budget_strategies

November 24, 2020

1 Init steps

```
0
```

2 Prepare models/datasets

```
HBox(children=(HTML(value=''), FloatProgress(value=0.0, max=6040.0),␣
↪HTML(value='')))
```

3 Strategies implementation

4 Strategies inputs

5 Random strategy

```
target position loop:   0%|          | 0/3 [00:00<?, ?it/s]
```

```
HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
↪HTML(value='')))
```

```
target position loop: 20it [09:34, 28.75s/it]
```

```
HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
↪HTML(value='')))
```

```
target position loop: 30it [20:31, 39.83s/it]
```

```
HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
↪HTML(value='')))
```

```
target position loop: 30it [31:13, 62.43s/it]
target position loop:   0%|          | 0/3 [00:00<?, ?it/s]
```

```
HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
↪HTML(value='')))
```

```
target position loop: 20it [05:25, 16.29s/it]
```

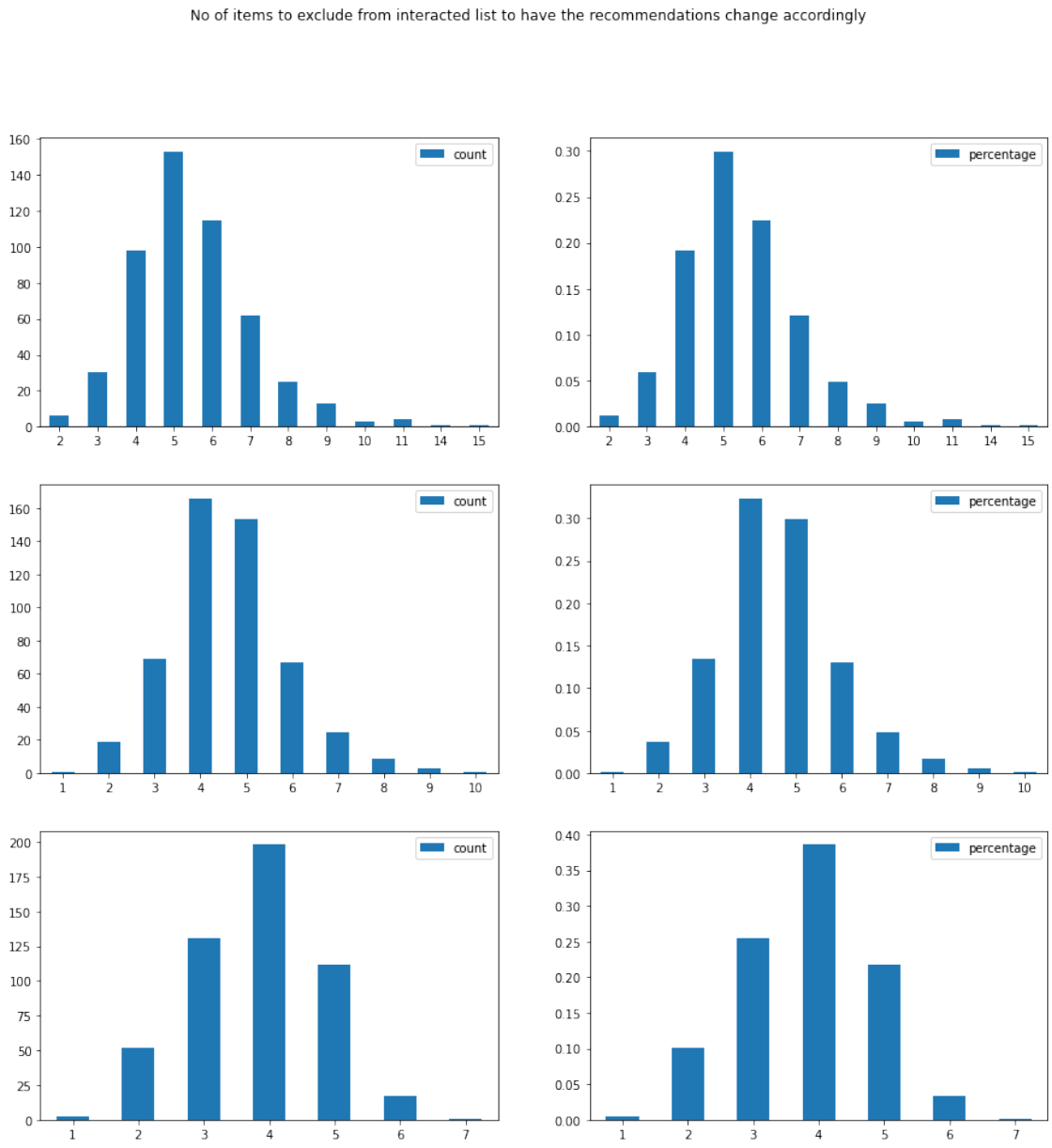
```
HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
↪HTML(value='')))
```

```
target position loop: 30it [10:50, 21.16s/it]
```

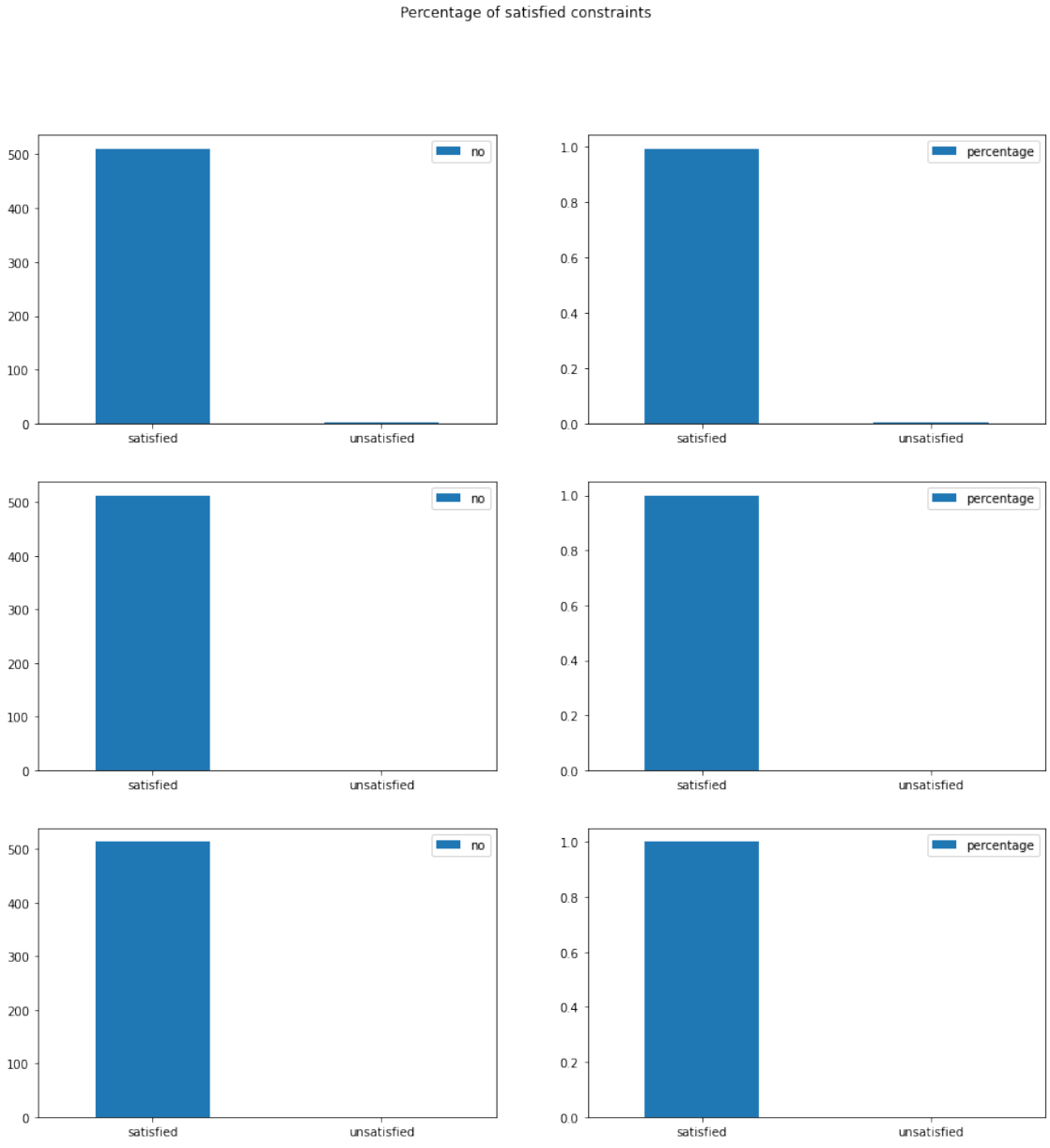
```
HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
↪HTML(value='')))
```

```
target position loop: 30it [16:14, 32.50s/it]
```

