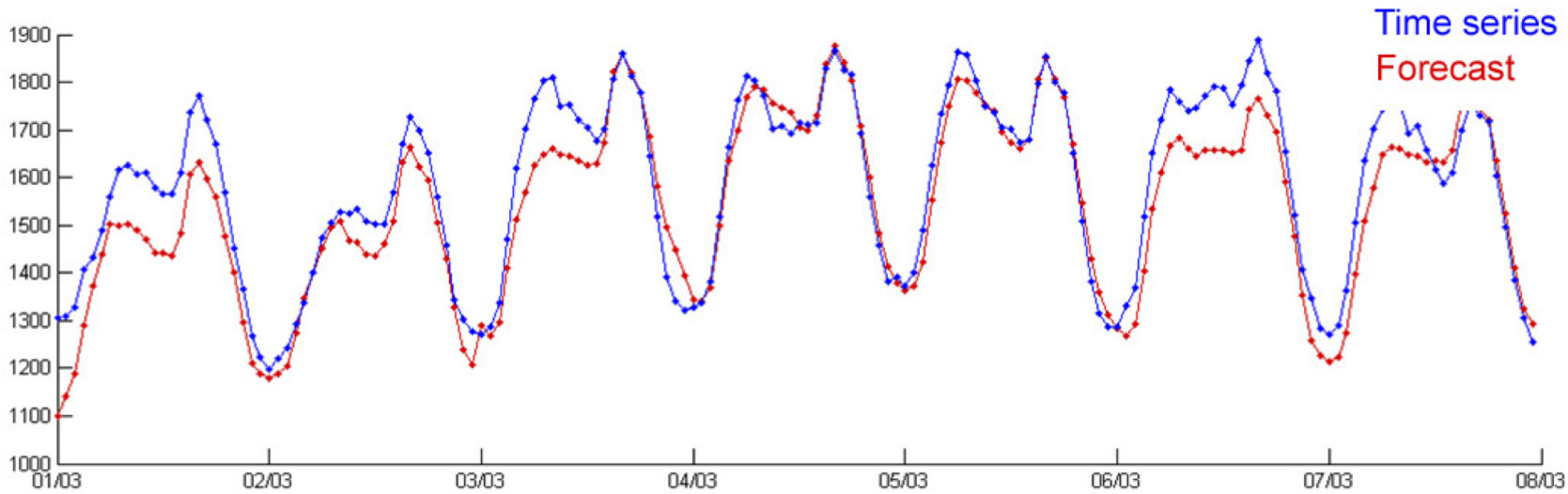
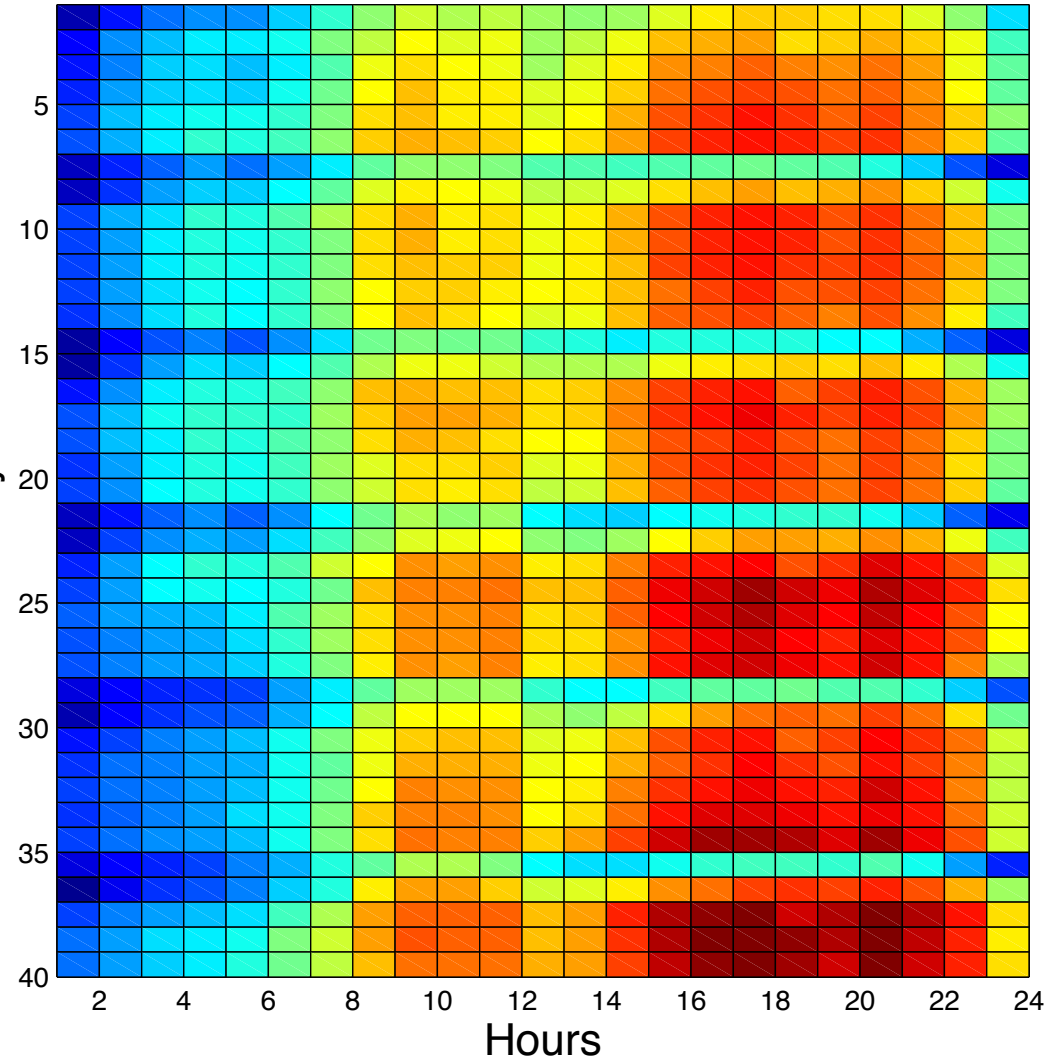
Energy consumption one-week forecast for each hour



