Consistency of Machine-Learning Frameworks' Implementations

There are dozens of machine-learning frameworks and often they implement the same machine-learning algorithms (e.g. linear regression). In theory, the same algorithms should return the same results, i.e. they should perform equally well. It is your task to find out if the theory applies in practice. This means, you will find out if machine-learning algorithms are implemented differently by different machine-learning frameworks, and if and how the performance of the algorithms differs. More precisely, your goal is to answer the following question:

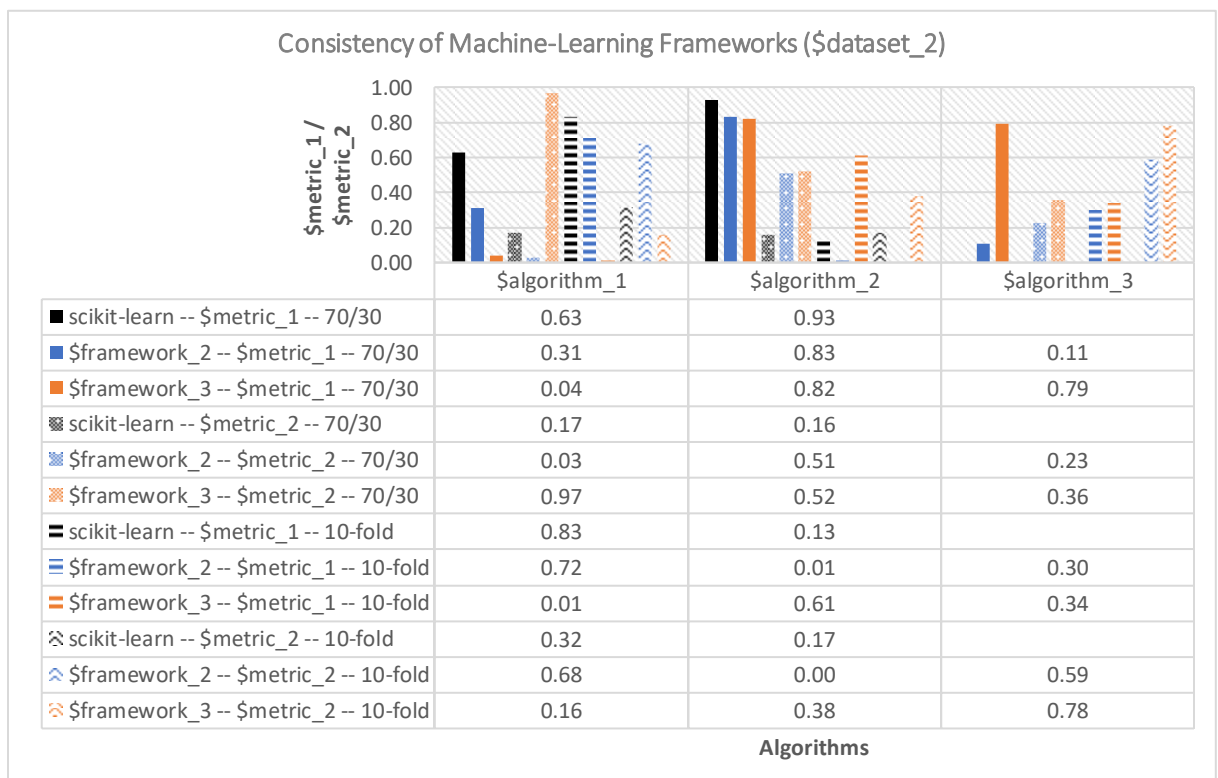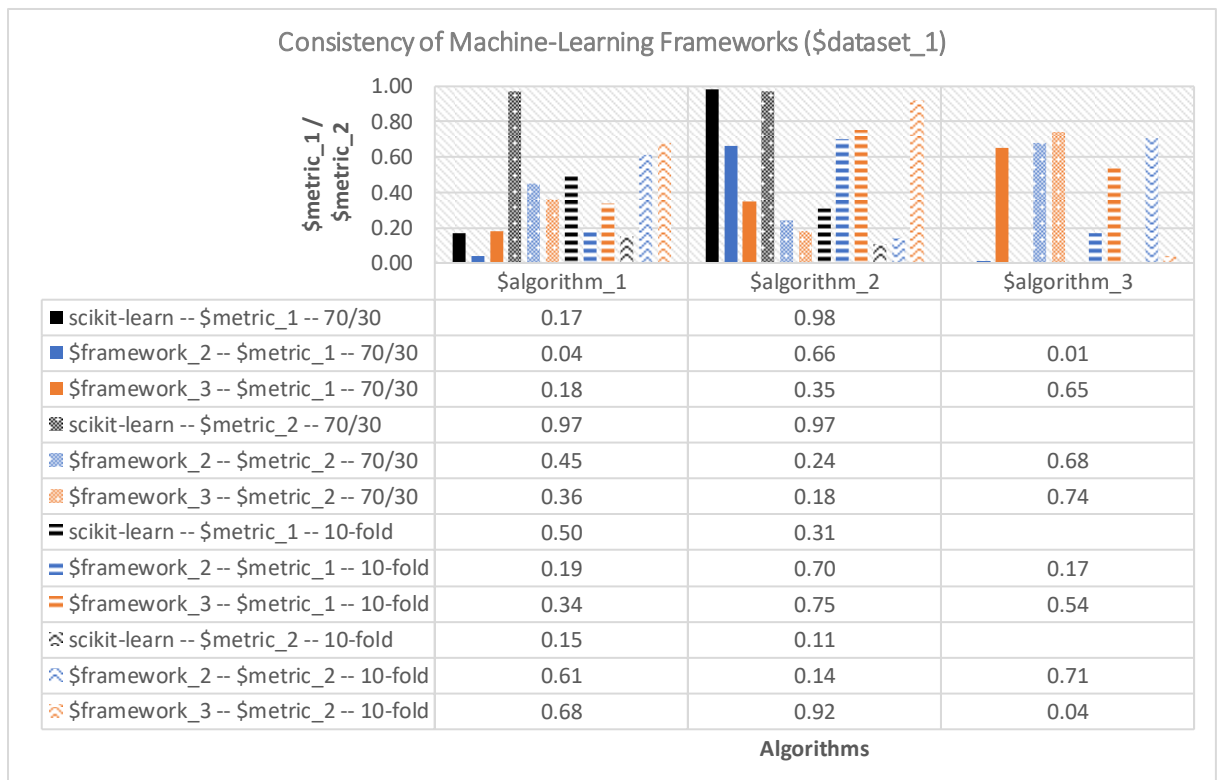1. How consistent are the implementations of machine-learning frameworks? [200-300 words]

