



# Estimation Stability with Cross Validation (ESCV)

Chinghway Lim, Bin Yu

(Submitted on 13 Mar 2013)

Cross-validation (CV) is often used to select the regularization parameter in high dimensional problems. However, when applied to the sparse modeling method Lasso, CV leads to models that are unstable in high-dimensions, and consequently not suited for reliable interpretation. In this paper, we propose a model-free criterion ESCV based on a new estimation stability (ES) metric and CV. Our proposed ESCV finds a locally ES-optimal model smaller than the CV choice so that the it fits the data and also enjoys estimation stability property. We demonstrate that ESCV is an effective alternative to CV at a similar easily parallelizable computational cost. In particular, we compare the two approaches with respect to several performance measures when applied to the Lasso on both simulated and real data sets. For dependent predictors common in practice, our main finding is that, ESCV cuts down false positive rates often by a large margin, while sacrificing little of true positive rates. ESCV usually outperforms CV in terms of parameter estimation while giving similar performance as CV in terms of prediction. For the two real data sets from neuroscience and cell biology, the models found by ESCV are less than half of the model sizes by CV. Judged based on subject knowledge, they are more plausible than those by CV as well. We also discuss some regularization parameter alignment issues that come up in both approaches.

Subjects: **Methodology (stat.ME)**; Machine Learning (stat.ML)

Cite as: [arXiv:1303.3128](#) [stat.ME]

(or [arXiv:1303.3128v1](#) [stat.ME] for this version)

## Submission history

From: Chinghway Lim [[view email](#)]

[v1] Wed, 13 Mar 2013 10:47:42 GMT (612kb,D)

[Which authors of this paper are endorsers?](#)

Link back to: [arXiv](#), [form interface](#), [contact](#).

## Download:

- [PDF](#)
- [Other formats](#)

Current browse context:

stat.ME

[< prev](#) | [next >](#)

[new](#) | [recent](#) | [1303](#)

Change to browse by:

[stat](#)

[stat.ML](#)

## References & Citations

- [NASA ADS](#)

Bookmark([what is this?](#))

