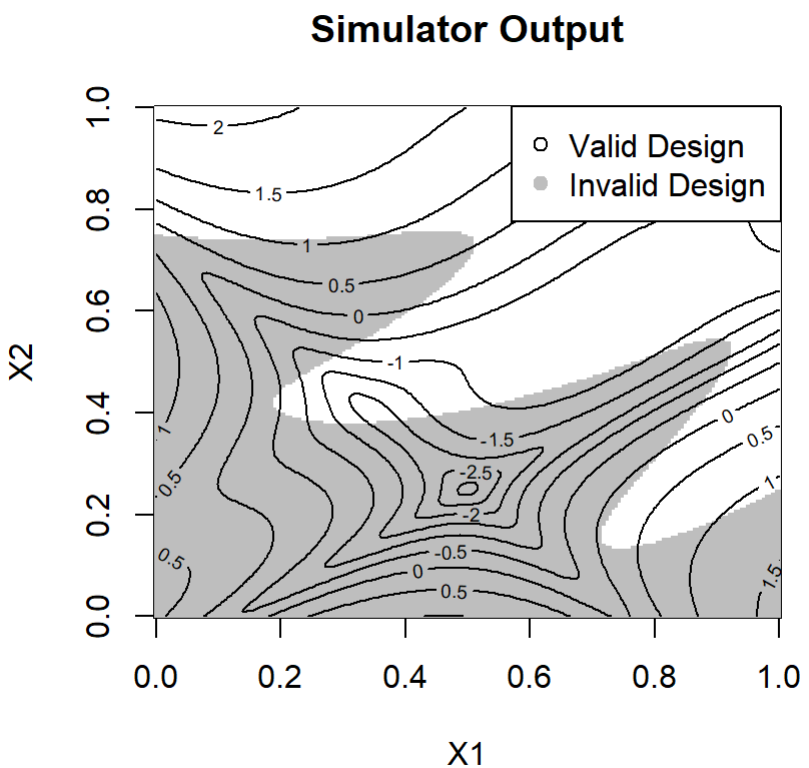

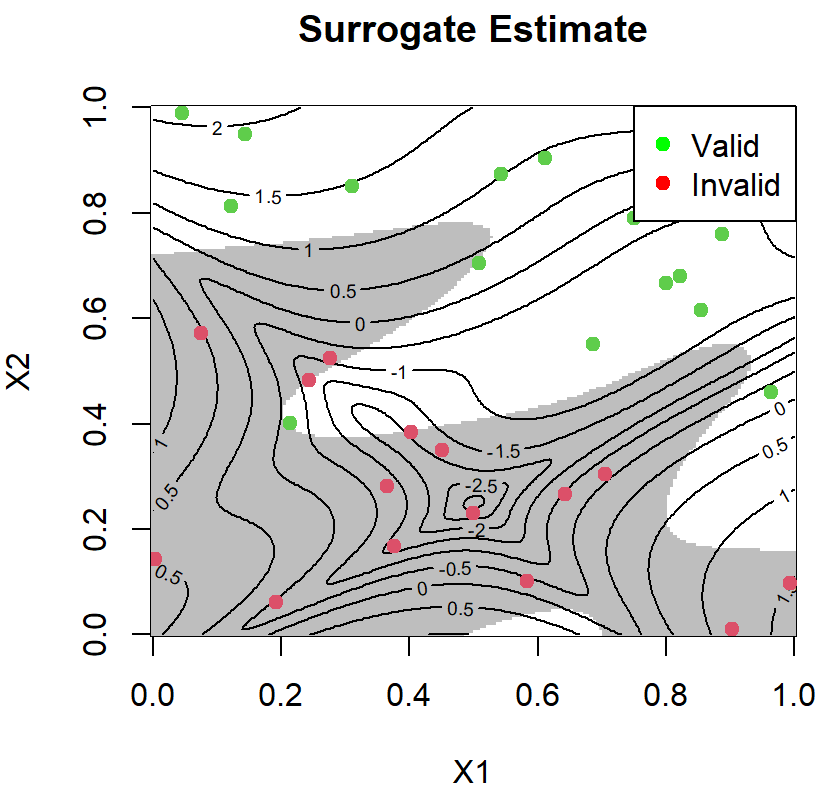

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