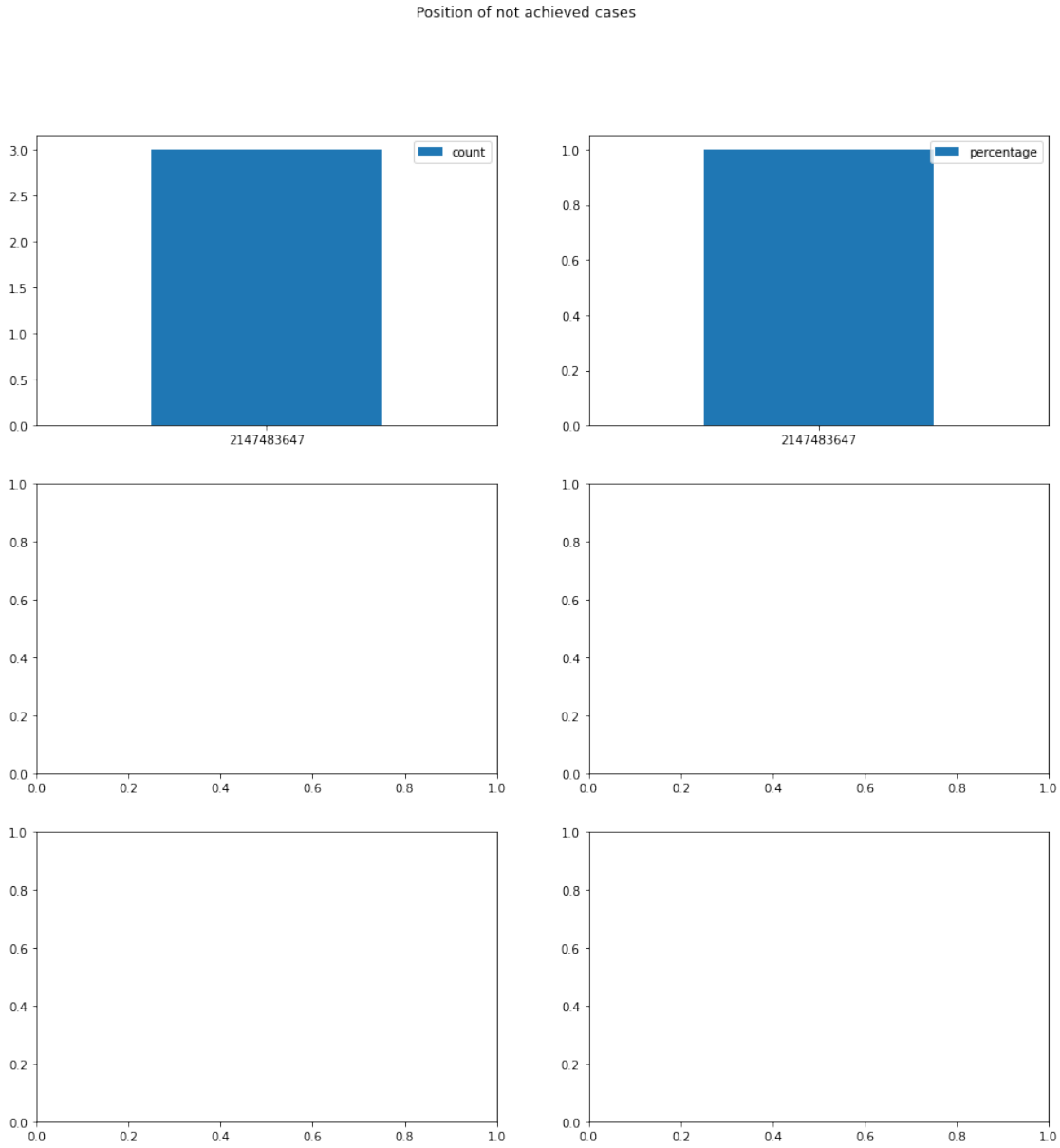
```
Text(0.5, 0.98, 'No of items to exclude from interacted list to have the
recommendations change accordingly')
```



```
Text(0.5, 0.98, 'Percentage of satisfied constraints')
```




```
Text(0.5, 0.98, 'Position of not achieved cases')
```



6 Most Similar strategy

6.1 Utilize pooling representation for similarities

```
target position loop:   0%|          | 0/3 [00:00<?, ?it/s]
```

```
HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
↪HTML(value='')))
```

```
target position loop: 20it [02:14,  6.75s/it]
```

```
HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))

target position loop: 30it [03:43,  7.37s/it]

HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))

target position loop: 30it [04:36,  9.21s/it]
target position loop:   0%|          | 0/3 [00:00<?, ?it/s]

HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))

target position loop: 20it [00:53,  2.69s/it]

HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))

target position loop: 30it [01:09,  2.35s/it]

HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))

target position loop: 30it [01:16,  2.56s/it]
target position loop:   0%|          | 0/3 [00:00<?, ?it/s]

HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))

target position loop: 20it [07:48, 23.44s/it]

HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))

target position loop: 30it [12:09, 24.22s/it]

HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))

target position loop: 30it [15:13, 30.44s/it]
target position loop:   0%|          | 0/3 [00:00<?, ?it/s]

HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))

target position loop: 20it [07:55, 23.78s/it]

HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))

target position loop: 30it [12:49, 25.47s/it]

HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))

target position loop: 30it [14:39, 29.30s/it]
```

6.2 Utilize ylosses for similarities

```
target position loop:   0%|          | 0/3 [00:00<?, ?it/s]
```

```
HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))
```

```
target position loop: 20it [00:53,  2.68s/it]
```

```
HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))
```

```
target position loop: 30it [01:27,  2.89s/it]
```

```
HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))
```

```
target position loop: 30it [01:52,  3.76s/it]
target position loop:   0%|          | 0/3 [00:00<?, ?it/s]
```

```
HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))
```

```
target position loop: 20it [00:45,  2.29s/it]
```

```
HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))
```

```
target position loop: 30it [01:10,  2.35s/it]
```

```
HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))
```

```
target position loop: 30it [01:25,  2.85s/it]
```

```
target position loop:   0%|          | 0/3 [00:00<?, ?it/s]
```

```
HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))
```

```
target position loop: 20it [01:25,  4.25s/it]
```

```
HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))
```

```
target position loop: 30it [02:15,  4.50s/it]
```

```
HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))
```

```
target position loop: 30it [02:50,  5.68s/it]
target position loop:   0%|          | 0/3 [00:00<?, ?it/s]
```

```
HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))
```

```
target position loop: 20it [00:37,  1.89s/it]
```

```
HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))
```

```
target position loop: 30it [00:56,  1.90s/it]
```

```
HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))
```

```
target position loop: 30it [01:08,  2.28s/it]
```

6.3 Utilize similarities based on yloss with DFS backward search

```
target position loop:   0%|          | 0/3 [00:00<?, ?it/s]
```

```
HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))
```

```
target position loop: 20it [00:50,  2.52s/it]
```

```
HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))
```

```
target position loop: 30it [01:24,  2.80s/it]
```

```
HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))
```

```
target position loop: 30it [01:51,  3.71s/it]
target position loop:   0%|          | 0/3 [00:00<?, ?it/s]
```

```
HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))
```

```
target position loop: 20it [00:36,  1.83s/it]
```

```
HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))
```

```
target position loop: 30it [00:58,  1.95s/it]
```

```
HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))
```

```
target position loop: 30it [01:11,  2.39s/it]
```

```
target position loop:   0%|          | 0/3 [00:00<?, ?it/s]
```

```
HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))
```

```
target position loop: 20it [00:52,  2.61s/it]
```

```
HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))
```

```
target position loop: 30it [01:30,  2.97s/it]
```

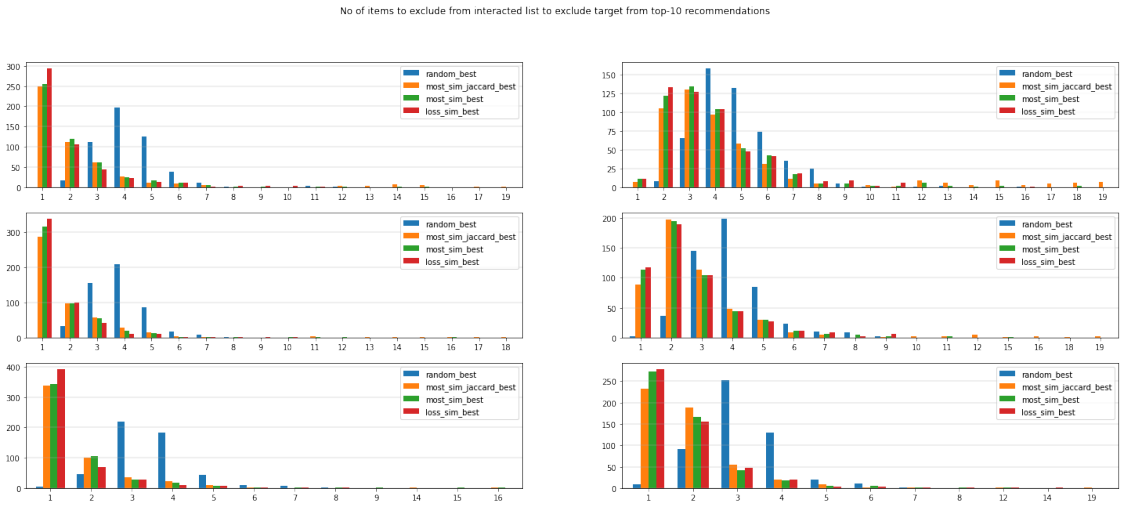
```
HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))

target position loop: 30it [02:00,  4.02s/it]
target position loop:   0%|          | 0/3 [00:00<?, ?it/s]

HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))

target position loop: 20it [00:27,  1.35s/it]

HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))

target position loop: 30it [00:42,  1.42s/it]

HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))

target position loop: 30it [00:52,  1.74s/it]

target position loop:   0%|          | 0/3 [00:00<?, ?it/s]

HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))

target position loop: 20it [01:00,  3.03s/it]

HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))

target position loop: 30it [01:42,  3.39s/it]

HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))

target position loop: 30it [02:15,  4.50s/it]
target position loop:   0%|          | 0/3 [00:00<?, ?it/s]

HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))

target position loop: 20it [00:51,  2.58s/it]

HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))

target position loop: 30it [01:21,  2.71s/it]

HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))

target position loop: 30it [01:37,  3.26s/it]

target position loop:   0%|          | 0/3 [00:00<?, ?it/s]

HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))
```

```
target position loop: 20it [01:10,  3.52s/it]

HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))

target position loop: 30it [01:59,  3.95s/it]

HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))

target position loop: 30it [02:39,  5.30s/it]
target position loop:   0%|          | 0/3 [00:00<?, ?it/s]

HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))

target position loop: 20it [00:44,  2.22s/it]

HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))

target position loop: 30it [01:09,  2.31s/it]

HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))

target position loop: 30it [01:22,  2.75s/it]

target position loop:   0%|          | 0/3 [00:00<?, ?it/s]

HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))

target position loop: 20it [01:14,  3.73s/it]

HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))

target position loop: 30it [02:06,  4.16s/it]

HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))

target position loop: 30it [02:46,  5.56s/it]
target position loop:   0%|          | 0/3 [00:00<?, ?it/s]

HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))

target position loop: 20it [01:08,  3.45s/it]

HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))

target position loop: 30it [01:48,  3.61s/it]

HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))
```

