On Robust Statistics

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Classical statistical inference is performed using a set of mathematically rigorous tools that have been studied and applied through the centuries. Its application is based on observations <u>and</u> assumptions. These assumptions are mathematically convenient rationalizations of knowledge and beliefs. The use of the assumptions is justified by appealing to some stability or continuity principles…a minor violation of the model assumptions should cause only a small effect in the final conclusion. Often, however, classically optimum procedures behave very poorly in the presence of even slight violations of the model assumptions. This problem certainly dates to the prehistory of statistics, but has been observed and investigated by the Titans of the science, from Bernoulli through Gauss and Tukey.

Robust Statistics is the statistics of approximate parametric models that are insensitive to small deviations from the idealized assumptions. In recent decades, a number of robust theories, methods, and tools have been proposed to deal more effectively with the problems.

This presentation will discuss the common assumptions and some theory of robust statistics, compare them with classical methods, and demonstrate their use and utility in several univariate examples. It will also propose some ideas of why these are relatively unknown or unused among industrial statisticians, and make some recommendations for their use.