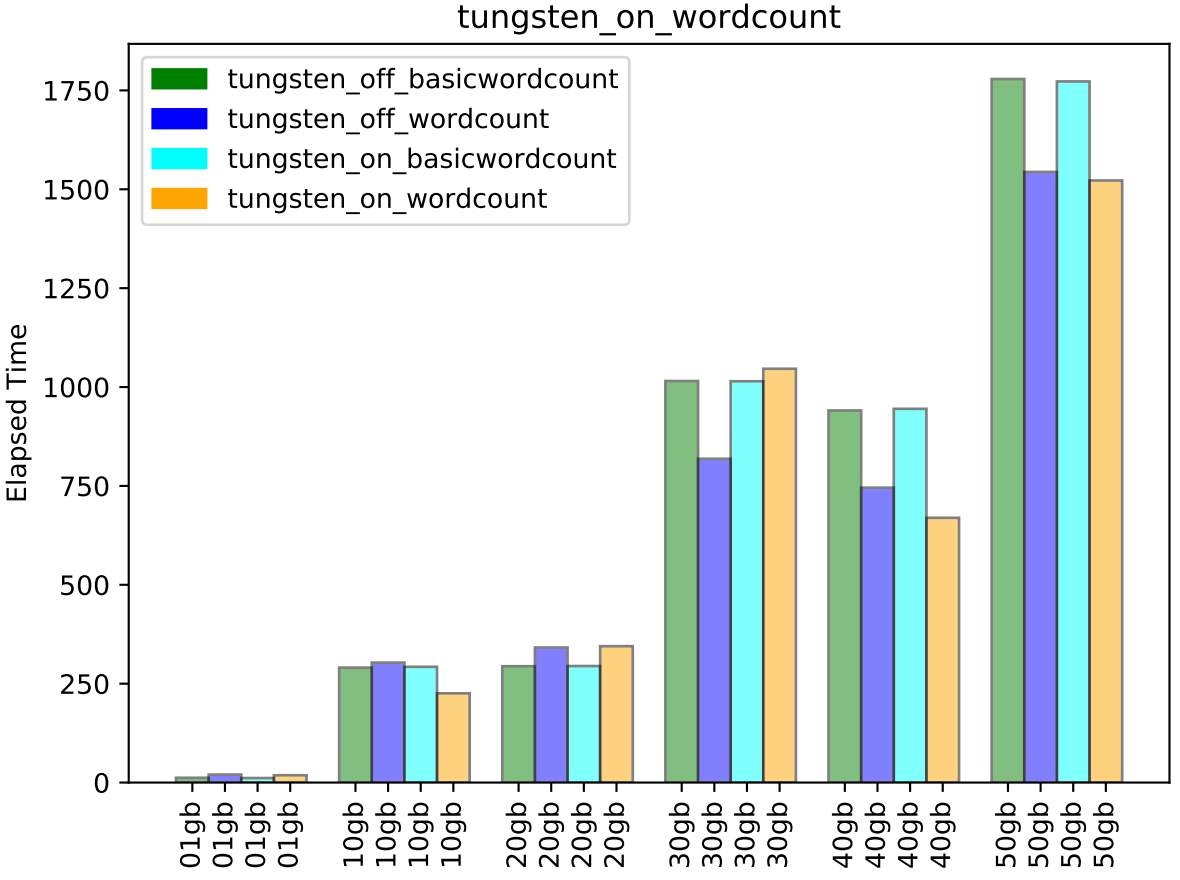
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Elapsed Time
0
250
500
750
1000
1250
1500
1750
01gb
01gb
01gb
01gb
10gb
10gb
10gb
10gb
20gb
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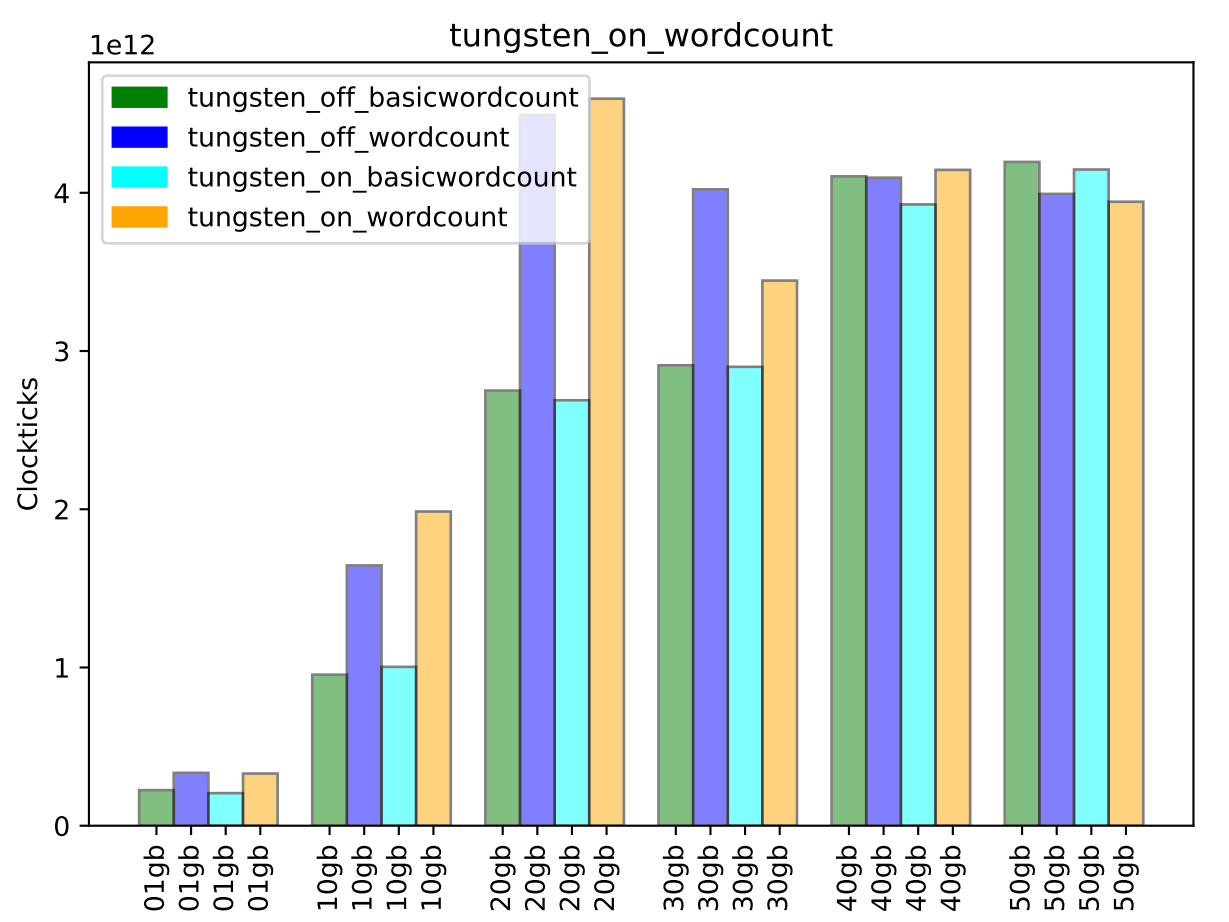
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Clockticks
0
1
2
3
4
01gb
01gb
01gb
01gb
10gb
10gb
10gb
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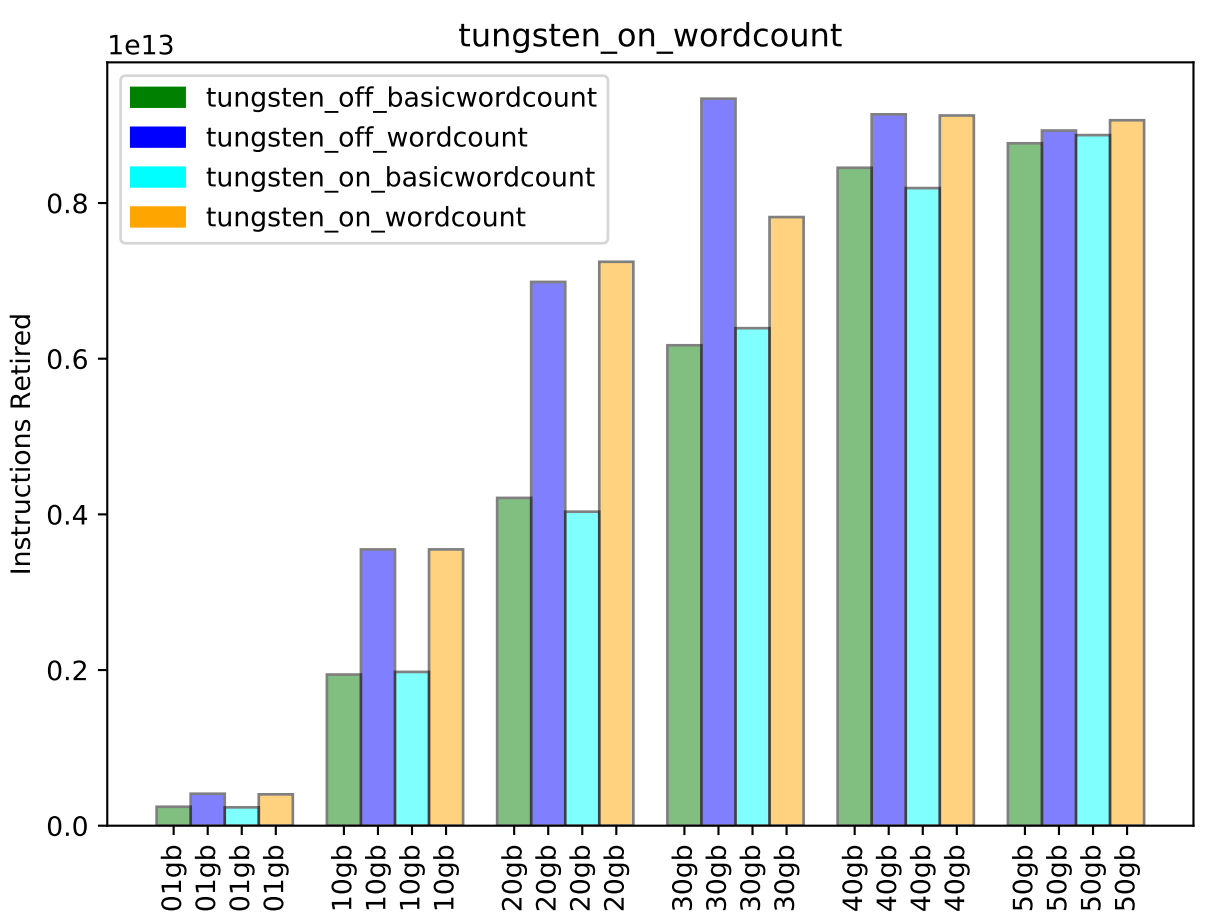
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0.0
0.2
0.4
0.6
0.8
01gb
01gb
01gb
01gb
10gb
10gb
10gb
10gb
20gb
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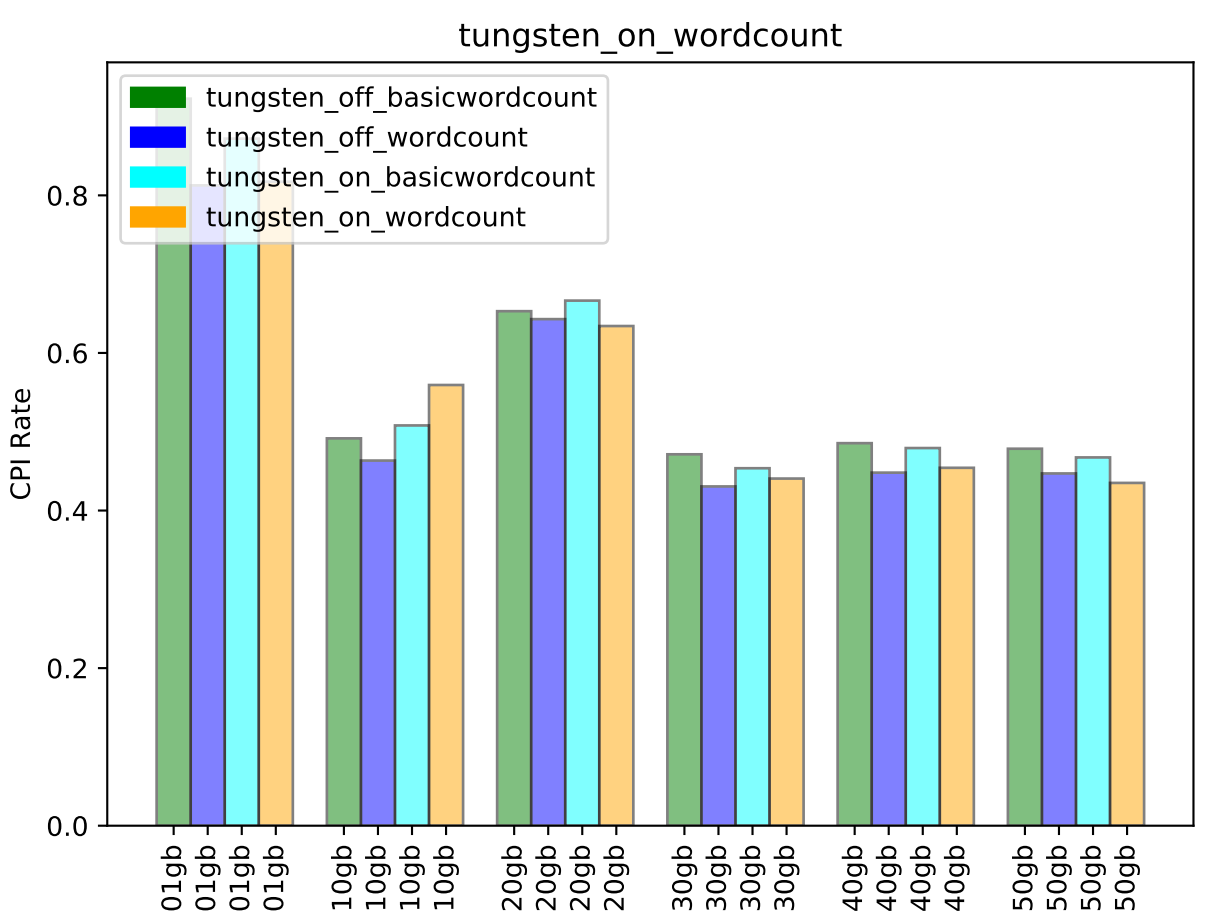