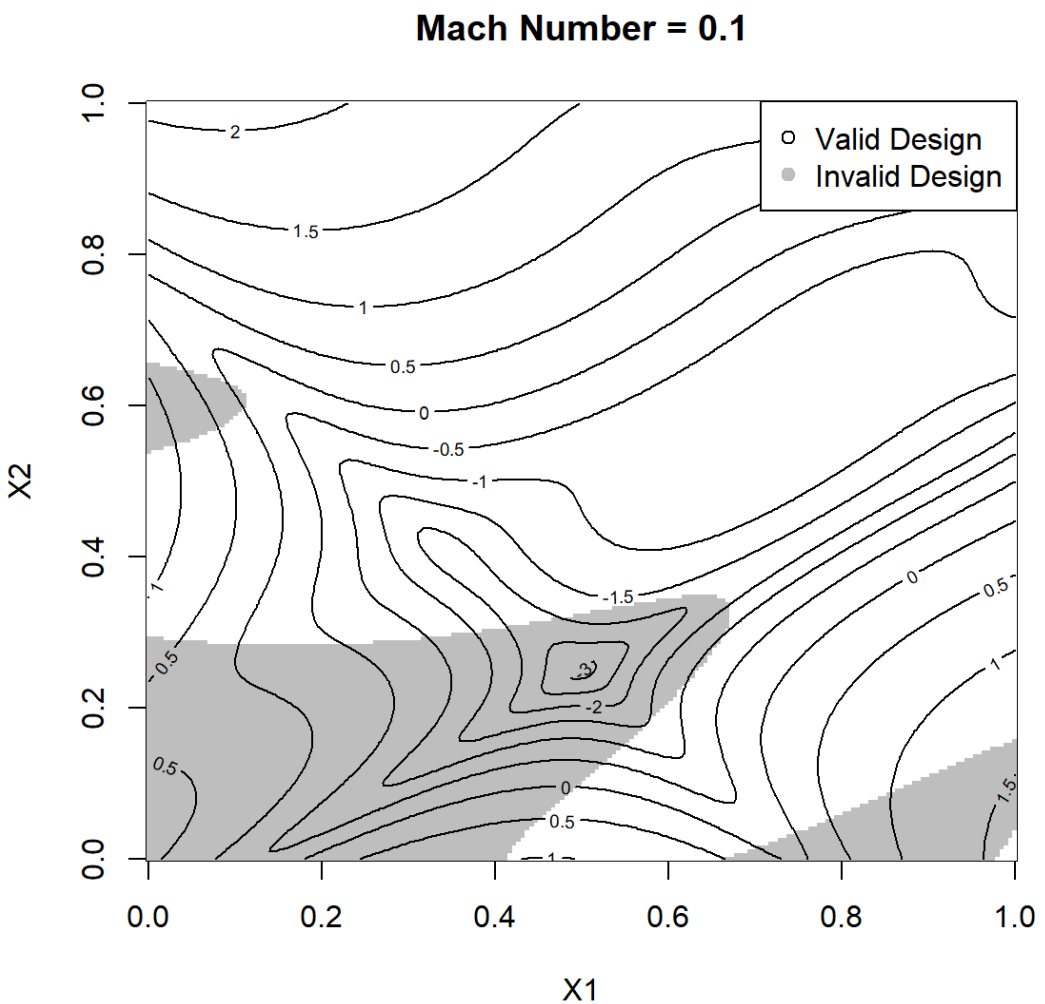

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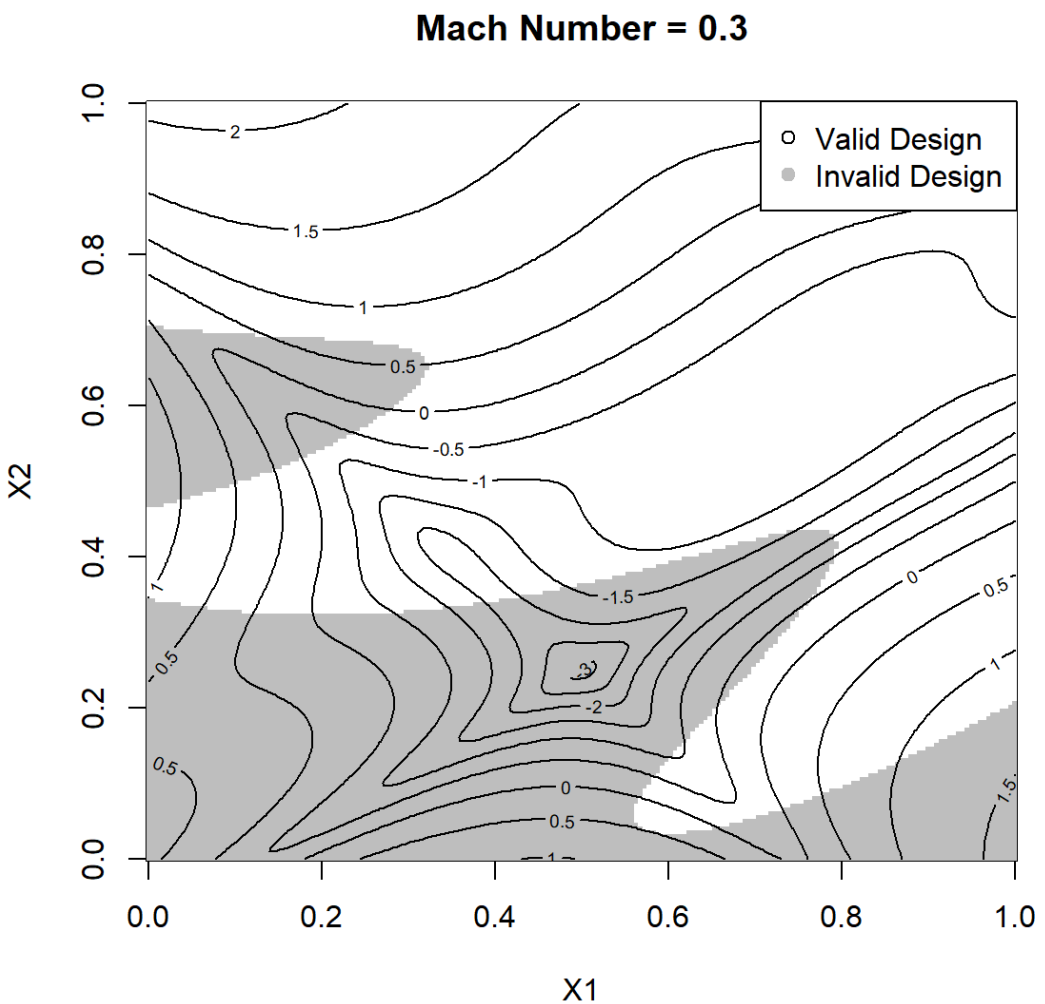

