LIRS Cache algorithm

Реализован Михаилом Баргатиным, Алпатовой Полиной, Толченицыной Елизаветой

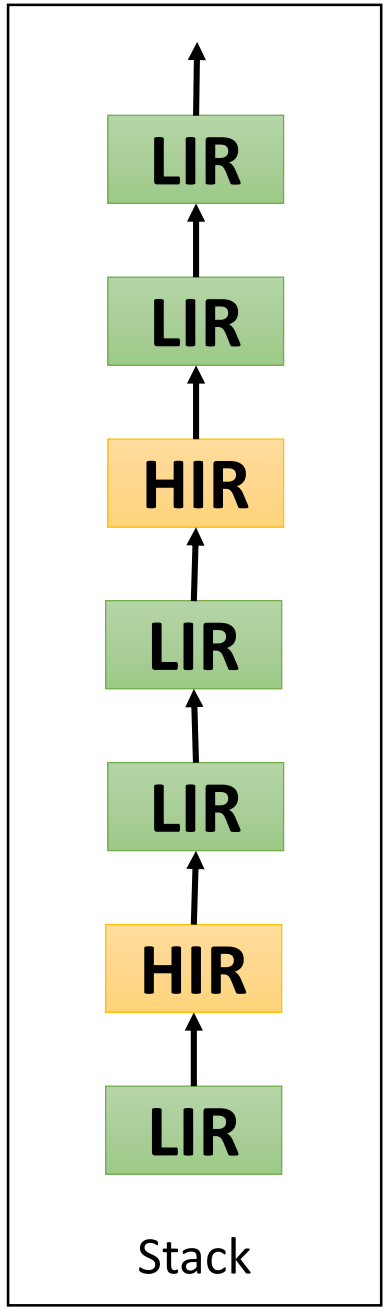
Concept

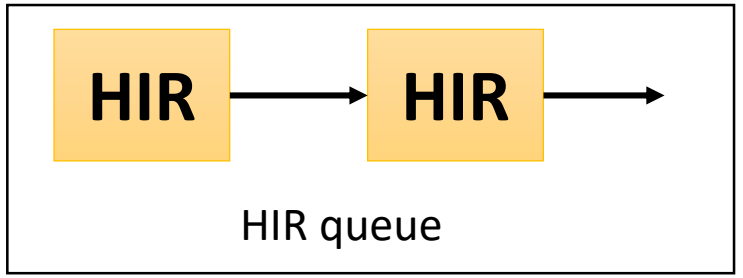
HIR - non-resident HIR blocks

HIR - resident HIR blocks

LIR - resident LIR blocks

LIR capacity = 99% of CacheSize

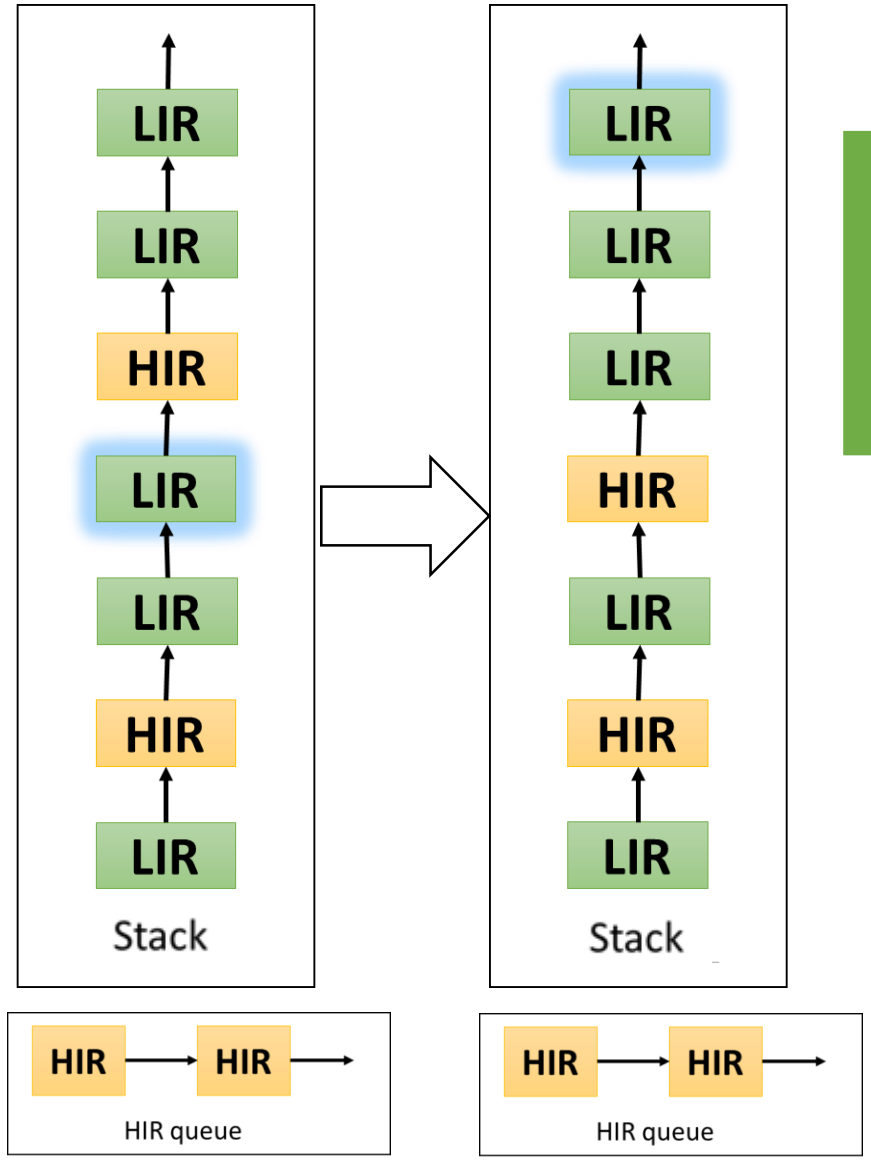




Cases of algorithm's behavior if new element is:

1. LIR block (always resident)
2. HIR block (resident)
   1) Block IS in Stack
   2) Block IS NOT in Stack, but IS in HIR queue
3. HIR block (non-resident)
   1) Not in Stack or hir queue (completely new)
   2) Block IS in Stack, but NOT in HIR queue

