

DRL Global Routing Implementation (Week 03/18/19):

Important points:

1. Make sure working on benchmark/benchmark_reduced in Router.py file
2. Github version local address: DARPA IDEA/1.Project/Github/GlobalRouting
3. Reduced capacity set to 3

Pending problem:

1. Make sure do not count via capacity in capacity statistical Solved 03/18
2. Check Net Merge (both A* and DRL) Solved 03/20
3. Save reward as npy, save model in training process Model Saved 03/19, reward needed, rewrite test function
4. A* capacity update issue (Prof Kara asked, check notes&code)

Documents

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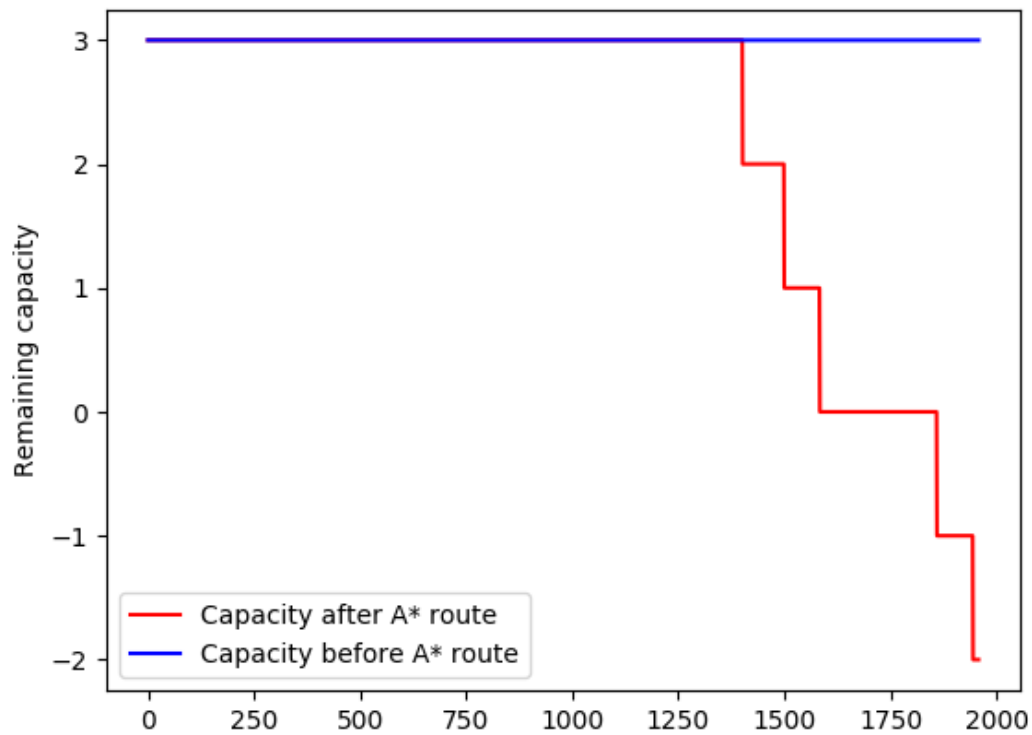
```
python GenSolEvalComp_Pipeline.py --benchNumber 5 --gridSize 16 --netNum 50 --capacity 3 --maxPinNum 8 --reducedCapNum 3
```

log: DRL fails to yield solution with 1000 episodes

03/18

```
python GenSolEvalComp_Pipeline.py --benchNumber 5 --gridSize 16 --netNum 50 --capacity 3 --maxPinNum 12 --reducedCapNum 3
```

