CS6290 Project1 Report

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For gcc.trace:

For leela.trace:

For linpack.trace:

For matmul_naive.trace:

For matmul tiled.trace

For mcf.trace:

Appendix:

For gcc.trace:

First, I executed the configuration combination of (b1, s1, b2, s2, prefetch policy, replacement policy, and insertion policy) parameters for the gcc.trace.

```
1
    b values=(5 6 7)
    s_values=(0 0 0 0 1 1 1 1 2 2 2 2)
 2
   S values=(2 3 4 5 2 3 4 5 2 3 4 5)
    insert_policy=(mip lip)
 4
 5
    replacement_policy=(lru lfu)
    prefetch_mode=(0 1 2)
 6
 7
    trace files=("gcc.trace")
    trace path="./traces"
 8
    for b in "${b values[@]}"; do
9
10
        for i in {0..11}; do
            s=${s_values[i]}
11
            S=${S_values[i]}
12
            for trace in "${trace_files[@]}"; do
13
                for insert in "${insert_policy[@]}"; do
14
                     for r in "${replacement_policy[@]}"; do
15
16
                         for p in "${prefetch mode[@]}"; do
                             ./cachesim -c 15 -b "$b" -s "$s" -C 17 -S "$S" -P "$p" -I
17
    "$insert" -r "$r" -f "$trace_path/$trace"
                             echo "Ran: -c 15 -b $b -s $s -C 17 -S $S -P $p -I $insert -
18
    r $r -f $trace_path/$trace"
19
                             sleep 1
20
                         done
2.1
                     done
22
                done
23
            done
24
        done
25
    done
```

The table present the top 30 configurations with the lowest L1 AAT for the gcc trace.

+	+	+	+	+	+	+	+		++
C1	B1 +	S1	C2	B2 +	S2	Prefetch Policy	Replacement Policy	Insertion Policy	L1_AAT
15	I 7	2	17	I 7	I 4	+1 prefetcher	I LRU	LIP.	2.207
15	i 7	i 2	17	i 7	i 5	+1 prefetcher	LRU	LIP.	2.211
15	i 7	i 2	i 17	i 7	i 4	+1 prefetcher	LRU	MIP.	i 2.217 i
15	i 7	i 2	17	i 7	i 5	+1 prefetcher	LRU	MIP.	i 2.217 i
15	i 7	i 2	17	i 7	i 3	+1 prefetcher	LRU	LIP.	i 2.220 i
15	j 7	i 2	17	j 7	i 4	+1 prefetcher	LFU	MIP.	i 2.230 i
15	j 7	i 2	17	i 7	i 4	+1 prefetcher	LFU	LIP.	i 2.231 i
15	j 7	2	17	j 7	j 5	+1 prefetcher	LFU	MIP.	2.232
15	j 7	j 2	17	j 7	j 5	+1 prefetcher	LFU	LIP.	i 2.232 i
15	j 7	j 2	17	j 7	і з	+1 prefetcher	LRU	MIP.	i 2.233 i
j 15	j 7	j 2	j 17	j 7	j 3	+1 prefetcher	LFU	MIP.	i 2.241 i
15	j 7	j 2	j 17	j 7	j 3	+1 prefetcher	LFU	LIP.	2.242
15	j 7	j 2	j 17	j 7	j 5	Strided prefetcher	LRU	LIP.	2.251
15	j 7	j 2	j 17	j 7	j 4	Strided prefetcher	LRU	LIP.	2.252
15	j 7	j 2	j 17	j 7	j 2	+1 prefetcher	LRU	LIP.	2.256
15	j 7	į 2	17	j 7	į 2	+1 prefetcher	LFU	MIP.	2.265
15	j 7	j 2	j 17	j 7	j 2	+1 prefetcher	j LFU	LIP.	i 2.265 i
15	j 7	j 2	j 17	j 7	j 3	Strided prefetcher	LRU	LIP.	2.269 j
15	j 7	j 2	j 17	j 7	j 5	Strided prefetcher	LFU	LIP.	2.272
15	j 7	2	17	7	2	+1 prefetcher	LRU	MIP.	2.273
15	j 7	2	17	j 7	j 4	Strided prefetcher	LFU	LIP.	2.274
15	7	2	17	7	5	Prefetcher disabled.	LRU	Prefetcher disabled.	2.274
15	7	2	17	7	5	Strided prefetcher	LFU	MIP.	2.274
15	7	2	17	7	4	Prefetcher disabled.	LRU	Prefetcher disabled.	2.275
15	j 7	j 2	17	j 7	j 4	Strided prefetcher	LFU	MIP.	2.276
15	j 7	j 2	17	j 7	j 5	Strided prefetcher	LRU	MIP.	2.283
15	7	2	17	7	j 3	Prefetcher disabled.	LRU	Prefetcher disabled.	2.287
15	7	2	17	7	j 3	Strided prefetcher	LFU	LIP.	2.289
15	7	2	17	7	3	Strided prefetcher	LFU	MIP.	2.290
15	7	2	17	į 7	4	Strided prefetcher	LRU	MIP.	2.296
+	+	+	+	+	+	+	+		++