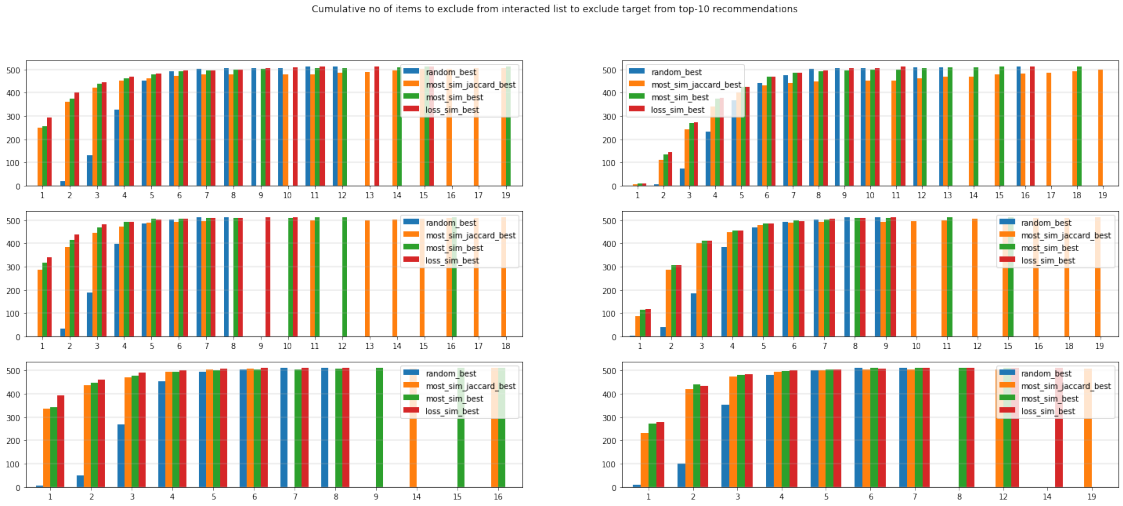
```
target position loop: 30it [02:08,  4.29s/it]
```

7 Plots

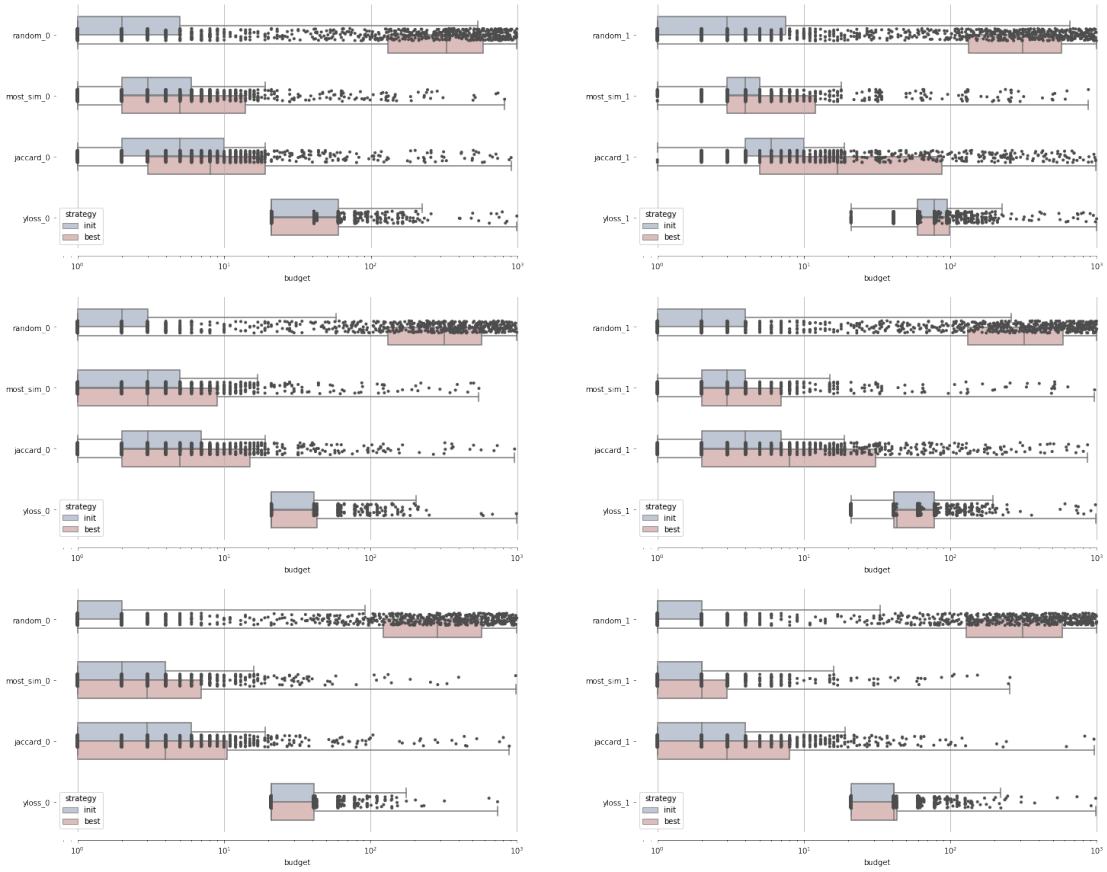
```
Text(0.5, 0.98, 'No of items to exclude from interacted list to exclude target
from top-10 recommendations')
```




```
Text(0.5, 0.98, 'Cumulative no of items to exclude from interacted list to
exclude target from top-10 recommendations')
```



7.1 Distribution of budget consumption



7.2 Randomized pick of candidates of interaction lists in lattice

```
target position loop:   0%|          | 0/3 [00:00<?, ?it/s]
```

```
HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))
```

```
target position loop: 20it [00:52,  2.61s/it]
```

```
HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))
```

```
target position loop: 30it [01:07,  2.29s/it]
```

```
HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))
```

```
target position loop: 30it [01:14,  2.49s/it]
target position loop:   0%|          | 0/3 [00:00<?, ?it/s]
```

```
HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))
```

```
target position loop: 20it [00:25,  1.25s/it]
```

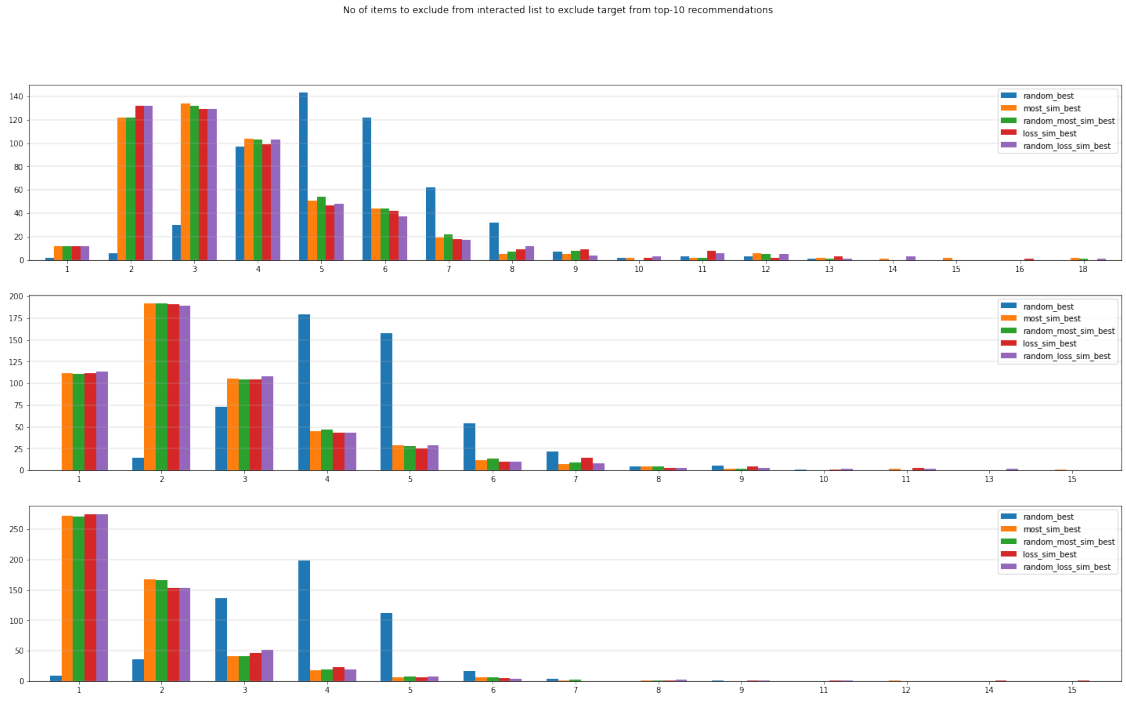
```
HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))
```

```
target position loop: 30it [00:40,  1.35s/it]
```