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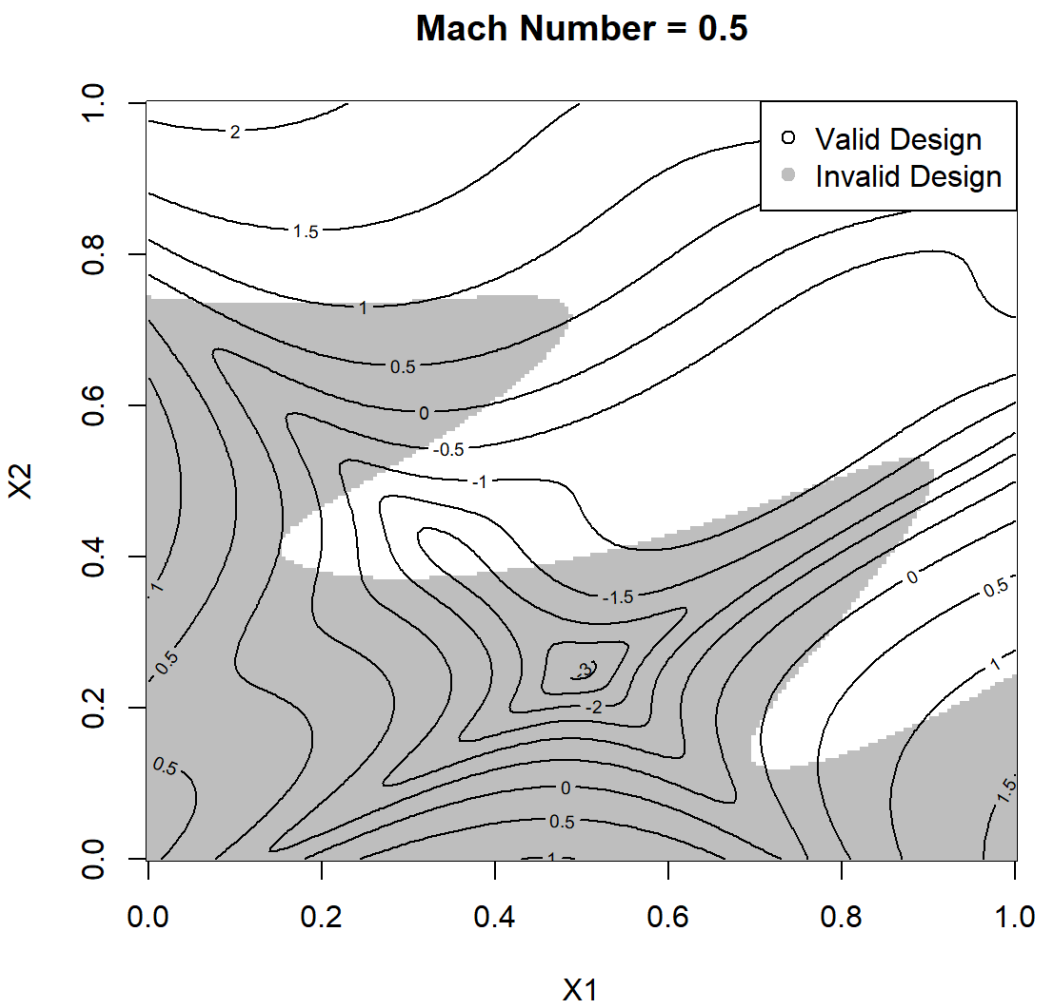

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