This result shows that, the B=7 always have better L1_AAT. And I set B to 7 and test more combination of S.

```
b values=(7)
   s_values=(3 3 3 3 4 4 4 4 5 5 5 5)
 2
   S_values=(3 4 5 6 4 5 6 7 5 6 7 8)
 3
   insert policy=(mip lip)
 5
   replacement_policy=(lru lfu)
   prefetch_mode=(0 1 2)
 6
 7
   trace_files=("gcc.trace")
   trace_path="./traces"
8
   for b in "${b values[@]}"; do
9
        for i in {0..11}; do
10
11
            s=${s_values[i]}
            S=${S values[i]}
12
            for trace in "${trace_files[@]}"; do
13
                for insert in "${insert_policy[@]}"; do
14
                    for r in "${replacement_policy[@]}"; do
15
                        for p in "${prefetch_mode[@]}"; do
16
17
                             ./cachesim -c 15 -b "$b" -s "$s" -C 17 -S "$S" -P "$p" -I
    "$insert" -r "$r" -f "$trace_path/$trace"
                            echo "Ran: -c 15 -b $b -s $s -C 17 -S $S -P $p -I $insert -
18
    r $r -f $trace path/$trace"
19
                            sleep 1
```

```
20 done
21 done
22 done
23 done
24 done
25 done
```

Also, I calculate the Meta_cost and show the Meta cost in the table.

The final result for gcc trace is this:

15			C2	B2	S2	Prefetch Policy	Replacement Policy	Insertion Policy	Meta_cost	L1_AAT
	7	4	17	 7	4	 +1 prefetcher	l LRU	LIP.	67328	 2.043
15 I	7	5	17	7	j 5	+1 prefetcher	LRU	LIP.	68608	2.044
15 j	7	5	17	7	j 6	+1 prefetcher	LRU	LIP.	69632	2.044
15 İ	7 i	4	17	7	j 5	+1 prefetcher	i LRU	LIP.	68352	2.046
15 j	7	5	17	7	j 8	+1 prefetcher	LRU	MIP.	71680	2.046
15 İ	7 i	3	17	7	i 4	+1 prefetcher	i LRU	LIP.	67072	2.047
15 j	7	5	17	7	j 7	+1 prefetcher	LRU	LIP.	70656	2.047
15 j	7 i	5	17	7	j 8	+1 prefetcher	LRU	LIP.	71680	2.048
15 İ	7 i	3	17	7	j 5	+1 prefetcher	i LRU	LIP.	68096	2.049
15 j	7	4	17	7	j 6	+1 prefetcher	LRU	LIP.	69376	2.049
15 j	7	5	17	7	j 5	+1 prefetcher	LRU	MIP.	68608	2.049
15 j	7	5	17	7	j 7	+1 prefetcher	LRU	MIP.	70656	2.049
15 j	7	5	17	7	j 6	+1 prefetcher	LRU	MIP.	69632	2.050
15 j	7	4	17	7	j 7	+1 prefetcher	LRU	LIP.	70400	2.051
15 j	7	3	17	7	j 6	+1 prefetcher	LRU	LIP.	69120	2.052
15 j	7	4	17	7	j 5	+1 prefetcher	LRU	MIP.	68352	2.052
15 j	7	4	17	7	j 6	+1 prefetcher	LRU	MIP.	69376	2.052
15 j	7	4	17	7	j 7	+1 prefetcher	LRU	MIP.	70400	2.052
15 j	7	4	17	7	j 4	+1 prefetcher	LRU	MIP.	67328	2.053
15 j	7	3	17	7	j 5	+1 prefetcher	LRU	MIP.	68096	2.056
15 j	7	3	17	7	6	+1 prefetcher	LRU	MIP.	69120	2.056
15 j	7	3	17	7	j 3	+1 prefetcher	LRU LRU	LIP.	66048	2.057
15 j	7	3	17	7	4	+1 prefetcher	LRU	MIP.	67072	2.058
15 j	7	3	17	7	j 3	+1 prefetcher	LRU	MIP.	66048	2.070
15 j	7	5	17	7	j 5	Strided prefetcher	LRU	LIP.	68608	2.084
15 j	7	5	17	7	j 6	Strided prefetcher	LRU	LIP.	69632	2.085
15 j	7	5	17	7	j 7	Strided prefetcher	LRU	LIP.	70656	2.086
15 j	7	5	17	7	j 8	Strided prefetcher	LRU	LIP.	71680	2.086
15 j	7	4	17	7	j 5	Strided prefetcher	LRU	LIP.	68352	2.087
15 j	7	4	17	7	j 4	Strided prefetcher	LRU	LIP.	67328	2.088