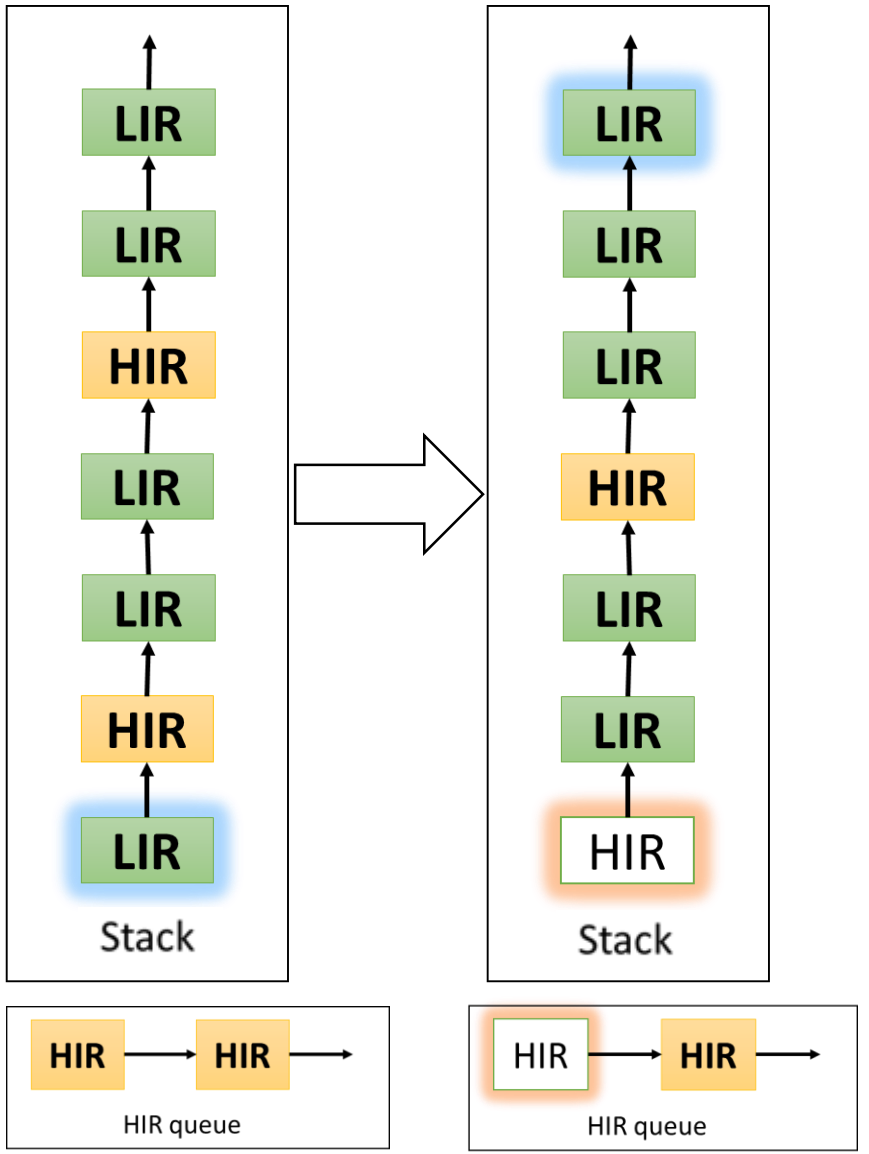
- MoveToFrontStack
- StackPrune



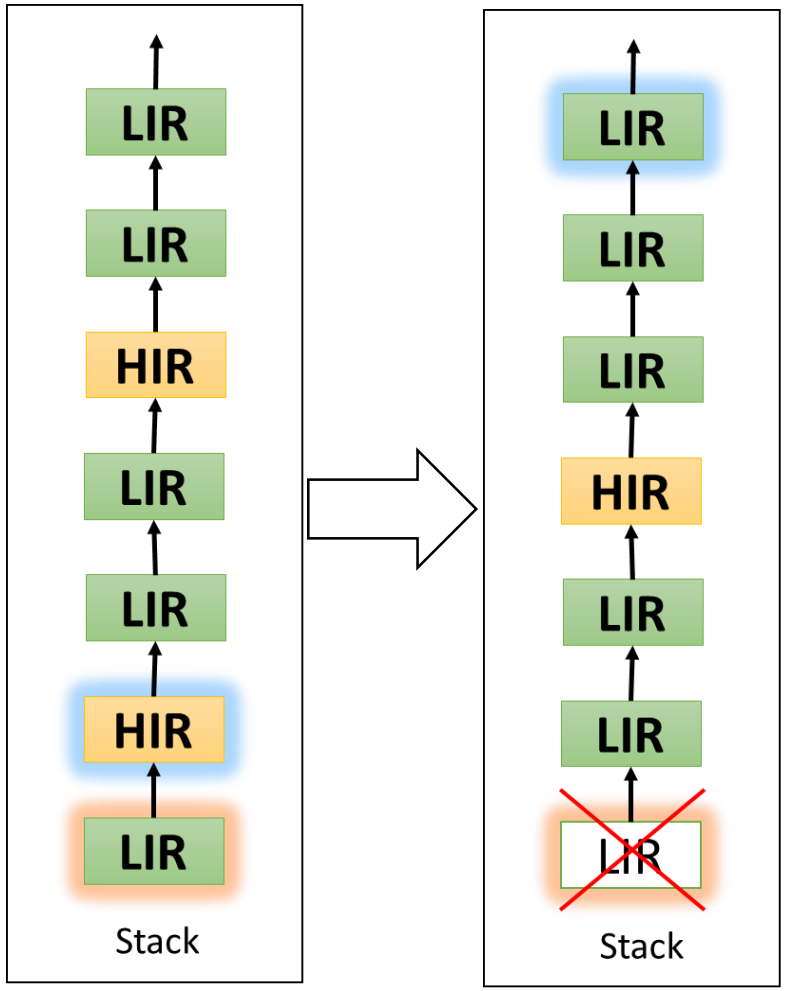
Found in Stack as LIR

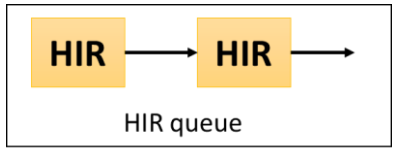
1 2