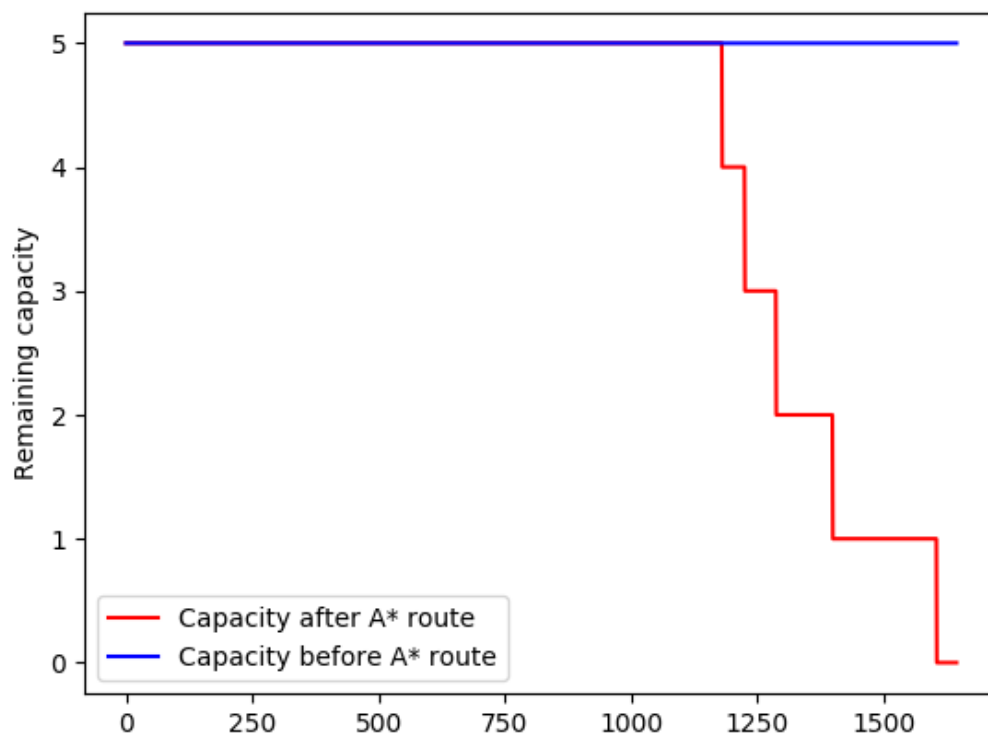
Edge Utilization:



A* score:

```
liaohaiguangdeMacBook-Pro:evaluation liaohaiguang$ python Evaluation.py
File Names(In, Out) Tot OF Max OF WL
test_benchmark_1.gr, test_benchmark_1.gr 523 5 2468
File Names(In, Out) Tot OF Max OF WL
test_benchmark_2.gr, test_benchmark_2.gr 419 4 2291
File Names(In, Out) Tot OF Max OF WL
test_benchmark_3.gr, test_benchmark_3.gr 441 5 2318
File Names(In, Out) Tot OF Max OF WL
test_benchmark_4.gr, test_benchmark_4.gr 418 5 2311
File Names(In, Out) Tot OF Max OF WL
test_benchmark_5.gr, test_benchmark_5.gr 505 7 2532
```

```
python GenSolEvalComp_Pipeline.py --benchNumber 5 --gridSize 16 --netNum
50 --capacity 5 --maxPinNum 12 --reducedCapNum 3
```



```
liaohaiguangdeMacBook-Pro:evaluation liaohaiguang$ python Evaluation.py
File Names(In, Out) Tot OF Max OF WL
test_benchmark_1.gr, test_benchmark_ 19 2 2246
File Names(In, Out) Tot OF Max OF WL
test_benchmark_2.gr, test_benchmark_ 15 1 2079
File Names(In, Out) Tot OF Max OF WL
test_benchmark_3.gr, test_benchmark_ 12 2 1970
File Names(In, Out) Tot OF Max OF WL
test_benchmark_4.gr, test_benchmark_ 28 2 2351
File Names(In, Out) Tot OF Max OF WL
test_benchmark_5.gr, test_benchmark_ 45 3 2389
```

Notes: Based on edge utilization, there should be no OF. Bug needs to be fixed in generate route files.

