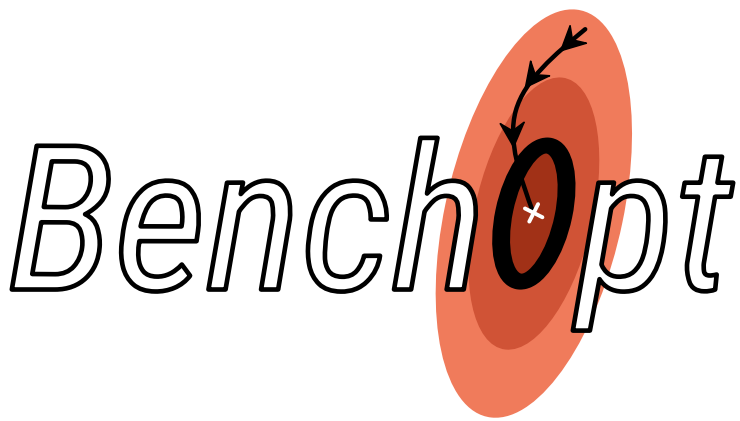
Benchopt:
Reproducible, efficient and collaborative optimization benchmarks

Journées "Recherche Reproductible"

Thomas Moreau



Reproducible research

Different goals:

- Reproduce the exact same results?
- Run with new parameters with robust results?
- Run with a new dataset?
- Extend the results with a new method?
- Provide tools for other to use?

Does not require the same set of tools!

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Here is my take.

Extending the results?

Current process in ML to extend results:

- Hard to extend existing code.
- Re-code methods and tools to integrate a new method.
- Competitors' methods do not work out of the box.

All of this started from scratch by every new methods!

Also very cumbersome to add a new dataset, or metric.

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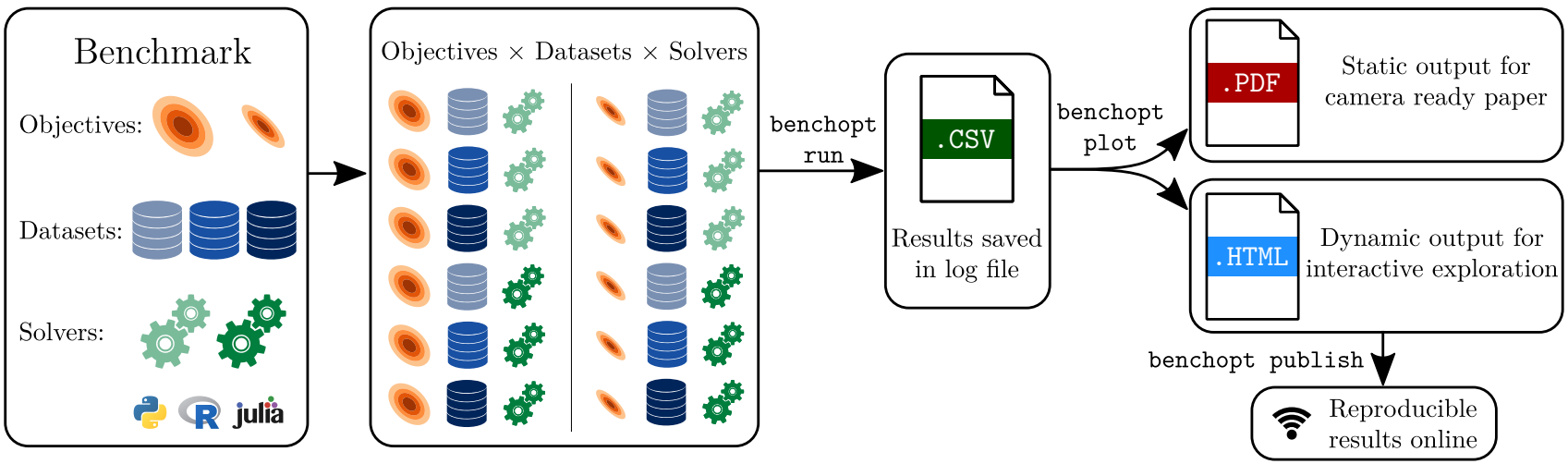
`Benchopt` produces **open**, **reproducible**, **extendable** benchmarks

How does Benchopt do it?