The autoregressive matrix and the model

$$\underset{(m+1)\times(n+1)}{\mathbf{X}^*} =$$

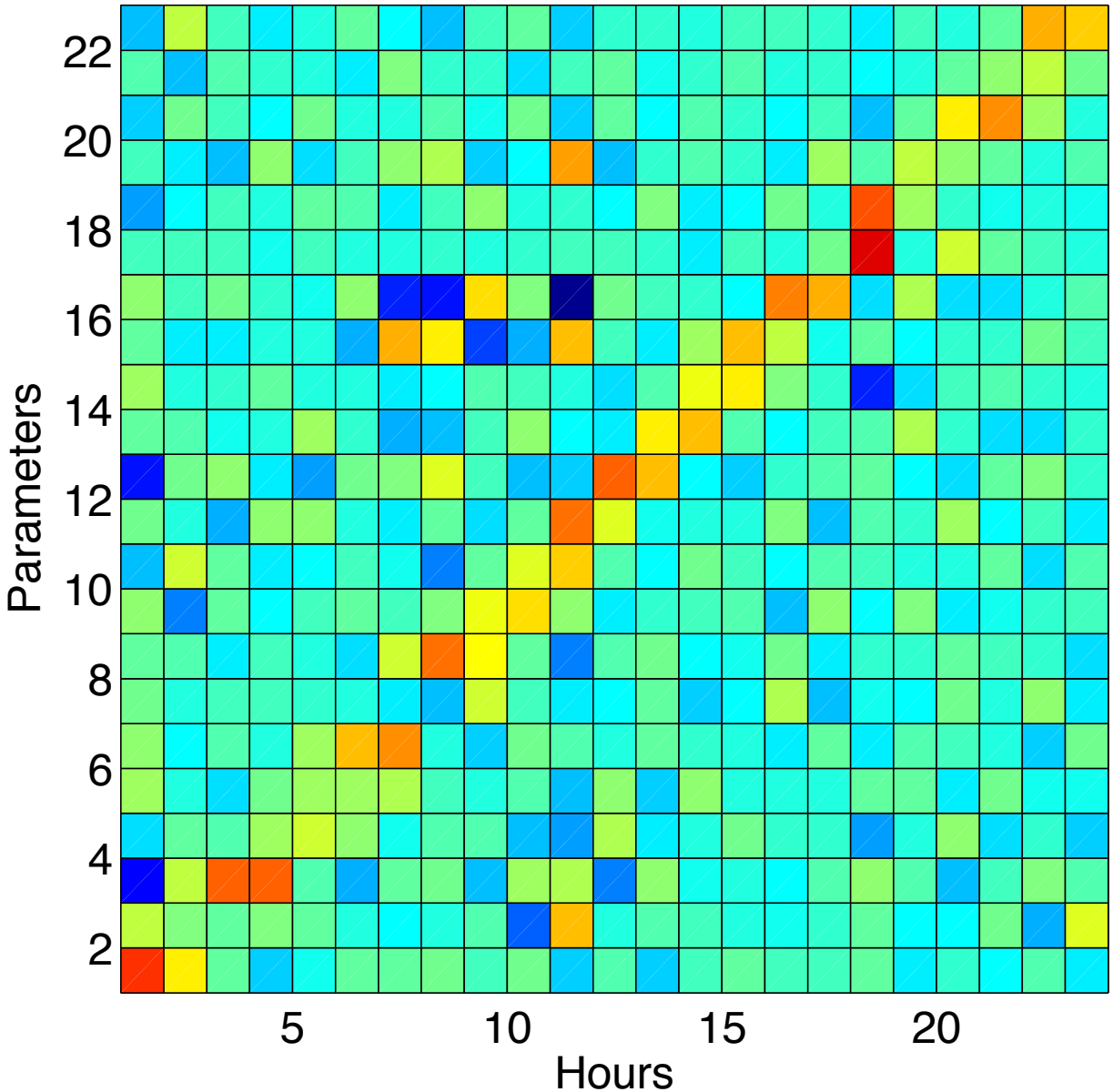


$$= \left[\begin{array}{c|c} \underset{1\times 1}{\hat{s}_T} & \underset{1\times n}{\mathbf{x}_{m+1}} \\ \hline \underset{m\times 1}{\mathbf{y}} & \underset{m\times n}{\mathbf{X}} \end{array}\right].$$

In terms of linear regression:

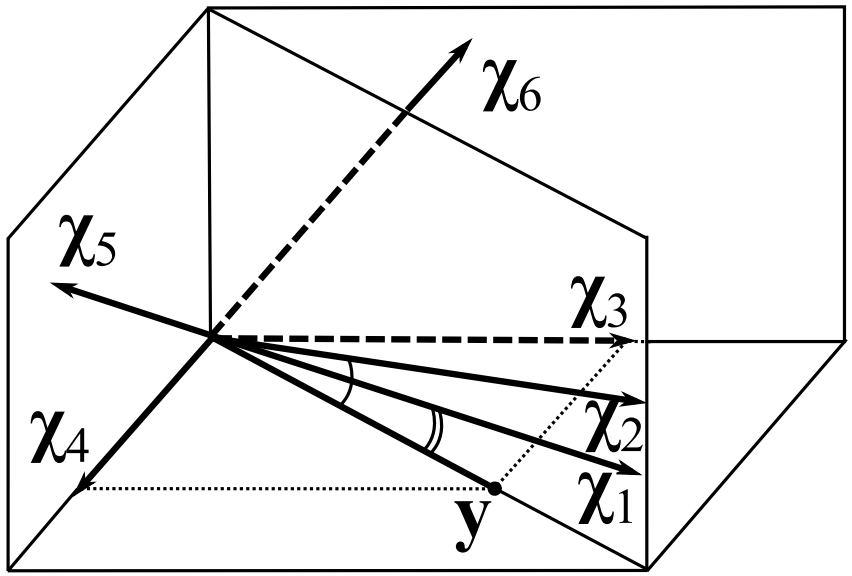
$$\hat{\mathbf{y}} = \mathbf{f}(\mathbf{X}, \mathbf{w}) = \mathbf{X}\mathbf{w},$$