The selected configuration is as follows:

C 1	ı	B1	S1	C2	B2	S2	Prefetch Policy	Replacement Policy	Insertion Policy	Meta_cost	L1_AAT
15	5	7	4	17	7	4	+1 prefetcher	LRU	LIP.	67328	2.043

For leela.trace:

I run the combination of (b1,s1,b2,s2,prefetch_policy, Replacement_policy and insertion policy) for leela.trace:

```
b_values=(5 6 7)
s_values=(0 0 0 0 1 1 1 1 1 2 2 2 2 3 3 3 3 4 4 4 4 4 5 5 5 5)
s_values=(2 3 4 5 2 3 4 5 2 3 4 5 3 4 5 6 4 5 6 7 5 6 7 8)
insert_policy=(mip lip)
```

```
6
    replacement policy=(lru lfu)
 7
    prefetch_mode=(0 1 2)
8
   trace_files=("leela.trace")
    trace_path="./traces"
9
    for b in "${b_values[@]}"; do
10
        for i in \{0...11\}; do
11
12
            s=${s_values[i]}
            S=${S_values[i]}
13
            for trace in "${trace files[@]}"; do
14
                for insert in "${insert_policy[@]}"; do
15
                     for r in "${replacement_policy[@]}"; do
16
                         for p in "${prefetch_mode[@]}"; do
17
                             ./cachesim -c 15 -b "$b" -s "$s" -C 17 -S "$S" -P "$p" -I
18
    "$insert" -r "$r" -f "$trace_path/$trace"
19
                             echo "Ran: -c 15 -b $b -s $s -C 17 -S $S -P $p -I $insert -
    r $r -f $trace_path/$trace"
20
                             sleep 1
21
                         done
22
                     done
23
                done
24
            done
25
        done
    done
26
27
```

The table present the top 30 configurations with the lowest L1 AAT for Leela trace.

C1					:					
+	B1	S1	C2	B2 	S2 	Prefetch Policy	Replacement Policy	Insertion Policy	Meta_cost 	L1_AAT
15	7	2	17	7	2	+1 prefetcher	LRU	MIP.	64768	1.952
15	7	2	17	7	2	+1 prefetcher	LFU	MIP.	64768	1.952
15	7	2	17	7	2	+1 prefetcher	LRU	LIP.	64768	1.952
15	7	2	17	7	2	+1 prefetcher	LFU	LIP.	64768	1.952
15	7	2	17	7	3	+1 prefetcher	LRU	MIP.	65792	1.952
15	7	2	17	7	3	+1 prefetcher	LFU	MIP.	65792	1.952
15 j	7	2	17	7	j 3	+1 prefetcher	LRU	LIP.	65792	1.952
15	7	2	17	7	j 3	+1 prefetcher	LFU	LIP.	65792	1.952
15	7	2	17	7	4	+1 prefetcher	LRU	MIP.	66816	1.952
15	7	2	17	7	4	+1 prefetcher	LFU	MIP.	66816	1.952
15	7	2	17	7	j 4	+1 prefetcher	LRU	LIP.	66816	1.952
15	7	2	17	7	4	+1 prefetcher	LFU	LIP.	66816	1.952
15	7	2	17	7	5	+1 prefetcher	LRU	MIP.	67840	1.952
15	7	2	17	7	5	+1 prefetcher	LFU	MIP.	67840	1.952
15	7	2	17	7	5	+1 prefetcher	LRU	LIP.	67840	1.952
15	7	2	17	7	5	+1 prefetcher	LFU	LIP.	67840	1.952
15	7	2	17	7	2	Strided prefetcher	LRU	MIP.	64768	1.961
15	7	2	17	7	2	Strided prefetcher	LFU	MIP.	64768	1.961
15	7	2	17	7	2	Strided prefetcher	LRU	LIP.	64768	1.961
15	7	2	17	7	2	Strided prefetcher	LFU	LIP.	64768	1.961
15	7	2	17	7	3	Strided prefetcher	LRU	MIP.	65792	1.961
15	7	2	17	7	3	Strided prefetcher	LFU	MIP.	65792	1.961
15	7	2	17	7	3	Strided prefetcher	LRU	LIP.	65792	1.961
15	7	2	17	7	j 3	Strided prefetcher	LFU	LIP.	65792	1.961
15	7	2	17	7	j 4	Strided prefetcher	LRU	MIP.	66816	1.961
15	7	2	17	7	j 4	Strided prefetcher	LFU	MIP.	66816	1.961
15	7	2	17	7	j 4	Strided prefetcher	LRU	LIP.	66816	1.961
15	7	2	17	7	j 4	Strided prefetcher	LFU	LIP.	66816	1.961
15	7	2	17	7	j 5	Strided prefetcher	LRU	MIP.	67840	1.961
15 j	7 j	2	17	7	5	Strided prefetcher	LFU	MIP.	67840	1.961

The selected configuration is as follows:

C1	B1	S1	C2	B2	S2	Prefetch Policy	Replacement Policy	Insertion Policy	Meta_cost	L1_AAT
15	7	2	17	7	2	+1 prefetcher	LRU	MIP	64768	1.952

For linpack.trace:

I run the combination of (b1,s1,b2,s2,prefetch_policy, Replacement_policy and insertion policy) for linpack.trace:

```
b_values=(5 6 7)
 2
    s_values=(0 0 0 0 1 1 1 1 2 2 2 2 3 3 3 3 4 4 4 4 5 5 5 5)
 3
   S values=(2 3 4 5 2 3 4 5 2 3 4 5 3 4 5 6 4 5 6 7 5 6 7 8)
 4
5
   insert_policy=(mip lip)
 6
   replacement policy=(lru lfu)
 7
    prefetch_mode=(0 1 2)
    trace files=("linpack.trace")
8
9
    trace_path="./traces"
    for b in "${b_values[@]}"; do
10
        for i in {0..11}; do
11
            s=${s_values[i]}
12
13
            S=${S_values[i]}
            for trace in "${trace_files[@]}"; do
14
                for insert in "${insert_policy[@]}"; do
15
                     for r in "${replacement policy[@]}"; do
16
                         for p in "${prefetch mode[@]}"; do
17
18
                             ./cachesim -c 15 -b "$b" -s "$s" -C 17 -S "$S" -P "$p" -I
    "$insert" -r "$r" -f "$trace path/$trace"
19
                             echo "Ran: -c 15 -b $b -s $s -C 17 -S $S -P $p -I $insert -
    r $r -f $trace_path/$trace"
2.0
                             sleep 1
21
                         done
22
                     done
2.3
                done
24
            done
25
        done
26
    done
27
```

I prioritized L1 Average Access Time (AAT) in analysis, sorting the results in ascending order.

The table present the top 30 configurations with the lowest L1 AAT for linpack trace.

+	+					·		+		++
C1	B1	S1	C2	B2	S2	Prefetch Policy	Replace Policy	Insertion Policy	Meta_cost	L1_AAT
1 15	l 6	2	17	6	3	Prefetcher disabled.	LRU	 Prefetcher disabled.	131584	10.971
j 15	i 6 i	2	17	6	4	Prefetcher disabled.	LRU	Prefetcher disabled.	133632	i 10.971 i
i 15	i 6 i	2	17	6	5	Prefetcher disabled.	LRU	Prefetcher disabled.	135680	i 10.971 i
j 15	i 6	2	17	6	3	Prefetcher disabled.	LFU	Prefetcher disabled.	131584	10.979
j 15	i 6 i	2	17	6	4	Prefetcher disabled.	LFU	Prefetcher disabled.	133632	10.979
j 15	i 6 i	2	17	6	5	Prefetcher disabled.	LFU	Prefetcher disabled.	135680	10.979
j 15	j 6	2	17	6	2	Prefetcher disabled.	LRU	Prefetcher disabled.	129536	10.996
j 15	j 6	2	17	6	2	Prefetcher disabled.	LFU	Prefetcher disabled.	129536	11.005
j 15	j 6 i	1	17	6	3	Prefetcher disabled.	LRU	Prefetcher disabled.	131072	11.121
j 15	j 6 i	1	17	6	3	Prefetcher disabled.	LFU	Prefetcher disabled.	131072	11.121
j 15	j 6 i	1	17	6	4	Prefetcher disabled.	LRU	Prefetcher disabled.	133120	11.121
j 15	j 6	1	17	6	4	Prefetcher disabled.	LFU	Prefetcher disabled.	133120	11.121
15	j 6	1	17	6	5	Prefetcher disabled.	LRU	Prefetcher disabled.	135168	11.121
j 15	j 6 i	1	17	6	5	Prefetcher disabled.	LFU	Prefetcher disabled.	135168	11.121
j 15	j 6 i	1	17	6	2	Prefetcher disabled.	LRU	Prefetcher disabled.	129024	11.146
j 15	j 6	1	17	6	2	Prefetcher disabled.	LFU	Prefetcher disabled.	129024	11.146
j 15	j 6	0	17	6	3	Prefetcher disabled.	LRU	Prefetcher disabled.	130560	11.405
15	j 6	0	17	6	4	Prefetcher disabled.	LRU	Prefetcher disabled.	132608	11.405
15	j 6	0	17	6	5	Prefetcher disabled.	LRU	Prefetcher disabled.	134656	11.405
15	j 6	0	17	6	2	Prefetcher disabled.	LRU	Prefetcher disabled.	128512	11.437
15	5	2	17	5	3	+1 prefetcher	LRU	MIP.	263168	11.694
15	5	2	17	5	3	+1 prefetcher	LFU	MIP.	263168	11.694
15	j 5	2	17	5	3	+1 prefetcher	LRU	LIP.	263168	11.694
15	j 5 i	2	17	5	3	+1 prefetcher	LFU	LIP.	263168	11.694
15	j 5	2	17	5	4	+1 prefetcher	LRU	MIP.	267264	11.694
j 15	j 5 i	2	17	5	4	+1 prefetcher	LFU	MIP.	267264	11.694
j 15	j 5 i	2	17	5	4	+1 prefetcher	LRU	LIP.	267264	11.694
15	j 5 i	2	17	5	4	+1 prefetcher	LFU	LIP.	267264	11.694
15	j 5 i	2	17	5	5	+1 prefetcher	LRU	MIP.	271360	11.694
15	j 5 j	2	17	5	5	+1 prefetcher	LFU	MIP.	271360	11.694
+	+							+		++