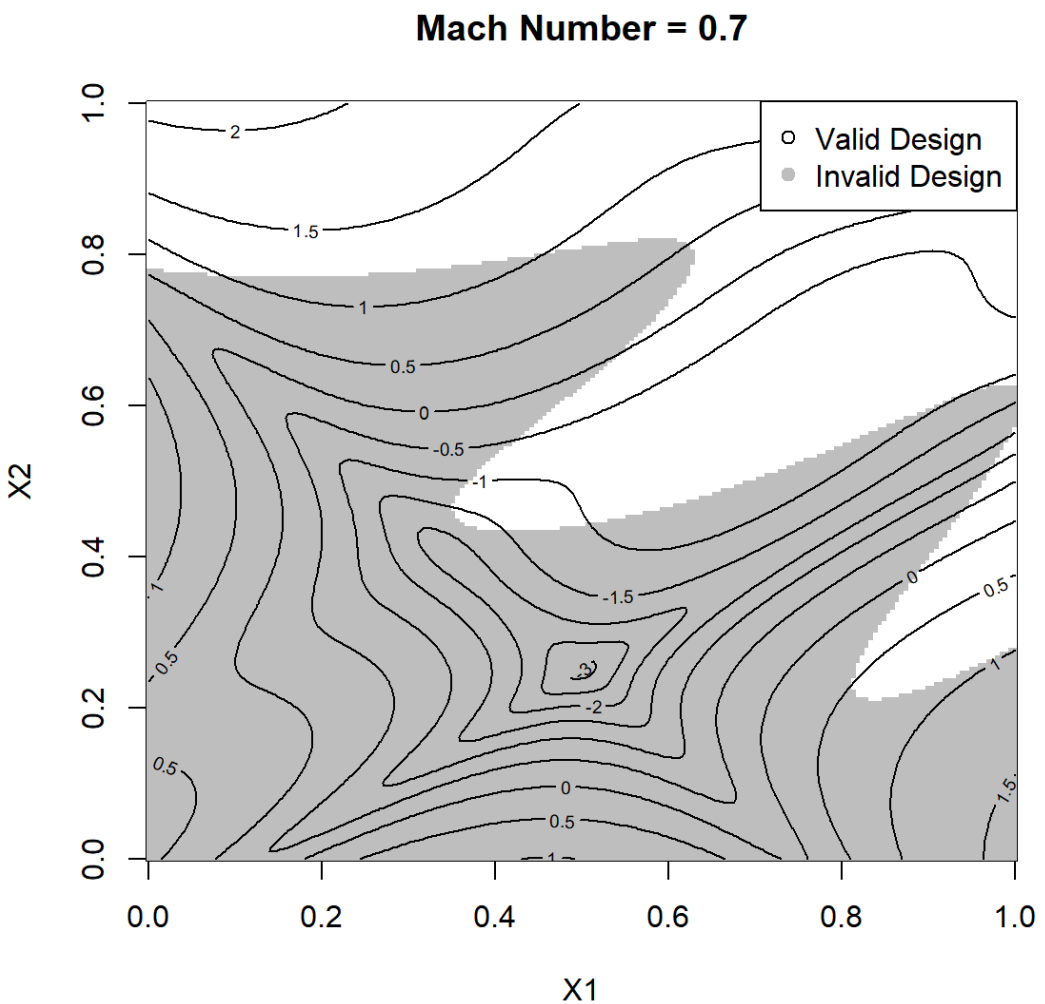

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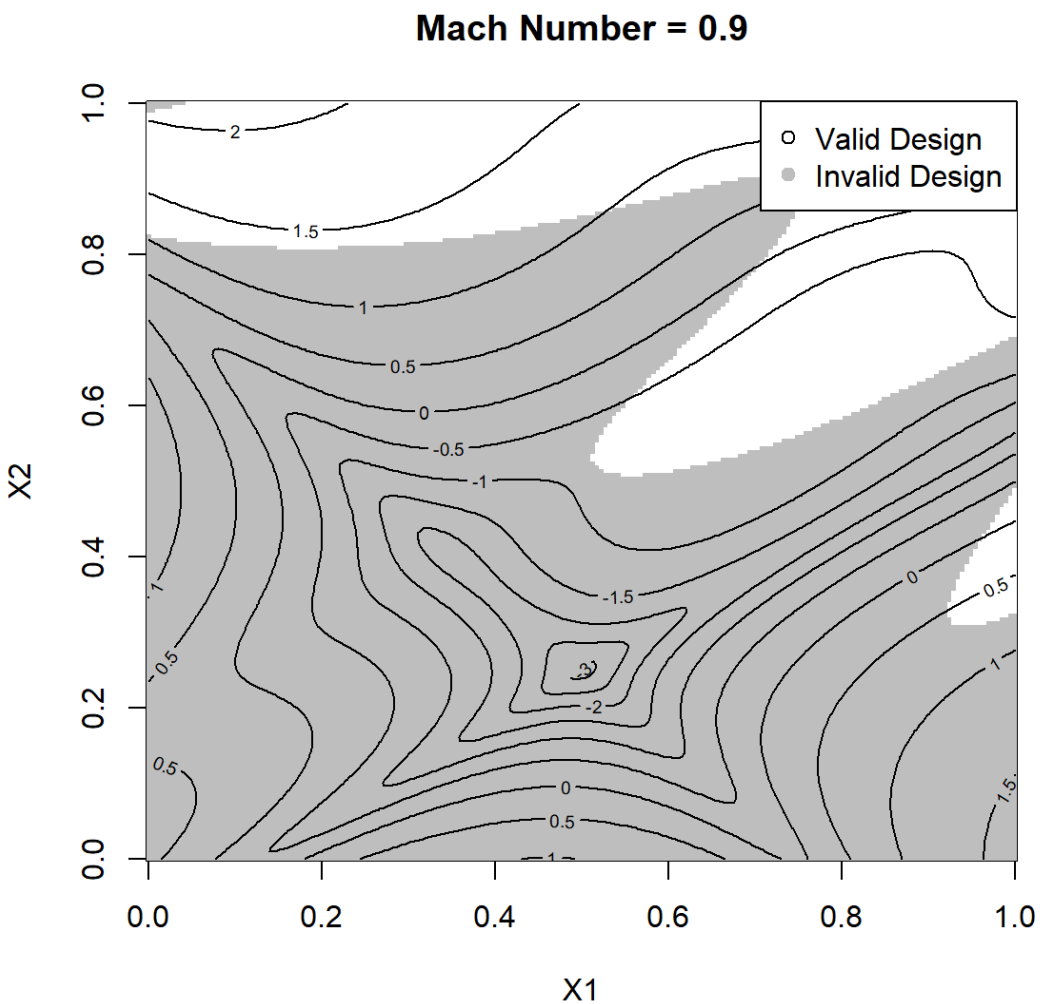