03/19

Task:

1. Reduce A* cost to 2. Should be able to see OF+ and WL-
2. Debugging: net merge issue
3. Ask Wentai implement: save and write model during training

Progress:

1. Model saving enabled, still needs to rewrite test function in Router.py

03/20

Task:

1. Net merge debugging in Router.py done

Net Merge debugging nots:

Places net merge: A* sol/ DRL sol * normal/reduced benchmark

Observation:

Change of OF cost for A* does not necessarily influence OF and WL. Depends on problem condition

Condition:

```
python GenSolEvalComp_Pipeline.py --benchNumber 5 --gridSize 16 --netNum 50 --capacity 4 --maxPinNum 8 --reducedCapNum 3
```

Cost 1000:

File Names(In, Out)	Tot OF	Max OF	WL
test_benchmark_1.gr, test_benchmark_	8	1	1576
File Names(In, Out)	Tot OF	Max OF	WL
test_benchmark_2.gr, test_benchmark_	31	2	1844
File Names(In, Out)	Tot OF	Max OF	WL
test_benchmark_3.gr, test_benchmark_	18	2	1761
File Names(In, Out)	Tot OF	Max OF	WL
test_benchmark_4.gr, test_benchmark_	52	2	1927
File Names(In, Out)	Tot OF	Max OF	WL
test_benchmark_5.gr, test_benchmark_	9	1	1693

Cost 2:

File Names(In, Out)	Tot OF	Max OF	WL
test_benchmark_1.gr, test_benchmark_	25	2	1738
File Names(In, Out)	Tot OF	Max OF	WL
test_benchmark_2.gr, test_benchmark_	36	2	1977
File Names(In, Out)	Tot OF	Max OF	WL
test_benchmark_3.gr, test_benchmark_	36	2	1804
File Names(In, Out)	Tot OF	Max OF	WL
test_benchmark_4.gr, test_benchmark_	33	1	1916
File Names(In, Out)	Tot OF	Max OF	WL
test_benchmark_5.gr, test_benchmark_	18	1	1649

Cost 200000:

File Names(In, Out)	Tot	OF	Max	OF	WL
test_benchmark_1.gr, test_benchmark_	49		2		1939
File Names(In, Out)	Tot	OF	Max	OF	WL
test_benchmark_2.gr, test_benchmark_	14		1		1724
File Names(In, Out)	Tot	OF	Max	OF	WL
test_benchmark_3.gr, test_benchmark_	8		1		1606
File Names(In, Out)	Tot	OF	Max	OF	WL
test_benchmark_4.gr, test_benchmark_	1		1		1441
File Names(In, Out)	Tot	OF	Max	OF	WL
test_benchmark_5.gr, test_benchmark_	15		1		1642

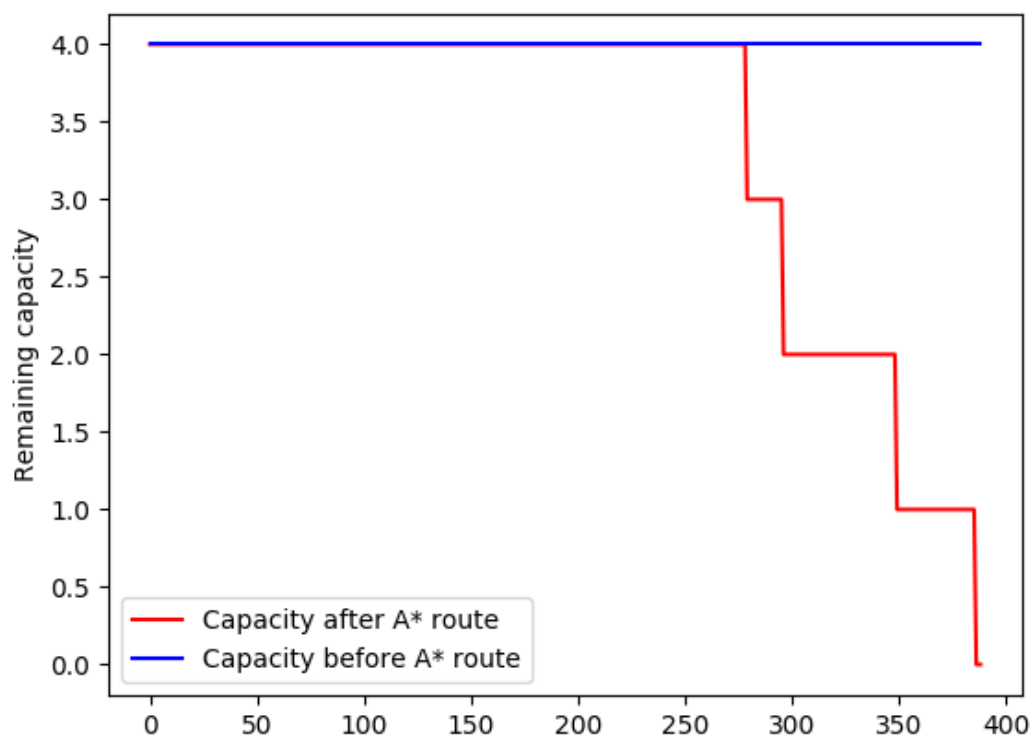
Condition running:

