scikit-posthocs: Pairwise multiple comparison tests in Python

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Summary

scikit-posthocs is a Python package providing multiple pairwise comparison tests (post hocs). Statisticians, data scientists, and researchers will find it useful in a statistical analysis routine to assess the differences between group levels if a statistically significant result of a parametric or nonparametric analysis of variance (ANOVA) test has been obtained.

Most statistical software packages (such as SPSS and Stata) provide a number of post hoc tests. However, Python ecosystem still lacks implementation of these tests for factorial and block design data. Currently, *Student*, *Wilcoxon*, *Mann-Whitney* tests which are not adapted to multiple pairwise comparisons are offered by *SciPy*. *Statsmodels* package includes *TukeyHSD* test which needs extra actions to be fluently integrated into a data analysis pipeline.

`scikit-posthocs` package is aimed at filling this gap by providing a number of nonparametric and parametric pairwise comparisons tests as well as outliers detection algorithms implemented in Python.

Currently, the following tests are implemented in this package:

1. *Parametric* pairwise multiple comparisons tests: Scheffe, Student T, Tamhane T2, and TukeyHSD test.
2. *Non-parametric* tests for factorial design: Conover, Dunn, Dwass-Steel-Critchlow-Fligner, Mann-Whitney, Nashimoto-Wright (NPM), Nemenyi, van Waerden, and Wilcoxon test.
3. *Non-parametric* tests for block design: Conover, Durbin and Conover, Miller, Nemenyi, Quade, Siegel test.
4. Additional tests: Anderson-Darling, Mack-Wolfe, Hayter (OSRT) test.

`scikit-posthocs` provides tests for outliers detection: interquartile range (IQR) test, Grubbs test, Tietjen-Moore test, and generalized (extreme Studentized deviate) ESD test. It also has plotting functionality to present the results of pairwise comparisons as a heatmap (significance plot, see figure).

`scikit-posthocs` is compatible with Python 2 and 3 versions, relies heavily and extends the functionality of `statsmodels`, `SciPy` and `PMCMRplus` packages (Seabold & Perktold, 2010), (Jones, Oliphant, & Peterson, 2001), (Pohlert, 2018). It is also integrated with `Pandas` (McKinney, 2010) and `Numpy` (T. E. Oliphant, 2006) for efficient computations and data analysis. The package is fully documented and comes with a Jupyter notebook example.
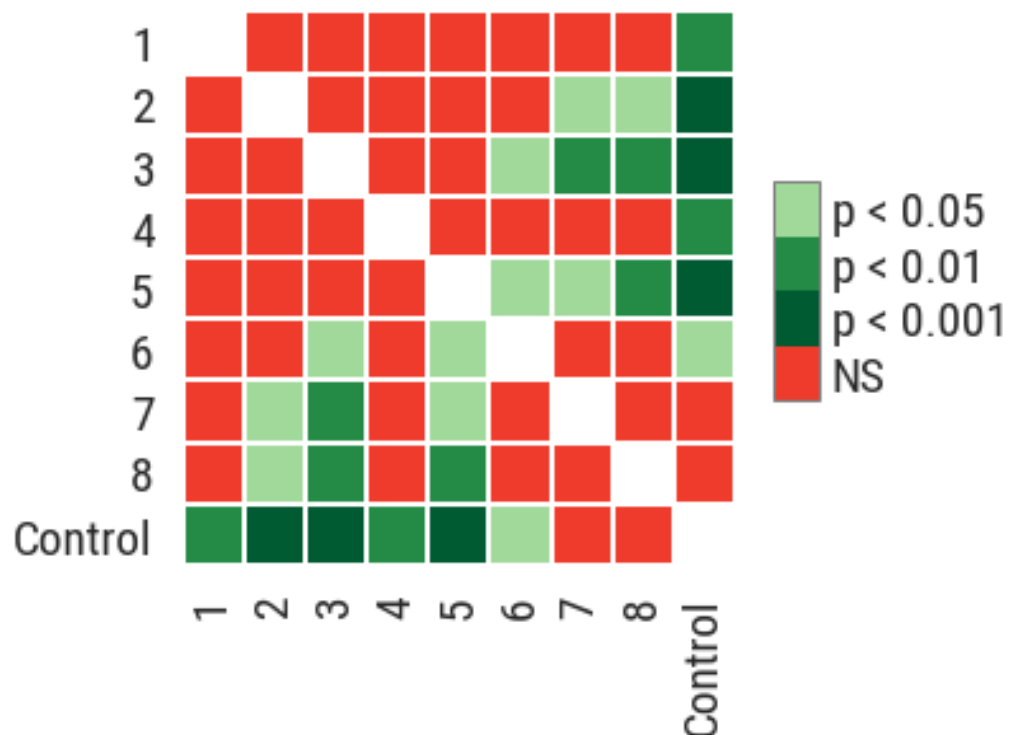
Figure 1: Significance plot

References

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