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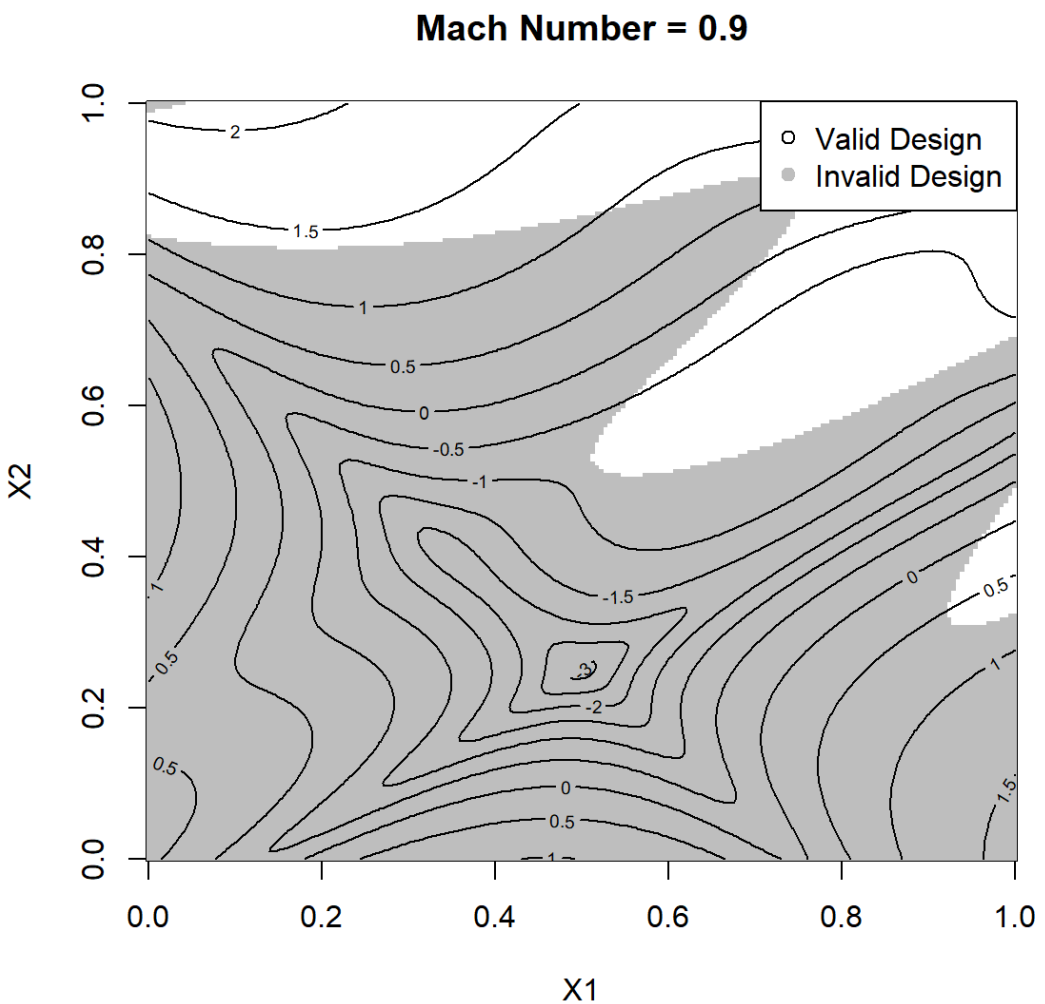
- “Robust” = feasible under **variety** of scenarios.



