# Total Least Square

## Formulation

, Feature Matrix , Label Vector , Noise and , Model Coefficients

Total Least Square:

Two steps:

## Transformation

,

KKT Condition: (1), (2), (3)

From (1) and (2): , , (4)

From (3) and (4): , , (5)

From (4) and (5): (6)

Put (5) and (6) into the objective function:

->

## Solution

-> -> ,

Ignore the constraint , directly solve

* The scale of has no impact to the objective value, we set
* , →, ->
* KKT condition: , is an eigenvalue of
* , is the smallest eigenvalue of
* is the eigenvector of corresponding to the smallest eigenvalue