Continuously Reproducing Toolchains in Pattern Recognition and Machine Learning Experiments
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Start here: https://www.idiap.ch/software/bob/

Typical Paper

- Pattern recognition and machine learning research work often contains experimental results on real-world data, which corroborates hypotheses and provides a canvas for the development and comparison of new ideas.
- Reproducibility is often overlooked.
- Scientific experiments often consist of many steps and parameters that are difficult to report.
- In our view, reproducible research work should be repeatable, shareable, extendable and stable.
- We investigate the implications of this key properties of RR work and the requirements for frameworks to fulfill them.

Definition

We consider a published paper to be reproducible if it is:

- **Reproducible**: It should be possible to re-run experiments declared in a report and obtain the same results, given the same selection of data, software, hyper-parameters, and evaluation protocol.
- **Shareable**: It should be possible to share the material (data and code) with others, so they can repeat experiments declared in a report.
- **Extensible**: It should be easy to implement new research directions or evaluate new conditions on existing experimental infrastructure.
- **Stable**: The repeatability through time should be guaranteed, on a best-effort basis.

Framework

Extensibility is an important aspect of reproducibility as today’s state of the art will eventually become tomorrow’s baselines. A “workflow” needs to be in place:

![Workflow Diagram]

- Protocol
- Dataset
- Toolchain
- Analysis

Tools

- Bare software frameworks are seldom successful in the long run without committed people and accompanying tools:
  - Version control
  - Unit testing and quality control
  - Packaging and deployment
  - Documentation

Use-case Analysis: Reproducible face recognition experiments

- Get data: https://www.idiap.ch/dataset/mobio
- Get code: https://gitlab.idiap.ch/bob/bob.paper.icml2017
- Install: Trivially done on any Linux/Mac OSX (64-bits) with Conda
- Run: Single command line to launch the multi-stage pipeline. Automatic parallelization on SGE or local machine supported

Results:

![Graphs and Figures]

- FAR (%)
- SFAR (%)
- HTER (%)
- Verification Scores
- Normalized Count
- Analysis

Toolchain implemented by framework:

- Dataset
- Preprocessing
- Feature Extraction
- Recognition
- Analysis

Version and Quality control:

- [Link to Version and Quality control]

Conclusions

1. To guarantee long-time reproducibility, scientific work must be repeatable, shareable, extendable and stable over time.
2. Committing to continuous reproducibility implies the creation and maintenance of a re-usable framework.
3. Efforts can be reduced if researchers are unified into standardized frameworks.
4. Bob is an example; we expect others to appear in the future.
5. Web-based frameworks such as the BEAT platform may provide a simpler mechanism of reproducibly while implementing "social" research and development.