Authors' Response to AE

"combinIT: An R Package for Combining Interaction Tests for Testing Interaction in Unreplicated Two-Way Tables"

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We would like to thank the referees for giving helpful comments. Below, we provided a point-by-point response letter. The referees' comments and our responses are in `gyre cursor` and regular font typefaces, respectively. In the revised version of the paper, the changes were highlighted in blue and green colors following the first referee's and the second referee's comments, respectively.
Note that we changed the package in accordance with the referees' comments and we submitted the new version of the package (Ver 2.0.0) to CRAN. Now, the new version of the package is available on https://cran.r-project.org/package=combinIT.

> –– Reviewer 1 ––

> Overview

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> This paper presents several tests that test for interaction
of different forms in an unreplicated two-way table and four meth-
ods of combining the results of these tests.  This is a rather
narrow, but important, application of statistics.  The methods
that are used are state of the art and not available in other
packages.  Consequently, combinIT represents a useful contri-
bution to the R community.
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> Article

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> I have suggested a number of improvements that could be made
to the paper in the marked up version of it.  My general com-
ments on the paper follow.  While overall the English in the pa-
per is quite good, there are a number of instances in which it
needs tidying up.  I have made some suggestions in the marked-
up file.
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Response: We would like to thank the referee for his/her constructive comments. We carefully followed the given comments in the marked-up file and made changes. They are in blue color in the new version of the paper.

> Marked up version

> **Page1 -- combinIT** -- > I agree that this name has a nice ring to it, but it is not obvious that it is about two-way interactions. To me the latter is the most important aspect of the package. I would be looking for a package that dealt with interactions. Of course, that tests are combined is a particular feature of this package. How about int2comb or combInt2? See Hadley Wickham's Package book at https://r-pkgs.org/Workflow101.html?q=naming#naming for material on naming functions.

Response: We thank the referee for this comment and the introduced book. We agree with the referee that the current package name is not obviously about two-way interactions. However, one can easily find our package by the Google search engine. For example, if one googles *interaction test in* unreplicated two-way, our package is shown as one of the first findings although neither two-way nor unreplicated has been included in the package name. On the other hand, our package had been released on CRAN and some researchers migth use it. If we change the package name, the current users may encounter some problems or ambiguity (specially, if they have cited our package in their projects and researches, or have used it in their codes).

> **Page1 -- Title** -- > omit "Testing Interaction in"

Response: Done.

> **Page1 -- Introduction** -- > I think that it would be worth including here the three contexts in which unreplicated, crossed, two-factor layouts arise, citing Franck and Osborne (2016).

Response: We cited Franck and Osborne (2016) and we included the three contexts in which unreplicated two-factor layouts arise.

> **Page2 -- Despite the wide ...** -- > This sentence can be read as meaning that they are commonly used. Franck and Osborne (2016) does not establish. It establishes that they have been employed in a diverse range of areas such as industry, ... Either delete wide or otherwise reword to make the sentence unambiguous.

Response: We deleted the word "wide" and we reworded the sentence to "Despite the application of unreplicated two-way ANOVA models in industry, biology, agriculture, and medicine, the new proposed interaction tests have not been discussed in statistical packages; as similarly noted by Franck and Osborne (2016)".

> **Page2 -- we notify that the combinIT ...** -- > Rccp does not write code. It integrates already written C++ code with R. The highlighted part of this sentence should come after the next sentence.

Response: We changed the sentences to “In terms of code execution speed, it is worth mentioning that nearly 25% of body codes have been written in C++; see https://github.com/haghbinh/combinIT. We used the Rcpp package (Eddelbuettel and François, 2011; Eddelbuettel, 2013; Eddelbuettel and Balamuta, 2018) for writing some parts of codes in C++.”

> **Page3** –– **Piepho** ––> change: "while the" to ". The"

Response: Done.

> **Page3** –– **Piepho** ––> change: ". This test" to " that"

Response: Done.

> **Page3** –– **Malik** ––> Isn’t this related to the Franck test.

Response: Note that the Franck test is different from the Malik test.

> **Page4** –– **Four methods for combining interaction tests** ––> Add ","

Response: Done.

> **Page4** –– **Four methods for combining interaction tests** ––> Add ","

Response: Done.

> **Page4** –– **Four methods for combining interaction tests** ––> change: "as a" to "using one of the following four"

Response: Done.

> **Page4** –– **Four methods for combining interaction tests** ––> change: "procedure" to "procedures"

Response: Done.

