Least Squares, Method Of Encyclopedia Article

Least Squares, Method Of

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Contents

Least Squares, Method Of Encyclopedia Article.....1

Contents.....2

Least Squares, Method Of.....3

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The method of least squares is an important statistical tool used to obtain the best values, those containing the "least" errors, of unknown quantities. Commonly used by engineers, business managers, government officials, market analysts and others in the field of statistical analysis, the method of least squares permits an accurate, yet uncomplicated system for the estimation of exact values from a set of observations containing errors. The process is called "least squares" because the procedure minimizes the sum of the squares of the differences between the observed and estimated values. The method is also used in interpolation theory to find simplier functions that are the best approximations to a given function in an interval of specified points. In matrix theory, the method of least squares can be used to find a "solution" x for an inconsistent system of linear equations Ax = b that makes the distance between Ax and b as small as possible.

It is primarily through the efforts of the renowned mathematician Carl Friedrich Gauss that the method of least squares was discovered. Gauss was born 1777 in Brunswick, Germany, to a poor, uneducated family. His father was a gardener and it is reported that Gauss taught himself to read and count very early in life. According to history, he is said to have spotted a mistake in his father's arithmetic at the age of three. He entered high school at the age of eleven, and, at fifteen, began to study at the Collegium Carolinum, with financial assistance from the Duke of Brunswick. Gauss became interested in astronomy, studying the relationship of probability and errors as they related to astronomy. His interest resulted in the development of the theory of least squares. Although Gauss discovered the method of least squares in 1795 at the age of eighteen, he never published his findings. In 1806, French mathematician Adrien-Marie Legendre, while doing research on the orbit of comets, developed and published the method of least squares in his book *Nouvelles méthodes pour la détermination des orbites des cometes*. Unbeknownst to Legendre, it was the same technique Gauss had developed eleven years earlier. When Gauss claimed prior discovery, Legendre became infuriated, particularly as he had once before been upstaged by another prior discovery of Gauss'. Although history credits Gauss with the first discovery of the method of least squares, Legendre receives credit for the first published account.