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CPI Rate
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0.2
0.4
0.6
0.8
01gb
01gb
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01gb
10gb
10gb
10gb
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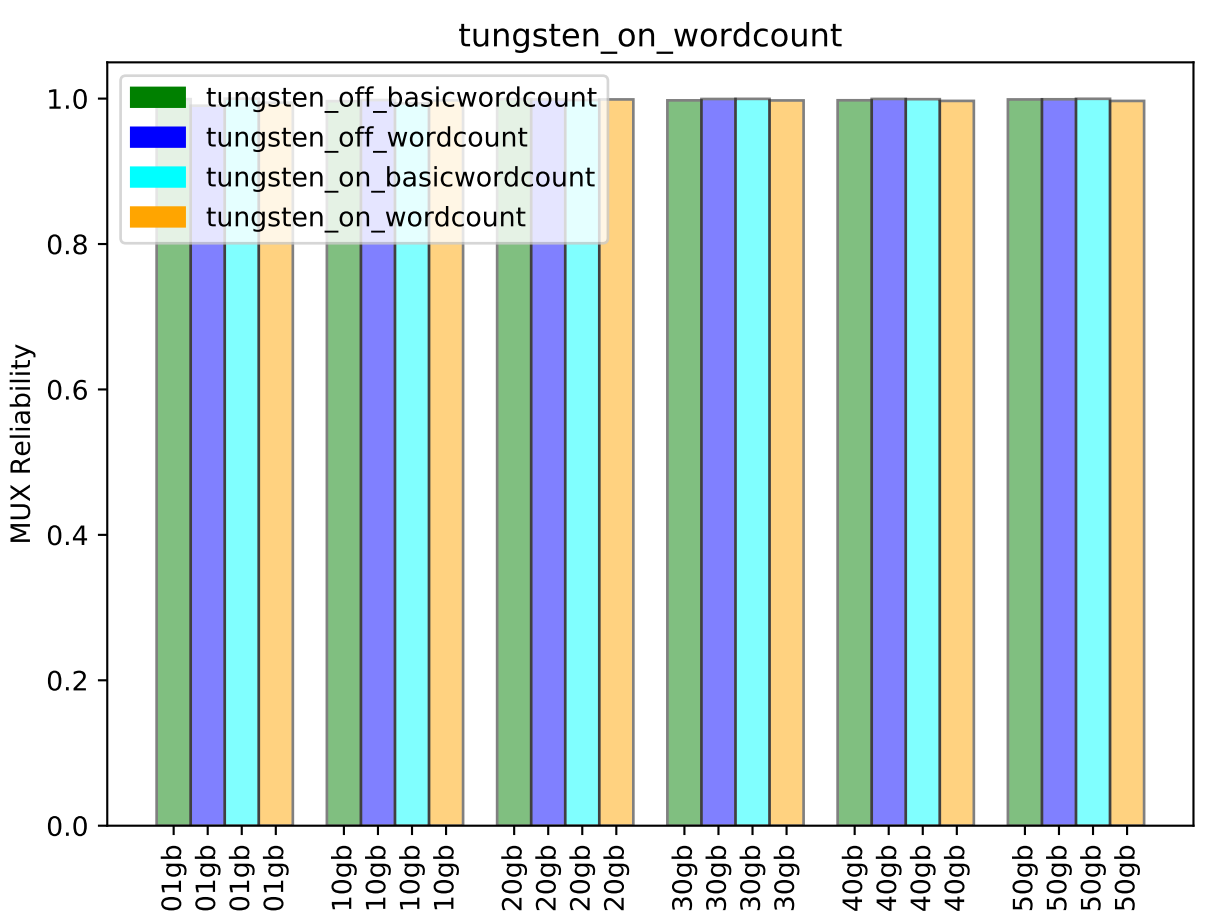
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0.2
0.4
0.6
0.8
1.0
01gb
01gb
01gb
01gb
10gb
10gb
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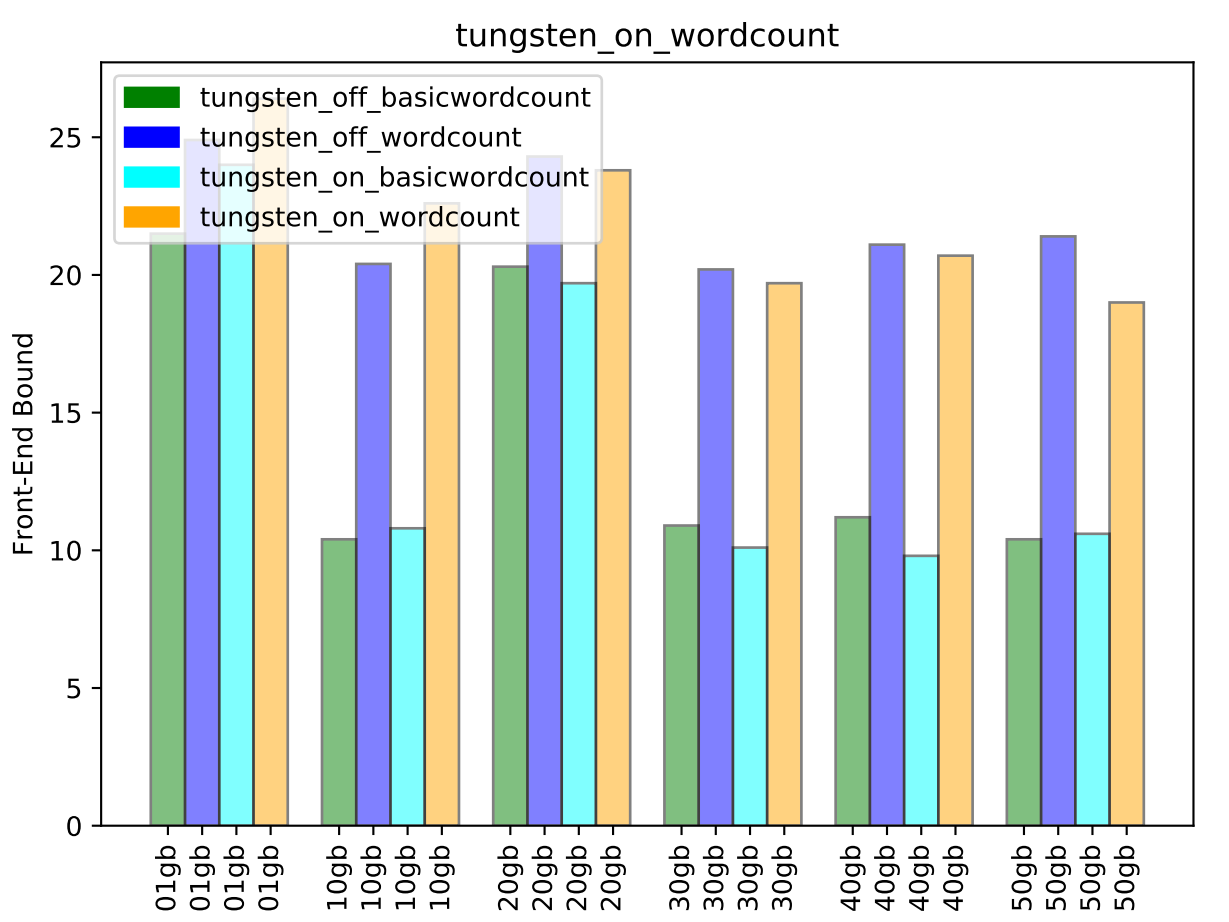
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5
10
15
20
25
01gb
01gb
01gb
01gb
10gb
10gb
