R Notebook

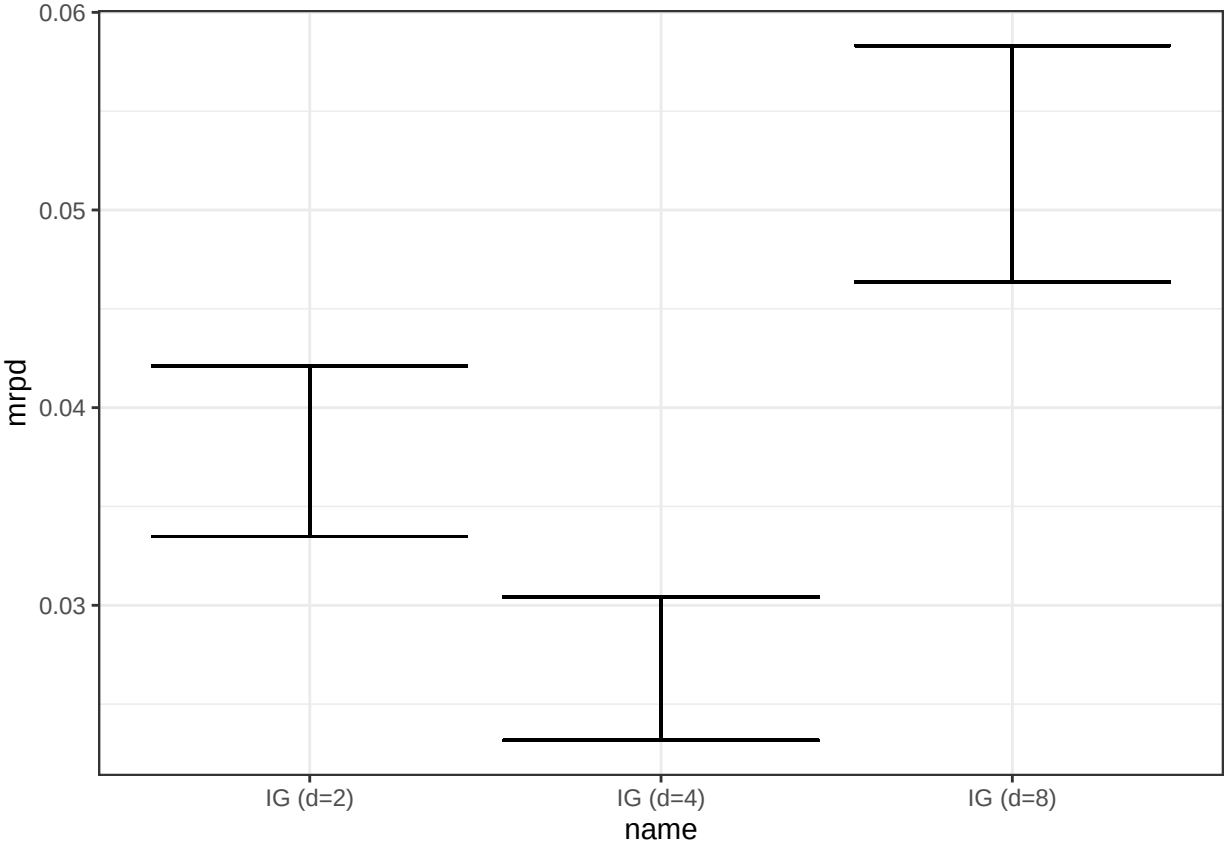
Introduction

Objective: use Automatic Operator Selection (AOS) to augment metaheuristics for flowshop and compare it to the meta-learning approach.

- The IG destruction size seems to control exploration/exploitation, which is the goal of most AOS strategies;
- Assumption: there are differences between different IG destruction sizes.