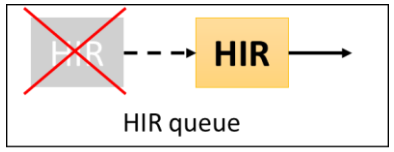
- MoveToFrontStack
- StackPrune



- MoveToFrontStack
- DeleteFromHIR
- StackPrune





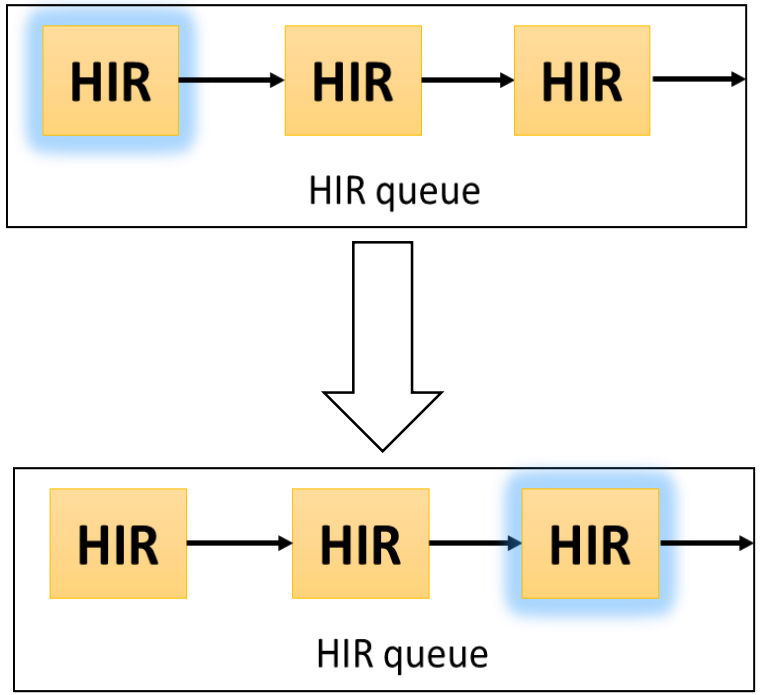


Found as HIR (Resident)