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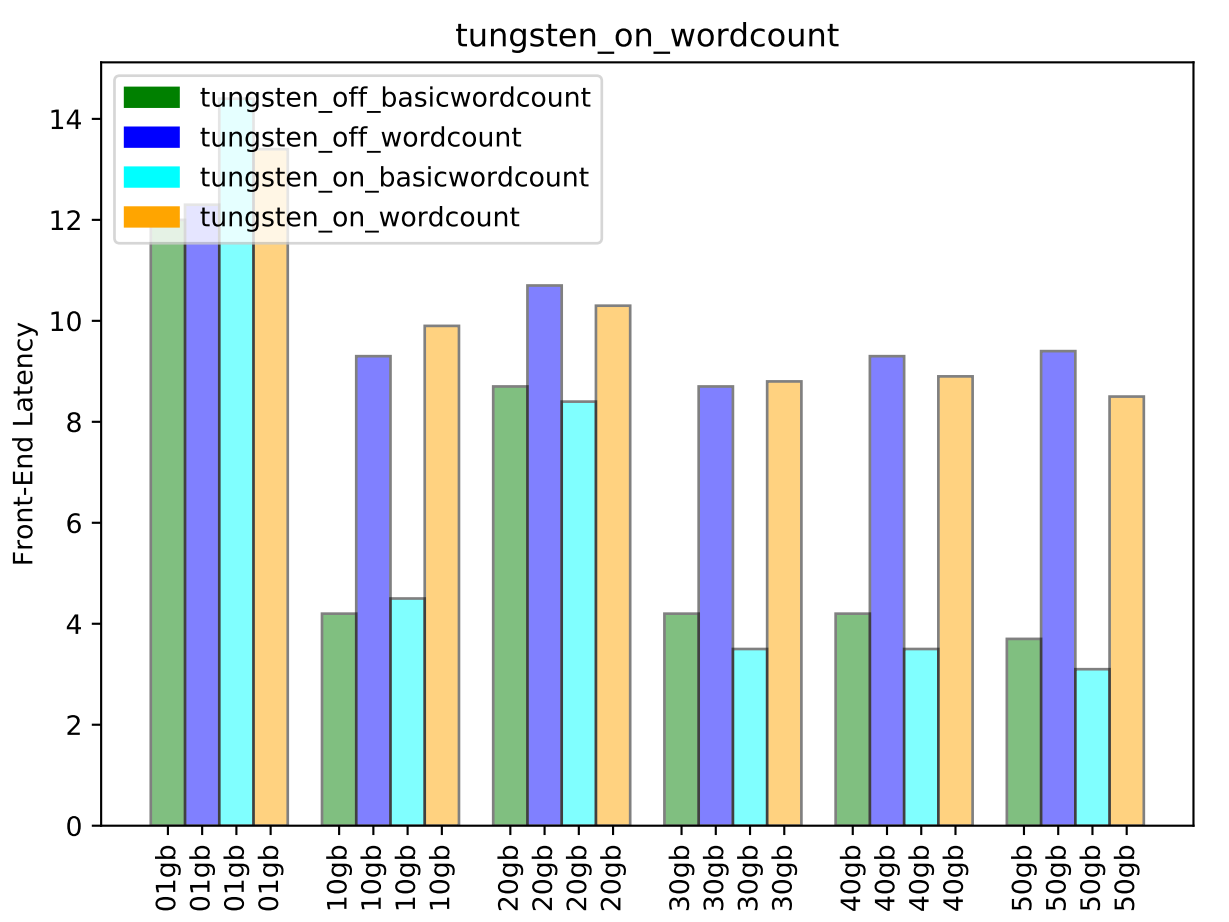
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Front-End Latency
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6
8
10
12
14
01gb
01gb
01gb
01gb
10gb
10gb
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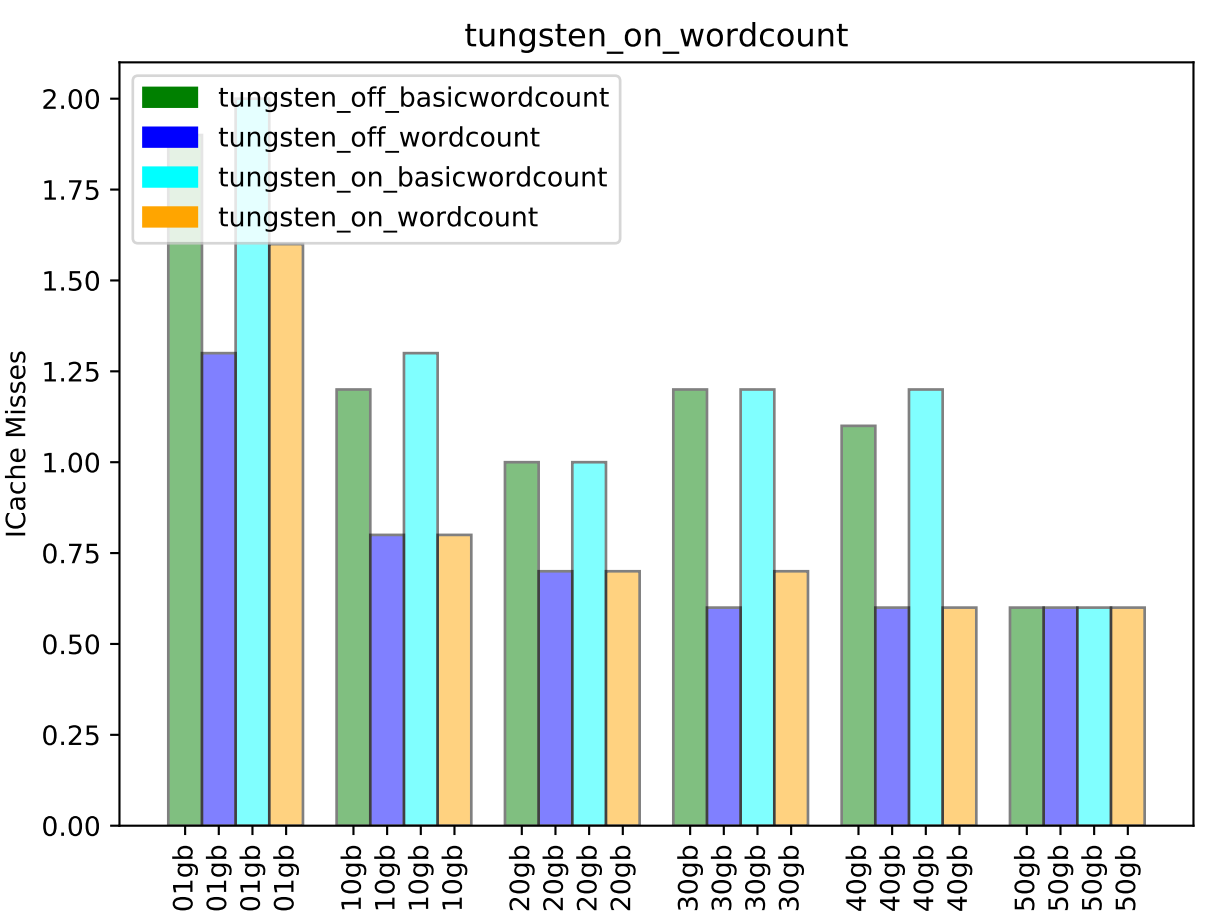
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ICache Misses
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0.25
0.50
0.75
1.00
1.25
1.50
1.75
2.00
01gb
01gb
01gb
01gb
10gb
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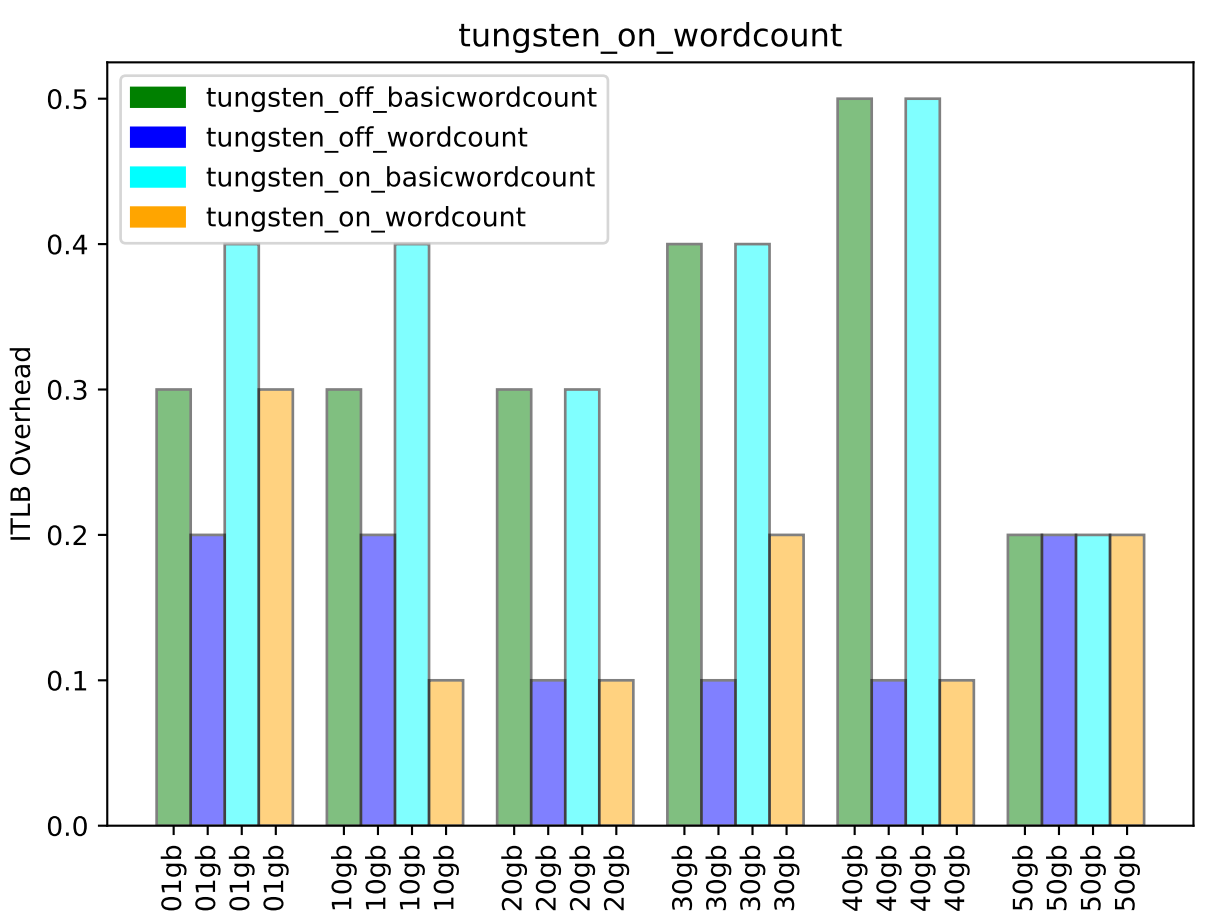
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ITLB Overhead
0.0
0.1
0.2
0.3
