Least squares regression
a short story on overdetermined linear systems and Moore-Penrose pseudoinverse

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Preface

Imagine a linear system of equations with more number equations than the number of unknowns.

Goal of this paper: explain why Moore-Penrose inverse give a least squares regression.

This document is still in preparation. Please feel free to contact me with any suggestions, corrections or comments.

Keywords

overdetermined linear systems, partial least squares regression, Moore-Penrose inverse

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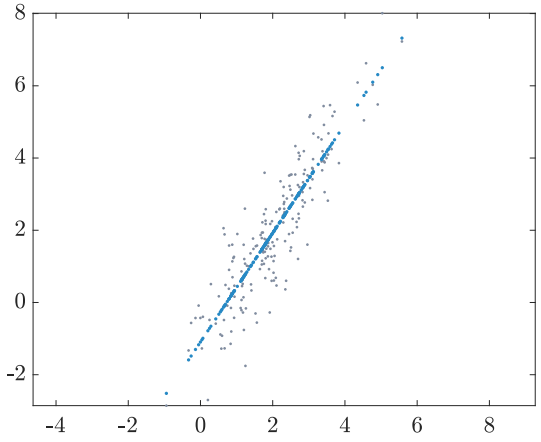

Figure 1: Linear basis function LS regression.

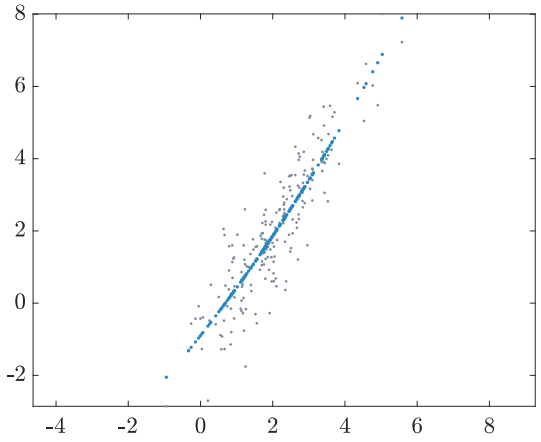

Figure 2: Non-linear (quadratic) basis function LS regression.

1 Partial Least Squares (PLS) regression

2D data example

Have a data set in pairs: (X, Y). X is a vector of N points and Y is a vector of corresponding N points. Together they make a cloud of points on a 2D-plane.

We now say that: X A = Y.

We are interested in finding the coefficients: y = C x + D.

References

[1] Nathan Kutz, *Data Driven Discovery of Dynamical Systems and PDEs*, an online lecture

[2] Gilbert Strang, *Introduction to Linear Algebra*, Fifth Edition, 2016