Autotuning: D-Optimal Designs

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Contents

1 Autotuning with D-Optimal Designs and Analysis of Variance

1. Use `optFederov` to find 24 experiments for the full model:

$$\begin{aligned} Y = & \, y\_component\_number + 1/y\_component\_number + \\ & vector\_length + lws\_y + 1/lws\_y + \\ & load\_overlap + temporary\_size + \\ & elements\_number + 1/elements\_number + \\ & threads\_number + 1/threads\_number \end{aligned}$$

2. Use `aov` to fit the full model, spending the 24 evaluations:

$$\begin{aligned} time\_per\_pixel = & \, y\_component\_number + 1/y\_component\_number + \\ & vector\_length + lws\_y + 1/lws\_y + \\ & load\_overlap + temporary\_size + \\ & elements\_number + 1/elements\_number + \\ & threads\_number + 1/threads\_number \end{aligned}$$

3. Identify the most significant factors from the ANOVA summary. In this case, they are *vector_length* and *lws_y*.

4. Use the fitted model to predict the best *time_per_pixel* value in the entire dataset

5. Prune the dataset using the predicted best values for *vector_length* and *lws_y*

6. Use `optFederov` to find 24 experiments for the pruned model. If there are less than or exactly 24 candidates, use the full candidate set.

$$\begin{aligned} Y = & \, y\_component\_number + 1/y\_component\_number + \\ & load\_overlap + temporary\_size + \\ & elements\_number + 1/elements\_number + \\ & threads\_number + 1/threads\_number \end{aligned}$$

7. Use `aov` to fit the pruned model, spending the 24 evaluations:

$$\begin{aligned} time\_per\_pixel = {} & y\_component\_number + 1/y\_component\_number + \\ & load\_overlap + temporary\_size + \\ & elements\_number + 1/elements\_number + \\ & threads\_number + 1/threads\_number \end{aligned}$$

8. Identify the most significant factors from the ANOVA summary. In this case, they are $y\_component\_number$ and $threads\_number$.

9. Use the fitted model to predict the best $time\_per\_pixel$ value in the entire dataset

10. Prune the dataset using the predicted best values for $y\_component\_number$ and $threads\_number$

11. Use `optFederov` to find 24 experiments for the pruned model. If there are less than or exactly 24 candidates, use the full candidate set.

$$\begin{aligned} Y = {} & load\_overlap + temporary\_size + \\ & elements\_number + 1/elements\_number \end{aligned}$$

12. Use `aov` to fit the pruned model, spending the 24 evaluations:

$$\begin{aligned} time\_per\_pixel = {} & load\_overlap + temporary\_size + \\ & elements\_number + 1/elements\_number \end{aligned}$$

13. Identify the most significant factors from the ANOVA summary. In this case, it is $elements\_number$

14. Use the fitted model to predict the best $time\_per\_pixel$ value in the entire dataset

15. Prune the dataset using the predicted best values for $elements\_number$

16. Use `optFederov` to find 24 experiments for the pruned model. If there are less than or exactly 24 candidates, use the full candidate set.