Case 6. How many parameters must be used? Relations of 24 hourly models



Selection of a stable set of features of restricted size

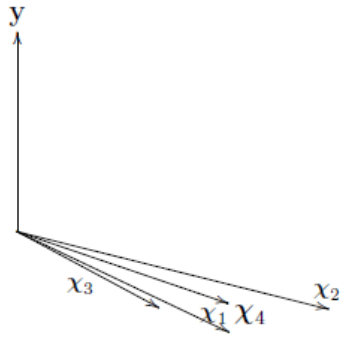
The sample contains multicollinear χ_1, χ_2 and noisy χ_5, χ_6 features, columns of the design matrix $\mathbf{X}$. We want to select two features from six.



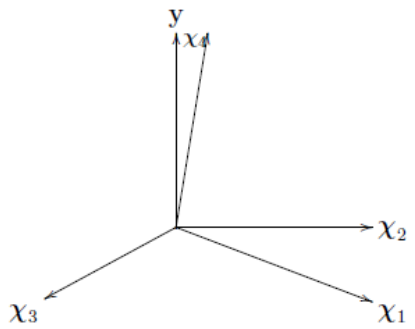
Stability and accuracy for a fixed complexity

The solution: $\chi_3, \chi_4$is an orthogonal set of features minimizing the error function.

