

SPEED Stat: an Excel package for teaching experimental statistics

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A more multidisciplinary graduate formation is a growing demand in today's world. However, a more multidisciplinary training requires, among other things, a pedagogical effort of objective synthesis of each content. In this sense, when teaching experimental statistics to students of agricultural and biological sciences, the learning curve in software such as R, Python or SAS is slow and consumes valuable time that could be invested in the contents of statistical science itself. Thus, the objective of this work was to develop a simple application in Excel for univariate statistical analysis of experiments. Classic ANOVA procedures (fixed effects) were included for the CRD and RBD models in simple, factorial (double or triple, including additional treatments), split-plot (with or without Satterthwaite correction), split-block, simple nested (mixed model) and repeated measures ANOVA (GG correction) for balanced or slightly unbalanced data. With just one click the tool can run Tukey, SNK, Dunnett, Scott-Knott, Holm or Benjamini-Hochberg tests. In factorials, the program allows executing them with EWER control (except for SNK and Scott-Knott). With 6 clicks the user can also perform regression analysis for linear and non-linear models (including exponential and sigmoidal models). Maximum, minimum, asymptotes or other relevant information from the regression models are also calculated automatically. Non-parametric regression with medians are also facilitated in the program. In addition, the application automatically performs tests for normality, homoscedasticity and additivity requirements. In case of violation, the program also automatically scans for outliers or a suitable transformation. The application also allows the performance of ANCOVA with great ease and provides the Papadakis method for correction of spatial autocorrelation according to a sketch informed by the user. Finally, the application allows you to edit the DF and MSerror values in order to allow other analyses (such as joint analysis, blocks with random effect, among others). Among the main limitations of the application, we can highlight the requirement of good hardware configurations and the limitations of scope of procedures. Important simple procedures such as Pearson's correlation matrix and multiple regression analysis could not be included as they would imply a complete change in the minimalist and intuitive structure of the developed spreadsheet program. However, these procedures are relatively simple to be performed with native Excel functions. The application (available for free at speedstatsoftware.wordpress.com in English, Portuguese and Spanish) has been tested with the resolution of hundreds of examples and will soon be adapted for use in LibreOffice as well.

Keywords: statistical software, statistics teaching, classic experimental designs.