0.4
0.5
01gb
01gb
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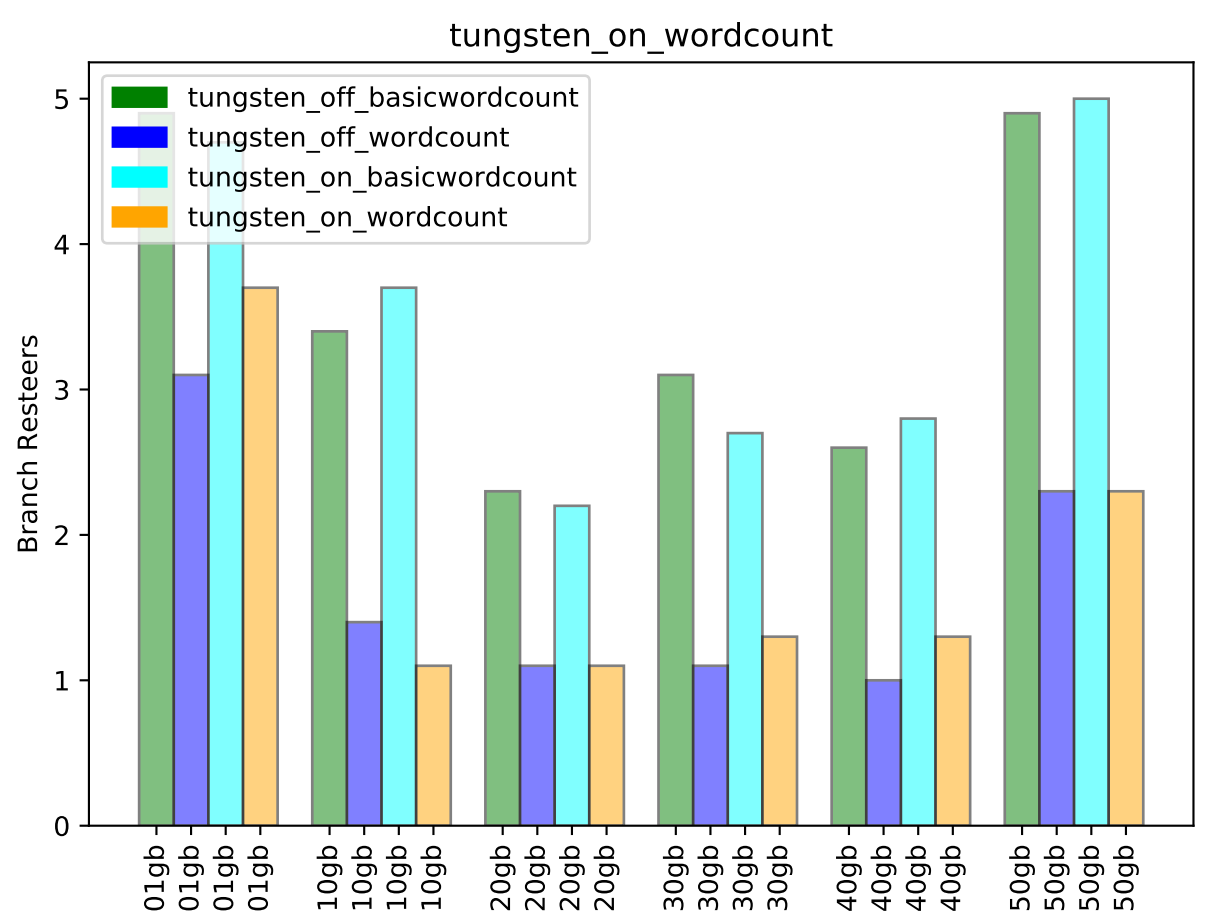
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tungsten_off_basicwordcount
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tungsten_on_basicwordcount
tungsten_on_wordcount
Branch Resteers
0
1
2
3
4
5
01gb
01gb
01gb
01gb
10gb
10gb
10gb
10gb
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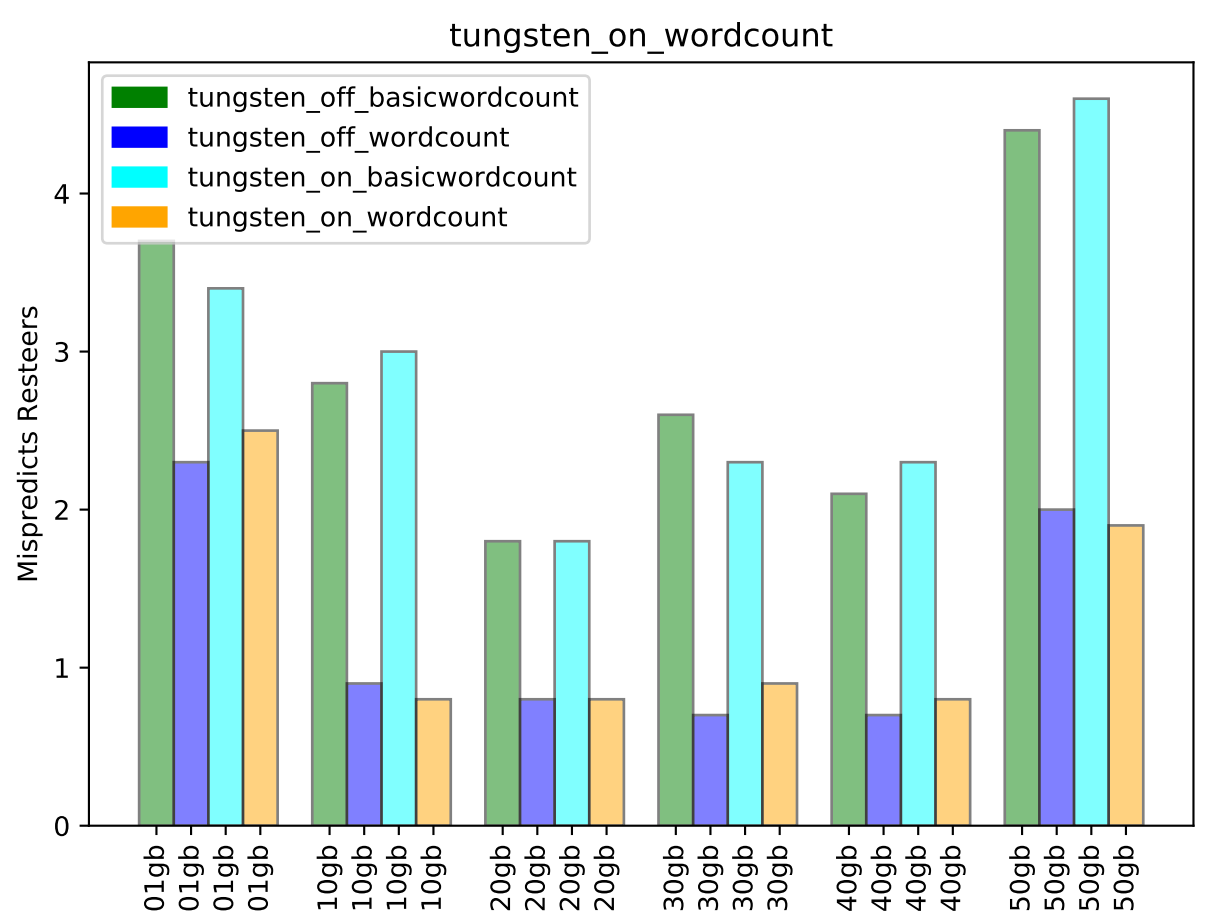
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Mispredicts Resteers
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1
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4
01gb