The selected configuration is as follows:

C1	B1	S1	C2	B2	S2	Prefetch Policy	Replacement Policy	Insertion Policy	Meta_cost	L1_AAT
15	6	2	17	6	3	Prefetcher disabled	LRU	Prefetcher disabled	131584	10.971

For matmul_naive.trace:

I run the combination of (b1,s1,b2,s2,prefetch_policy, Replacement_policy and insertion policy) for matmul_naive.trace:

```
b_values=(5 6 7)
   s_values=(0 0 0 0 1 1 1 1 1 2 2 2 2 3 3 3 3 4 4 4 4 5 5 5 5)
 2
 3
   S_values=(2 3 4 5 2 3 4 5 2 3 4 5 3 4 5 6 4 5 6 7 5 6 7 8)
 4
 5
   insert_policy=(mip lip)
 6
   replacement_policy=(lru lfu)
7
    prefetch_mode=(0 1 2)
   trace_files=("matmul_naive.trace")
8
9
   trace_path="./traces"
   for b in "${b_values[@]}"; do
10
11
        for i in {0..11}; do
12
            s=${s_values[i]}
13
            S=${S_values[i]}
14
            for trace in "${trace_files[@]}"; do
15
                for insert in "${insert_policy[@]}"; do
                    for r in "${replacement_policy[@]}"; do
16
```

```
17
                         for p in "${prefetch_mode[@]}"; do
18
                             ./cachesim -c 15 -b "$b" -s "$s" -C 17 -S "$S" -P "$p" -I
    "$insert" -r "$r" -f "$trace path/$trace"
                             echo "Ran: -c 15 -b $b -s $s -C 17 -S $S -P $p -I $insert -
19
    r $r -f $trace_path/$trace"
20
                             sleep 1
21
                         done
2.2
                     done
23
                 done
            done
24
25
        done
26
    done
27
```

The table present the top 30 configurations with the lowest L1 AAT for matmul_naive trace.

+ C1	+ B1	 S1	C2	 B2	+ S2	+ Prefetch Policy	Replace Policy	 Insertion Policy	 Meta_cost	+ L1_AAT
15	 7	2	17	 7	3	 +1 prefetcher	LFU	MIP.	65792	 3.894
j 15	j 7	i 2	17	7	і з	+1 prefetcher	LFU	LIP.	65792	3.894
j 15	j 7	i 2	17	7	j 5	+1 prefetcher	LFU	LIP.	67840	3.900
j 15	j 7	i 2	17	7	j 5	+1 prefetcher	LFU	MIP.	67840	3.901
15	j 7	j 2	17	7	j 4	+1 prefetcher	LFU	MIP.	66816	3.904
15	j 7	j 2	17	7	j 4	+1 prefetcher	LFU	LIP.	66816	3.905
15	j 7	j 2	17	7	ј 3	Strided prefetcher	LFU	LIP.	65792	3.929
15	j 7	2	17	7	j 3	Strided prefetcher	LFU	MIP.	65792	3.933
15	j 7	2	17	7	j 5	Strided prefetcher	LFU	LIP.	67840	3.934
15	j 7	2	17	7	j 5	Strided prefetcher	LFU	MIP.	67840	3.935
15	7	2	17	7	4	Strided prefetcher	LFU	LIP.	66816	3.940
15	7	2	17	7	4	Strided prefetcher	LFU	MIP.	66816	3.942
15	7	2	17	7	2	+1 prefetcher	LFU	MIP.	64768	3.982
15	7	2	17	7	2	+1 prefetcher	LFU	LIP.	64768	3.983
15	7	2	17	7	3	Prefetcher disabled.	LFU	Prefetcher disabled.	65792	3.999
15	7	2	17	7	5	Prefetcher disabled.	LFU	Prefetcher disabled.	67840	4.004
15	7	2	17	7	4	Prefetcher disabled.	LFU	Prefetcher disabled.	66816	4.009
15	7	2	17	7	2	Strided prefetcher	LFU	LIP.	64768	4.018
15	7	2	17	7	2	Strided prefetcher	LFU	MIP.	64768	4.019
15	7	2	17	7	3	+1 prefetcher	LRU	MIP.	65792	4.075
15	7	2	17	7	4	+1 prefetcher	LRU	MIP.	66816	4.075
15	7	2	17	7	5	+1 prefetcher	LRU	MIP.	67840	4.075
15	7	2	17	7	3	+1 prefetcher	LRU	LIP.	65792	4.079
15	7	2	17	7	4	+1 prefetcher	LRU	LIP.	66816	4.080
15	7	2	17	7	5	+1 prefetcher	LRU	LIP.	67840	4.082
15	7	2	17	7	2	Prefetcher disabled.	LFU	Prefetcher disabled.	64768	4.089
15	7	2	17	7	3	Strided prefetcher	LRU	MIP.	65792	4.113
15	7	2	17	7	4	Strided prefetcher	LRU	MIP.	66816	4.113
15	7	2	17	7	5	Strided prefetcher	LRU	MIP.	67840	4.113
15	7	2	17	7	3	Strided prefetcher	LRU	LIP.	65792	4.114
T							r	r 	r -	r- -

