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Linear Algebra Project

Summary on Least Squares Problems

Least squares Problem is a standard approach to the get the closest answers as possible for the sets of equation in which there are more equations are unknown. We use Least Square when Ax = b (A is m \* n with m>n) if b is not in range (A) and we cannot solve for X. The best we can do is the to find an x that makes Ax as close as possible to b. In other words, we use least squares when vector b is not in col(A). Least square means If A is m \* n and b is in R^m, a least square solution of Ax = b is an x hat in R^n, such that ||b - Ax hat|| <= ||b- Ax|| for all x in R^n. The minimize length between b and Ax is defined by ||b - Ax hat||. This will give the closest approximation. The advantage of doing least square is that no matter what value you choose for x, it will always be in cla(A). The closest new vector we find is called the projection of b on to col(A).

The least squares problems are used everywhere in all the different kinds of applications. It's most important application is data fillings. For example let's say wou wan to find the the population of the world in next 5 years. You use a function that best fits the data you have now. And find the parameters. You use the normal equation A^t Ax( hat) = A^t b. And by solving you will get the least approximation solution. And by plugging in x will get you the closest data. There are many more applications that are really important like approximation the global population, state population, country population, currency drop and increase, etc.