Benchopt is a framework to organize and run benchmarks:

- one repository per benchmark
- one base open source Python CLI to run them

3 components: Objective, Dataset, Solver



Start yours with

https://github.com/benchopt/template_benchmark!

Structure of a benchmark

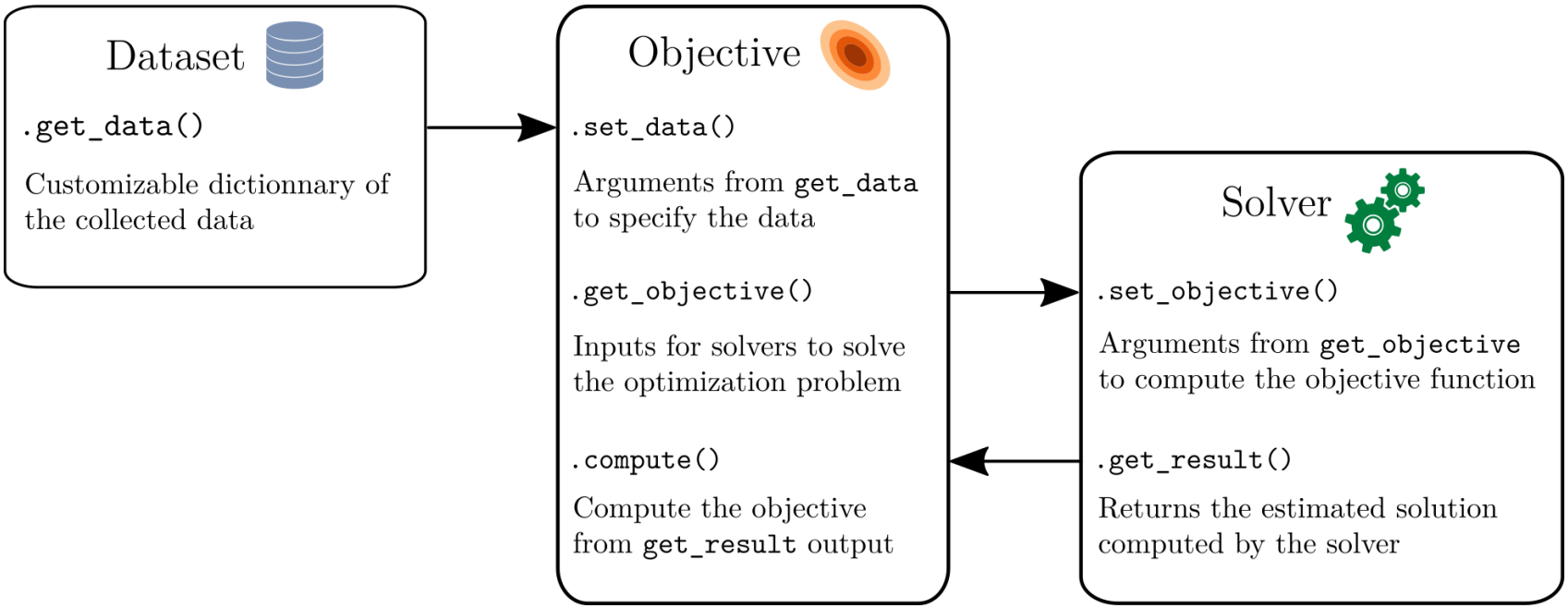
```
benchmark/
├── objective.py
├── datasets/
│   ├── dataset1.py
│   └── dataset2.py
└── solvers/
    ├── solver1.py
    └── solver2.py
```

Modular & extendable

New solver? add a file
New dataset? add a file
New metric? modify objective

Components of a benchmark

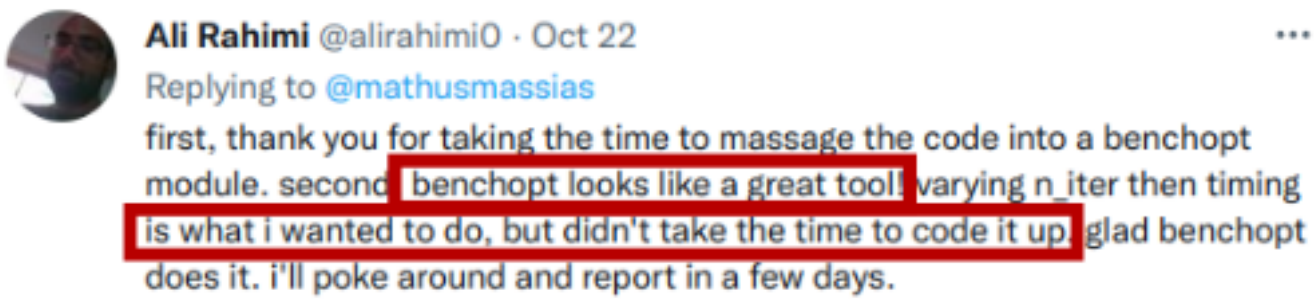
Dependency relation between Dataset - Objective - Solver