The selected configuration is as follows:

C1	B1	S1	C2	B2	S2	Prefetch Policy	Replacement Policy	Insertion Policy	Meta_cost	L1_AAT
15	7	2	17	7	3	+1 prefetcher	LFU	MIP	65792	3.894

For matmul_tiled.trace

I run the combination of (b1,s1,b2,s2,prefetch_policy, Replacement_policy and insertion policy) for matmul_tiled.trace:

```
b_values=(5 6 7)
 1
 2
    s values=(0 0 0 0 1 1 1 1 2 2 2 2 3 3 3 3 4 4 4 4 5 5 5 5)
 3
    S_values=(2 3 4 5 2 3 4 5 2 3 4 5 3 4 5 6 4 5 6 7 5 6 7 8)
 4
 5
    insert policy=(mip lip)
    replacement_policy=(lru lfu)
 6
 7
    prefetch_mode=(0 1 2)
    trace_files=("matmul_tiled.trace")
 8
 9
    trace_path="./traces"
    for b in "${b_values[@]}"; do
10
        for i in {0..11}; do
11
            s=${s values[i]}
12
            S=${S values[i]}
13
14
            for trace in "${trace_files[@]}"; do
                for insert in "${insert_policy[@]}"; do
15
                     for r in "${replacement_policy[@]}"; do
16
17
                         for p in "${prefetch_mode[@]}"; do
                             ./cachesim -c 15 -b "$b" -s "$s" -C 17 -S "$S" -P "$p" -I
18
    "$insert" -r "$r" -f "$trace_path/$trace"
19
                             echo "Ran: -c 15 -b $b -s $s -C 17 -S $S -P $p -I $insert -
    r $r -f $trace_path/$trace"
20
                             sleep 1
21
                         done
22
                     done
2.3
                done
24
            done
25
        done
26
    done
27
```

The table present the top 30 configurations with the lowest L1 AAT for matmul_tiled trace.

+			+	 -	+		+	+	+	++
C1	B1	S1	C2	B2	S2	Prefetch Policy	Replace Policy	Insertion Policy	Meta_cost	L1_AAT
15	7	2	17	. – – – · I 7	3	+1 prefetcher	l LRU	MIP.	l 65792	l 2.059
15	7	2	17	7	i 4	+1 prefetcher	LRU	MIP.	66816	2.059
15	7	2	17	7	j 5	+1 prefetcher	LRU	İ MIP.	i 67840	i 2.059 i
15	7	2	17	7	2	+1 prefetcher	LRU	MIP.	64768	2.060 i
j 15	7	2	17	7	j 5	+1 prefetcher	LRU	LIP.	67840	i 2.061 i
j 15	7	2	17	7	j 3	+1 prefetcher	LRU	LIP.	65792	i 2.062 i
15	7	2	17	7	j 4	+1 prefetcher	LRU	LIP.	66816	j 2.062 j
15	7	2	17	7	j 2	+1 prefetcher	LRU	LIP.	64768	2.063
15	7	2	17	7	j 4	+1 prefetcher	LFU	MIP.	66816	2.067
15	7	2	17	7	5	+1 prefetcher	LFU	MIP.	67840	2.067
15	7	2	17	7	5	+1 prefetcher	LFU	LIP.	67840	2.067
15	7	2	17	7	j 4	+1 prefetcher	LFU	LIP.	66816	2.068
15	7	2	17	7	j 3	+1 prefetcher	LFU	MIP.	65792	2.070
15	7	2	17	7	3	+1 prefetcher	LFU	LIP.	65792	2.070
15	7	2	17	7	2	+1 prefetcher	LFU	MIP.	64768	2.072
15	7	2	17	7	2	+1 prefetcher	LFU	LIP.	64768	2.073
15	7	2	17	7	5	Strided prefetcher	LRU	MIP.	67840	2.089
15	7	2	17	7	3	Strided prefetcher	LRU	MIP.	65792	2.090
15	7	2	17	7	3	Strided prefetcher	LRU	LIP.	65792	2.090
15	7	2	17	7	4	Strided prefetcher	LRU	MIP.	66816	2.090
15	7	2	17	7	4	Strided prefetcher	LRU	LIP.	66816	2.090
15	7	2	17	7	5	Strided prefetcher	LRU	LIP.	67840	2.090
15	7	2	17	7	2	Strided prefetcher	LRU	LIP.	64768	2.091
15	7	2	17	7	2	Strided prefetcher	LRU	MIP.	64768	2.093
15	7	2	17	7	4	Strided prefetcher	LFU LFU	MIP.	66816	2.096
15	7	2	17	7	4	Strided prefetcher	LFU LFU	LIP.	66816	2.096
15	7	2	17	7	5	Strided prefetcher	LFU	MIP.	67840	2.096
15	7	2	17	7	5	Strided prefetcher	LFU LFU	LIP.	67840	2.096
15	7	2	17	7	3	Strided prefetcher	LFU	MIP.	65792	2.098
15	7	2	17	7	3	Strided prefetcher	LFU	LIP.	65792	2.098
+			+	+	+		+	+	+	++

