Optimizing data acquisition for MLDS: when is it valid to take a short-cut?

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**Background**

- Maximum Likelihood Difference Scaling (MLDS) is a robust method to estimate perceptual scales [1, 2]
- Requires large amount of trials
- e.g. 10 stimulus levels: 120 triads

**Proposal to increase efficiency**

- Shooper & Mullen (2022) proposed to use a subset of all triads
- Prior knowledge of scales: adjacent stimuli are perceptually equidistant
- Select triads with specific difference between pairs of stimuli:

**Method: Simulating perceptual scales for subset of trials**

1. Ground truth scale
2. Design
3. Simulated observer
4. Simulated data
5. Estimated scale

**Results: Effect of subsampling for different noise levels**

Sampling scheme and noise affect validity of scale estimation

**Results: Simulated scales for one noise level**

Subsampling might introduce bias for non-linear scales

**Discussion**

- Subsampling can increase efficiency of data collection with prior knowledge of scale shape
- Without prior knowledge estimated scales might misestimate true internal scales
- Visualizing the frequency of responses for sorted triads helps to sample the right regime

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