ON CONFIDENCE INTERVALS FROM PERMUTATION TESTS

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As randomization methods are used by more and more instructors to introduce inferential ideas in introductory statistics courses, there is a need for software that can make the calculations simple for students. This is not a difficult problem when calculating *p*-values for permutation tests, especially when Monte Carlo approximations to the true *p*-value are used. The *p*-value is obtained by repeatedly calculating a test statistic for a large number of permutations (*M*) of the data. This is relatively easy to implement.

But the same is not true for permutation confidence intervals (i.e., confidence intervals calculated by inverting permutation tests). Calculating permutation confidence intervals has been seen as a much more computationally difficult problem.

The idea behind a permutation confidence interval is well known and fairly straightforward (Ernst 2004). The confidence interval is simply the set of all values of the parameter for which the null hypothesis is not rejected. On its face, this implies that the amount of calculation necessary for the permutation confidence interval is at least an order of magnitude greater than for the permutation test, since the *p*-value for the test, involving *M* permutations, must be calculated for each potential value of the parameter that is tried. The total number of necessary permutations grows very rapidly.

We present a method of calculating the permutation confidence interval in the two-sample problem that is computationally no more difficult than calculating a single permutation *p*-value. This method can be implemented in any programmable statistical software so that students can calculate permutation confidence intervals as easily as permutation test *p*-values.

REFERENCES

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