The selected configuration is as follows:

C1	B1	S1	C2	B2	S2	Prefetch Policy	Replacement Policy	Insertion Policy	Meta_cost	L1_AAT
15	7	2	17	7	3	+1 prefetcher	LRU	MIP	65792	2.059

For mcf.trace:

I run the combination of (b1,s1,b2,s2,prefetch_policy, Replacement_policy and insertion policy) for mcf trace:

```
1
   b_values=(5 6 7)
   s values=(0 0 0 0 1 1 1 1 2 2 2 2 3 3 3 3 4 4 4 4 5 5 5 5)
   S_values=(2 3 4 5 2 3 4 5 2 3 4 5 3 4 5 6 4 5 6 7 5 6 7 8)
 3
 4
 5
   insert_policy=(mip lip)
   replacement_policy=(lru lfu)
 6
 7
   prefetch mode=(0 1 2)
   trace_files=("mcf.trace")
8
   trace_path="./traces"
9
   for b in "${b_values[@]}"; do
10
        for i in {0..11}; do
11
            s=${s_values[i]}
12
            S=${S_values[i]}
13
            for trace in "${trace_files[@]}"; do
14
                for insert in "${insert policy[@]}"; do
15
```

```
for r in "${replacement_policy[@]}"; do
16
17
                        for p in "${prefetch_mode[@]}"; do
                             ./cachesim -c 15 -b "$b" -s "$s" -C 17 -S "$S" -P "$p" -I
18
    "$insert" -r "$r" -f "$trace_path/$trace"
19
                            echo "Ran: -c 15 -b $b -s $s -C 17 -S $S -P $p -I $insert -
    r $r -f $trace_path/$trace"
20
                             sleep 1
                        done
21
22
                    done
23
                done
24
            done
25
        done
26
   done
27
```

The table present the top 30 configurations with the lowest L1 AAT for mcf trace.

15			C2	B2	S2	Prefetch Policy	Replace Policy	Insertion Policy	Meta_cost	L1_AAT
	7	2	17	 7	l 5	+1 prefetcher	LRU	MIP.	 l 67840	2.070
15	7	2	17	7	i 4	+1 prefetcher	LRU	MIP.	66816	i 2.071 i
15 İ	7 i	2	17	7	і з	+1 prefetcher	LRU	MIP.	65792	i 2.072 i
15 İ	7	2	17	7	i 2	+1 prefetcher	LRU	MIP.	64768	2.075
15 İ	7 i	2	17	7	і з	+1 prefetcher	LRU	LIP.	65792	i 2.077 i
15 İ	7 i	2	17	7	i 4	+1 prefetcher	LRU	LIP.	66816	i 2.080 i
15 İ	7	2	17	7	і з	+1 prefetcher	LFU	MIP.	65792	i 2.081 i
15 İ	7	2	17	7	i 5	+1 prefetcher	LRU	LIP.	67840	i 2.081 i
15 j	7	2	17	7	і з	+1 prefetcher	LFU	LIP.	65792	i 2.082 i
15 j	7 i	2	17	7	i 4	+1 prefetcher	LFU	MIP.	66816	i 2.082 i
15 j	7 i	2	17	7	j 5	+1 prefetcher	LFU	MIP.	67840	i 2.083 i
15 j	7	2	17	7	j 2	+1 prefetcher	LRU	LIP.	64768	j 2.084 j
15 j	7	2	17	7	j 5	+1 prefetcher	LFU	LIP.	67840	j 2.084 j
15 j	7	2	17	7	j 4	+1 prefetcher	LFU	LIP.	66816	j 2.085 j
15 j	7	2	17	7	j 2	+1 prefetcher	LFU	MIP.	64768	j 2.096 j
15 j	7	2	17	7	j 2	+1 prefetcher	LFU	LIP.	64768	j 2.098 j
15 j	7	2	17	7	5	Strided prefetcher	LRU	MIP.	67840	2.104
15 j	7	2	17	7	3	Strided prefetcher	LRU	LIP.	65792	2.105
15 j	7	2	17	7	4	Strided prefetcher	LRU	MIP.	66816	2.105
15	7	2	17	7	4	Strided prefetcher	LRU	LIP.	66816	2.105
15 j	7	2	17	7	5	Strided prefetcher	LRU	LIP.	67840	2.105
15 j	7	2	17	7	3	Strided prefetcher	LRU	MIP.	65792	2.106
15 j	7	2	17	7	4	Strided prefetcher	LFU	MIP.	66816	2.107
15 j	7	2	17	7	5	Strided prefetcher	LFU	MIP.	67840	2.107
15 j	7	2	17	7	2	Strided prefetcher	LRU	LIP.	64768	2.108
15 j	7	2	17	7	4	Strided prefetcher	LFU	LIP.	66816	2.108
15 j	7	2	17	7	j 5	Strided prefetcher	LFU	LIP.	67840	j 2.108 j
15 j	7	2	17	7	2	Strided prefetcher	LRU	MIP.	64768	2.109
15 j	7	2	17	7	j 3	Strided prefetcher	LFU	MIP.	65792	2.109
15	7	2	17	7	3	Strided prefetcher	LFU	LIP.	65792	2.109