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01gb
01gb
10gb
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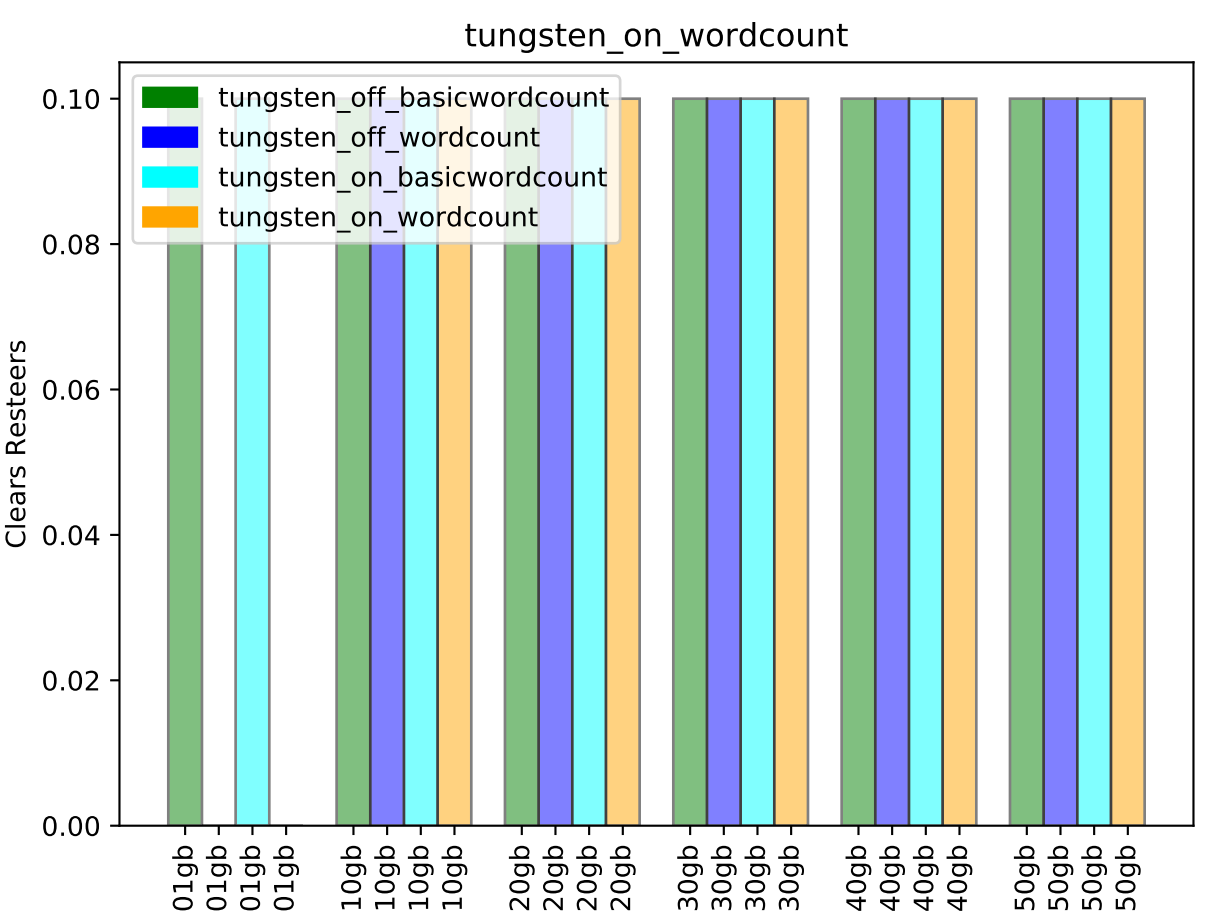
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0.00
0.02
0.04
0.06
0.08
0.10
01gb
01gb
01gb
01gb
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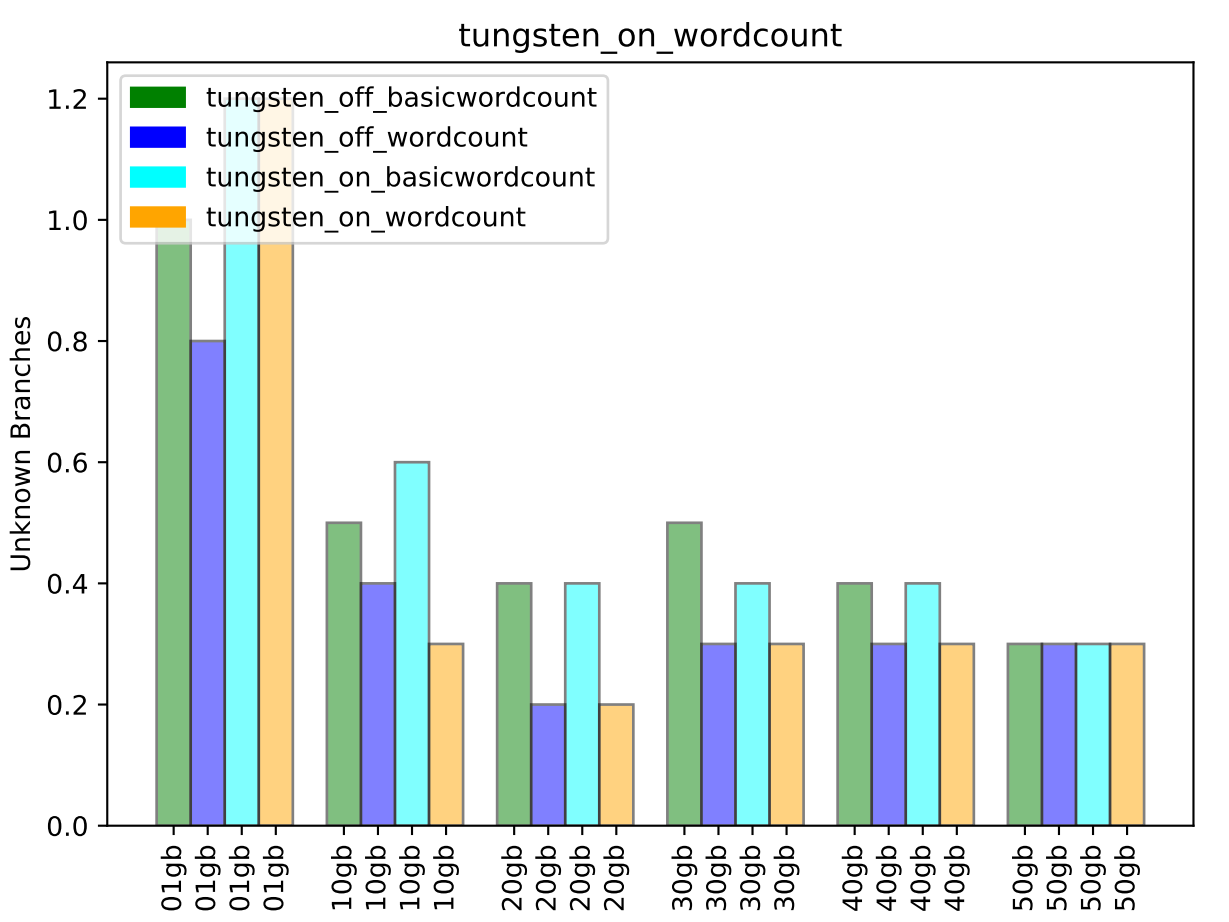
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0.4
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1.0
1.2
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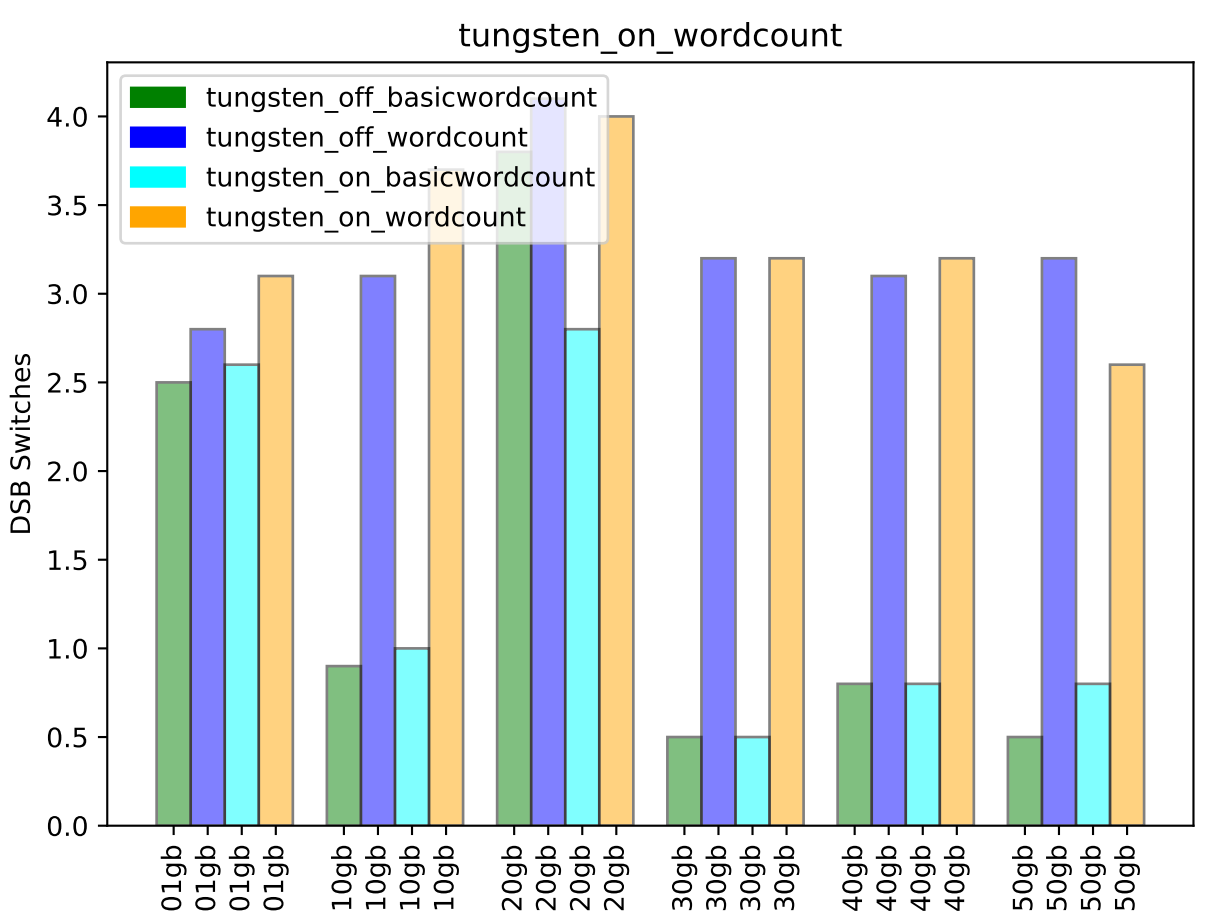
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0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
01gb