Working on reduced

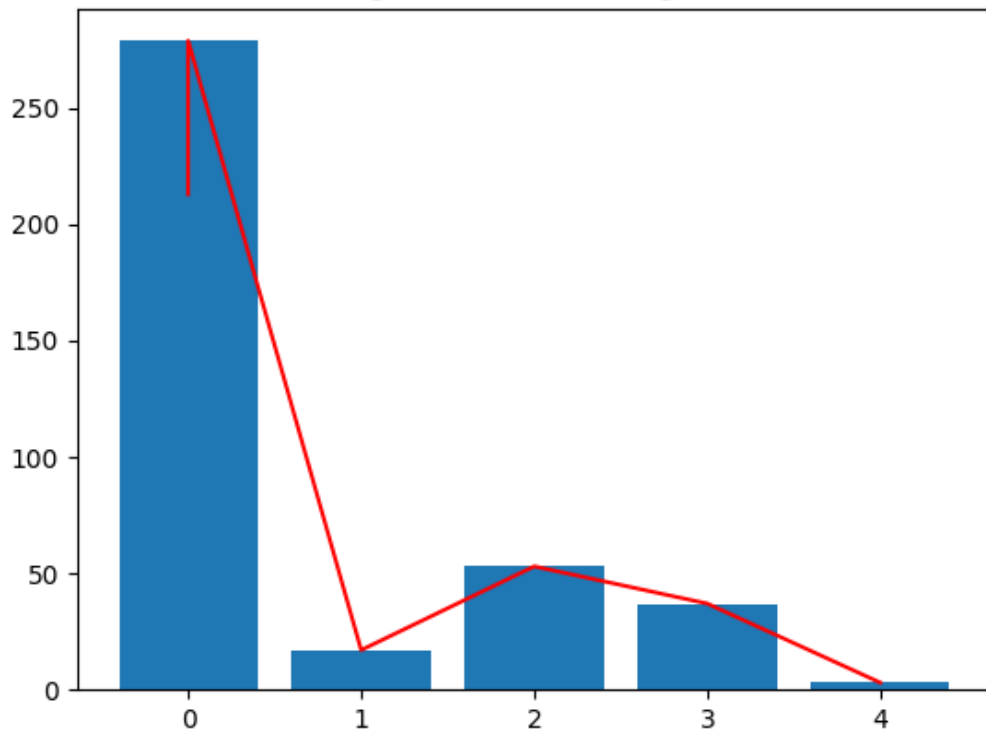
```
python GenSolEvalComp_Pipeline.py --benchNumber 5 --gridSize 8 --netNum
20 --capacity 4 --maxPinNum 8 --reducedCapNum 3
```