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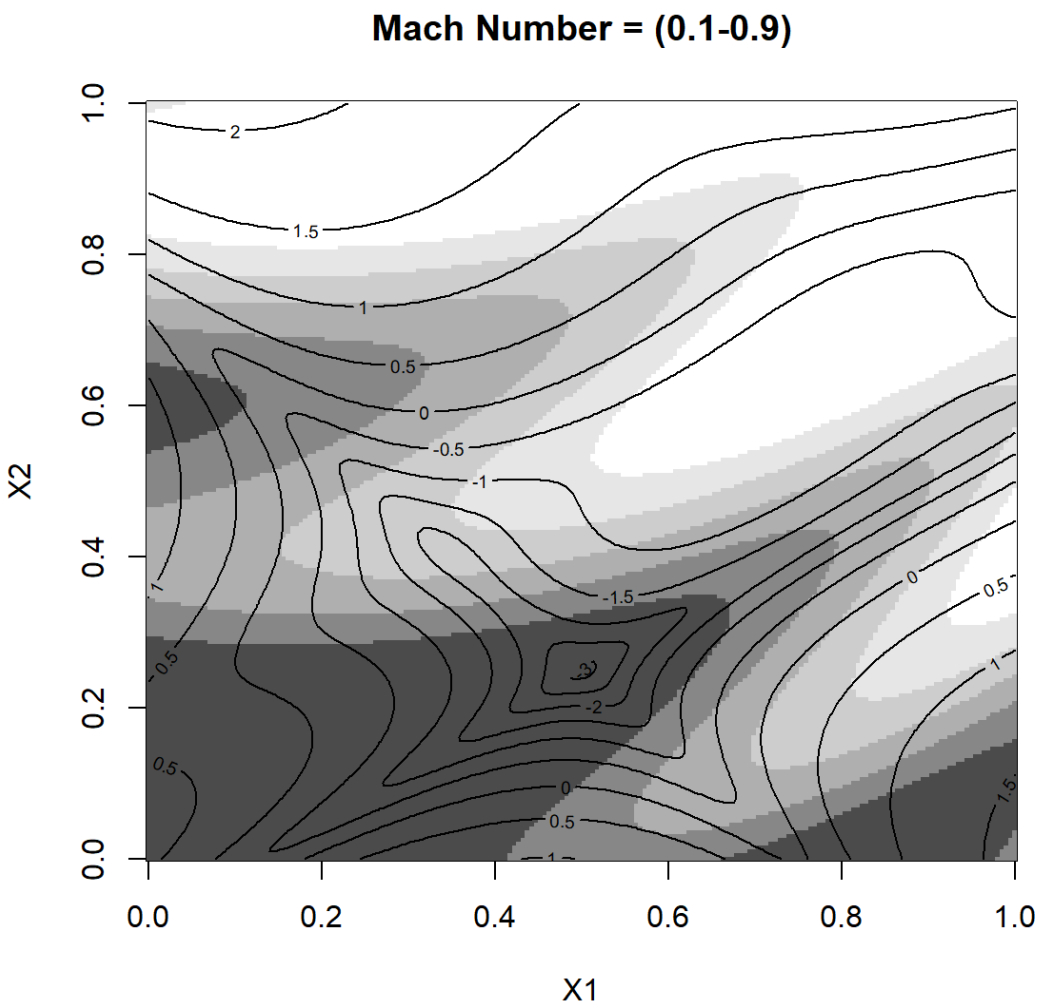

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