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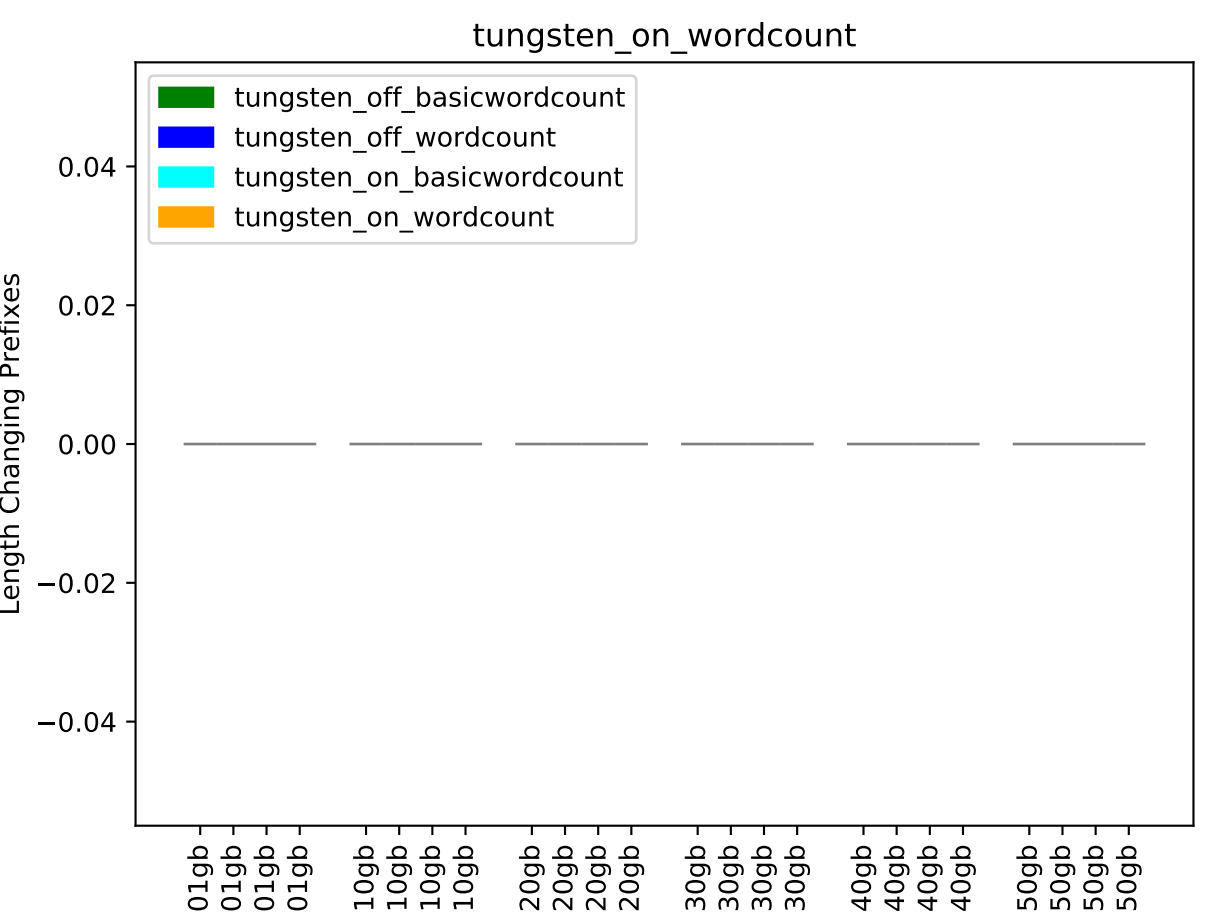
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0.02
0.00
−0.02
−0.04
01gb
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10gb
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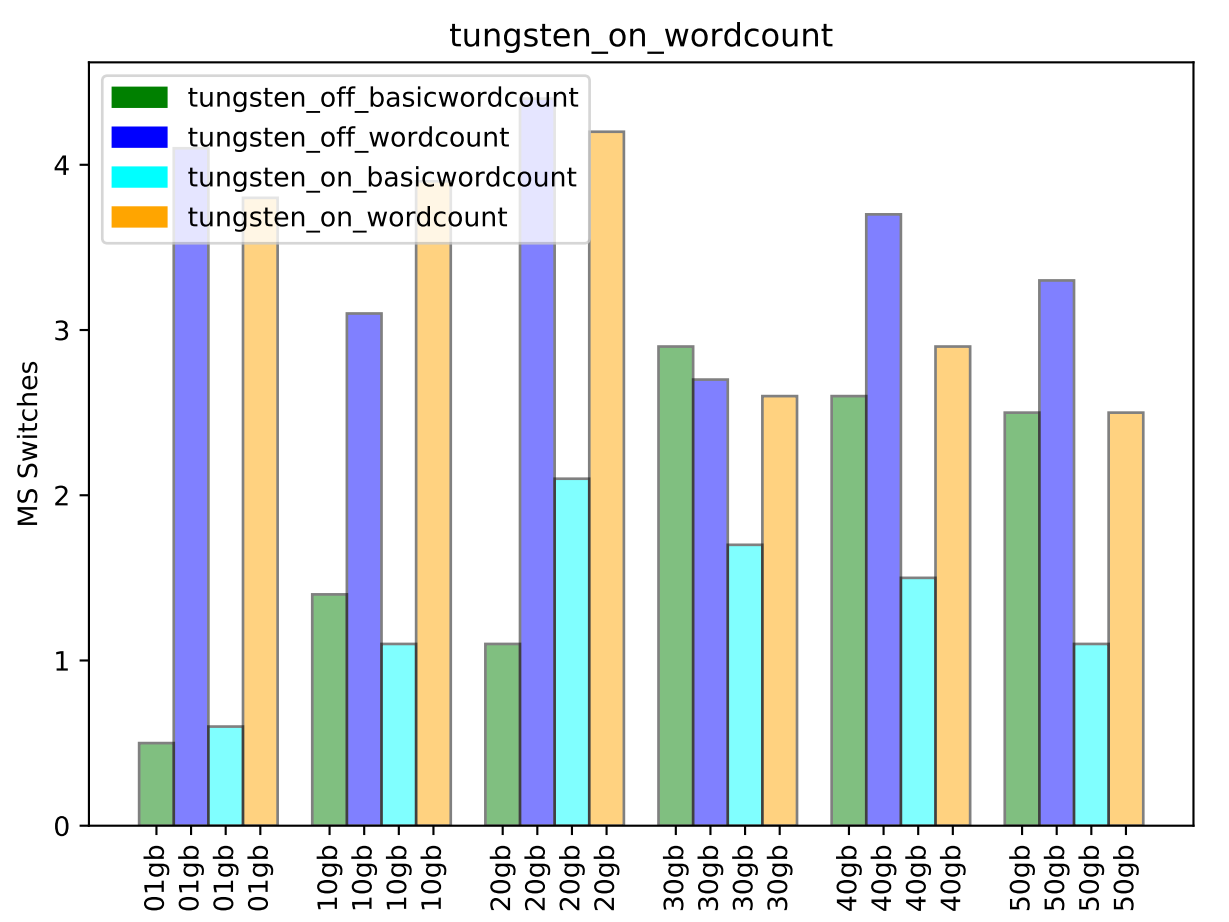
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MS Switches
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2
3
4
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01gb
01gb
01gb
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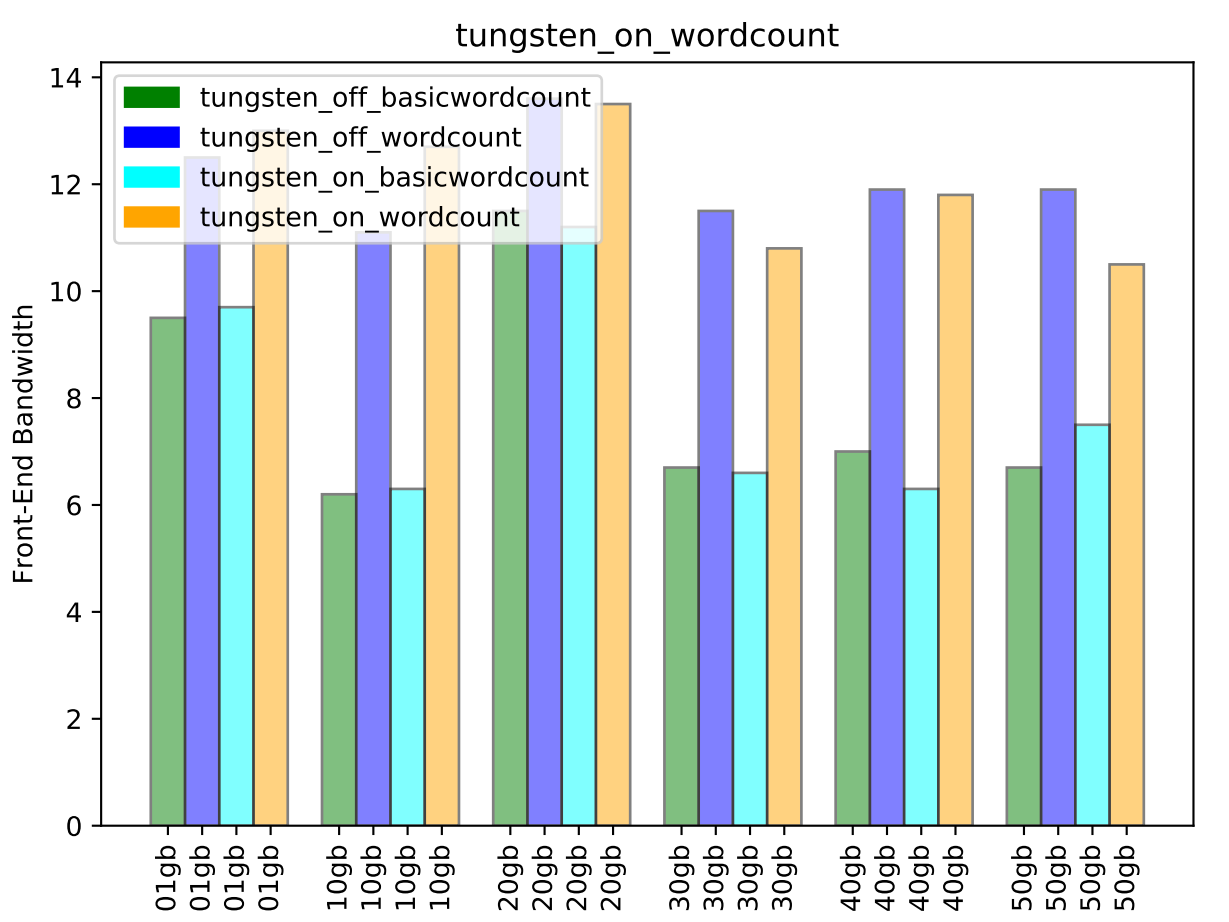
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Front-End Bandwidth