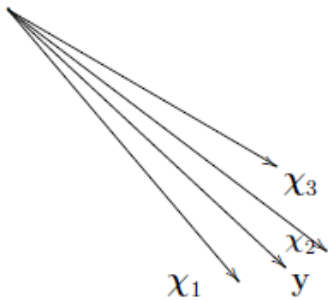
Multicollinear features and the forecast: possible configurations



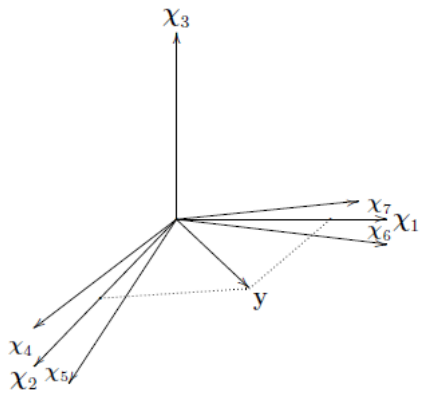
Inadequate and correlated



Adequate and random



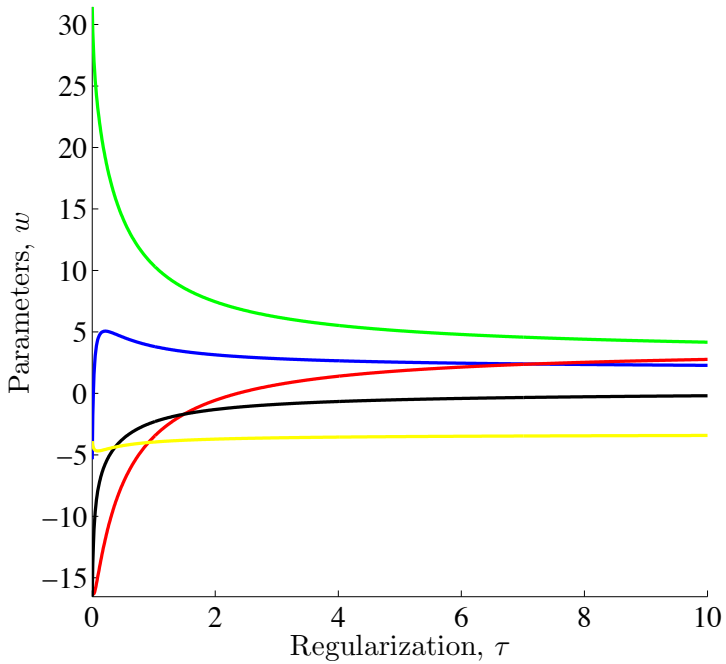
Adequate and redundant



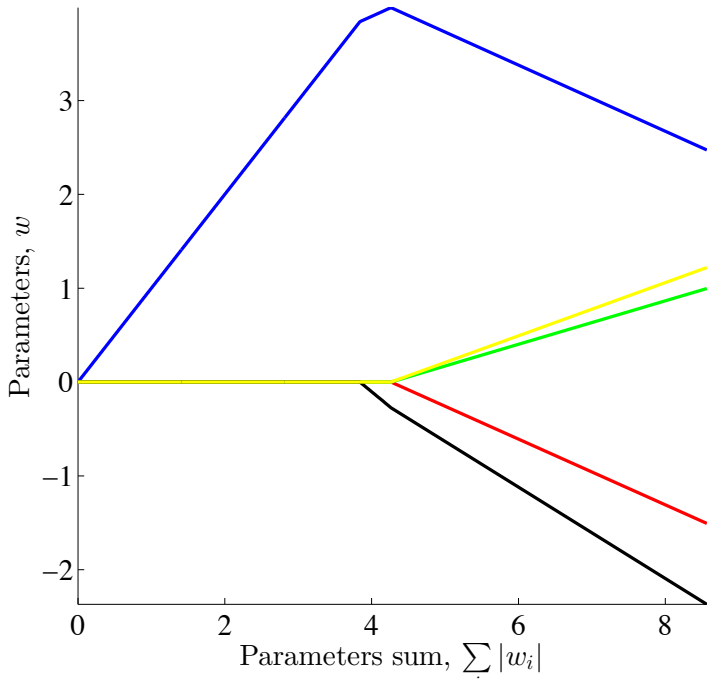
Adequate and correlated

Model parameter values with regularization

Vector-function $\mathbf{f} = \mathbf{f}(\mathbf{w}, \mathbf{X}) = [f(\mathbf{w}, \mathbf{x}_1), \ldots, f(\mathbf{w}, \mathbf{x}_m)]^\mathsf{T} \in \mathbb{Y}^m$.