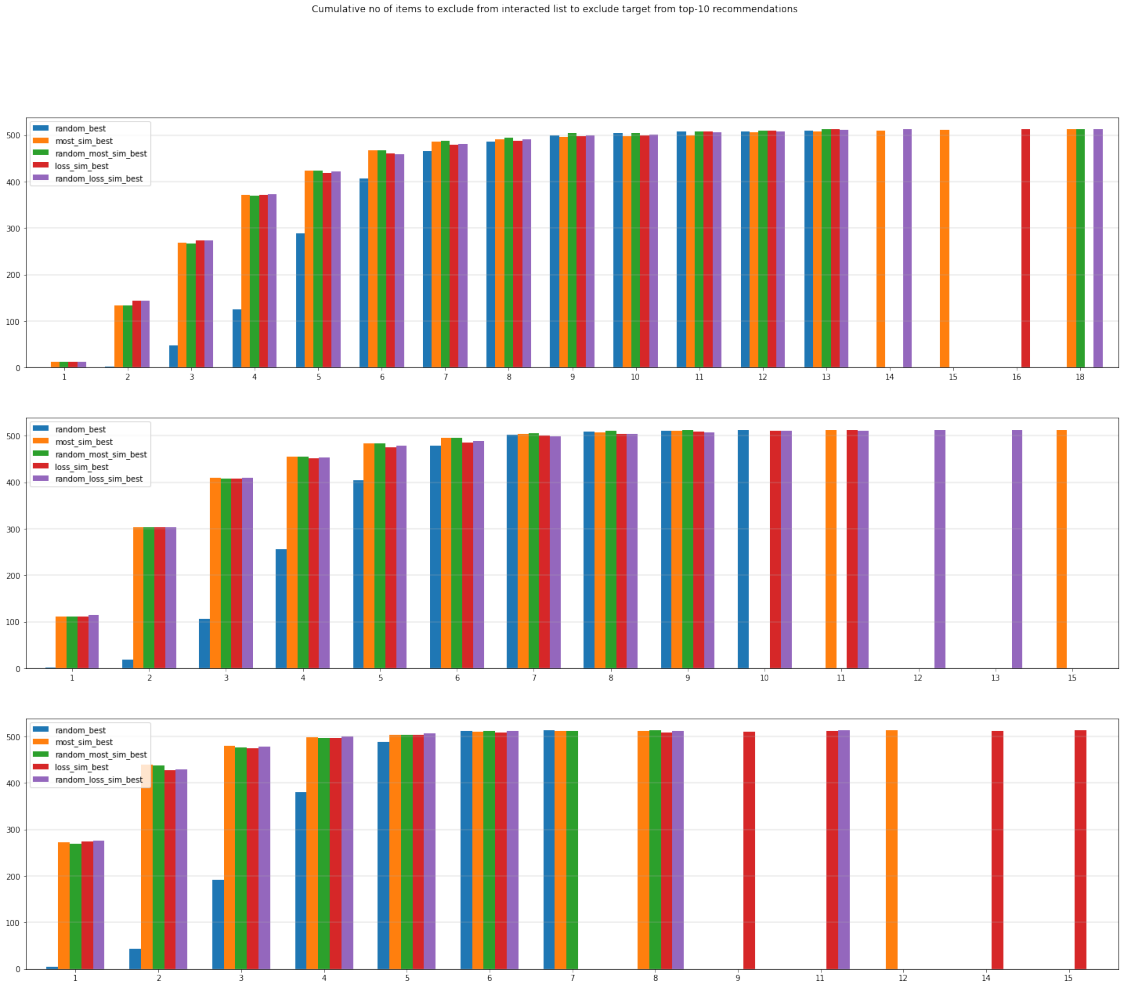
```
HBox(children=(HTML(value='users loop'), FloatProgress(value=0.0, max=499.0),␣
 ↪HTML(value='')))
```

```
target position loop: 30it [00:51,  1.73s/it]
```

```
Text(0.5, 0.98, 'No of items to exclude from interacted list to exclude target
from top-10 recommendations')
```

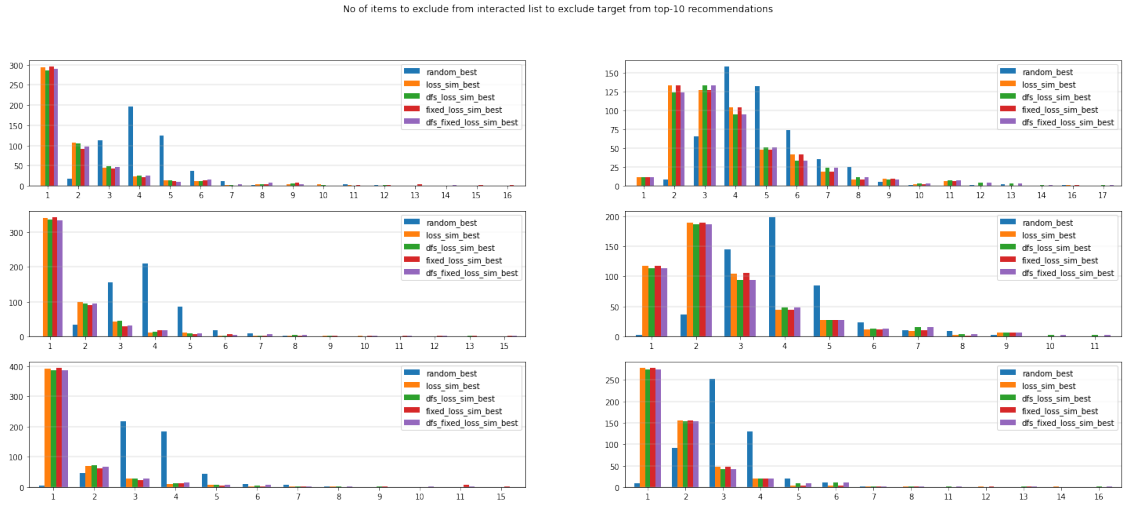



```
Text(0.5, 0.98, 'Cumulative no of items to exclude from interacted list to
exclude target from top-10 recommendations')
```

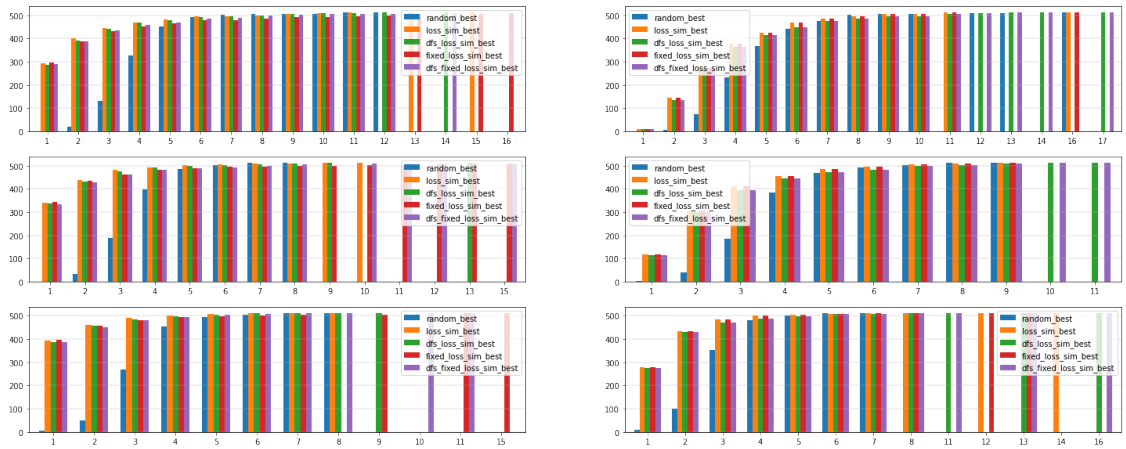


7.3 DFS search and fix ordering of excluding interacted items based on target's yloss

```
Text(0.5, 0.98, 'No of items to exclude from interacted list to exclude target
from top-10 recommendations')
```