Episodes: 2000

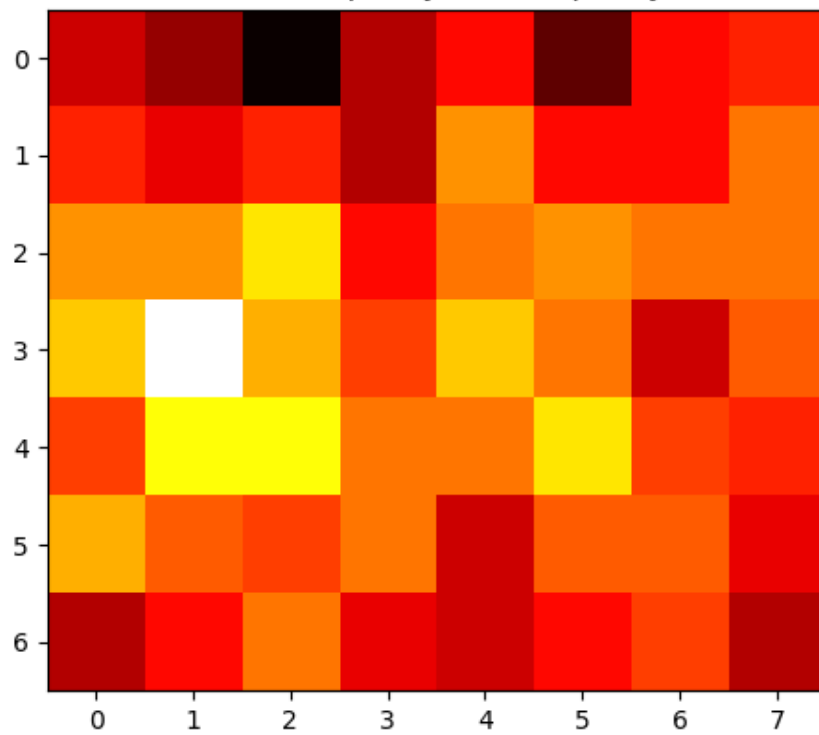
Net Utilization:



Edge Utilization Histogram



Horizontal Capacity Heatmap (Layer1)



```

liaohaiangdeMBP:evaluation liaohaiguang$ perl eval2008.pl test_benchmark_2.gr test_benchmark_2.grAstar_solution
File Names(In, Out) Tot OF Max OF WL test_benchmark_2.gr, test_benchmark_2.grAstar_solution
test_benchmark_2.gr, test_benchmark_2.gr 3 2 346
liaohaiangdeMBP:evaluation liaohaiguang$ perl eval2008.pl test_benchmark_2.gr test_benchmark_2.gr.DRLsolution
File Names(In, Out) Tot OF Max OF WL test_benchmark_2.gr, test_benchmark_2.gr.DRLsolution
test_benchmark_2.gr, test_benchmark_2.gr 2 1 347
liaohaiangdeMBP:evaluation liaohaiguang$ perl eval2008.pl test_benchmark_3.gr test_benchmark_3.gr.DRLsolution
File Names(In, Out) Tot OF Max OF WL test_benchmark_3.gr, test_benchmark_3.gr.DRLsolution
test_benchmark_3.gr, test_benchmark_3.gr 3 1 269
liaohaiangdeMBP:evaluation liaohaiguang$ perl eval2008.pl test_benchmark_3.gr test_benchmark_3.grAstar_solution
File Names(In, Out) Tot OF Max OF WL test_benchmark_3.gr, test_benchmark_3.grAstar_solution
test_benchmark_3.gr, test_benchmark_3.gr 0 0 280
liaohaiangdeMBP:evaluation liaohaiguang$ perl eval2008.pl test_benchmark_4.gr test_benchmark_4.grAstar_solution
File Names(In, Out) Tot OF Max OF WL test_benchmark_4.gr, test_benchmark_4.grAstar_solution
test_benchmark_4.gr, test_benchmark_4.gr 1 1 337
liaohaiangdeMBP:evaluation liaohaiguang$ perl eval2008.pl test_benchmark_4.gr test_benchmark_4.gr.DRLsolution
File Names(In, Out) Tot OF Max OF WL test_benchmark_4.gr, test_benchmark_4.gr.DRLsolution
test_benchmark_4.gr, test_benchmark_4.gr 1 1 348
liaohaiangdeMBP:evaluation liaohaiguang$ perl eval2008.pl test_benchmark_5.gr test_benchmark_5.grAstar_solution
File Names(In, Out) Tot OF Max OF WL test_benchmark_5.gr, test_benchmark_5.grAstar_solution
test_benchmark_5.gr, test_benchmark_5.gr 0 0 384
liaohaiangdeMBP:evaluation liaohaiguang$ perl eval2008.pl test_benchmark_5.gr test_benchmark_5.gr.DRLsolution
File Names(In, Out) Tot OF Max OF WL test_benchmark_5.gr, test_benchmark_5.gr.DRLsolution
test_benchmark_5.gr, test_benchmark_5.gr 2 1 365

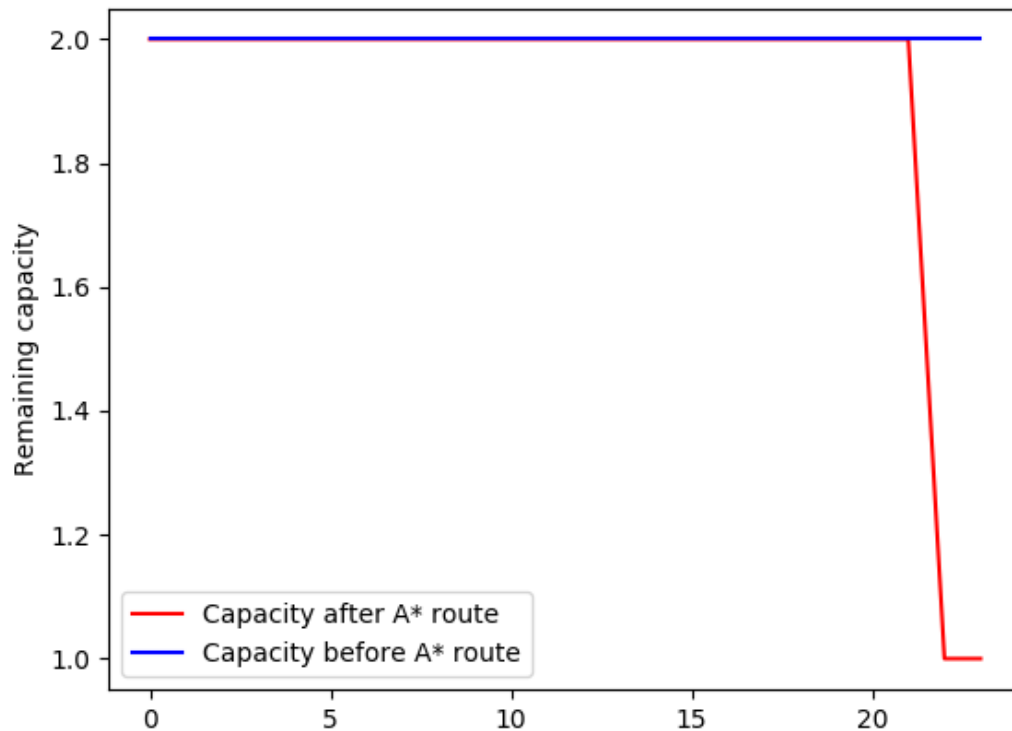
```