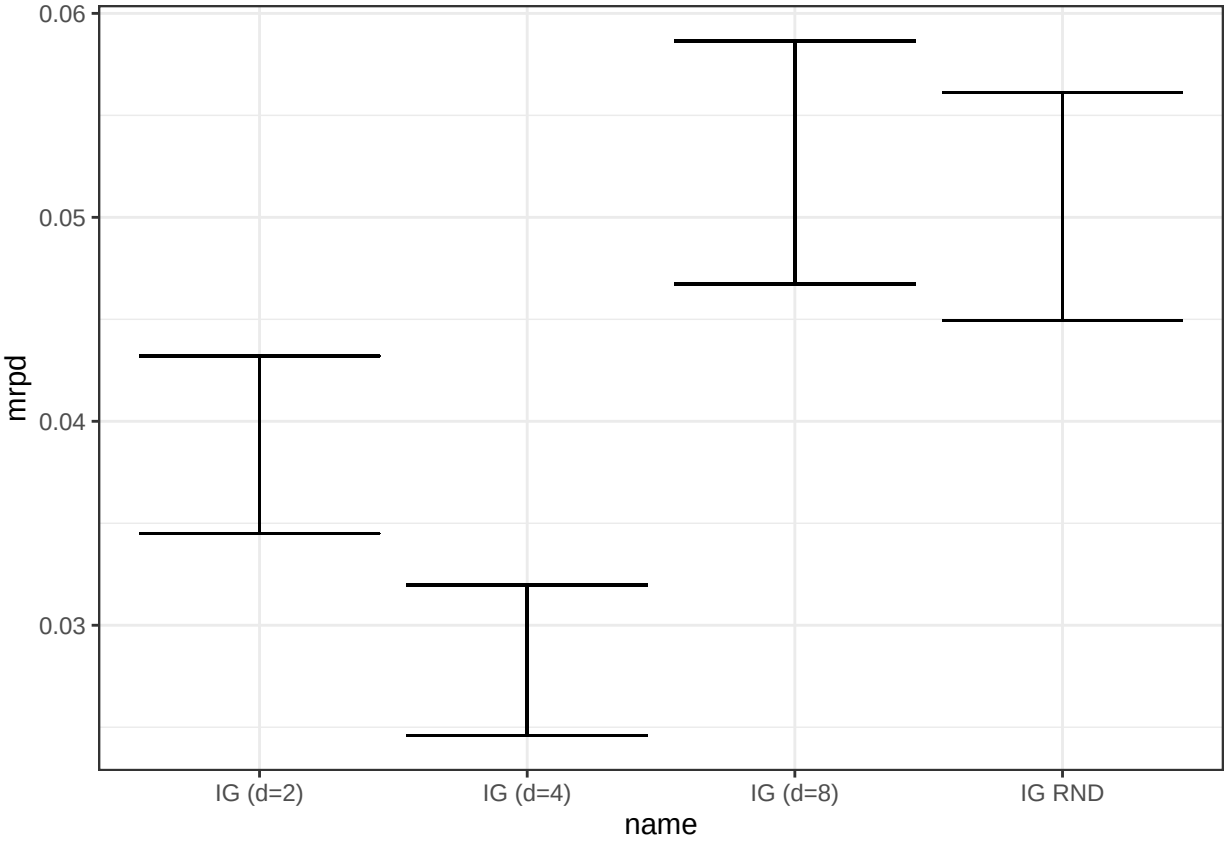
Assumption #1: is there any difference between different values of destruction sizes?

Setup: 55 instances, 5 replications on permutation flowshop with makespan objective.



- There are significand differecentes between destruction sizes choices;
- It corroborates with the literature;
- $d = 2$ is too much exploitation and $d = 8$ is too much exploration (further investigation involving mean local optima distances / solution destruction distances)

Assumption #2: how does it compare to a random approach?



- Random is worse then the average
- Random might imply too much exploration ($d = 8$ has a bigger impact)