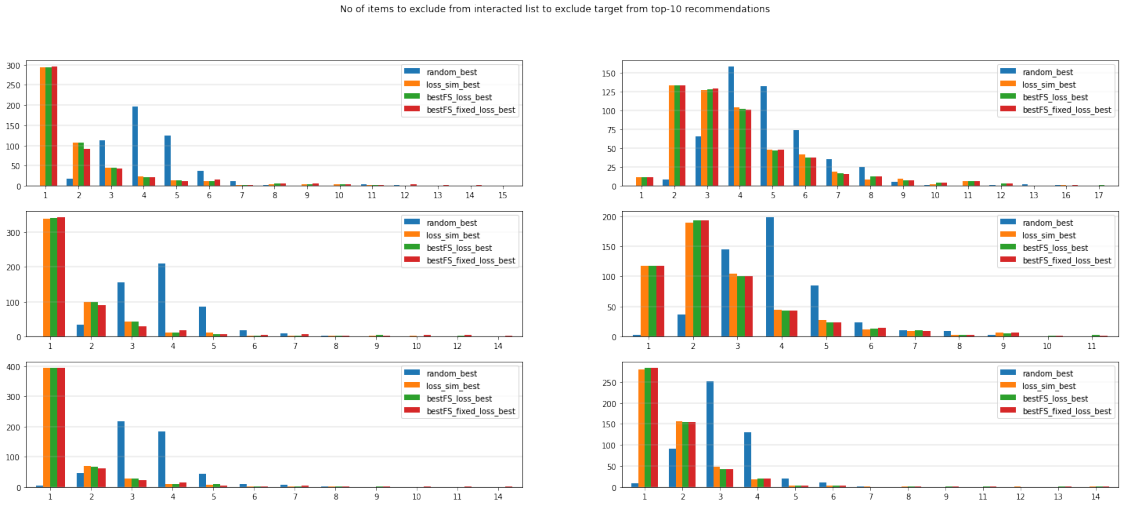



```
Text(0.5, 0.98, 'Cumulative no of items to exclude from interacted list to
exclude target from top-10 recommendations')
```

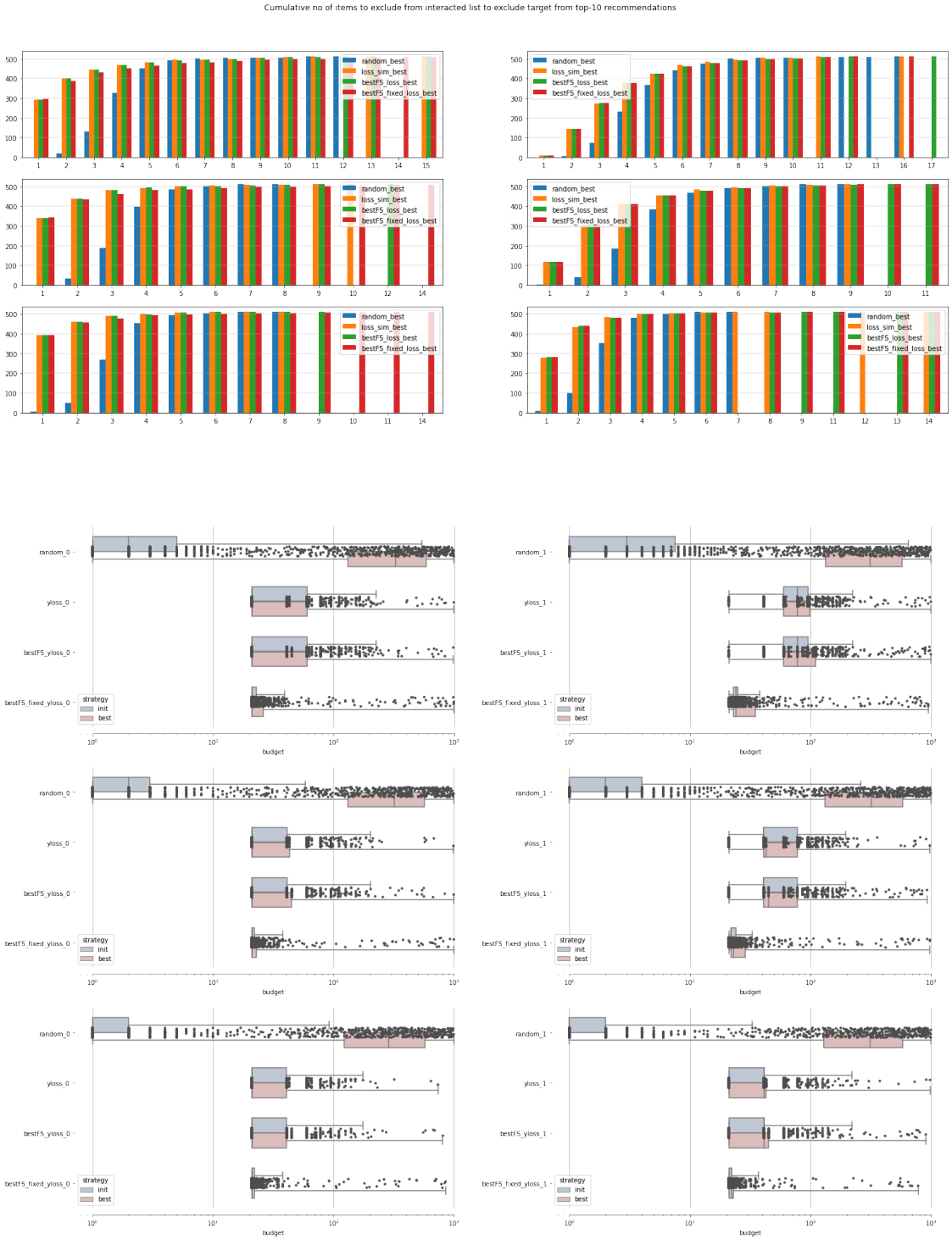


7.4 Best First Searching

```
Text(0.5, 0.98, 'No of items to exclude from interacted list to exclude target
from top-10 recommendations')
```

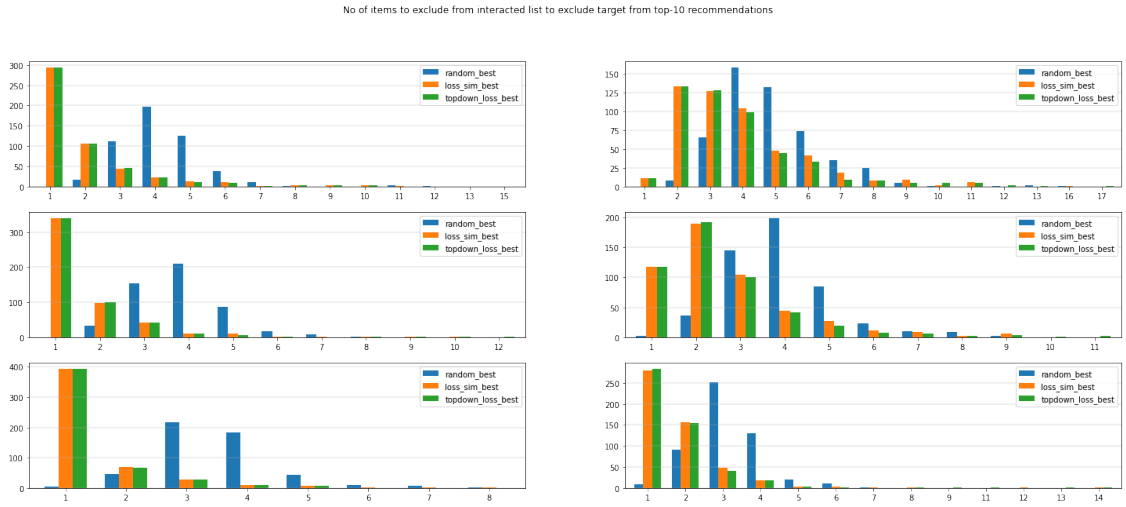


```
Text(0.5, 0.98, 'Cumulative no of items to exclude from interacted list to
exclude target from top-10 recommendations')
```

