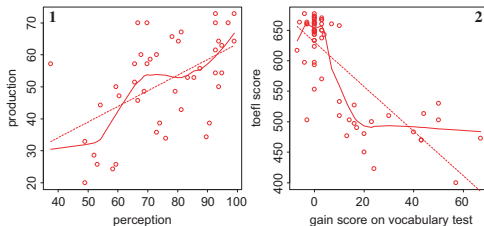# LOESS Regression

- A type of non-parametric regression
- Basic idea – fit a curve (or surface) to a set of data by fitting a large number of *local regressions*.
- Cleveland, W.S. (1979). "Robust Locally Weighted Regression and Smoothing Scatterplots". Journal of the American Statistical Association 74 (368): 829-836. doi:10.2307/2286407.
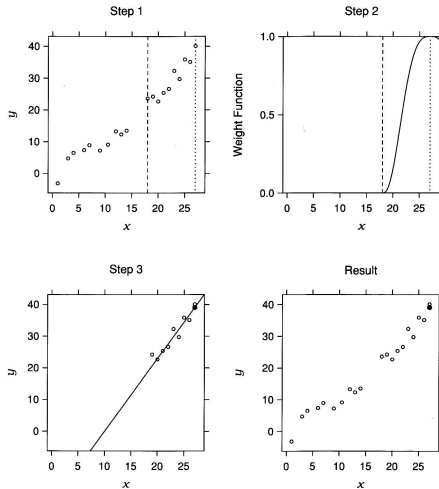
Graphical overview of LOESS fitting, I

from Cleveland (1993)
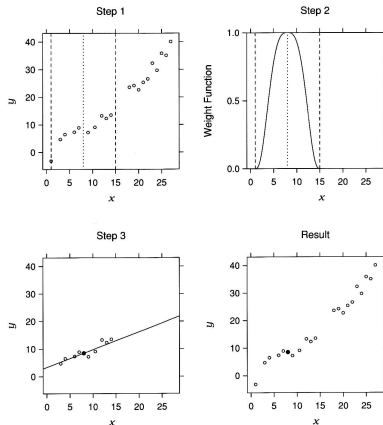
3.49 HOW LOESS WORKS. The graphs show how the initial fit at $x = 8$ is computed. (Top left) α, which is 0.5, is multiplied by 20, the number of points, which gives 10. A vertical strip is defined around $x = 8$ so that one boundary is at the 10th nearest neighbor. (Top left) Weights are defined for the points using the weight function. (Bottom left) A line is fitted using weighted least-squares. The value of the line at $x = 8$ is the initial loess fit at $x = 8$. (Bottom right) The result is one point of the initial loess curve, shown by the filled circle.
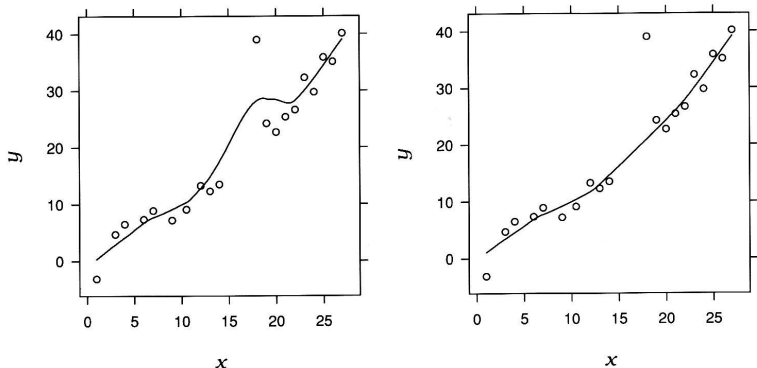
Graphical overview of LOESS fitting, II

from Cleveland (1993)

3.50 HOW LOESS WORKS. The computation of the initial loess fit value at $x = 27$ is illustrated.

Graphical overview of LOESS fitting, III

from Cleveland (1993)

3.51 HOW LOESS WORKS. Loess employs robustness iterations that prevent outliers from distorting the fit. (Left panel) The open circles are the points of the graph; there is one outlier between $x = 15$ and $x = 20$. The initial loess curve has been distorted in the neighborhood of the outlier. (Right panel) The graphed curve is the fit after four robustness iterations. Now the fit follows the general pattern of the data.