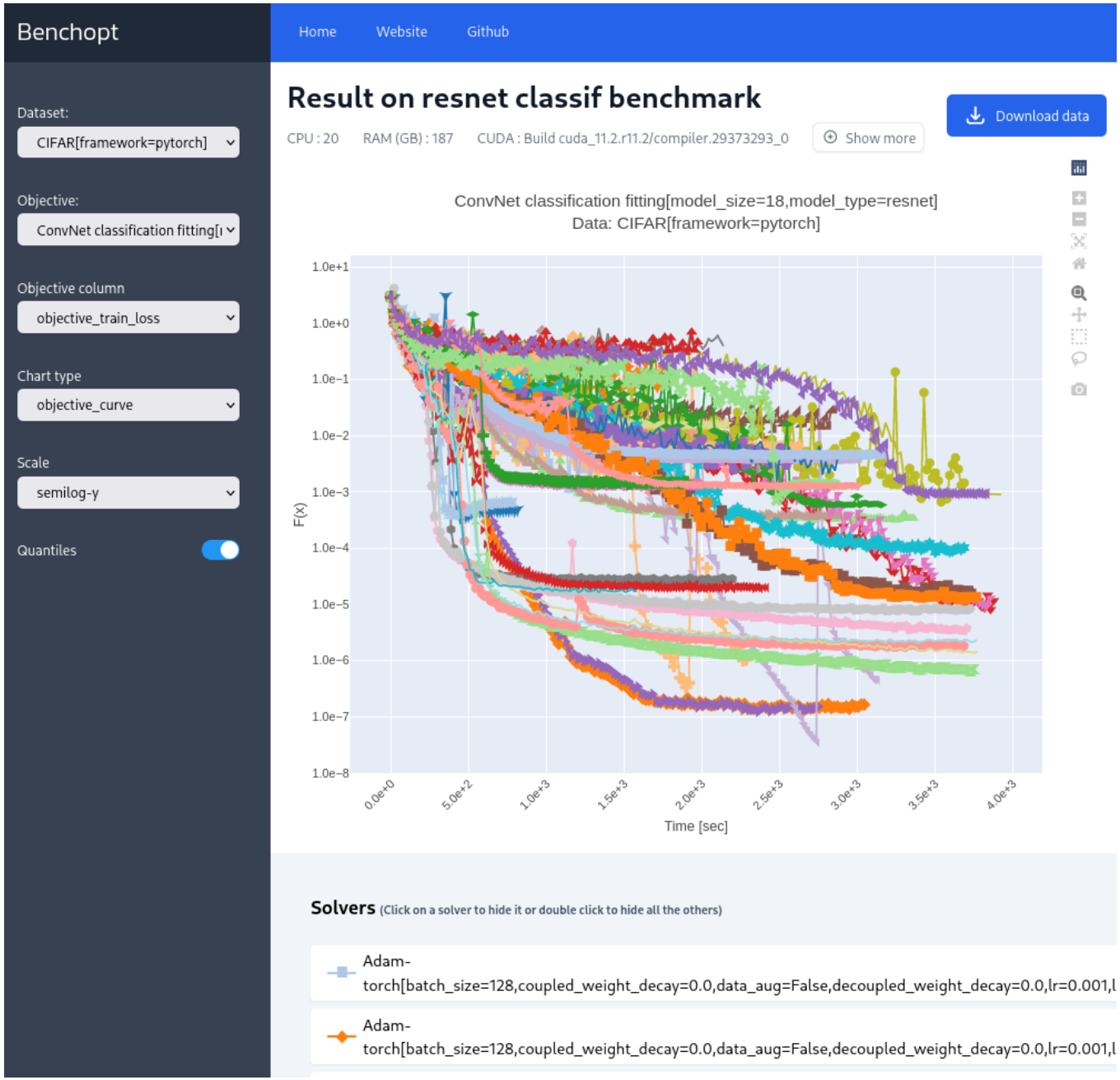
Flexible API so that each component is standalone.