> **Page5** –– **Note 1** ––> change: "recommend " to "suggest"

Response: Done.

> **Page5** –– **Technical details** ––> change: "combine six NFBF interaction tests. " to "perform the six NFBF interaction tests individually and to perform a combined test of the six NFBF interaction tests. It also has a function to produce an interaction plot and four data sets. "

Response: Done.

> **Page5** –– **Technical details** ––> change: "utilized functions " to "available functions "

Response: Done.

> **Page5 –– Technical details** ––> change: "Based on the similarities between the inherent nature of these functions, their returns are classified into two types of classes which have developed in the base of a S3 OO system. These classes are: " to "This package produces two S3-class objects: (i) ITtest that is produced by functions that perform a single test and (ii) combtest that is produced by the function that performs the combined test. These returned objects are lists with the following components: "

Response: Done.

> **Page5 –– Technical details** ––> change: "consisting " to "consists "

Response: Done.

> **Page5 –– attributes** ––> This is incorrect, the elements of a list being called components. In this case, the object has only one attribute, its class that is "ITtest".

Response: Thank you for this comment. We changed attribute to components.

> **Page5 –– Technical details** ––> change: "to " to "used to "

Response: Done.

> **Page5 –– Technical details** ––> change:"consisting " to "consists "

Response: Done.

> **Page5 ––Technical details** ––> change: "attributes " to "components "

Response: Done.

> **Page5 –– Technical details** ––> change: "the results of the mentioned tests accurately " to "accurate results for the various tests "

Response: Done.

> **Page5 –– Technical details** ––> change: "functions defined in " to "C++ functions that are called from R using "

Response: Done.

> **Page6 -- table format** -- > This is a big table with little content.

Response: We deleted the last column of the table and it is shortened in the new version of the paper.

> **Page6 -- Used Rcpp function(s)** -- > Is this column necessary?????

Response: We deleted that column.

> **Page6 -- Table** -- > change: "Used Rcpp function(s)" to "C++ function(s)"

Response: Done.

> **Page6 -- Function** -- > The names of the functions for doing tests are not best practice in that full stops are used separate the name of the test and what the functions does, namely tests. This contravenes the R S3 convention that a full stop separates the name of the function and the class of the object on which the function operates, namely an object of class matrix. It gives the impression that the functions operate on an object of class test. Two options are to replace "." with "_" or to use camel case e.g. BoikTest or testBoik. The interactionplot function needs to be named in a consistent manner e.g. interaction_plot. For more on function naming see https://devguide.ropensci.org/building.html?q=naming#function-and-argument-naming.

Response: Thank you for this comment. We replaced "." with "_" in the new version of the package and the paper. We also changed "interactionplot" to "intercation_plot".

> **Page6 -- CPI.test** -- > CPI stands for Combined P-value Interaction test. It is an ambiguous name for the test in that it is not clear what P-values are involved. Why not something like CI_test or combint_test?

Response: We changed "CPI.test" to "CI_test".

> **Page6 -- Table caption** -- > change: "Written functions" to "the functions"

Response: Done.

> **Page6 -- Using the package ...** -- > change: "speed execution" to "execution speed"

Response: Done.

> **Page7** -- > Add "(CNV)"

Response: Done.

> **Page7** −− > change: "data set which is about copy number variation (CNV) between " to "CNV data set that contains CNV values for"

Response: Done.

> **Page7** −− **The result of the combined ....** −− > The p-value for the result of the combined test is never explicitly stated. Also, this predisposes one to use a 5% level of significance. I think that this should be replaced by the p-value and "at the 5% level" added to the end of the next sentence.

Response: Note that the p-value of the combined test is stated the above of the given report and a user can change the level of significance by changing the argument "alpha". We changed that report to "A report on the combined test: A significant hidden structure exists at the 5% level. The first group includes rows: 4, 5. The second group includes rows: 1, 2, 3, 6 . The estimated critical value of the Franck.test at the level 5% with 10000 Monte Carlo samples is 55.508 .

> **Page7** −− > change: "can detect " to " has detected"

Response: Done.

> **Page7** −− > change: " the CNV data set in more detail. That is to see the hidden structure better, the argument" to " the hidden structure in the CNV data set in more detail. The argument"

Response: Done.

> **Page8** −− > change: "plot has been shown in Figure 2. As it is seen in Figure 2," to " plot in Figure 2 shows that"

Response: Done.

