Scoring the implicit: The implicitMeasures package

24 aprile, 2020

Statement of need

Within the past decades, social sciences have shown a growing interest in the implicit investigation of attitudes. The Implicit Association Test (IAT; Greenwald, McGhee, and Schwartz 1998) and the Single Category IAT (SC-IAT; Karpinski and Steinman 2006) are the most common measures used for this aim. Both tests result in a differential score (the *D-score*) expressing respondents' bias in categorizing different stimuli in two contrasting conditions. While the scoring of the SC-IAT is based only on one algortihm (Karpinski and Steinman 2006), six different algorithms are availbale for computing the IAT *D-score* (Greenwald, Nosek, and Banaji 2003). The core procedure for the computation of the IAT *D-score* is the same for all the alogirithms, which differentiate themsleves according for the treatment of extreme fast responses and the replacement of error responses.

Despite that many R packages exist for computing IAT *D-score* algorithms, no packages exist for scoring the SC-IAT. Additionally, majority of existing R packages created for the computation of IAT *D-score* algorithms do not provide all the available algorithms. The packages allowing for the computation of multiple *D-score* algorithms either do not offer the chance to compare their results, or do not disambiguate the specific algorithm they are computing, raising reproducibility issue (Ellithorpe, Ewoldsen, and Velez 2015).

Recently, a Shiny Web Application (Chang et al. 2020) has been developed for computing the IAT *D-score*, called *DscoreApp* (Epifania, Anselmi, and Robusto 2019). This app proied an inutitive and easy to use user interface. By providing a detailed explanation of the *D-score* algortihms that can be computed, *DscoreApp* addresses the majority of the above mentioned replicabilit issues. Moreover, the graphical representation of the results can give an immediate glimpse of the results. However, *DscoreApp* presents some shortcomings as well. Firstly, since it is a shiny app, it is associated with the most oustanding issue of the shiny aps in general, namely, the replicabilit of the results. Specifically, since it is not possible to access the code used for the computation, it is not possible to replicate the results and even check whether the code presents some mistakes. However, Epifania, Anselmi, and Robusto (2019) used a GitHub repository to let public access the code used for the compusation. Despite the graphical representations of the results provided by *DscoreApp* are really useful for getting a first idea on the IAT results and they are all downloadble in a .pdf format, they cannot be changed by the users. Moreover, *DscoreApp* computes the *D-score* for only the IAT.

`implicitMeasures` package is an `R` package aimed at overcoming both the shortcomings of the existing `R` packages for the computaion of the IAT *D-score* and those of the shiny app *DscoreApp*. `implicitMeasures` provides an easy and open source way to clean and score both the IAT and the SC-IAT, to easily compare different IAT *D-score* algorithms, and to provide clear and customizable plots.

Overview of `implicitMeasures` package

The released version of `implicitMeasures` can be installed from CRAN:

```r
install.packages("implicitMeasures")
```

while the development version can be installed from GitHub:

```r
# install.packages("devtools") # if you don't have devtools installed
                   # un comment this line
devtools::install_github("OttaviaE/implicitMeasures")
```

`implicitMeasures` contains three vignettes, namely "implicitMeasures", "IAT-example", and "SC-IAT-example". Vignette "implicitMeasures" contains information regarding both the IAT and the SC-IAT, the computation of their respective scoring algorithms, as well as an explanation of the dataset (i.e., `raw_data`) included in the package. Vignettes "IAT-example" and "SC-IAT-example" provides examples of how to use the package functions for computing the IAT and SC-IAT *D-score*, respectively, for plotting their results, and for obtaining descriptive tables of the results. In the IAT case, an illustration of how to use the packages for computing multiple *D-score* algorithms concurrently, as well as for plotting their results, is provided. In the SC-IAT case, also an example of how to use the package for plotting multiple SC-IATs scores in one graph is provided.

References

Chang, Winston, Joe Cheng, JJ Allaire, Yihui Xie, and Jonathan McPherson. 2020. *Shiny: Web Application Framework for R*. https://CRAN.R-project.org/package=shiny.

Ellithorpe, Morgan E, David R Ewoldsen, and John A Velez. 2015. "Preparation and Analyses of Implicit Attitude Measures: Challenges, Pitfalls, and Recommendations." *Communication Methods and Measures* 9 (4): 233–52. https://doi.org/10.1080/19312458.2015.1096330.

Epifania, O. M., Pasquale Anselmi, and Egidio Robusto. 2019. "DscoreApp: An User-Friendly Web Application for Computing the Implicit Association Test d-Score." *Journal of Open Source Software* 4 (42): 1764. https://doi.org/10.21105/joss.01764.

Greenwald, Anthony G, Debbie E McGhee, and Jordan L K Schwartz. 1998. "Measuring Individual Differences in Implicit Cognition: The Implicit Association Test." *Journal of Personality and Social Psychology* 74 (6): 1464–80. https://doi.org/10.1037/0022-3514.74.6.1464.

Greenwald, Anthony G, Brian A Nosek, and Mahzarin R Banaji. 2003. "Understanding and Using the Implicit Association Test: I. An Improved Scoring Algorithm." *Journal of Personality and Social Psychology* 85 (2): 197–216. https://doi.org/10.1037/0022-3514.85.2.197.

Karpinski, Andrew, and Ross B. Steinman. 2006. "The Single Category Implicit Association Test as a measure of implicit social cognition." *Journal of Personality and Social Psychology* 91 (1): 16–32. https://doi.org/10.1037/0022-3514.91.1.16.