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2
4
6
8
10
12
14
01gb
01gb
01gb
01gb
10gb
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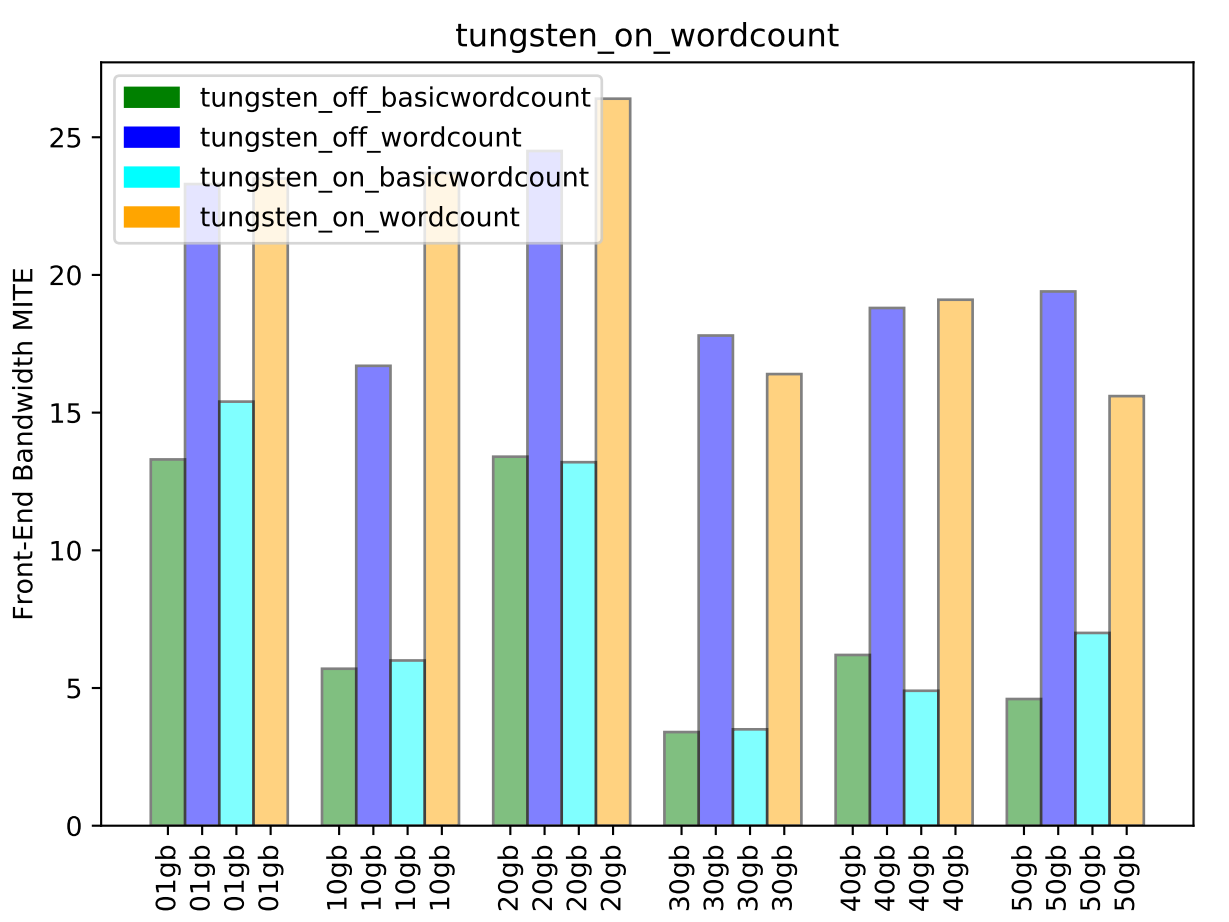
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Front-End Bandwidth MITE
0
5
10
15
20
25
01gb
01gb
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01gb
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10gb
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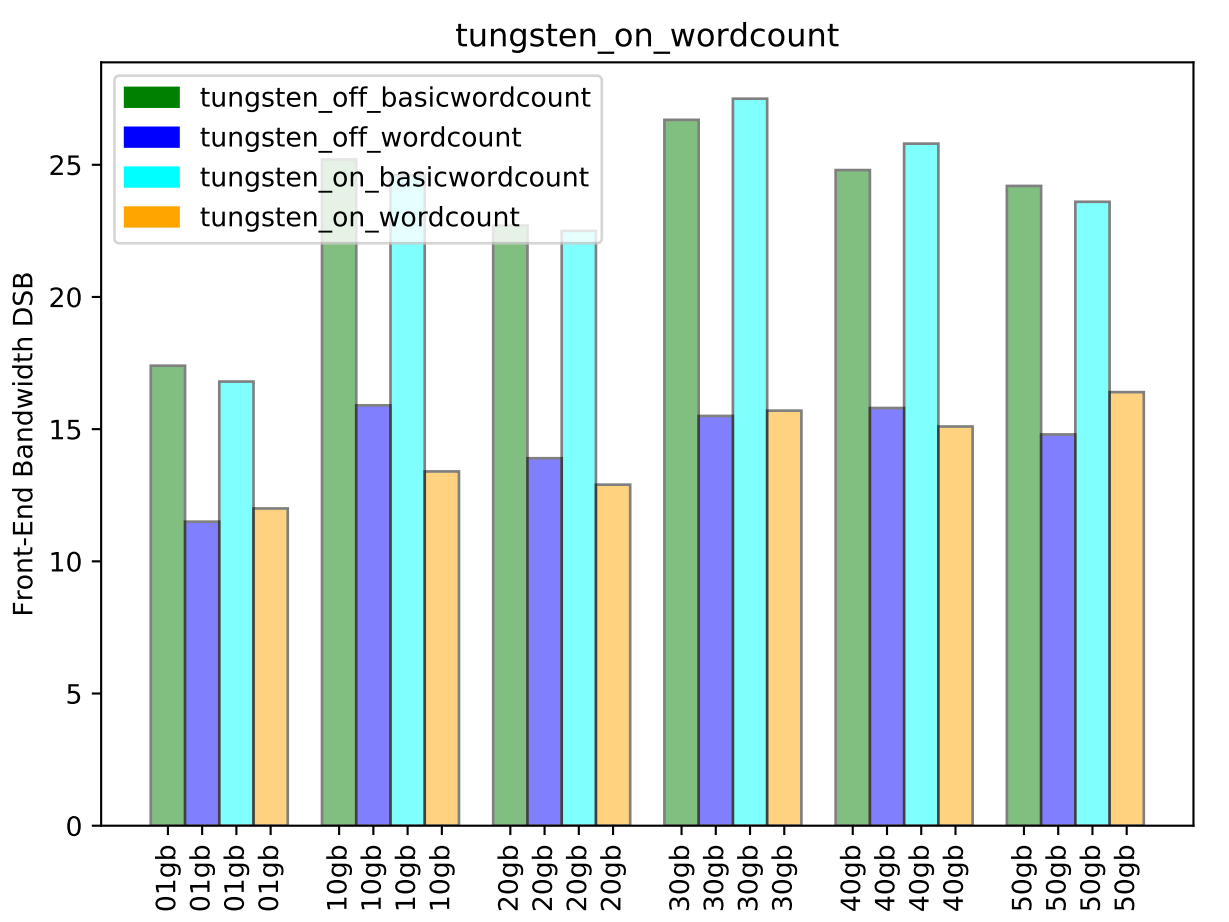
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Front-End Bandwidth DSB
0
5
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15
20
25