> **Page8** −− > change: "and they " to "and that they"

Response: Done.

> **Page8** −− **The result of the test at the 5% level...** −− > These two sentence could be combined as described for the CPI test.

Response: Done.

> **Page8** −− > change: "solely " to "individually"

Response: Done.

> **Page8** −− > change: "the result of testing H_0 : There is no interaction is not simultaneously at the 5% level. " to "a Type I error has not resulted from the multiple tests that have been performed."

Response: Done.

> **Page8** −− **The result of the test at the 5% level. The Boik.test...** −− > Combine

Response: Done.

> **Page9** −− **The result of the test at the 5% level. The Piepho.test...** −− > Combine

Response: Done.

> **Page9** −− **The result of the test at the 5% level. The KKM.test...** −− > Combine

Response: Done.

> **Page9** −− **The result of the test at the 5% level. There may exist...** −− > Combine

Response: Done.

> **Page9** −− **The result of the test at the 5% level. The KKM.test could ...** −− > Combine

Response: Done.

> **Page9** −− > change: "do not differ very much" to "differ little"

Response: Done.

> **Page9** −− > change: "while" to ";on the other hand"

Response: Done.

> **Page10** −− **run speed of** −− > It is time that is plotted.

Response: We changed “run speed” to “run time”.

> **Page10** −− > change: "more" to "shorter"

Response: Done.

> **Page10**−− **Simulation study** −− > change: “the performance of these combination methods when the p-values of the Boik, Piepho, KKSA, Franck, KKM, and Malik tests had been combined.” to “the

performance of these methods for combining p-values of the Boik, Piepho, KKSA, Franck, KKM, and Malik tests."

Response: Done.

> **Page10-- Simulation study** --> change: "For given a and b, an a × b data table is generated from the standard normal distribution." to "For given a and b, an a × b data table is generated from the standard normal distribution and computed its interaction effects."

Response: Done.

> **Page10-- Simulation study** --> delete: "Note that we set the grand mean, main effects, and interaction effects to zero since the interaction tests are based on the residuals."

Response: Done.

> **Page10-- Simulation study** --> change: "For the generated data table," to "For the generated interaction effects,"

Response: We changed to "For the computed interaction effects,"

> **Page10-- Simulation study** --> change: "calculated as the estimated type one error rate of the combination method" to "calculated as an estimated of the Type I error rate of the combining method."

Response: Done.

> **Page10** --> change: "of " to " in"

Response: Done.

> **Page10** --> change: "combination " to "combining"

Response: Done.

> **Page11--Summary** --> delete "briefly"

Response: Done.

> **Page11--Summary** --> change: " in this paper. The" to "and demonstrated that the"

Response: Done.

> **Page11--Summary** --> change: "(iii) the execution speed of codes is fast enough for calculating " to "(iii) its execution speed is fast enough to make it feasible to calculate"

Response: Done.

> **Page11--Summary** --> change: "while " to ",although"

Response: Done.

> **Page11 -- Summary** --> How large? As the size of the data set approaches the maximum size?

Response: We changed the sentence to "when the size of the data set gets larger."

> **Page11-- Acknowledgment** --> change: " acknowledgment " to "acknowledge"

Response: Done.

> **Page11 -- doi: 10.1191/0962280206sm426oa. URL** https://doi.org/10.1191/0962280206sm426oa. --> The treatment of doi and URls is not consistent. Here the doi is given in text form and as a url. In the Eddelbuettel references only the text form is given. Corsten the text is specified as an unlinked url. They need to be made consistent. A linked url has the advantage of being clickable.

Response: We deleted the doi of references and we provided only their URL (if available).

> Package

> Except for CPI.test, the code for each exported R functions consists of a single R function with calls to appropriate C++ functions. They are not overlong and are relatively straightforward to read.

Response: Thanks reviewr for this careful reading. Note that some time-comsuming parts of the single R functions have been implemented in C++ to improve the executation speed.

> * I feel that the name of the package does not suggest the main function of the function, namely to perform interaction tests on unreplicated two-way layouts (nor does hiddenf for that matter). When I see IT, I think of Information Technology. Also, I appreciate that an novel feature of the package is the combined tests, but to my mind this is qualifier of interaction tests. In the marked-up file I have suggested int2comb or combInt2. I prefer the former because it would put in a list of packages near where one would expect to find packages that deal with interactions. If the authors have not already done so, I suggest they consult Hadley Wickham's book on Packages. I have provided links to Section 5 in the marked-up file.