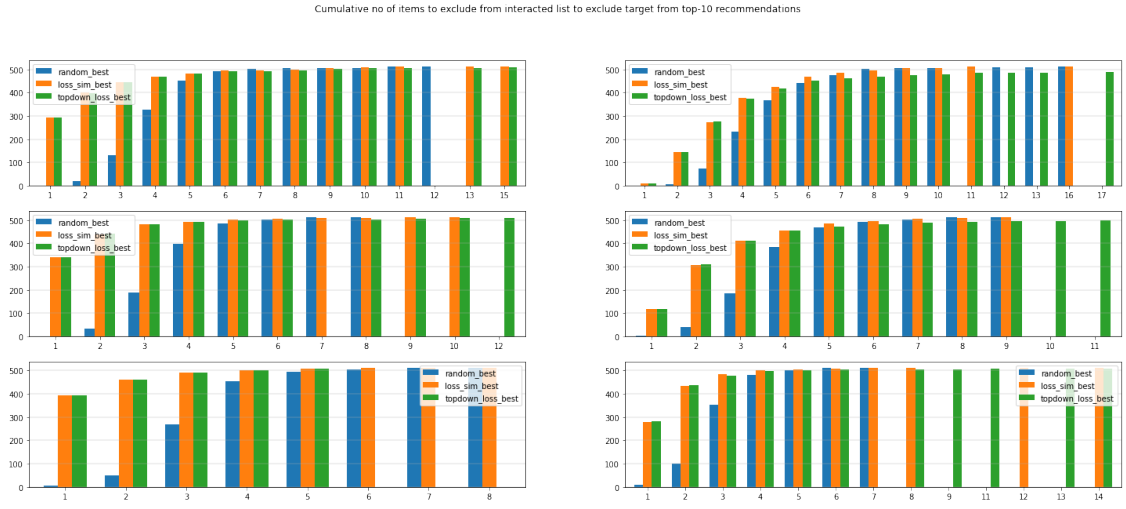


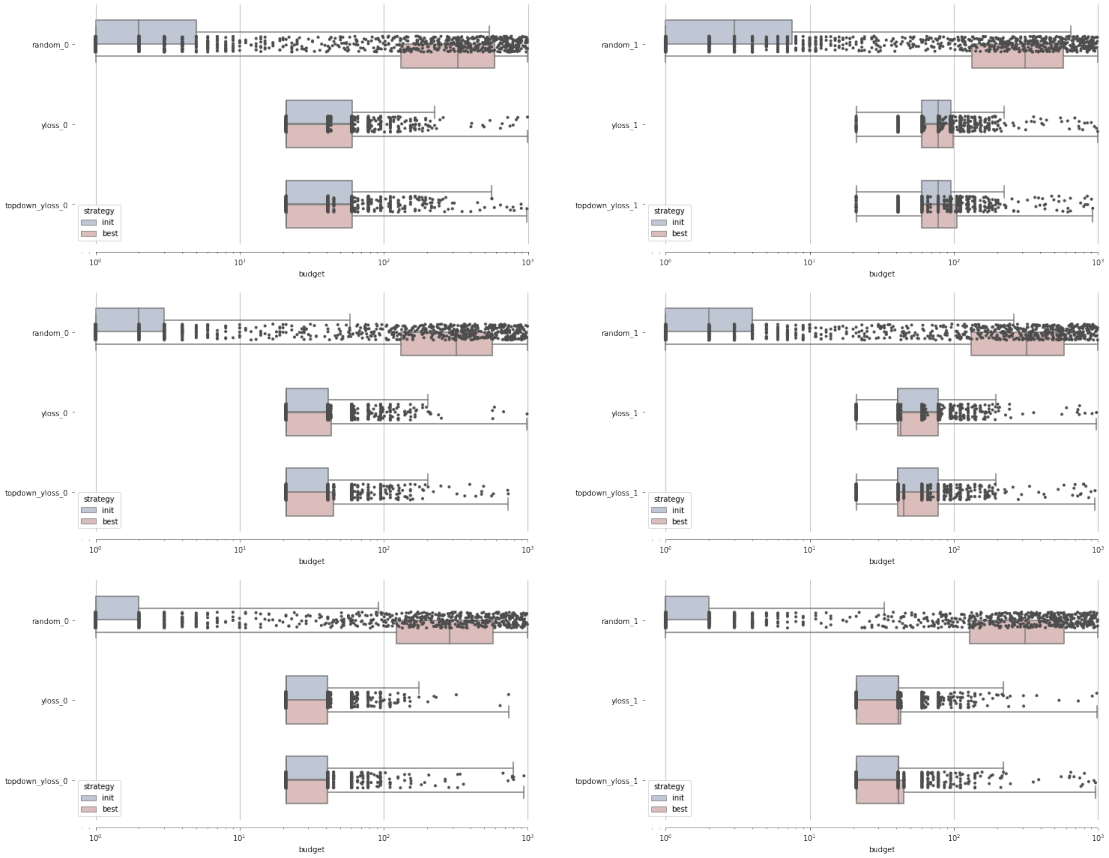
7.5 Top Down Searching

```
Text(0.5, 0.98, 'No of items to exclude from interacted list to exclude target
from top-10 recommendations')
```

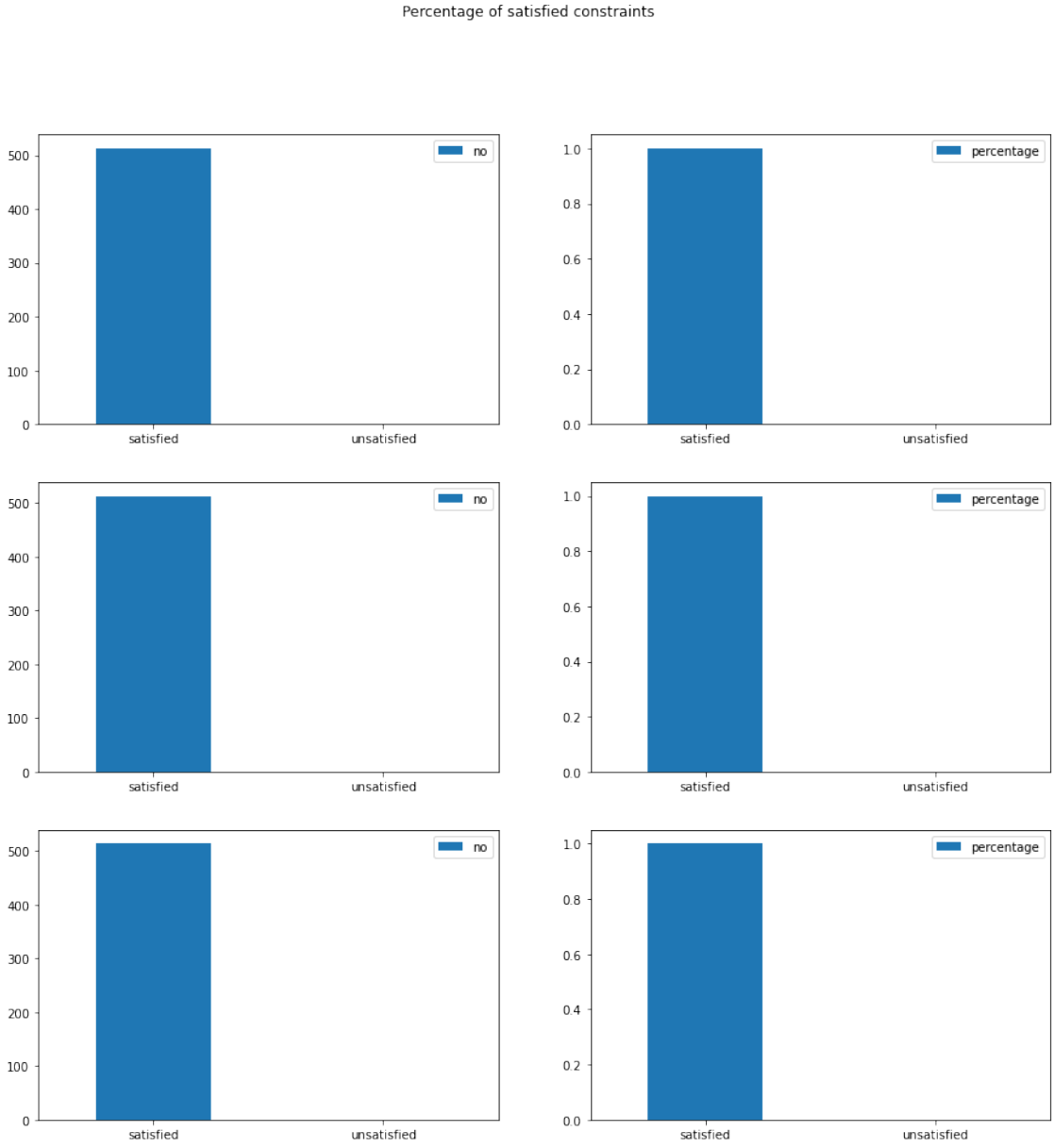



```
Text(0.5, 0.98, 'Cumulative no of items to exclude from interacted list to
exclude target from top-10 recommendations')
```