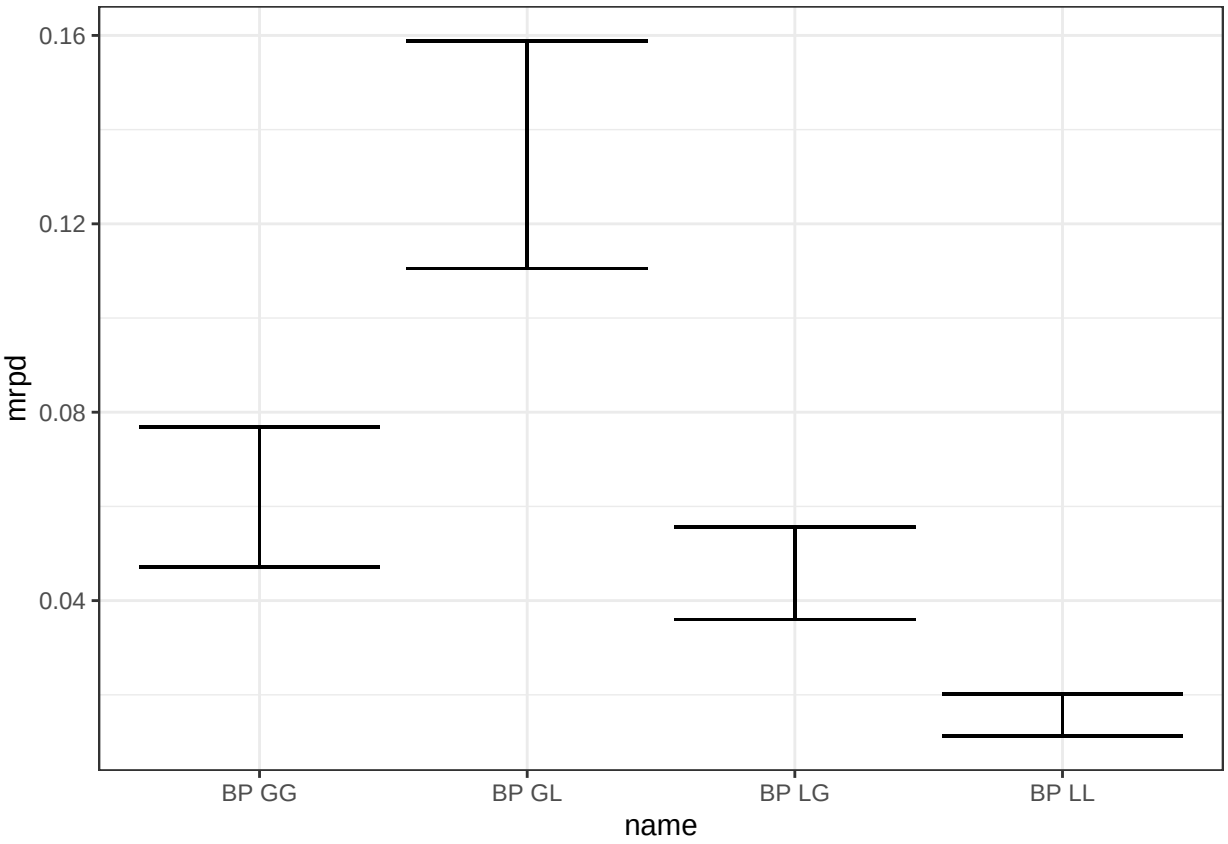
Can a iteration-based reward be used to inform the best destruction size?

Possible adaptation rewards:

