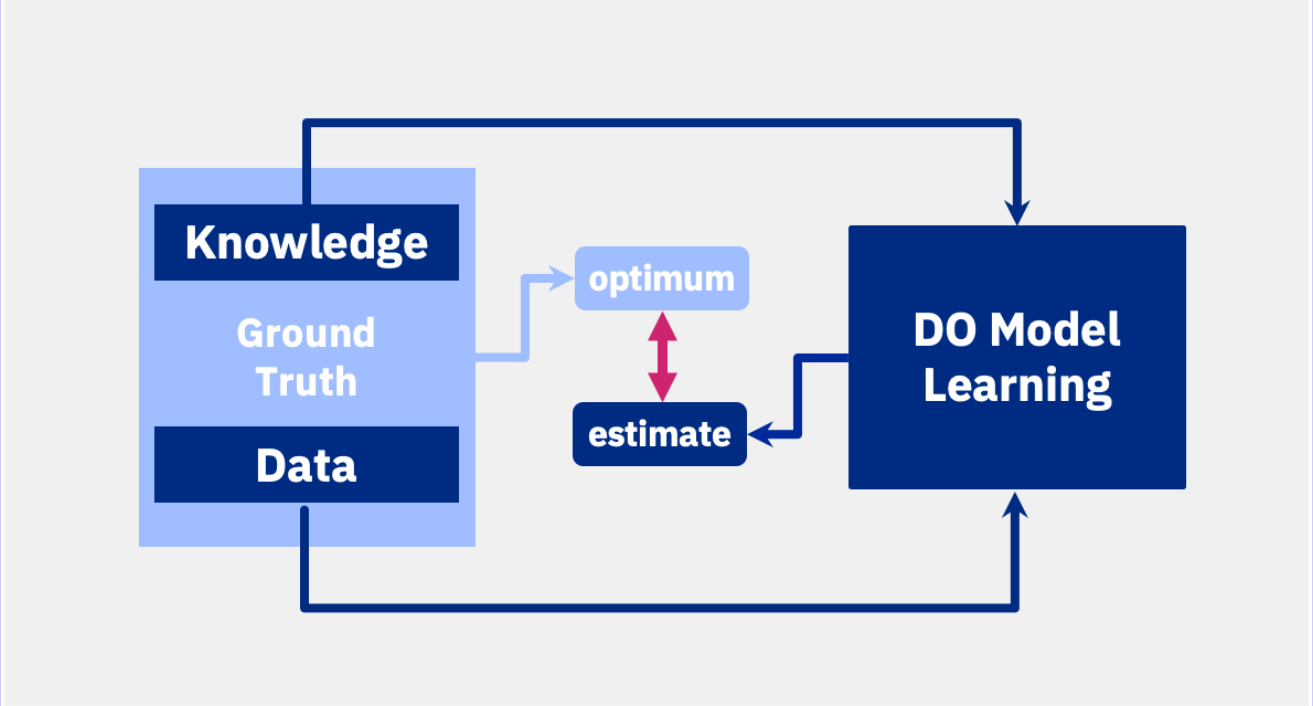
DOFramework

DOFramework: a testing framework for DO model learners.



Knowledge Ω	Bounded convex polytope $\Omega \subseteq \text{dom}\,(f) \subseteq \mathbb{R}^d$, $d = n + m + k \geq 2$.
Ground Truth f	Continuous PWL f with (combinatorially) known $\mathbf{x}^* \in \arg\min_{x \in \Omega} f(\mathbf{x})$.
Data D	Gaussian mix model in $\text{dom}\,(f)$.

Profiling

DO Problem Instance: (f, Ω, D, x^*)

Estimate $\hat{\mathbf{x}}^*$ score:

$$\text{score}(\hat{\mathbf{x}}^*) = \frac{f(\hat{\mathbf{x}}^*) - f(\mathbf{x}^*)}{f_{\text{max}} - f_{\text{min}}}$$

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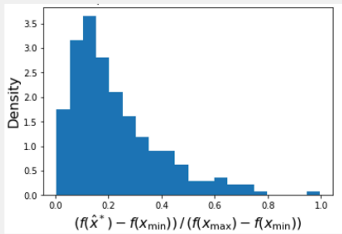
$$\text{score}(\hat{\mathbf{x}}^*) = \frac{f(\hat{\mathbf{x}}^*) - f(\mathbf{x}^*)}{f_{\max} - f_{\min}} \implies \text{score density}$$

