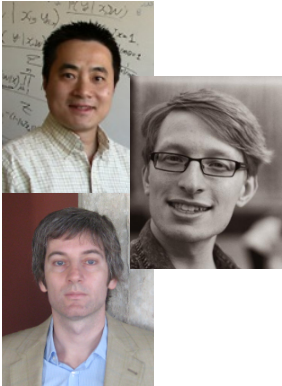


Optimal Teaching for Limited-Capacity Human Learners

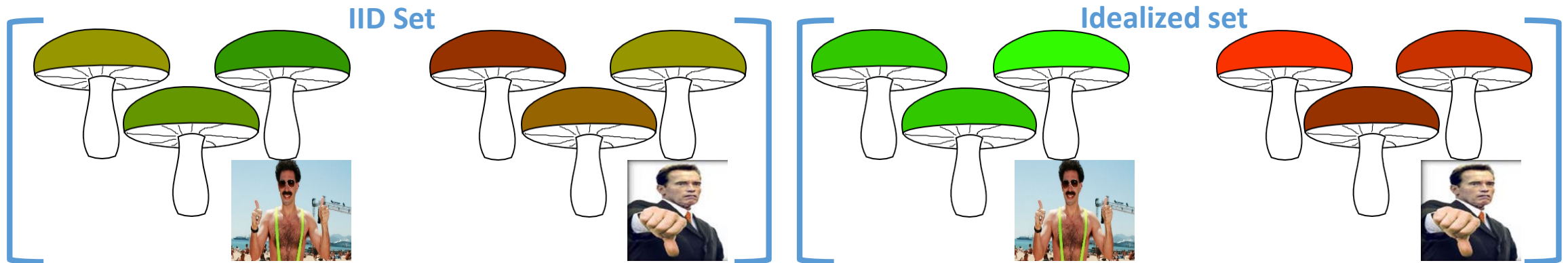


Kaustubh R Patil (UCL & MIT)

Xiaojin Zhu (Wisconsin-Madison)

Łukasz Kopeć (University College London)

Bradley C Love (University College London)



Which training set will help a human learner the most during test?

Human category learning & optimal teaching

Test

...



...

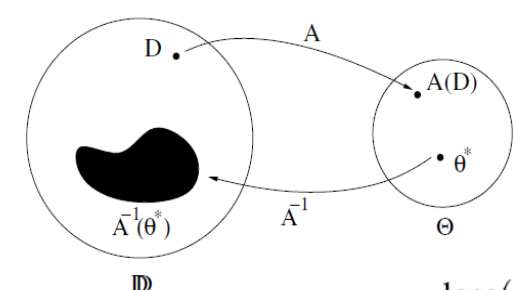




Idealized training sets help at decision time by reducing noise in memory retrieval

Optimal teaching

- Identify a teaching set given a hypothesis to be taught to a learner.
- A tractable solution for teaching GCM



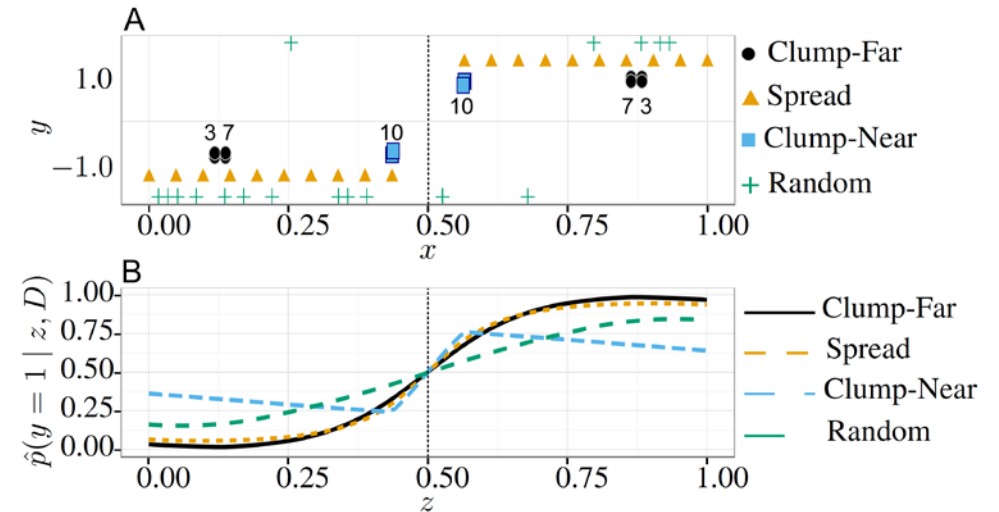
$$\min_{D \in \mathbb{D}} \text{loss}(D) + \text{effort}(D).$$

$$\text{loss}(D) = \mathbb{E}_{(x,y) \sim p(x,y)} \mathbb{E}_{\hat{y} \sim \hat{p}(y|x,D)} \mathbb{1}_{y \neq \hat{y}}.$$

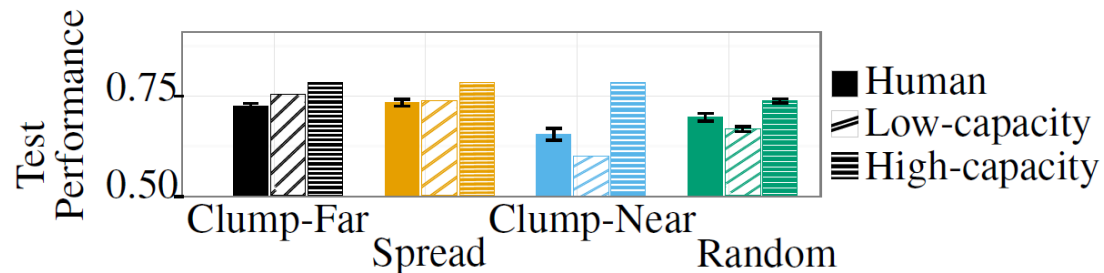
Optimal teaching for limited-capacity learner

- The optimal sets tend to be non-IID
- Humans perform *significantly better* on the Clump-Far compared to IID Random sets
- Human performance pattern adds further evidence of low-capacity account of human learning
- Lower test inconsistency on the Clump-Far set

Optimal teaching for GCM



Performance



Inconsistency