$$Y = load\_overlap + temporary\_size$$

17. Use `aov` to fit the pruned model, spending the 24 evaluations:

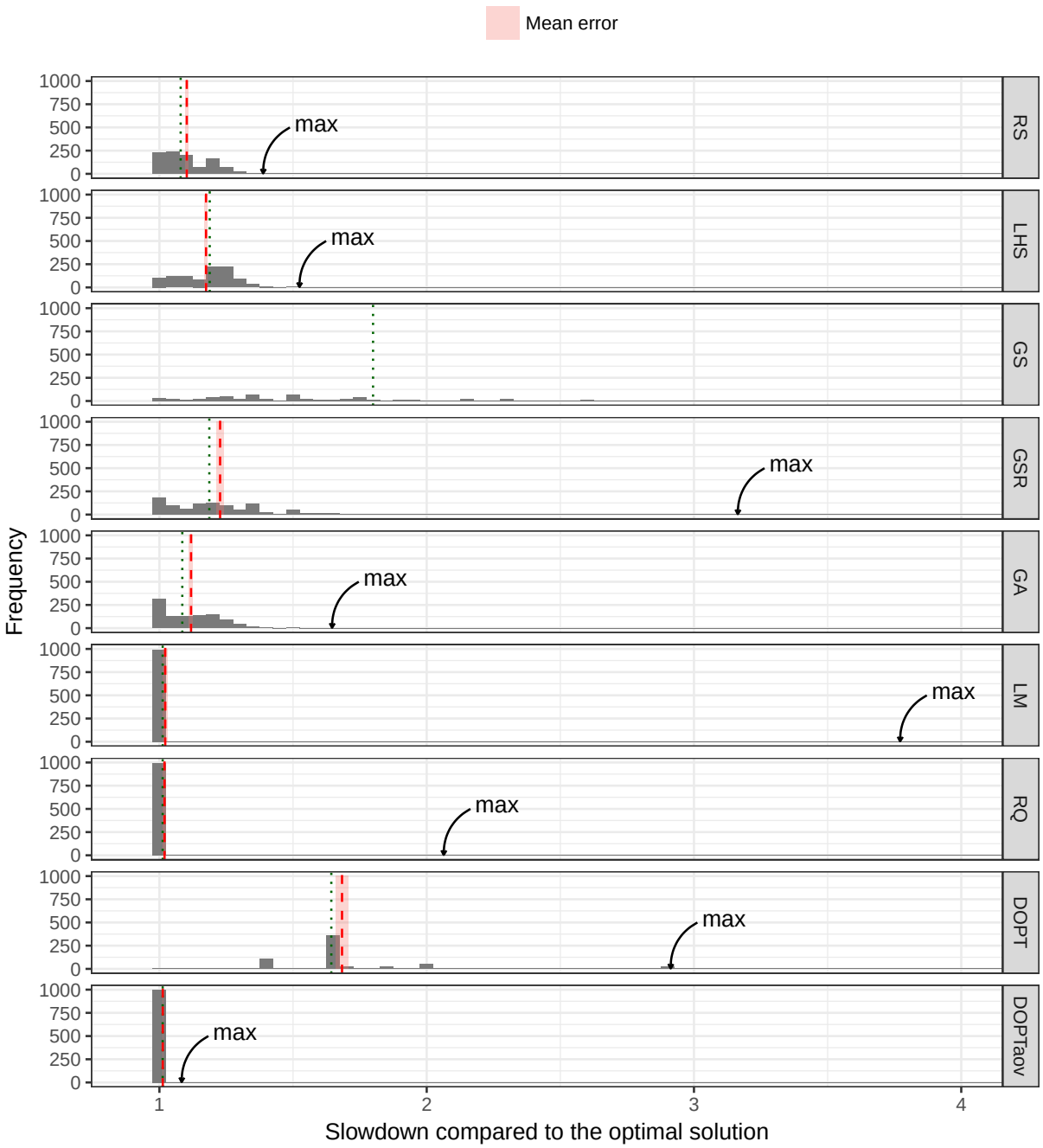
$$time\_per\_pixel = load\_overlap + temporary\_size$$

18. Use the fitted model to predict the best $time\_per\_pixel$ value in the entire dataset

19. Compare the predicted $time\_per\_pixel$ with the global optimum

2 Results

2.1 Comparing Strategies



	RS	LHS	GS	GSR	GA	LM	RQ	DOPT	DOPTaov
Min.	1.00	1.00	1.00	1.00	1.00	1.01	1.01	1.38	1.01
1st Qu.	1.03	1.09	1.35	1.07	1.02	1.01	1.01	1.64	1.01
Median	1.08	1.19	1.80	1.19	1.09	1.01	1.01	1.64	1.01
Mean	1.10	1.17	6.46	1.23	1.12	1.02	1.02	1.68	1.01
3rd Qu.	1.18	1.24	6.31	1.33	1.19	1.01	1.01	1.64	1.01
Max.	1.39	1.52	124.76	3.16	1.65	3.77	2.06	2.91	1.08
Mean Pt.	120.00	98.92	22.17	120.00	120.00	119.00	119.00	120.00	54.85
Max Pt.	125.00	125.00	106.00	120.00	120.00	119.00	119.00	120.00	56.00

Table 1: Summary statistics