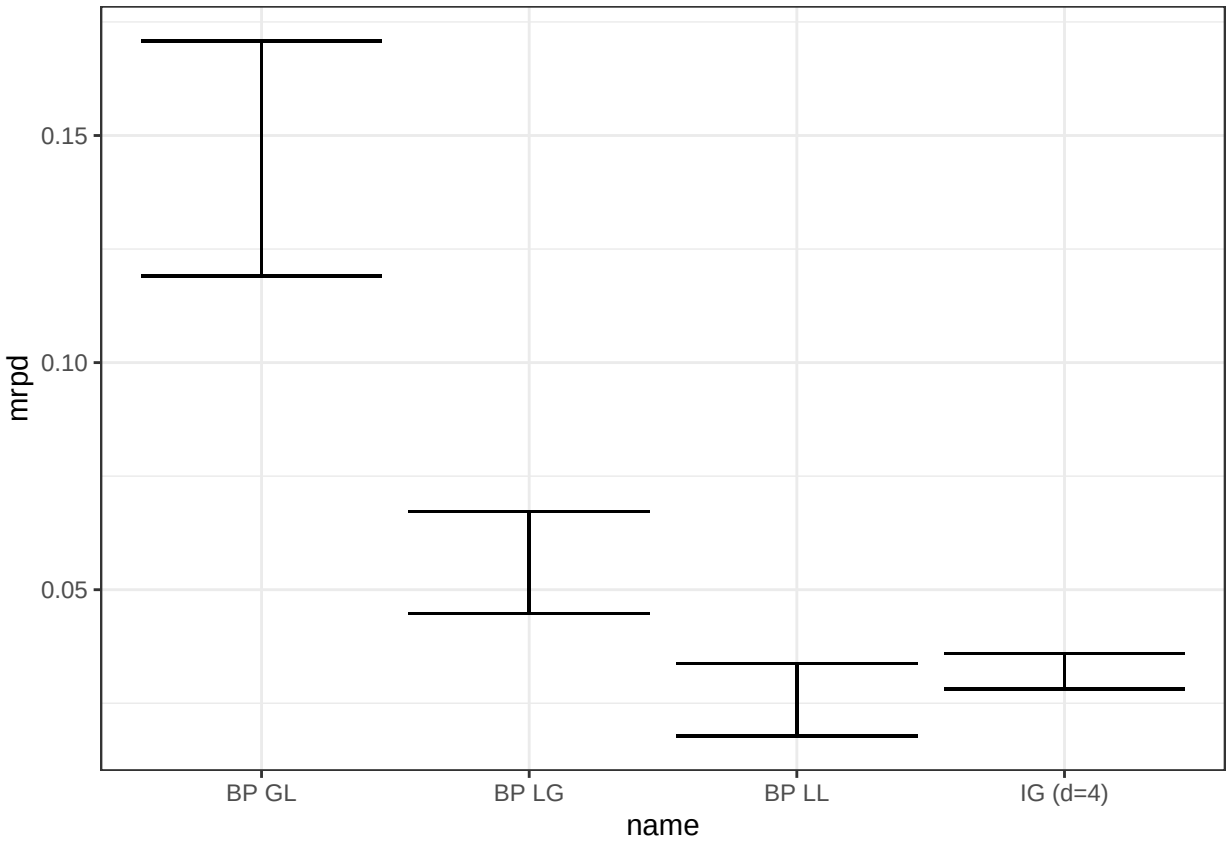
```
IteratedGreedy:
sol_0 = Init()
sol_0' = sol_0
sol_0'' = sol_0
while (!StoppingCriterion()) :
  d = OperatorSelection(Reward())
  sol_t' = Construction(Destruction(sol_t, d))
  sol_t'' = LocalSearch(sol_t')
  sol_t+1 = Accept(sol_t'', sol_t)
  Feedback(sol_t, sol_t', sol_t'', sol_t+1)´

GG = (sol_t+1 - sol_t ) / sol_t
GL = (sol_t'' - sol_t ) / sol_t
GG = (sol_t+1 - sol_t') / sol_t'
GG = (sol_t'' - sol_t') / sol_t'
```

To test the rewards, all destruction sizes are applied and the best perturbation (BP) for each reward is chosen:

