Neil E Cotter
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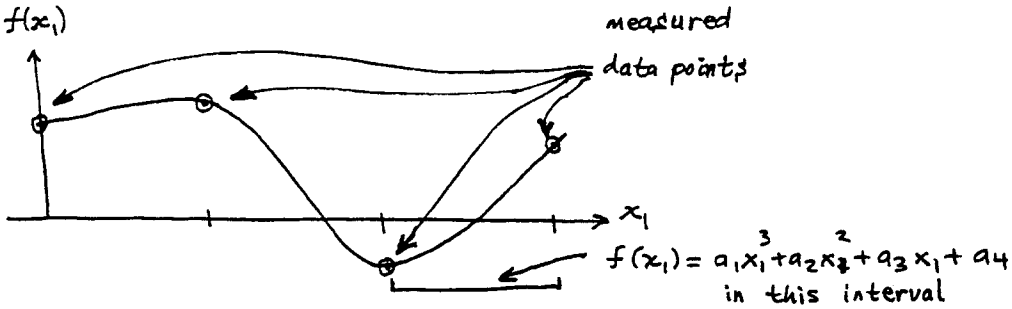
A cubic spline is like a piecewise linear approximation where the line segments are replaced by cubic polynomials.



We require that the cubic polynomials have continuous first and second derivatives at the data points marking the point where one cubic polynomial ends and the next begins. This continuity requirement is sufficient to guarantee a unique set of coefficients for the cubic polynomials.

The cubic spline is, by construction, both smooth and differentiable. Since most functions in nature have these characteristics, splines often have an advantage over linear interpolation.

In multiple dimensions, however, we encounter run-time constraints. For two dimensions, we can construct splines for grid points in the x_1 direction, but we have to construct a spline in the x_2 direction after we evaluate the spline in the x_1 direction. Constructing the spline on the fly is time consuming.