IS in Stack

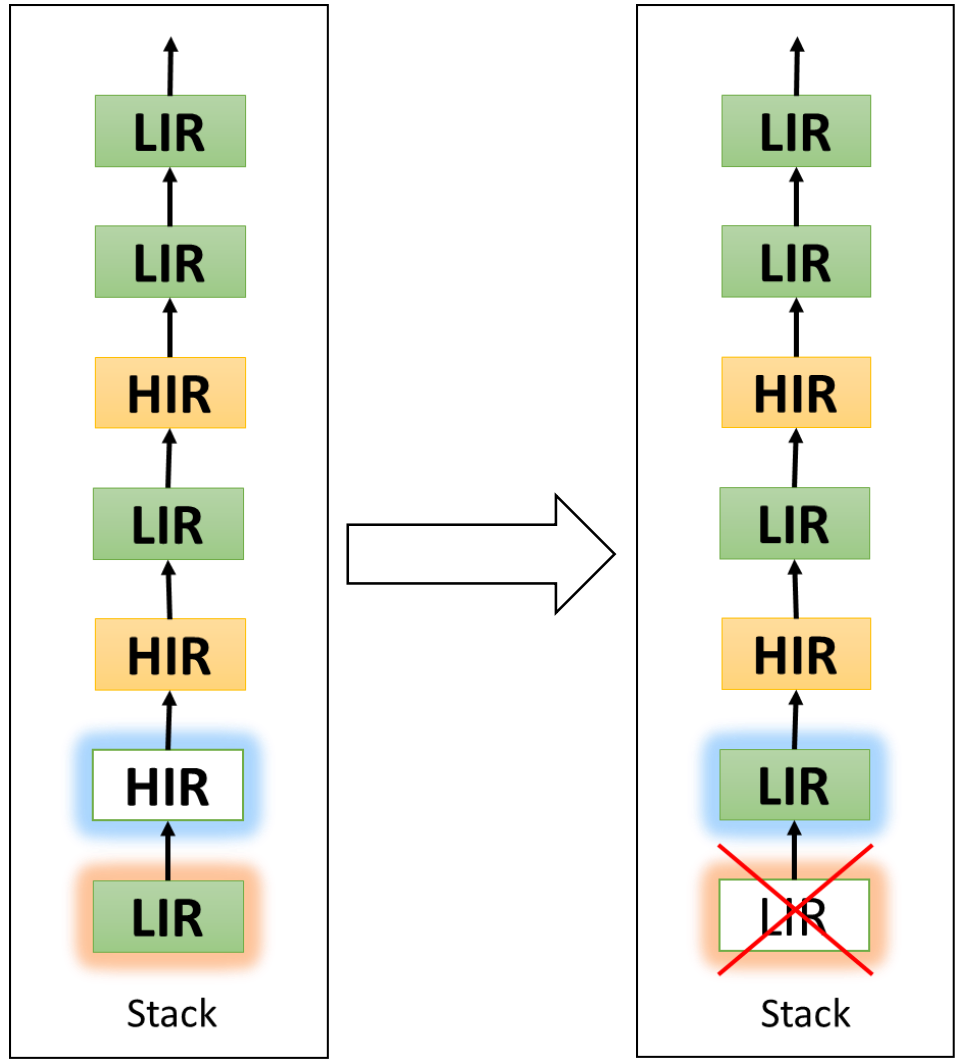
IS NOT in Stack

- MoveToFrontHIRQueue

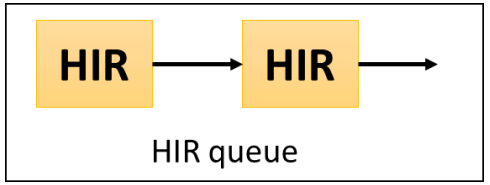


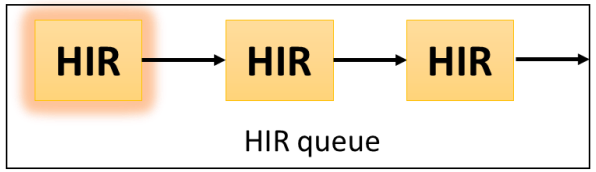
Found as HIR (Non-resident)

The element IS in Stack, but have been removed from HIR queue



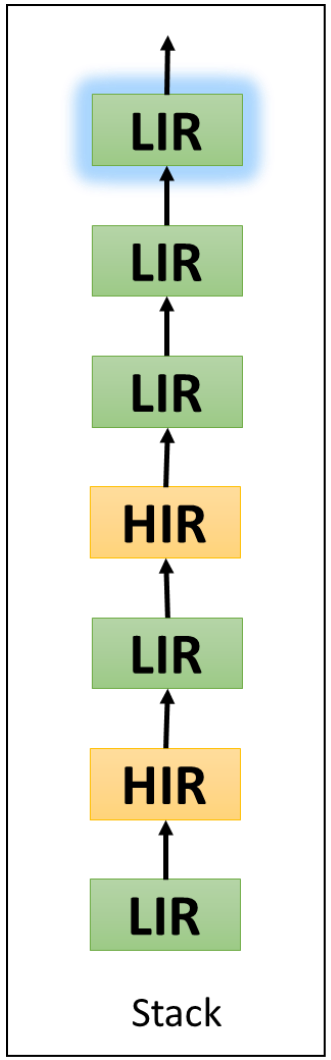
- ChangeStatus
- AddToHIRQueue
- StackPrune