Details:

1. Use scikit-learn, and two more machine-learning frameworks of your choice.
2. Use two datasets of your choice (each with at 10,000 data points, another one with at least 100,000 data points).
3. Use three algorithms of your choice (each algorithm must be implemented by at least two of the three frameworks).
4. Apply the algorithms to the datasets and evaluate them with:
   a. Test Method
      i. 70/30 split
      ii. 10-fold cross validation.
   b. Two metrics of your choice

The expected deliverables are

1. A CSV file with your results. The CSV file must be exactly (!) in the format as specified by the example file. The file name must follow exactly (!) the pattern "task2, $team_id, consistency of ml frameworks, data.csv", e.g. "task2, team_01, consistency of ml frameworks, data.csv"

$dataset_1	scikit-learn -- $metric_1 -- 70/30	$framework_2 -- $metric_1 -- 70/30	$framework_3 -- $metric_1 -- 70/30	scikit-learn -- $metric_2 -- 70/30	$framework_2 -- $metric_2 -- 70/30	$framework_3 -- $metric_2 -- 70/30	
$algorithm_1	0.4	0.2	0.29	0.85	0.77	0.08	…
$algorithm_2	0.85	0.53	0.43	0.89	0.26	0.3	
$algorithm_3	#N/A	0.06	0.53	#N/A	0.24	0.68	
$dataset_2	scikit-learn -- $metric_1 -- 70/30	$framework_2 -- $metric_1 -- 70/30	$framework_3 -- $metric_1 -- 70/30	scikit-learn -- $metric_2 -- 70/30	$framework_2 -- $metric_2 -- 70/30	$framework_3 -- $metric_2 -- 70/30	
$algorithm_1	0.52	0.56	0.48	0.88	0.18	0.81	…
$algorithm_2	0.77	0.55	0.56	0.29	0.46	0.59	
$algorithm_3	#N/A	0.38	0.16	#N/A	0.73	0.1	

2. Two PNG images illustrating your results, named "task2, $team_id, consistency of ml frameworks, chart ($dataset_1).png" and "task2, $team_id, consistency of ml frameworks, chart ($dataset_2).png", e.g. "task2, team_55, consistency of ml frameworks, chart (movielens).png". The two images should look like this:

Consistency of Machine-Learning Frameworks ($dataset_1)

	$algorithm_1	$algorithm_2	$algorithm_3
■ scikit-learn -- $metric_1 -- 70/30	0.17	0.98	
■ $framework_2 -- $metric_1 -- 70/30	0.04	0.66	0.01
■ $framework_3 -- $metric_1 -- 70/30	0.18	0.35	0.65
▦ scikit-learn -- $metric_2 -- 70/30	0.97	0.97	
▦ $framework_2 -- $metric_2 -- 70/30	0.45	0.24	0.68
▦ $framework_3 -- $metric_2 -- 70/30	0.36	0.18	0.74
═ scikit-learn -- $metric_1 -- 10-fold	0.50	0.31	
═ $framework_2 -- $metric_1 -- 10-fold	0.19	0.70	0.17
═ $framework_3 -- $metric_1 -- 10-fold	0.34	0.75	0.54
≋ scikit-learn -- $metric_2 -- 10-fold	0.15	0.11	
⋀ $framework_2 -- $metric_2 -- 10-fold	0.61	0.14	0.71
⋀ $framework_3 -- $metric_2 -- 10-fold	0.68	0.92	0.04

Algorithms

Consistency of Machine-Learning Frameworks ($dataset_2)

	$algorithm_1	$algorithm_2	$algorithm_3
■ scikit-learn -- $metric_1 -- 70/30	0.63	0.93	
■ $framework_2 -- $metric_1 -- 70/30	0.31	0.83	0.11
■ $framework_3 -- $metric_1 -- 70/30	0.04	0.82	0.79
▦ scikit-learn -- $metric_2 -- 70/30	0.17	0.16	
▦ $framework_2 -- $metric_2 -- 70/30	0.03	0.51	0.23
▦ $framework_3 -- $metric_2 -- 70/30	0.97	0.52	0.36
═ scikit-learn -- $metric_1 -- 10-fold	0.83	0.13	
═ $framework_2 -- $metric_1 -- 10-fold	0.72	0.01	0.30
═ $framework_3 -- $metric_1 -- 10-fold	0.01	0.61	0.34
≋ scikit-learn -- $metric_2 -- 10-fold	0.32	0.17	
⋀ $framework_2 -- $metric_2 -- 10-fold	0.68	0.00	0.59
⋀ $framework_3 -- $metric_2 -- 10-fold	0.16	0.38	0.78

Algorithms

3. A PDF report that
   a. Contains the team id, individual student IDs, and the total time that was spent to complete the task
   b. Answers the above-mentioned questions
   c. Contains the created image (please ensure that the quality of the image is good. It doesn't matter if we must zoom in e.g. 400%, but the numbers etc. must be readable at some zoom level).

d. Provides a brief overview (table) of the used datasets, algorithms, etc.
e. Lists the contributions of all team members
f. Contains additional information if required
g. Is in about the same format as the report-template and named "task2, $team_id, consistency of ml frameworks, report.pdf"

4. Your source code (no compiled/binary files) in the sub folder / task2, $team_id, consistency of ml frameworks, source/. Ensure you follow the "developer guidelines".