The selected configuration is as follows:

C1	B1	S1	C2	B2	S2	Prefetch Policy	Replacement Policy	Insertion Policy	Meta_cost	L1_AAT
15	7	2	17	7	5	+1 prefetcher	LRU	MIP	67840	2.070

Appendix:

The python code to analysis the output file and generate table:

```
def parse_cache_settings(file_path):
 1
 2
        with open(file_path, 'r') as file:
 3
            lines = file.readlines()
 4
        return [1.rstrip("\n") for 1 in lines if len(1) >= 5]
 5
 6
    def parse string(data str):
7
        parsed_values = {
            'c1': None,
8
9
            'b1': None,
            's1': None,
10
11
            'c2': None,
            'b2': None,
12
            's2': None,
13
14
            'prefetch': None,
15
            'rp': None,
            'IP': None,
16
17
        }
        sections = data_str.split('. ')
18
19
        11_values = sections[0].split('(')[1].split(')')[0].split(',')
2.0
        parsed_values['c1'] = int(l1_values[0])
21
        parsed values['b1'] = int(l1 values[1])
22
        parsed_values['s1'] = int(l1_values[2])
23
        parsed_values['rp'] = sections[1].split('.')[0]
24
        12 values = sections[3].split('(')[1].split(')')[0].split(',')
25
        parsed_values['c2'] = int(12_values[0])
26
        parsed_values['b2'] = int(12_values[1])
27
        parsed values['s2'] = int(12 values[2])
28
29
        prefetch value = sections[5]
30
        parsed_values['prefetch'] = sections[5]
31
32
        parsed values['IP'] = sections[-1]
33
        return parsed values
34
35
    def compute meta data(c1,b1,s1,c2,b2,s2):
36
        meta1 = 2**(c1-b1)*(64-(c1-s1)+2)
37
        meta2 = 2**(c2-b2)*(64-(c2-s2)+1)
38
        return meta1 + meta2
39
40
41
    from prettytable import PrettyTable
42
    file dict = {}
43
44
   file_path = './pb_out/traces/mcf.trace.txt'
    file_list = parse_cache_settings(file_path)
45
    for i in range(0, len(file_list), 2):
46
        num_l = file_list[i+1].split()[0]
47
```

```
48
        file dict[file list[i]] = num l
49
50
    data list = []
    for line in file_dict.keys():
51
52
        line_dict = parse_string(line)
53
        parsed_data = [l for l in line_dict.values()]
54
        parsed_data.append(compute_meta_data(line_dict['c1'],line_dict['b1'],
    line_dict['s1'] \
    ,line dict['c2'],line dict['b2'],line dict['s2']))
55
        parsed_data.append(file_dict[line])
        data_list.append(parsed_data)
56
57
58
    table = PrettyTable()
59
60
    sorted_data_lists_by_last_element = sorted(data_list, key=lambda x: x[-1])
61
    column names = [f"Column {i+1}" for i in range(len(data list[0]))]
62
    column_names = ["C1","B1", "S1","C2","B2","S2","Prefetch Policy","Replace
63
    Policy","Insertion Policy","Meta_cost","L1_AAT"]
    table.field_names = column_names
64
65
    for one line in sorted data lists by last element[:30]:
66
        table.add row(one line)
67
68
69
   print(table)
```

The shell script to generate out for every trace:

```
for script in valid_grad_*.sh; do
    ./"$script" &
    done

wait
```