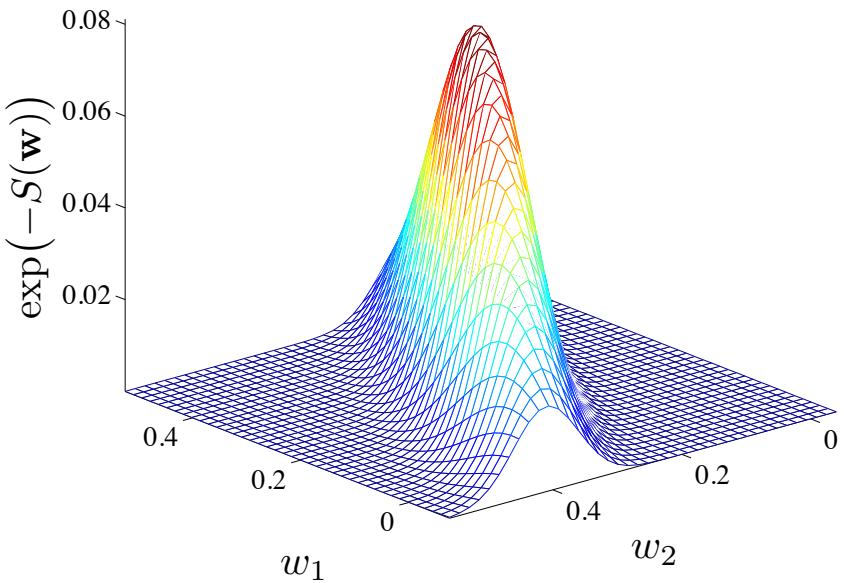
$$S(\mathbf{w}) = \|\mathbf{f}(\mathbf{w}, \mathbf{X}) - \mathbf{y}\|^2 + \gamma^2 \|\mathbf{w}\|^2$$

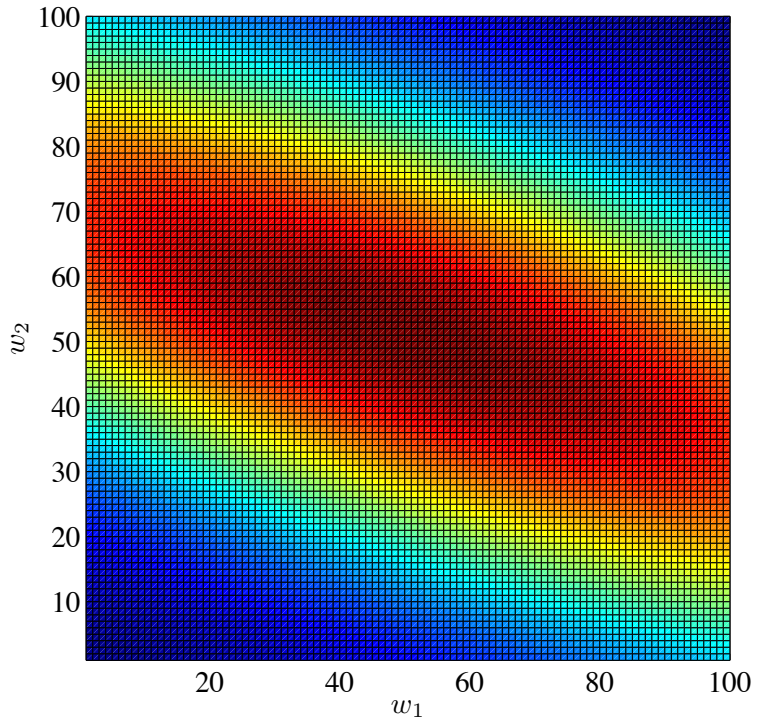


$$S(\mathbf{w}) = \|\mathbf{f}(\mathbf{w}, \mathbf{X}) - \mathbf{y}\|^2,$$
$$T(\mathbf{w}) \leqslant \tau$$

Empirical distribution of model parameters

There given a sample $\{\mathbf{w}_1, \ldots, \mathbf{w}_K\}$ of realizations of the m.r.v. $\mathbf{w}$ and an error function $S(\mathbf{w}|\mathfrak{D}, \mathbf{f})$. Consider the set of points $\{s_k = \exp\big(-S(\mathbf{w}_k|\mathfrak{D}, \mathbf{f})\big) | k = 1, \ldots, K\}$.





x- and y-axis: parameters $\mathbf{w}$, z-axis: $\exp\big(-S(\mathbf{w})\big)$.