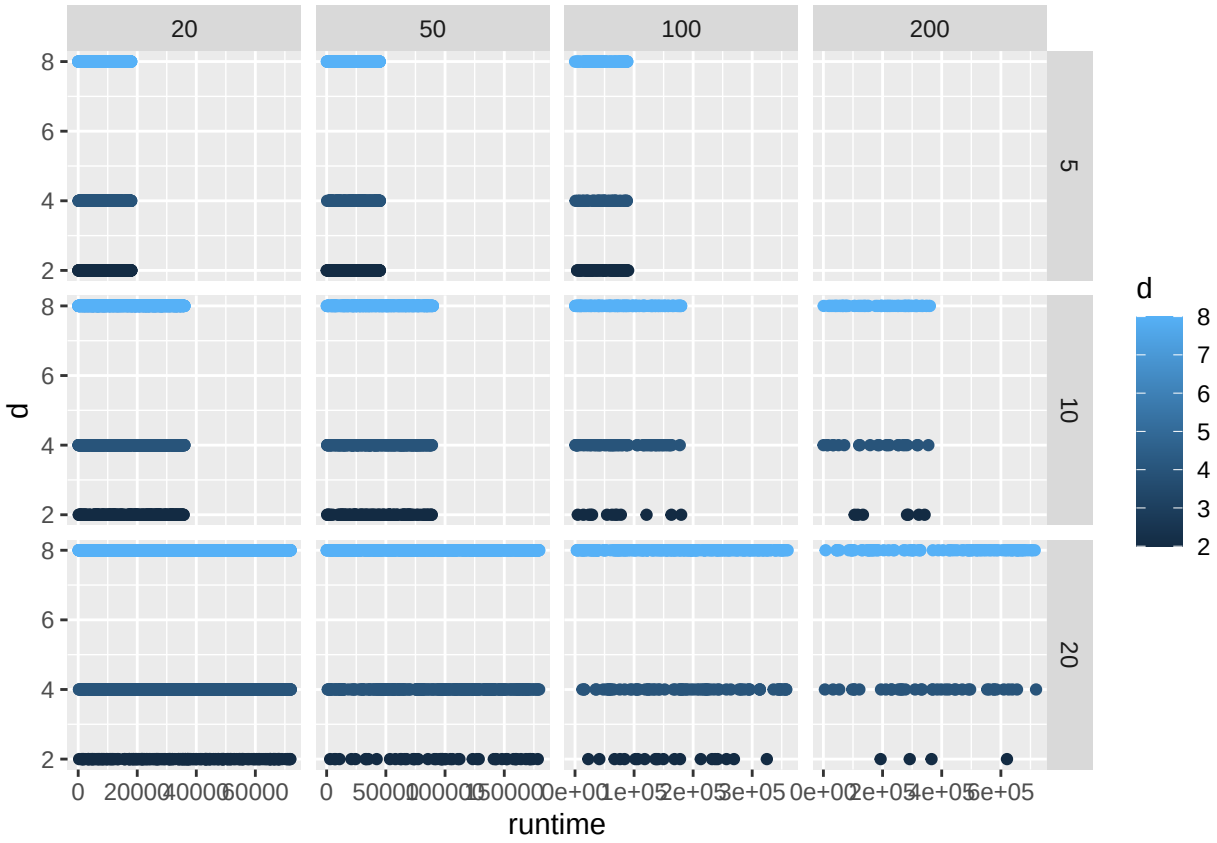


Comparing to the best fixed choice:

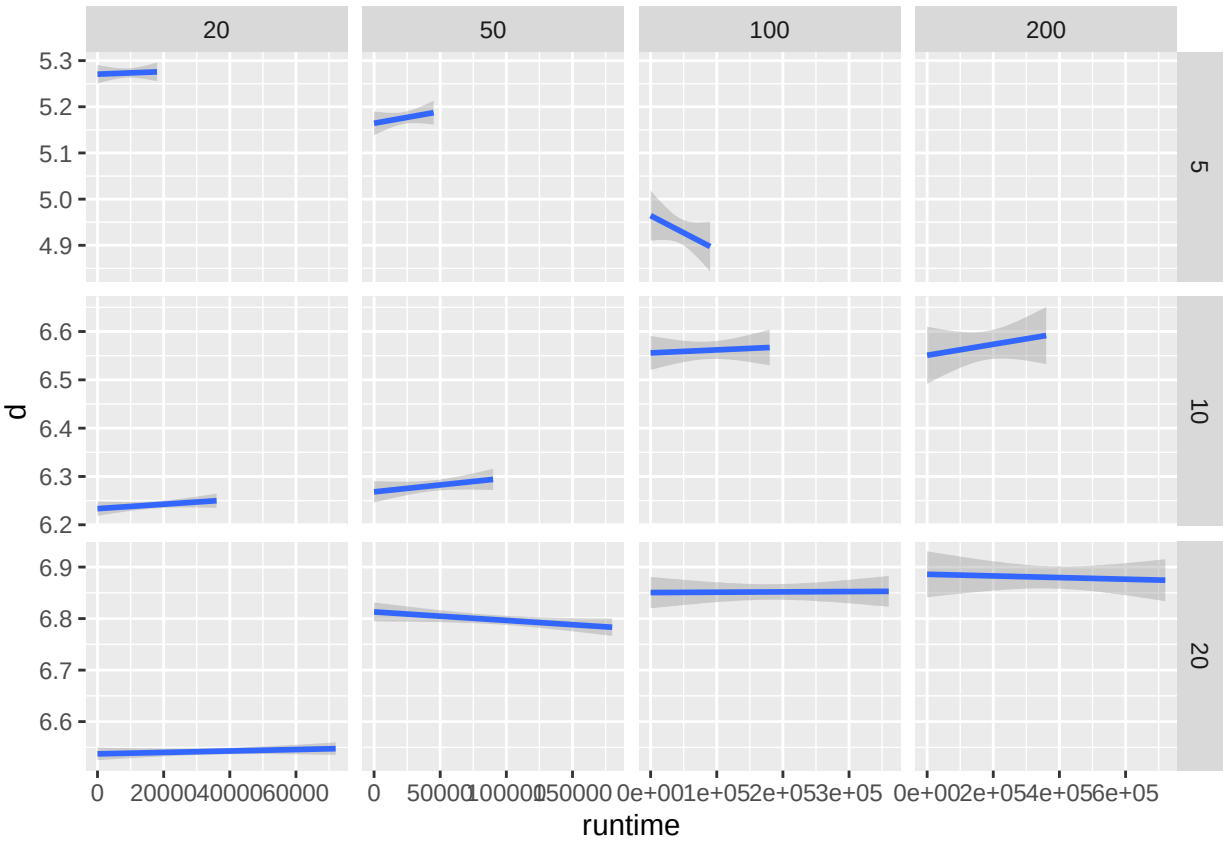


- LL reward is considerably better

Is there a pattern of destructions sizes over runtime?




```
## `geom_smooth()` using formula 'y ~ x'
```