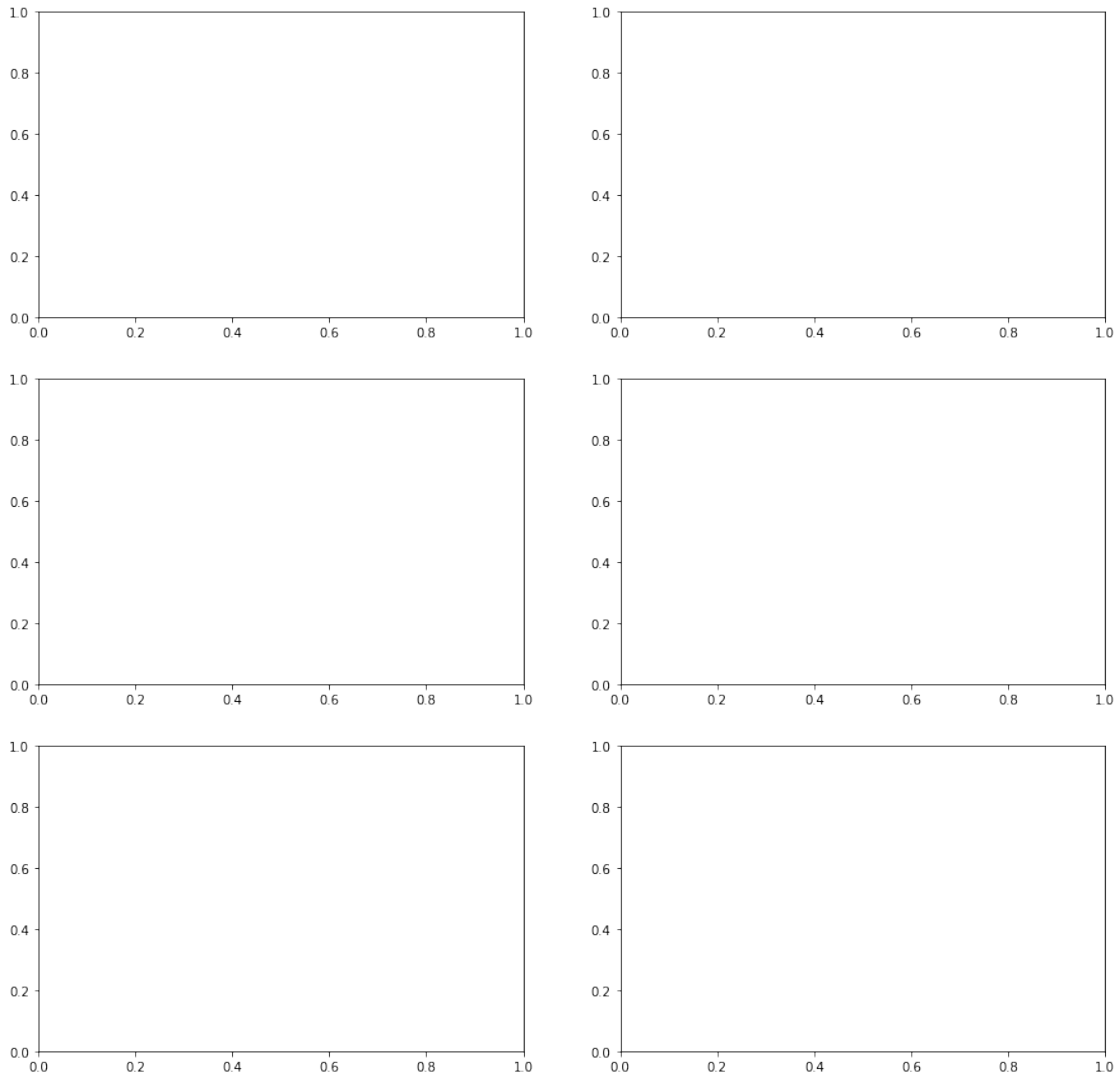


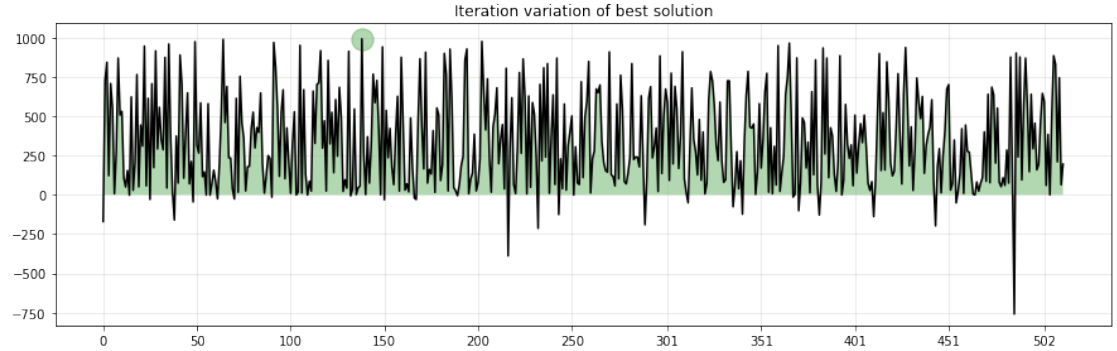


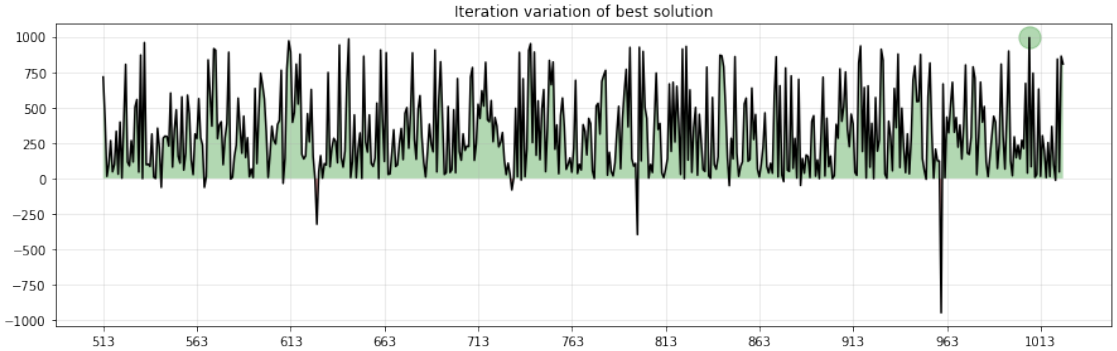
Text(0.5, 0.98, 'Percentage of satisfied constraints')

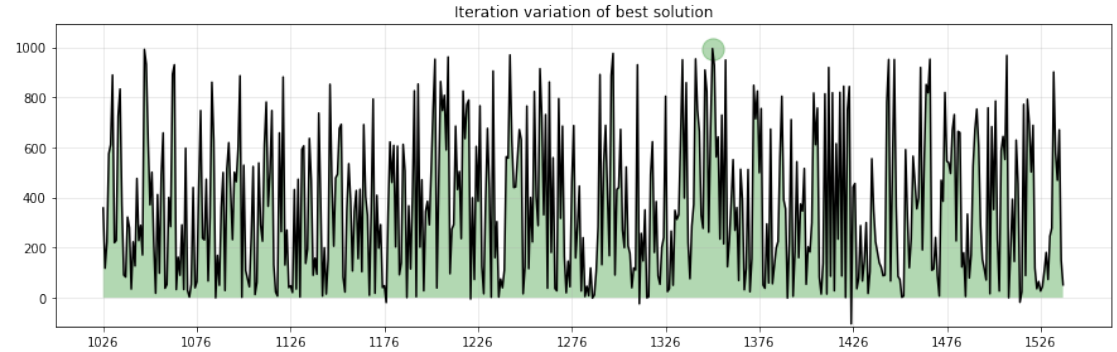


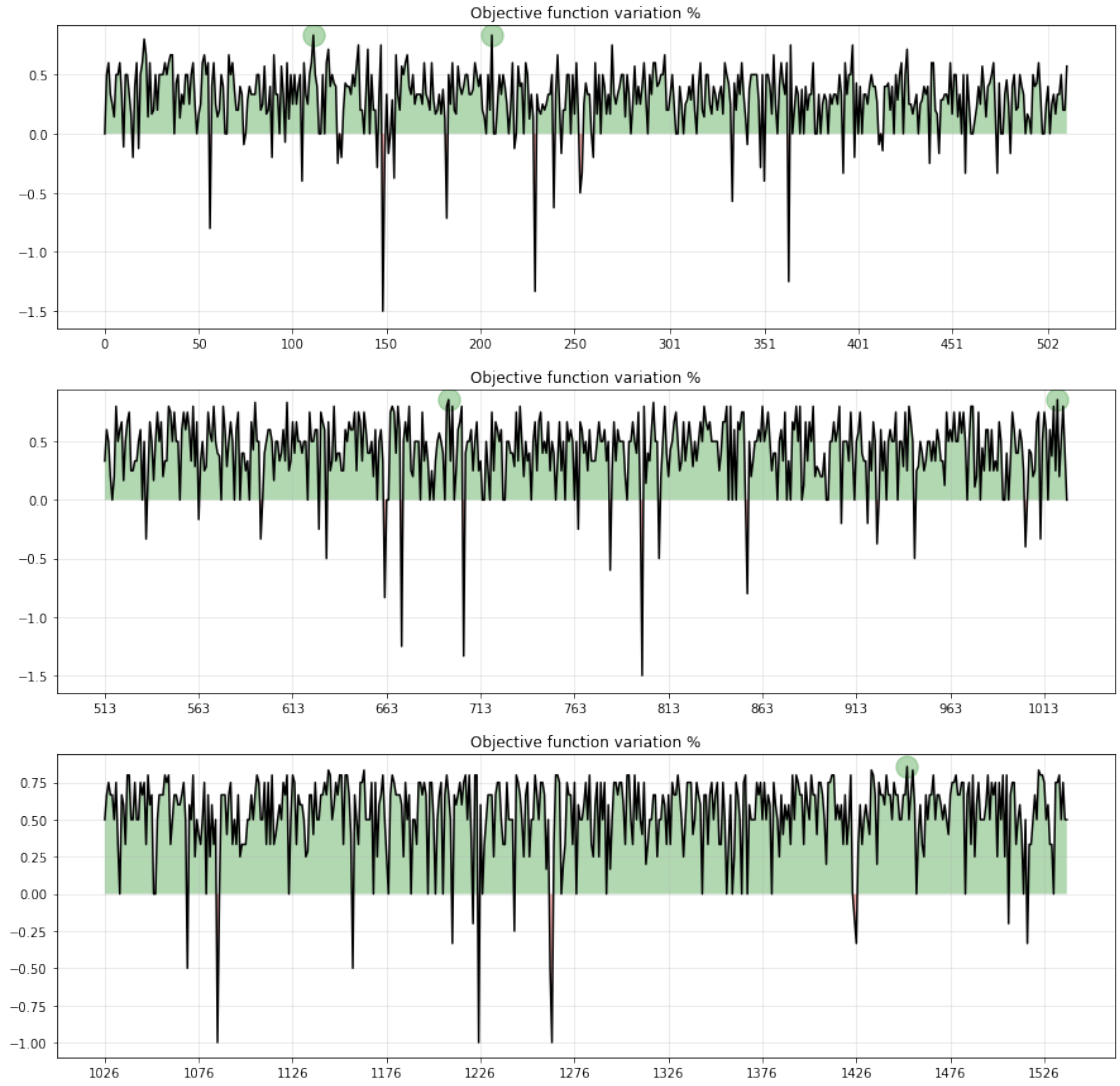

```
Text(0.5, 0.98, 'Position of not achieved cases')
```