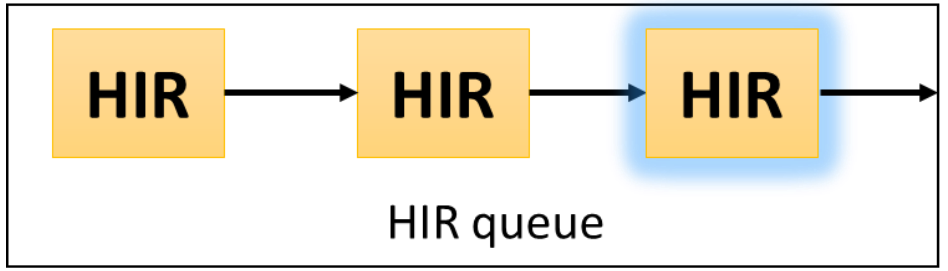
Completely new element

- AddToStackAsLIR

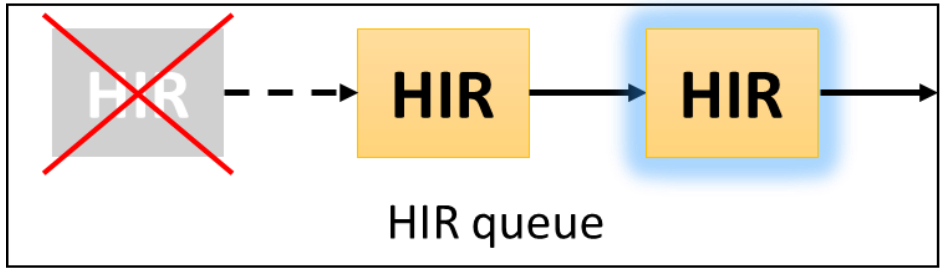


if not enough space in LIRs

- AddToHIRQueue

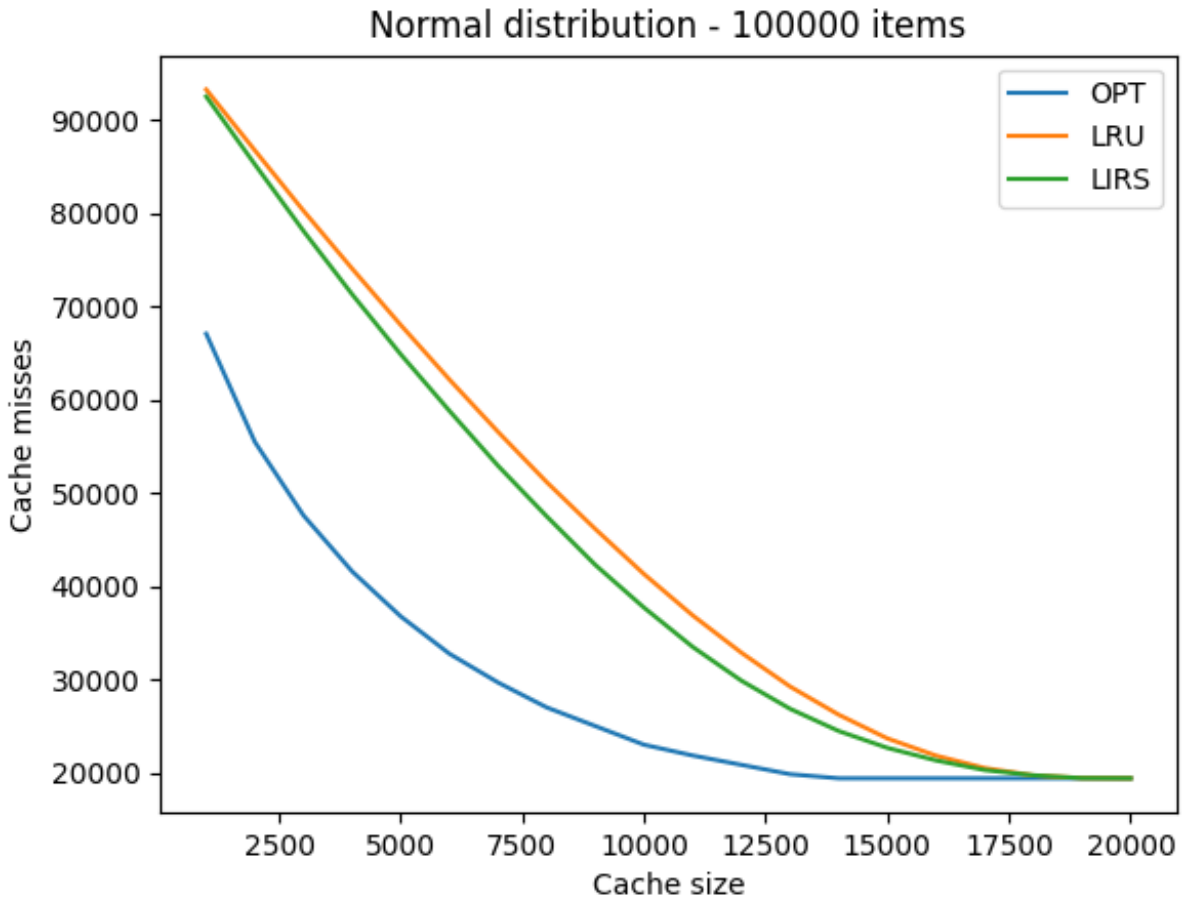