Response: We thank the referee for this comment and the introduced

book. We agree with the referee that the current package name is not obviously about two-way interactions. However, one can easily find our package by the Google search engine. For example, if one googles *interaction test in* unreplicated two-way, our package is shown as one of the first findings although neither two-way nor unreplicated has been included in the package name. On the other hand, our package had been released on CRAN and some researchers migth use it. If we change the package name, the current users may encounter some problems or ambiguity (specially, if they have cited our package in their projects and researches, or have used it in their codes).

> Another area in which the package could be improved in that it uses two-part names for packages with a full stop separating the parts and the last part is not the name of the class of object on which the function operates. Again, I have provided links to Hadley's book on Packages in the marked-up file.

Response: We thank the referee for this comment. We changed "." to "_".

> −− Reviewer 2 −−

> Overall comments

> This is a nice paper with clear objectives, thorough description of the statistical methods, a useful comparison with previous packages, and a simulation study to validate results. The R package appears to be quite useful for testing interaction in two-way ANOVA tables. The R code is well written.

> Table 2 could perhaps be better presented as a graph. This is not a required change, just a comment.

Response: We just shortened the table.

> Paper review

> Page 1

> Change: "each test is powerful to detect a pattern of interaction" to "each test is powerful for detecting certain types of interaction"

Response: Done.

> Change "model is usually used" to "model is sometimes used"

Response: Done.

> Change "is powerful to detect a particular " to "is powerful for detecting a particular "

Response: Done.

> Page 2

> Change "models in the industry, biology," to models in industry, biology,"

Response: Done.

> Change "we notify that" to "we note that"

Response: We completely changed that phrase.

> Change "have been written by Rcpp" to "have been written using the Rcpp"

Response: We completely changed that sentence.

> Change "package is provided" to "package are provided"

Response: Done.

> Change "powerful to detect" to "powerful for detecting"

Response: Done.

> Change "the interested null hypothesis" to "the null hypothesis of interest"

Response: Done.

> **Page 3**

> Change "Note that Boik test is powerful to detect" to "Note that the Boik test is powerful for detecting"

Response: Done.

> **Page 4**

> Change "a significant interaction presents" to "a significant interaction is present"

Response: Done.

> Change " This test procedure is powerful to detect significant" to " This test procedure is powerful for detecting significant"

Response: Done.

> Change "Since there is no the best interaction test " to "Since there is no single best interaction test "

Response: Done.

> **Page 5**

> Change (in two places) "class consisting of" to "class consists of"

Response: Done.

> I think you mean "the print method" instead of "the print generic"

Response: We changed it.

> **Page 9**

> Change "shows the used R codes" to "shows the R code used"

Response: Done.

> **Page 10**

> Change "is much more" to "is much faster"

Response: We changed it to “is much shorter”.

> Change "the Tukey’s test" to "Tukey’s test"

Response: Done.

> Change (several places) "type one error" to "Type I error"

Response: We changed all those phrases to "Type I error".

> Change "may introduce" to "may be introduced"

Response: Done.

> **Page 11**

> Change "new version of the package" to "next version of the package"

Response: Done.

> Suggestion for your future papers: Use "one" when counting, but use "1" when referring to numbers.

Response: Thank you for the given comment.

> Package review

>1. Formatting of output

> I tried the following example:
R> data(RDWW)
R> RDWW The output looks (partly) like:

> There may exist a significant intercation and it might be caused by some cells. The absolute estimates of the significant pair-wise interaction contrasts (PIC) and the corresponding involved cell means are:

$$|\mu_{11} - \mu_{21} - \mu_{13} + \mu_{23}| = 0.317$$

The format of the text is extremely wide and will not work well when used to create PDF reports. Can you improve this? There may be similar examples for other functions.

Response: We added the function “justify” to the package in order to make tidy the format of the texts in reports. Thank you for the given comment.

>2. Issue tracker

> It is great that the package is on GitHub. It would be nice to add the GitHub issue tracker to your DESCRIPTION file

Response: Thank you for the given comment. A GitHub issue tracker already has been added to the GitHub repository for bug reports and its link has been inserted in the Description file in the new version of the package on CRAN.

>3. Unit tests

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> It is nice to see examples in the .Rd files.  I would be even
more impressed if you could add some unit tests to the package
(e.g.  using "testthat" package).
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Response: Thank you for the given comment. The examples are in the .Rd files and some unit tests have been added to the package in the new version of the package on CRAN.