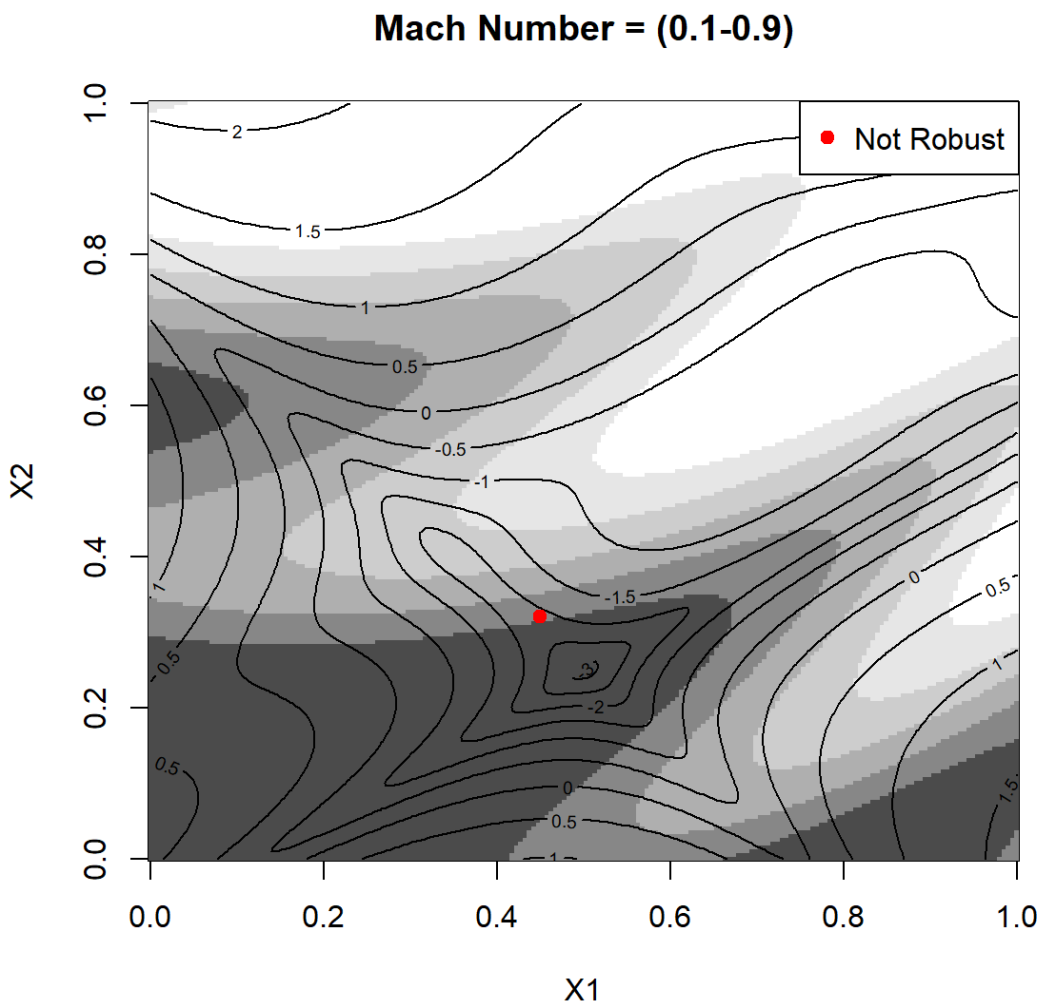

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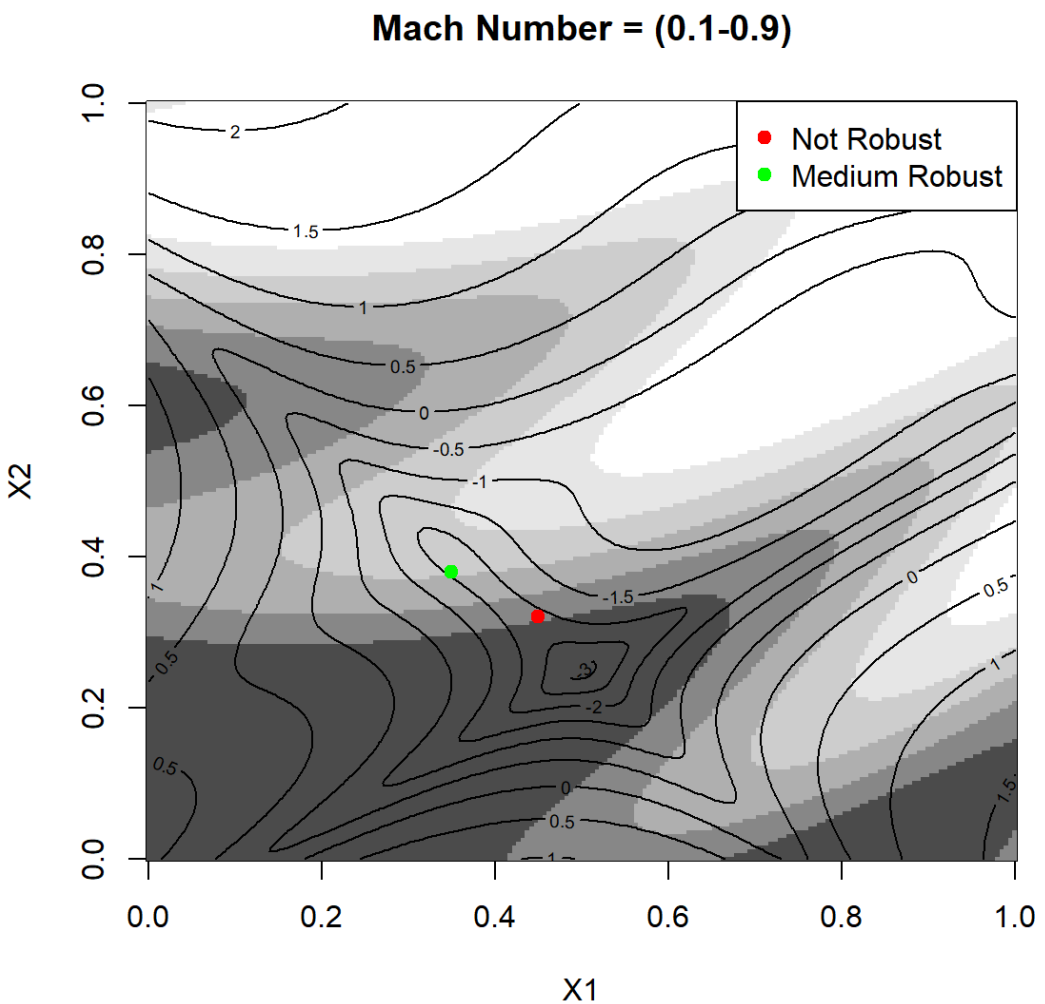