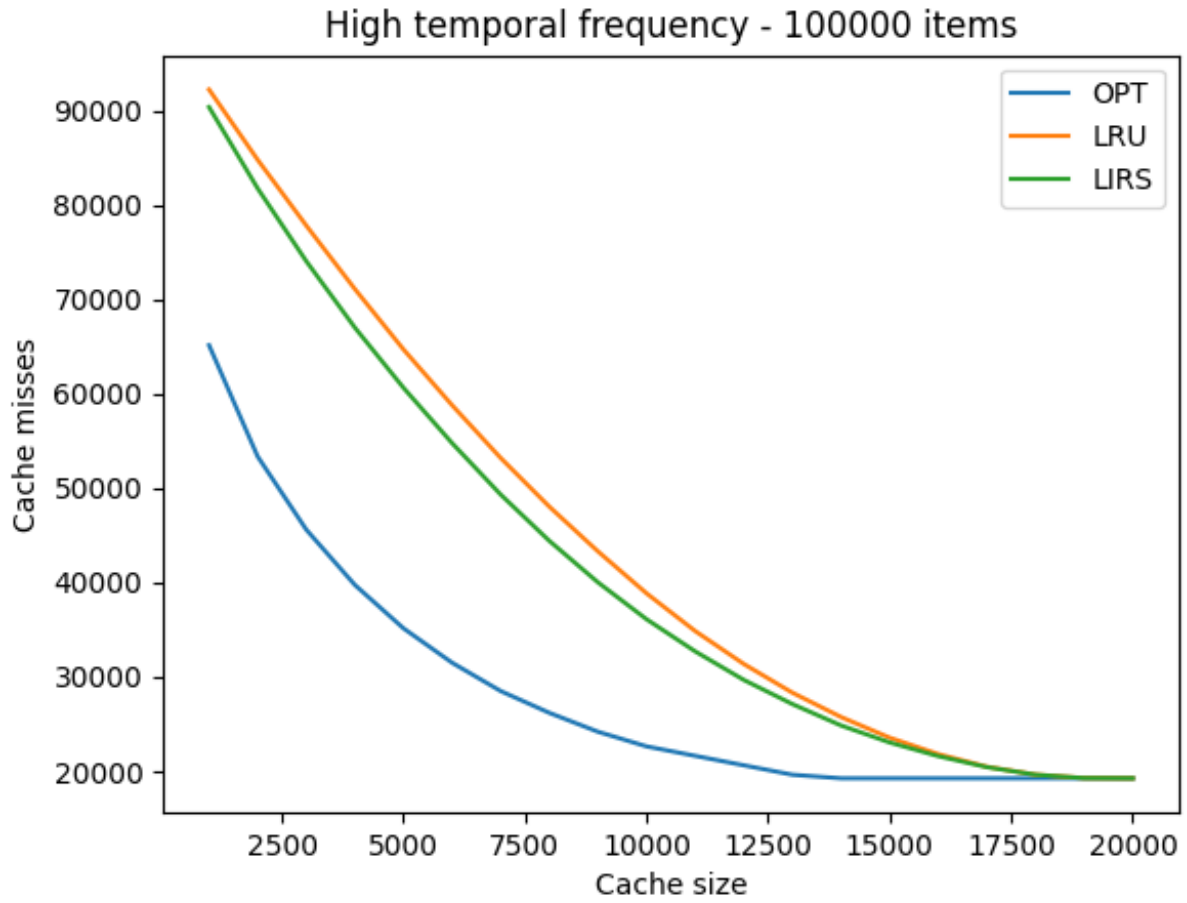
if not enough space in LIRs and HIRs



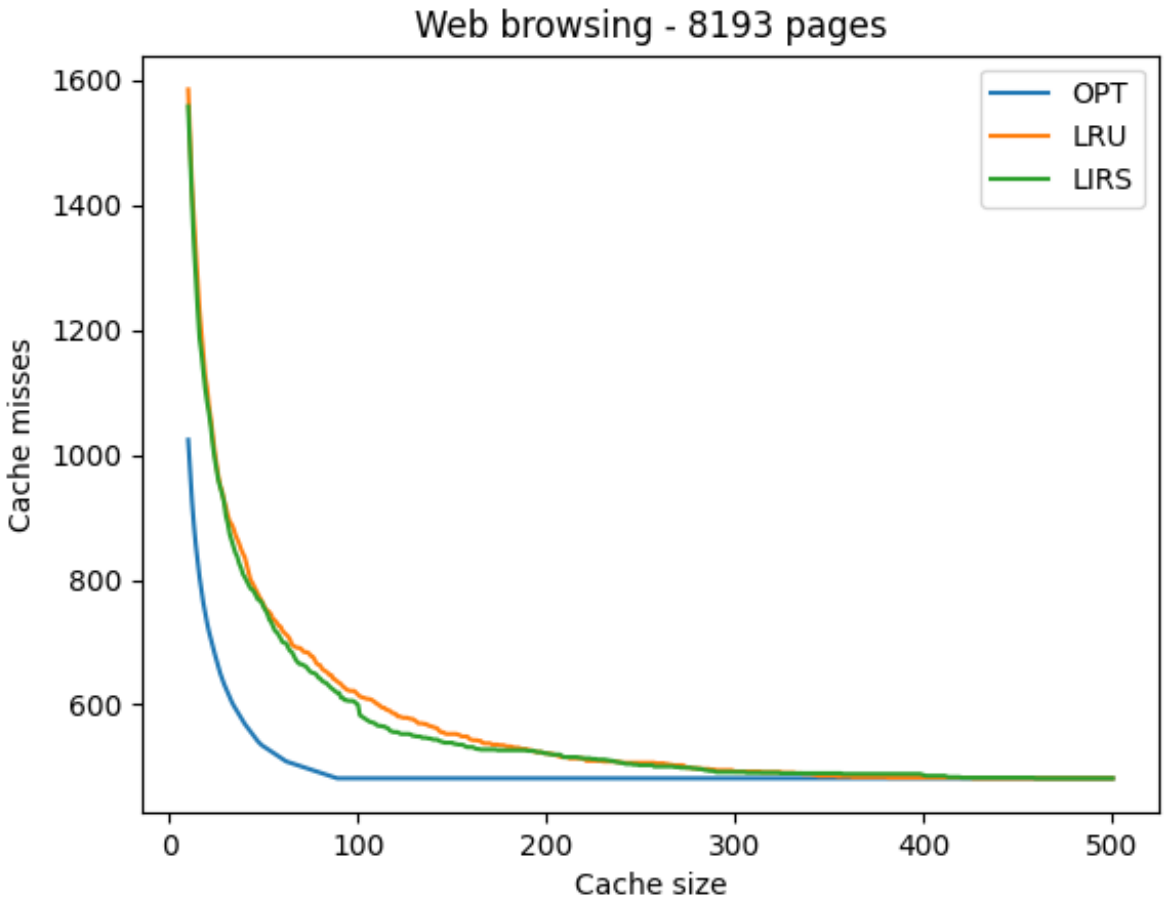
- PopHIRQueue
- AddToHIRQueue

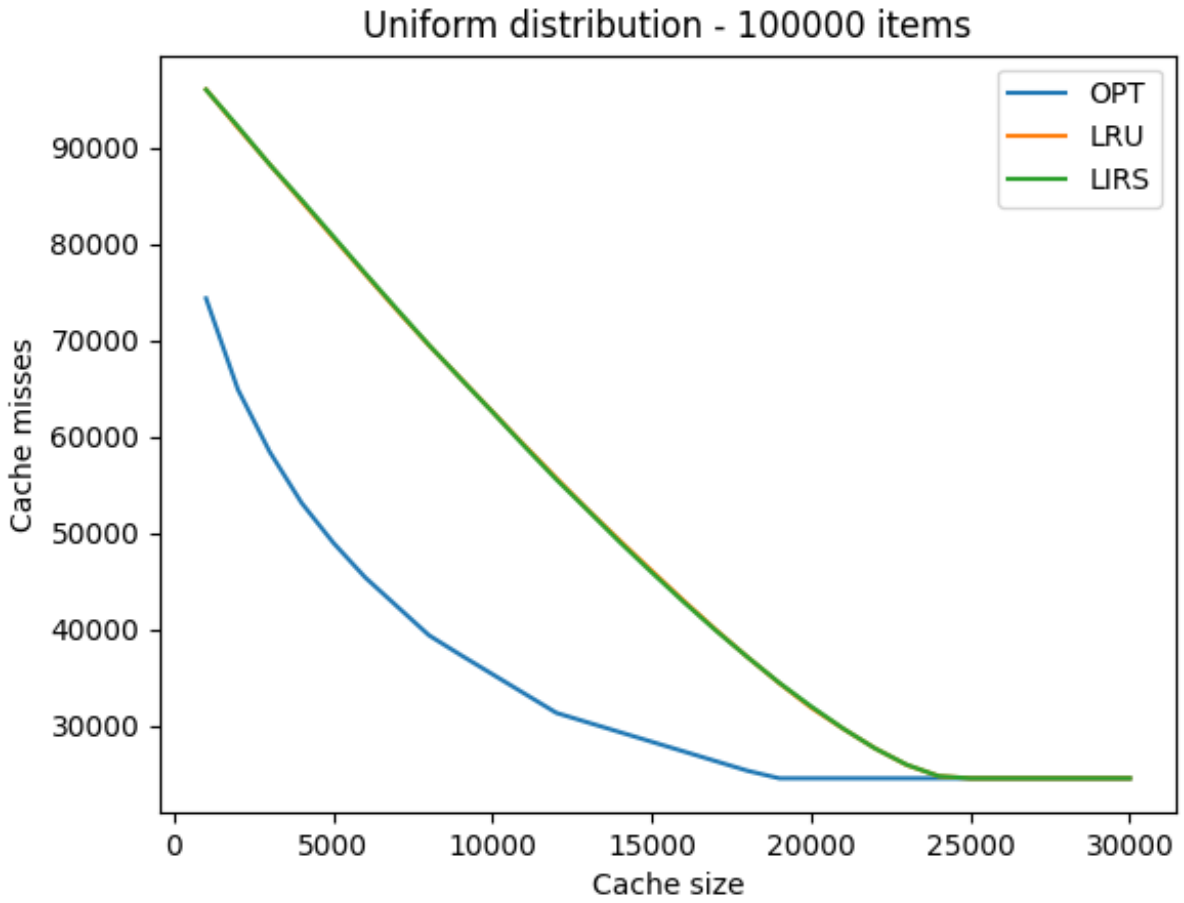
LIRS vs LRU


Normal distribution - 100000 items
OPT
LRU
LIRS
Cache misses
90000
80000
70000
60000
50000
40000
30000
20000
2500
5000
7500
10000
12500
15000
17500
20000
Cache size