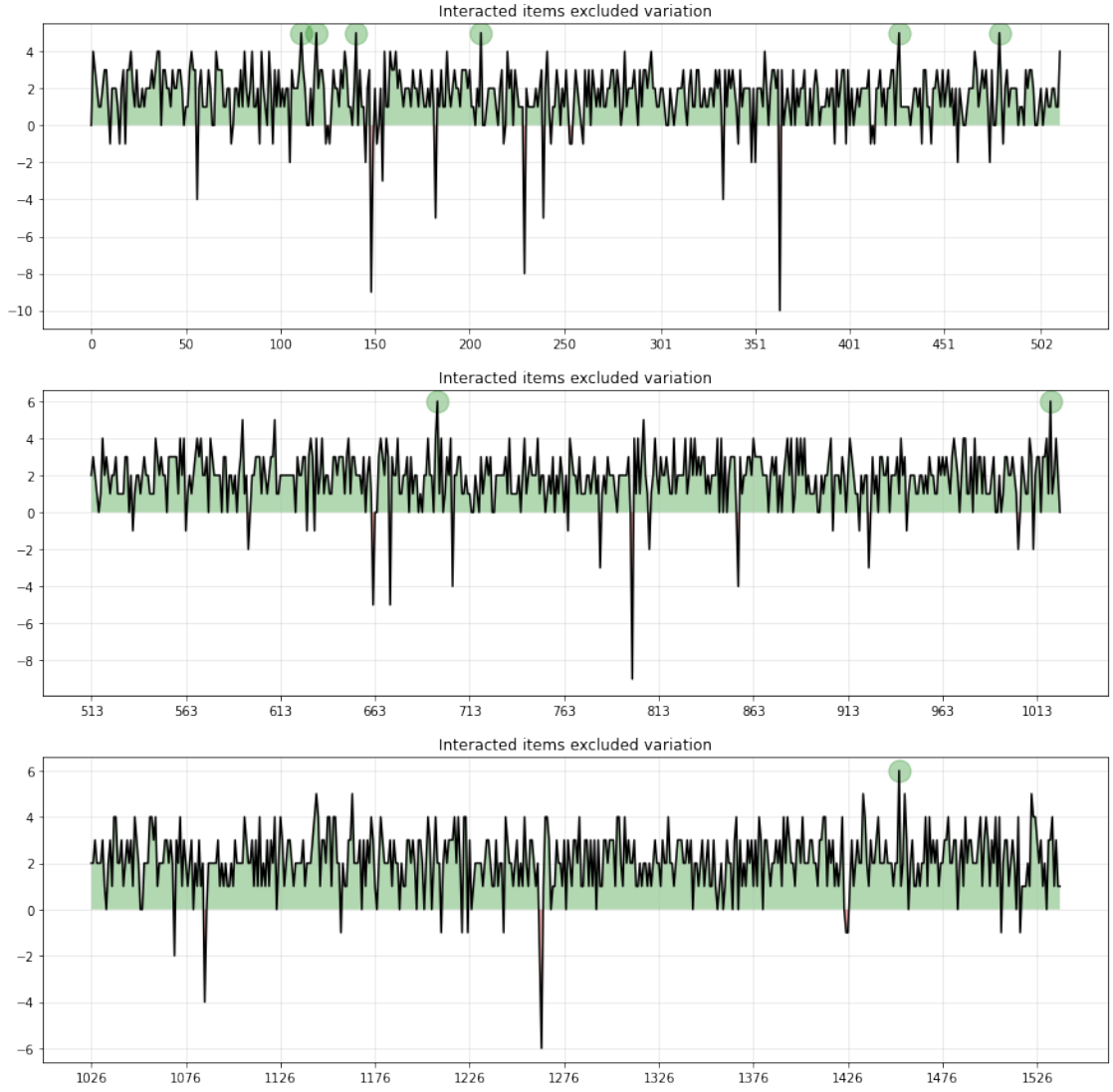

Position of not achieved cases
1.0
0.8
0.6
0.4
0.2
0.0
0.0
0.2
0.4
0.6
0.8
1.0

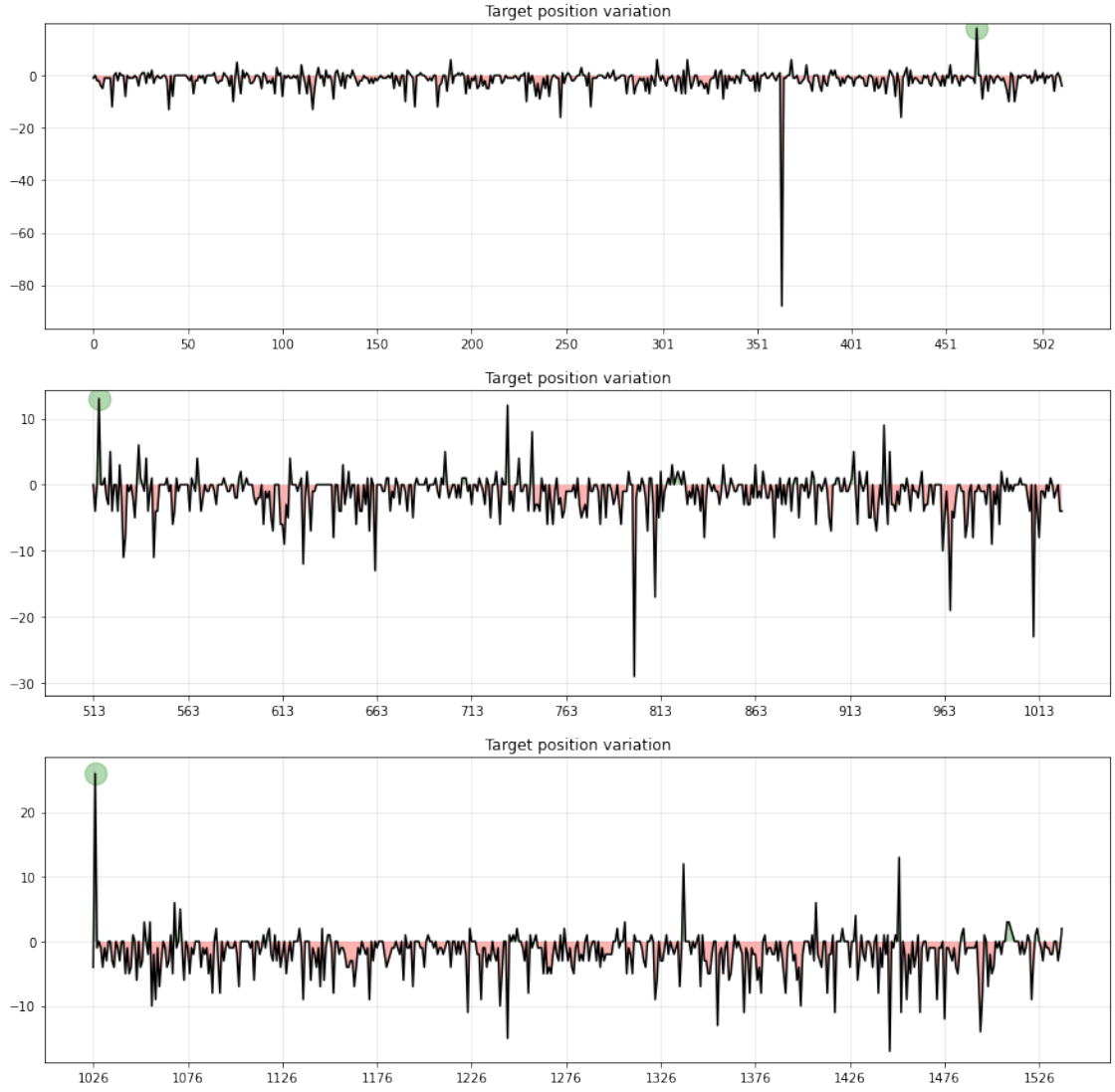

Iteration variation of best solution
1000
750
500
250
0
−250
−500
−750
0
50
100
150
200
250
301
351
401
451
502


Iteration variation of best solution
1000
750
500
250
0
−250
−500
−750
−1000
513
563
613
663
713
763
813
863
913
963
1013


Iteration variation of best solution
1000
800
600
400
200
0
1026
1076
1126
1176
1226
1276
1326
1376
1426
1476
1526


Objective function variation %
0.5
0.0
−0.5
−1.0
−1.5
0
50
100
150
200
250
301
351
401
451
502
Objective function variation %
0.5
0.0
−0.5
−1.0
−1.5
513
563
613
663
713
763
813
863
913
963
1013
Objective function variation %
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00
1026
1076
1126
1176
1226
1276
1326
1376
1426
1476
1526


Interacted items excluded variation
Interacted items excluded variation
Interacted items excluded variation


Target position variation
0
−20
−40
−60
−80
0
50
100
150
200
250
301
351
401
451
502
Target position variation
10
0
−10
−20
−30
513
563
613
663
713
763
813
863
913
963
1013
Target position variation
20
10
0
−10
1026
1076
1126
1176
1226
1276
1326
1376
1426
1476
1526