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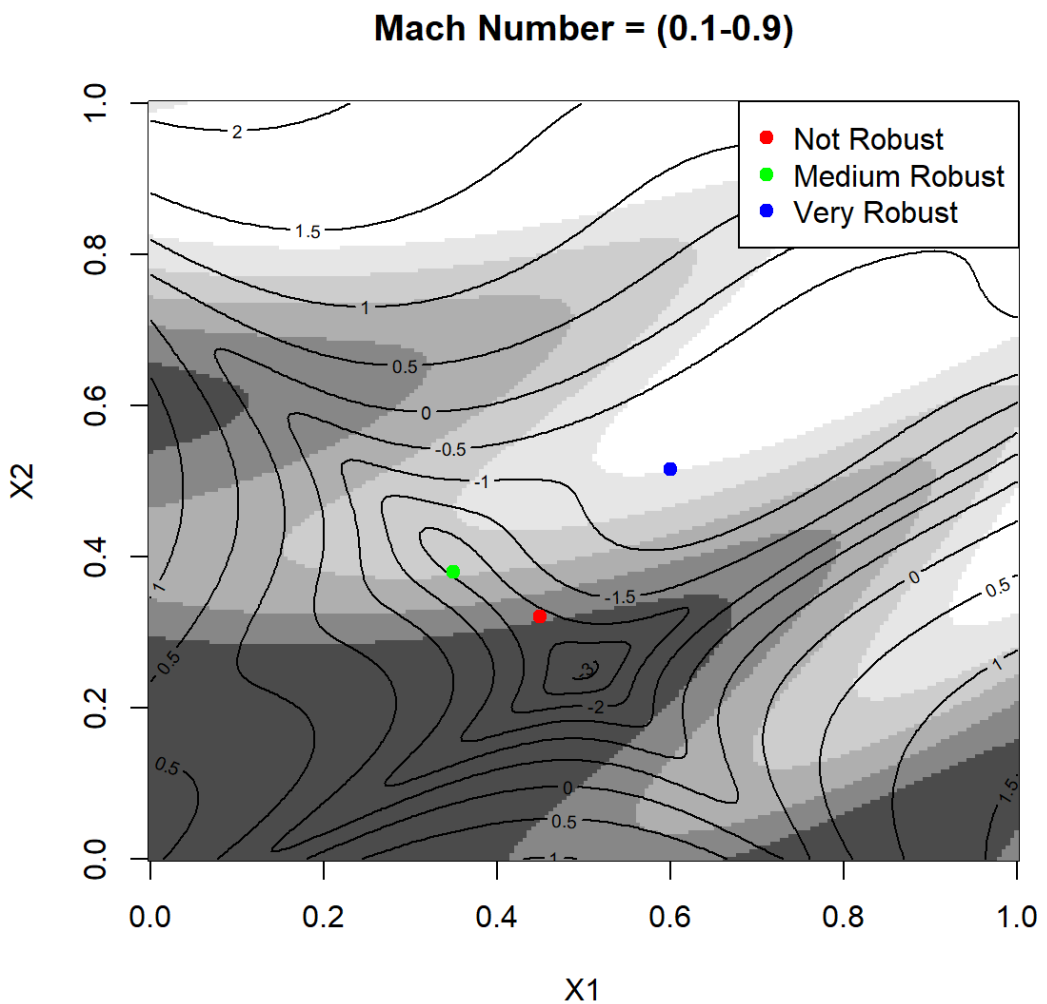

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