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```

python GenSolEvalComp_Pipeline.py --benchNumber 10 --gridSize 3 --netNum
3 --capacity 2 --maxPinNum 4 --reducedCapNum 3

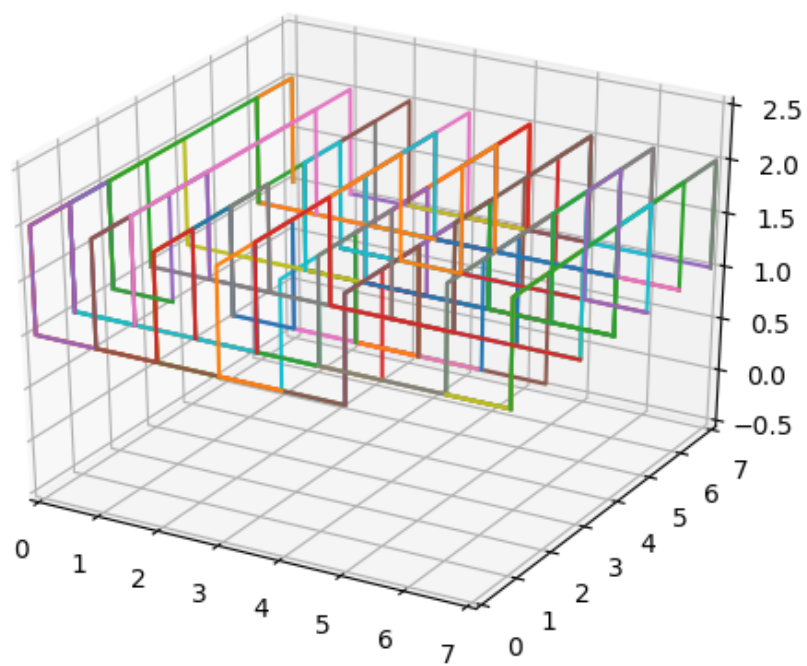
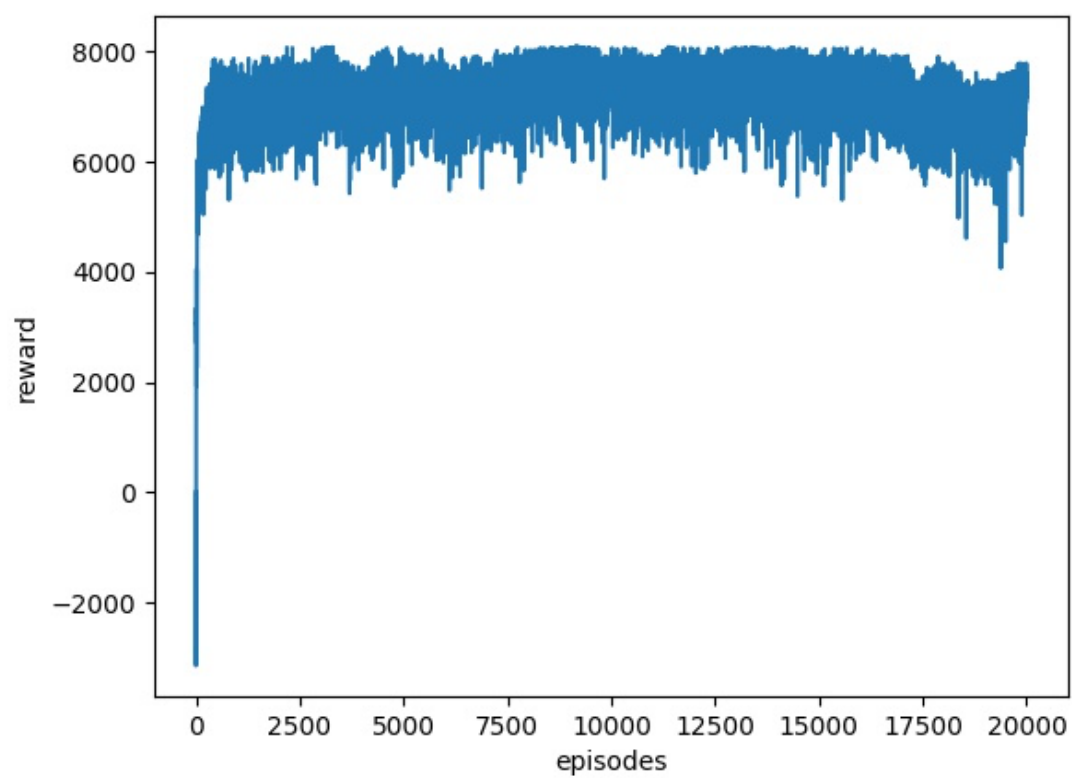
```



File Names(In, Out)		Tot OF	Max OF	WL
test_benchmark_1.gr, test_benchmark_1.gr		0	0	11
File Names(In, Out)		Tot OF	Max OF	WL
test_benchmark_2.gr, test_benchmark_2.gr		0	0	14
File Names(In, Out)		Tot OF	Max OF	WL
test_benchmark_3.gr, test_benchmark_3.gr		2	1	19
File Names(In, Out)		Tot OF	Max OF	WL
test_benchmark_4.gr, test_benchmark_4.gr		0	0	14
File Names(In, Out)		Tot OF	Max OF	WL
test_benchmark_5.gr, test_benchmark_5.gr		1	1	15
File Names(In, Out)		Tot OF	Max OF	WL
test_benchmark_6.gr, test_benchmark_6.gr		0	0	12
File Names(In, Out)		Tot OF	Max OF	WL
test_benchmark_7.gr, test_benchmark_7.gr		0	0	18
File Names(In, Out)		Tot OF	Max OF	WL
test_benchmark_8.gr, test_benchmark_8.gr		0	0	11
File Names(In, Out)		Tot OF	Max OF	WL
test_benchmark_9.gr, test_benchmark_9.gr		2	1	17
File Names(In, Out)		Tot OF	Max OF	WL
test_benchmark_10.gr, test_benchmark_10.gr		1	1	16
liaohaiguangdeMacBook-Pro:evaluation liaohaiguang\$ perl eval2008.pl test_benchmark_1.gr test_benchmark_1.gr.DRLsolution				
File Names(In, Out)		Tot OF	Max OF	WL