20
50
100
200
5
10
20
d
5.3
5.2
5.1
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6.5
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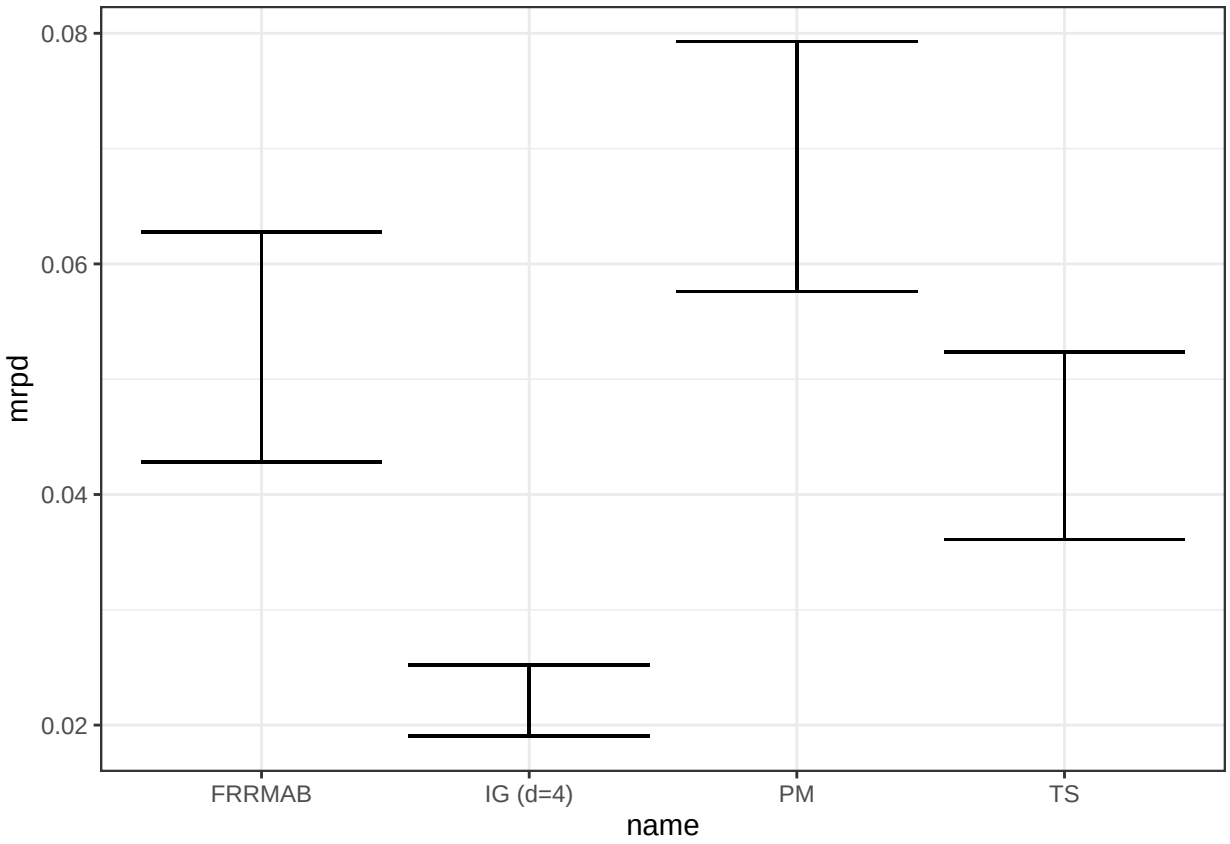
6.9
6.8
6.7
6.6
0
20000
40000
60000
0
50000
100000
150000
0e+00
1e+05
2e+05
3e+05
0e+00
2e+05
4e+05
6e+05
runtime

Can the LL reward be used to inform the best destruction size?



TODO

- Parameter tunning for AOS strategies
- LinUCB on test instances
- Measure the effect when the number of local search steps is 1 or 0