Solution Quality Probability:

$$Pr[f(\hat{\mathbf{x}}^*) - f(\mathbf{x}^*) < \epsilon(f_{\max} - f_{\min})]$$

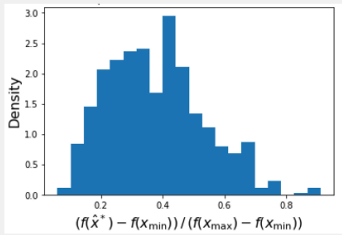
Profiling

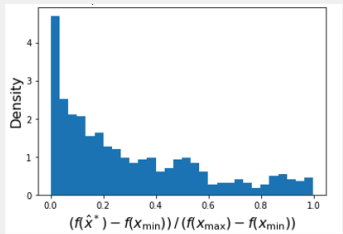
dim = 2,3
# probs = 570



OptiCL

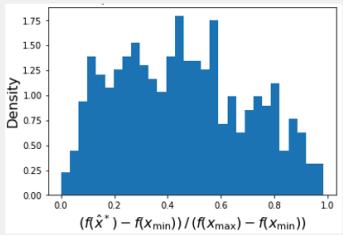
dim = 5,7
# probs = 615





dim = 2,3
# probs = 640

Baseline

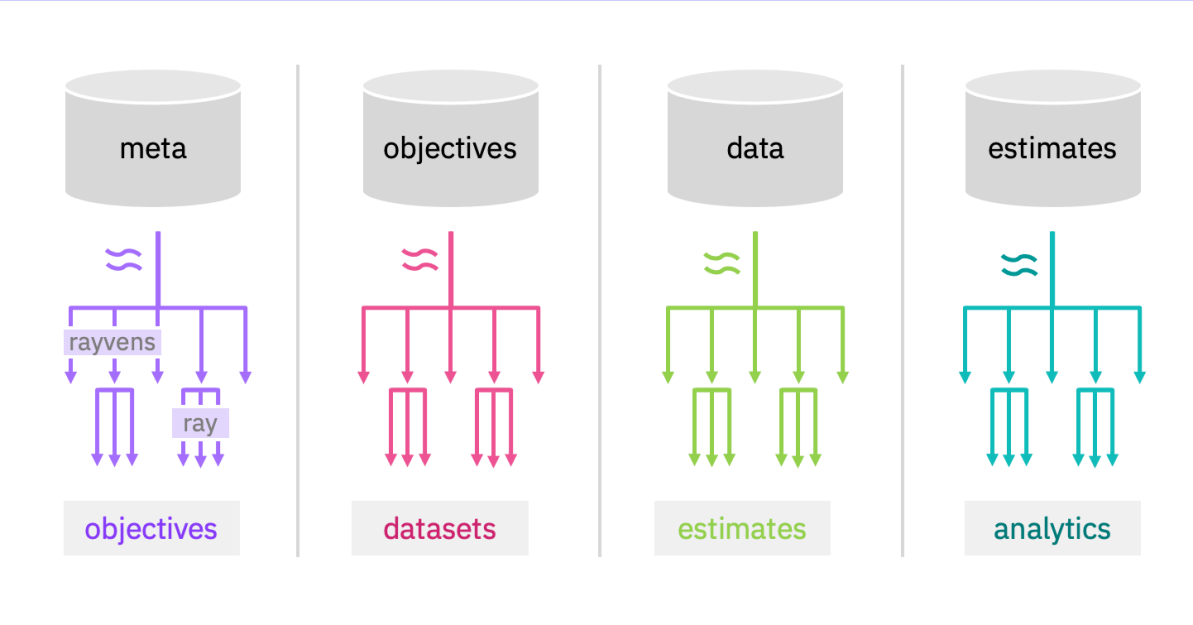


dim = 5,7
# probs = 680

– Maragno, Wiberg. *OptiCL: Mixed-integer optimization with constraint learning* (2021). `https://github.com/hwiberg/OptiCL/`.

– Mitchell, OSullivan, Dunning. *PuLP: A Linear Programming Toolkit for Python* (2011). `https://coin-or.github.io/pulp/`.

Design



– Moritz et. al.. *Ray: A Distributed Framework for Emerging AI Applications* (OSDI 2018). `https://github.com/ray-project/ray`.

– Bercea, Tardieu. *Rayvens: Event sources and sinks on Ray*, `https://github.com/project-codeflare/rayvens`

Deployment

Requirements:

- Local / Cloud Object Storage (`configs.yaml`)
- Local / k8s Cluster (AWS / IBM Cloud)

Installation:

```
$ pip install doframework
$ cd <project_folder>
$ doframework-setup.sh --configs configs.yaml
```

Running:

```
$ python user_module.py --configs configs.yaml
$ ray submit doframework.yaml user_module.py \\
                                    --configs configs.yaml
```