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# Fundamentals of Statistics

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analyzing data

analyse the data

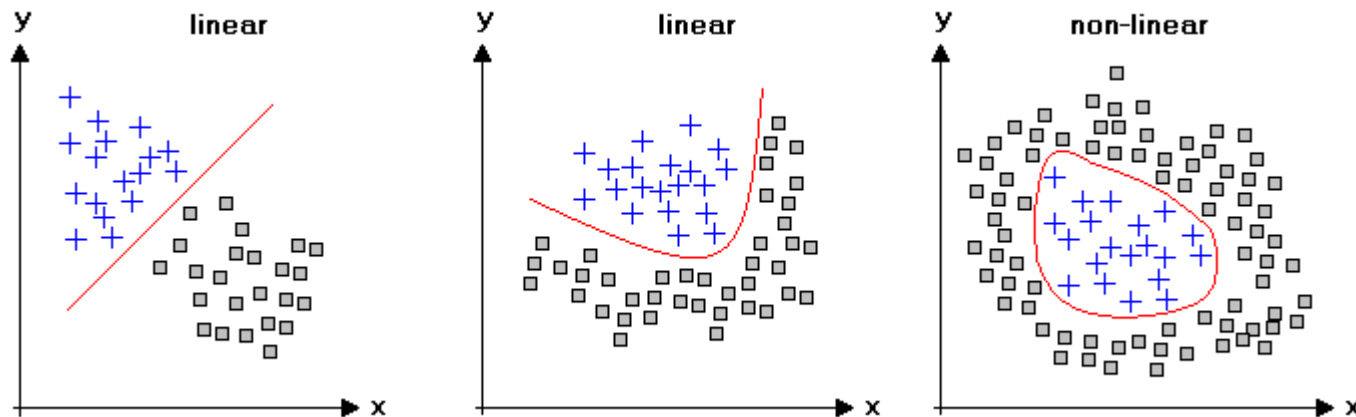
analysis linear



## Linear vs. Nonlinear Models

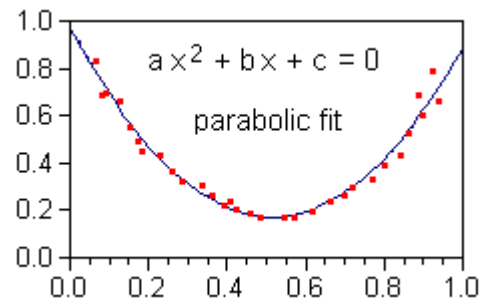


Most people have difficulties in determining whether a model is linear or non-linear. Before discussing the issues of linear vs. non-linear systems, let's have a short look at some examples, displaying several types of discrimination lines between two classes:



Have you already guessed the difference between linear and non-linear models ? Here's the answer: linear models are **linear in the parameters which have to be estimated**, but not necessarily in the independent variables. This explains why the middle of the three figures above shows a linear discrimination line between the two classes, although the line is not linear in the sense of a straight line.

Another example of a linear model is shown in the figure below. It displays a parabolic regression line, which of course has a curvature, but is a linear model:



It's not the independent variable,  $x$ , which counts for linearity, but the parameters of the model (in our parabolic example  $a$ ,  $b$ , and  $c$ ). From this simple insight it follows that **multiple linear regression** can be used to estimate the parameters of "curved" models.



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Last Update: 2012-10-08