Air crew problem, air04, binary programming problem

* 8904 decision variables
* 823 constraints

After change binary constraints to continuous constraints, time to solve LP problems with R package “Rglpk”, Rglpk is based on C++

* Solve 600 LPs: 1058s,

When training the prediction models, errors happen

Error: protect(): protection stack overflow

It seems there are too many predictors.

P0033.mps problem

* 33 decision variables
* 16 constraints

Rglpk solve LP problems, 0.87 seconds for 600 LP problems.

Speed comparison, solve LPs

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| --- | --- | --- | --- |
| Method | Solver | Prediction | Comment |
| 1 gbm | 0.12s | 10.89s |  |
| 1 gbm | 12.98s | 1.5s | Solve 10,000 LPs |
| 2 glm | 0.12 | 11.16s |  |
| 3 xgboost | 0.12 | 3.06s | Predict 1 by 1 |
| 3 xgboost | 0.12 | 0.46s | Predict 100 LPs simultaneously |
| 3 xgboost | 12.98s | 1.05s | Solve 10,000 LPs |

Discussion about the speed.

* Rglpk is based on C++, gbm and glm are based on R, xgboost is based on Python
* when number of LPs increases, time of solver increases much while prediction’s time increases a little.
* Inverse of matrix is not considered here. Since Dr. Banerjee told me it is necessary to compute the inverse once.

Precision of LP, LP solution error