`Benchopt` makes your life easy

- build on previous benchmarks
- use solvers in Python, R, Julia, binaries...
- monitor any metric you want altogether (test/train loss, ...)
- add parameters to solvers
- share and publish HTML results
- run all benchmarks in parallel
- cache results
- and much more!

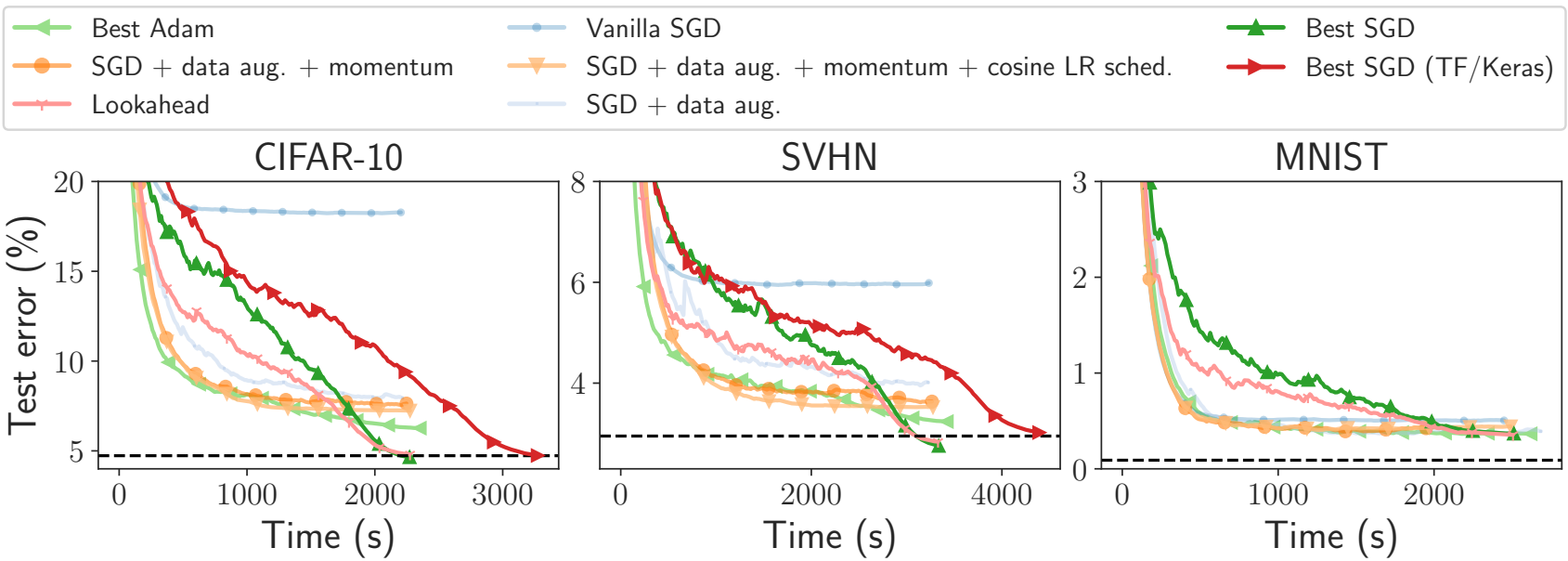


Interactive results exploration



Example: Resnet benchmark

- image classification with resnet18
- various optimization strategies
- compare `pytorch` and `tensorflow`
- publish reproducible SOTA for baselines



https://github.com/benchopt/benchmark_resnet_classif/

Other examples

- Resnet18
- Lasso
- ICA
- Logistic regression
- Federated Learning
- Total Variation
- Ordinary Least Squares
- Non convex sparse regression
- linear SVM
- Bi-level optimization

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You can easily add yours! :)

Conclusion

Reproducible research needs more than just releasing code:

- Clean and Documented.
- Reusable.
- Extendable.

Use proper tools to make it possible!

Research is also collaborative: don't hesitate to report your issues and give feedback :)

Contributors from...