test_benchmark_1.gr, test_benchmark_1.gr		0	0	11
liaohaiguangdeMacBook-Pro:evaluation liaohaiguang\$ perl eval2008.pl test_benchmark_2.gr test_benchmark_2.gr.DRLsolution				
File Names(In, Out)		Tot OF	Max OF	WL
test_benchmark_2.gr, test_benchmark_2.gr		1	1	16
liaohaiguangdeMacBook-Pro:evaluation liaohaiguang\$ perl eval2008.pl test_benchmark_6.gr test_benchmark_6.gr.DRLsolution				
File Names(In, Out)		Tot OF	Max OF	WL
test_benchmark_6.gr, test_benchmark_6.gr		0	0	12
liaohaiguangdeMacBook-Pro:evaluation liaohaiguang\$				

python GenSolEvalComp_Pipeline.py --benchNumber 5 --gridSize 8 --netNum 20 --capacity 4 --maxPinNum 8 --reducedCapNum 3

liaohaiguangdeMacBook-Pro:evaluation liaohaiguang\$ perl eval2008.pl test_benchmark_1.gr test_benchmark_1.gr.DRLsolution				
File Names(In, Out)		Tot OF	Max OF	WL
test_benchmark_1.gr, test_benchmark_1.gr		6	1	440
liaohaiguangdeMacBook-Pro:evaluation liaohaiguang\$ perl eval2008.pl test_benchmark_1.gr test_benchmark_1.grAstar_solution				
File Names(In, Out)		Tot OF	Max OF	WL
test_benchmark_1.gr, test_benchmark_1.gr		9	1	507



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```
python GenSolEvalComp_Pipeline.py --benchNumber 5 --gridSize 16 --netNum  
30 --capacity 4 --maxPinNum 8 --reducedCapNum 3  
Tomcat RunningCase04_Mar222019 (BASELINE)
```