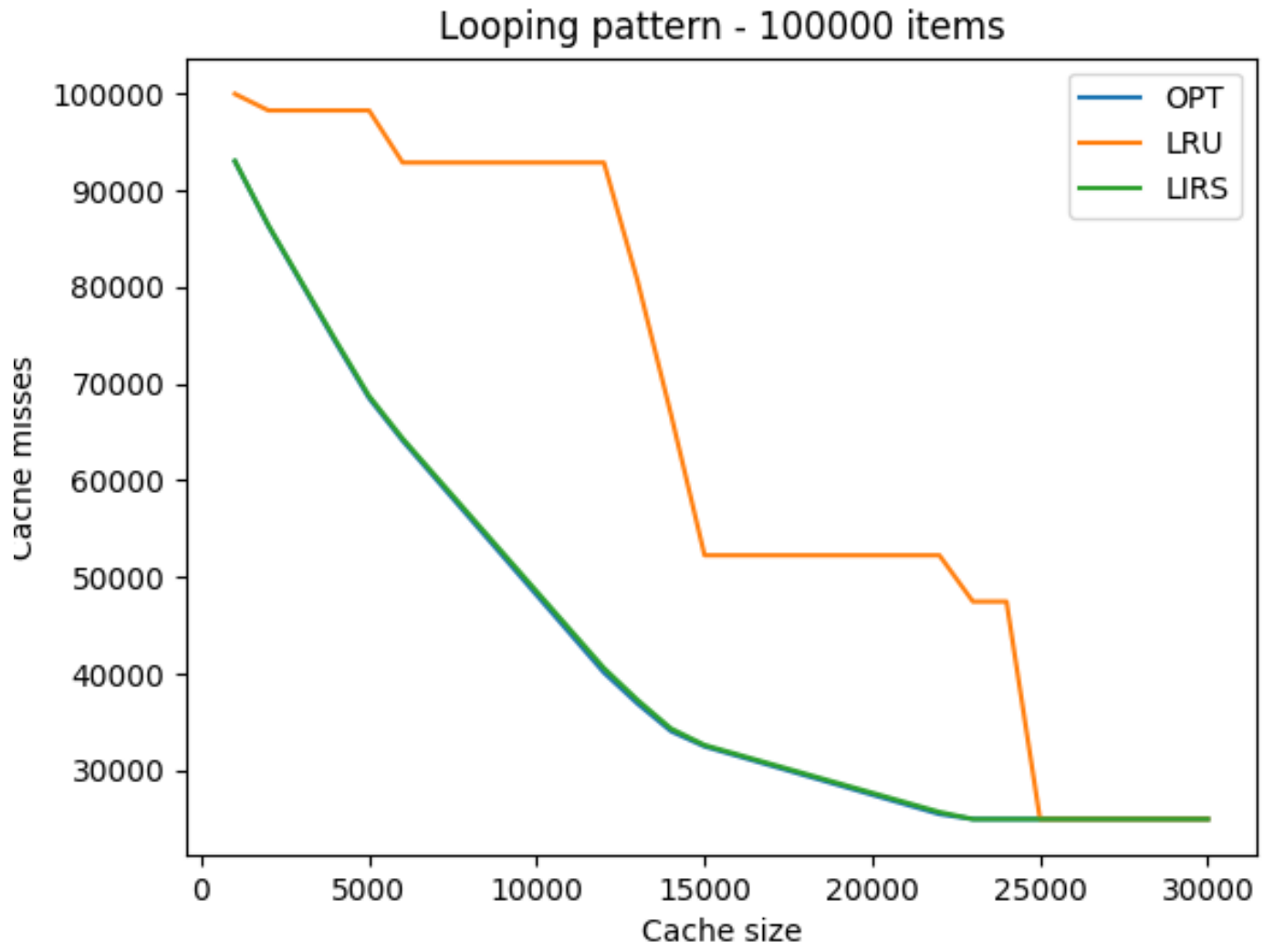

High temporal frequency - 100000 items
OPT
LRU
LIRS
Cache misses
90000
80000
70000
60000
50000
40000
30000
20000
2500
5000
7500
10000
12500
15000
17500
20000
Cache size

LIRS vs LRU


Web browsing - 8193 pages
OPT
LRU
LIRS
Cache misses
1600
1400
1200
1000
800
600
0
100
200
300
400
500
Cache size


Uniform distribution - 100000 items
OPT
LRU
LIRS
Cache misses
90000
80000
70000
60000
50000
40000
30000
0
5000
10000
15000
20000
25000
30000
Cache size

LIRS vs LRU


Looping pattern - 100000 items
OPT
LRU
LIRS
Cache misses
100000
90000
80000
70000
60000
50000
40000
30000
0
5000
10000
15000
20000
25000
30000
Cache size