Practical Applications of the Fence Method

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“A humble view"

2013 R.A. Fisher Lecture by Peter Bickel

“(1) Applied statistics must engage theory and conversely.

(2) More significantly, it should be done in full ongoing collaboration with scientists and participation in the gathering of data and full knowledge of their nature”

Jiang J. **2014**. The fence methods. *Adv. Stat.* 2014:830821

The Fence Method

Flexible for choosing the optimal model

Not just statistical

Use other subject matter expertise

Clinical Trials Application, Study Design

- Multi-center clinical trial of 56 postmenopausal women
- Randomized, double-blind, placebo-controlled trial
- Baseline, 6 and 12 months
- n=56 for this example

Nguyen T and Jiang J, “Restricted fence method for covariate selection in longitudinal data analysis”, *Biostatistics*, vol. 13, no. 2, pp. 303-314, 2012.

Clinical Trials Application, Goal

Examine association of cytokines over time on expression of inflammatory

Along with a large number of other variables/covariates (total 36)

Does treatment affect bone metabolism?

Nguyen T and Jiang J, “Restricted fence method for covariate selection in longitudinal data analysis”, *Biostatistics*, vol. 13, no. 2, pp. 303-314, 2012.

Clinical Trials Application, Approach

Restricted Fence method used due to large number of variables/covariates

Worked with subject matter experts to identify grouping of variables

Nguyen T and Jiang J, “Restricted fence method for covariate selection in longitudinal data analysis”, *Biostatistics*, vol. 13, no. 2, pp. 303-314, 2012.

Clinical Trials Application, Methods

Restricted Fence compared to a variety of selection criterion

- BIC
- Consistent AIC
- Hannan and Quinn
- AIC
- Lasso
- Adaptive Lasso
- SCAD

Clinical Trials Application, Results for Treatment Variable

Restricted Fence* compared to a variety of selection criterion

Identified treatment effect: Restricted fence, AIC and SCAD

Did not identify treatment effect: BIC, Consistent AIC, Hannan and Quinn, Lasso, Adaptive Lasso

Clinical Trials Application, Results for Covariates

Identified BMI effect: Restricted fence and SCAD

Identified Bone Mineral Densiry effect: Restricted fence

Clinical Trials Application, Conclusion

The results from the analysis using Restricted Fence were more clinically relevant than other methods

Other methods may over penalize and miss important covariates


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