NET_NUM STUDY

```
python GenSolEvalComp_Pipeline.py --benchNumber 5 --gridSize 16 --netNum  
40 --capacity 4 --maxPinNum 8 --reducedCapNum 3  
Tomcat RunningCase_Mar222019
```

```
python GenSolEvalComp_Pipeline.py --benchNumber 5 --gridSize 16 --netNum  
50 --capacity 4 --maxPinNum 8 --reducedCapNum 3  
Tomcat RunningCase02_Mar222019
```

```
python GenSolEvalComp_Pipeline.py --benchNumber 5 --gridSize 16 --netNum  
60 --capacity 4 --maxPinNum 8 --reducedCapNum 3  
Tomcat RunningCase03_Mar222019
```

CAPACITY_STUDY

```
python GenSolEvalComp_Pipeline.py --benchNumber 5 --gridSize 16 --netNum  
30 --capacity 3 --maxPinNum 8 --reducedCapNum 3  
Tomcat RunningCase05_Mar222019
```

```
python GenSolEvalComp_Pipeline.py --benchNumber 5 --gridSize 16 --netNum  
30 --capacity 2 --maxPinNum 8 --reducedCapNum 3  
Tomcat RunningCase06_Mar222019
```

MAX_PIN_NUM STUDY

```
python GenSolEvalComp_Pipeline.py --benchNumber 5 --gridSize 16 --netNum  
30 --capacity 4 --maxPinNum 12 --reducedCapNum 3  
Tomcat RunningCase07_Mar222019
```

```
python GenSolEvalComp_Pipeline.py --benchNumber 5 --gridSize 16 --netNum  
30 --capacity 4 --maxPinNum 16 --reducedCapNum 3  
Tomcat RunningCase08_Mar222019
```