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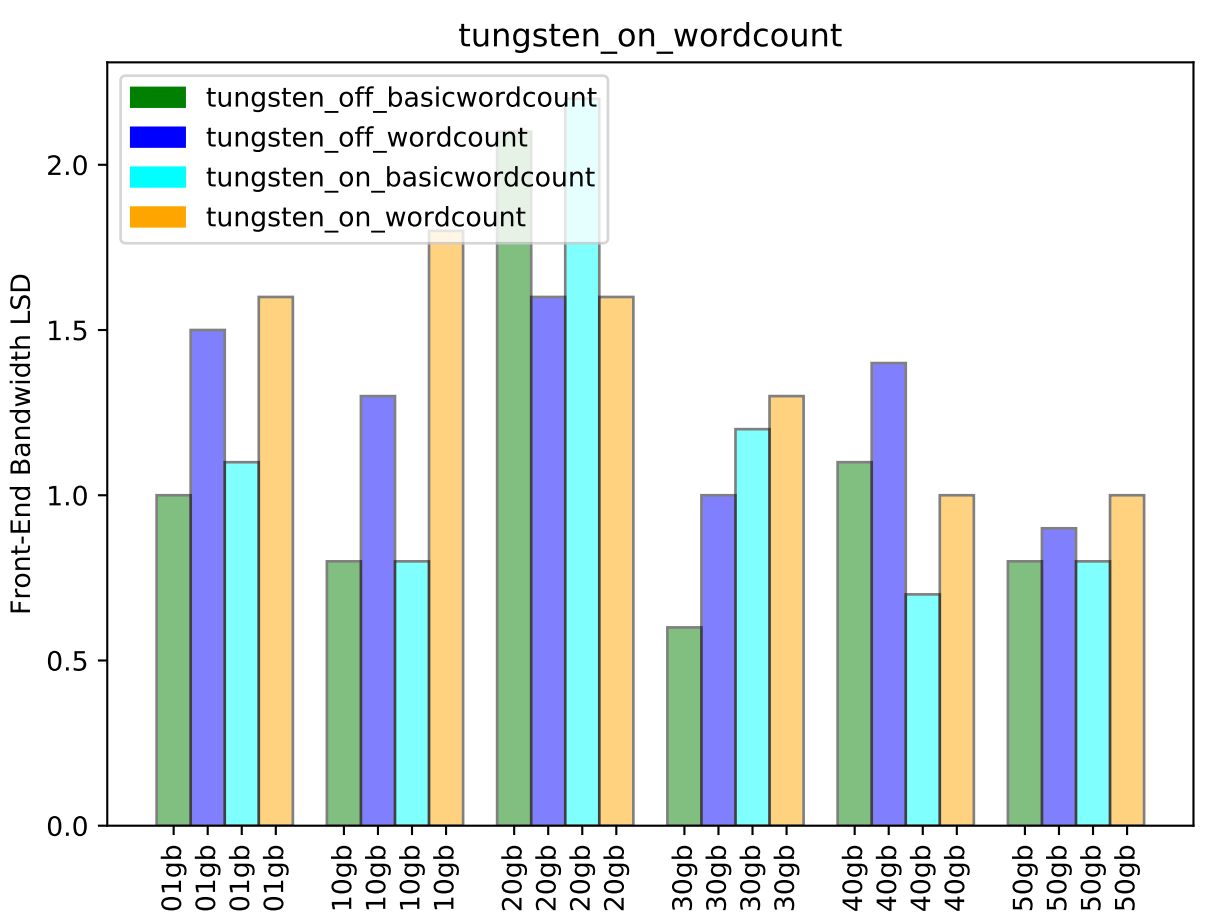
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1.0
1.5
2.0
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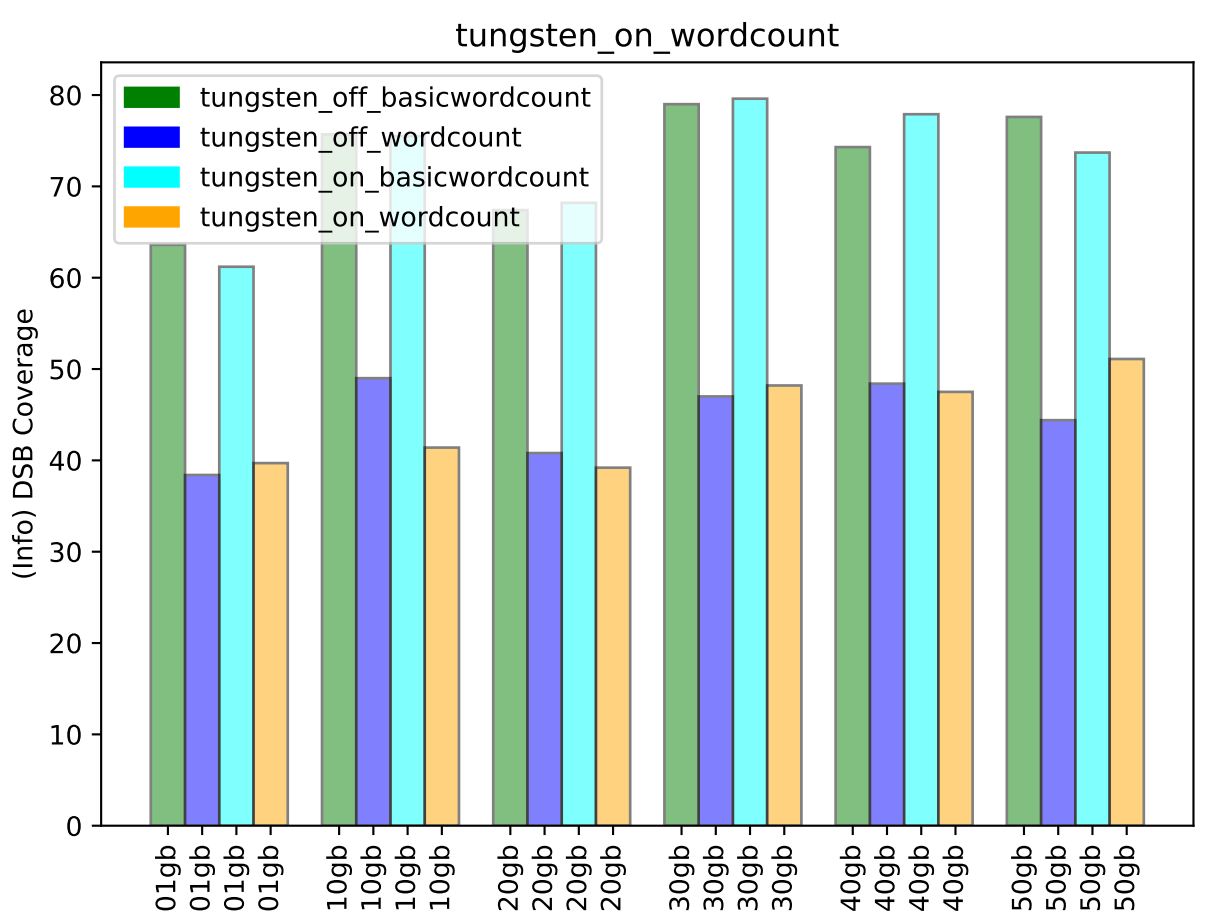
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70
80
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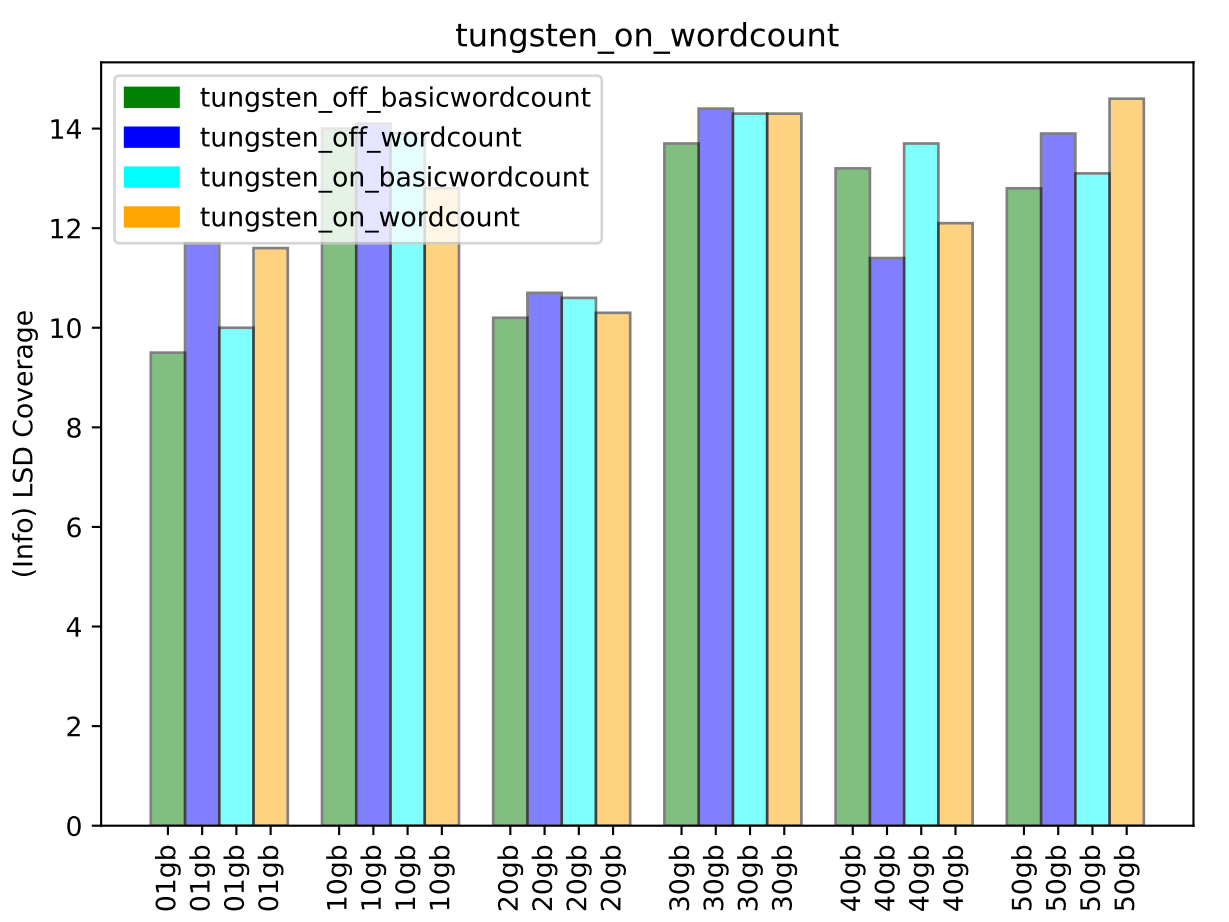
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(Info) LSD Coverage
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2
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6
8
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14
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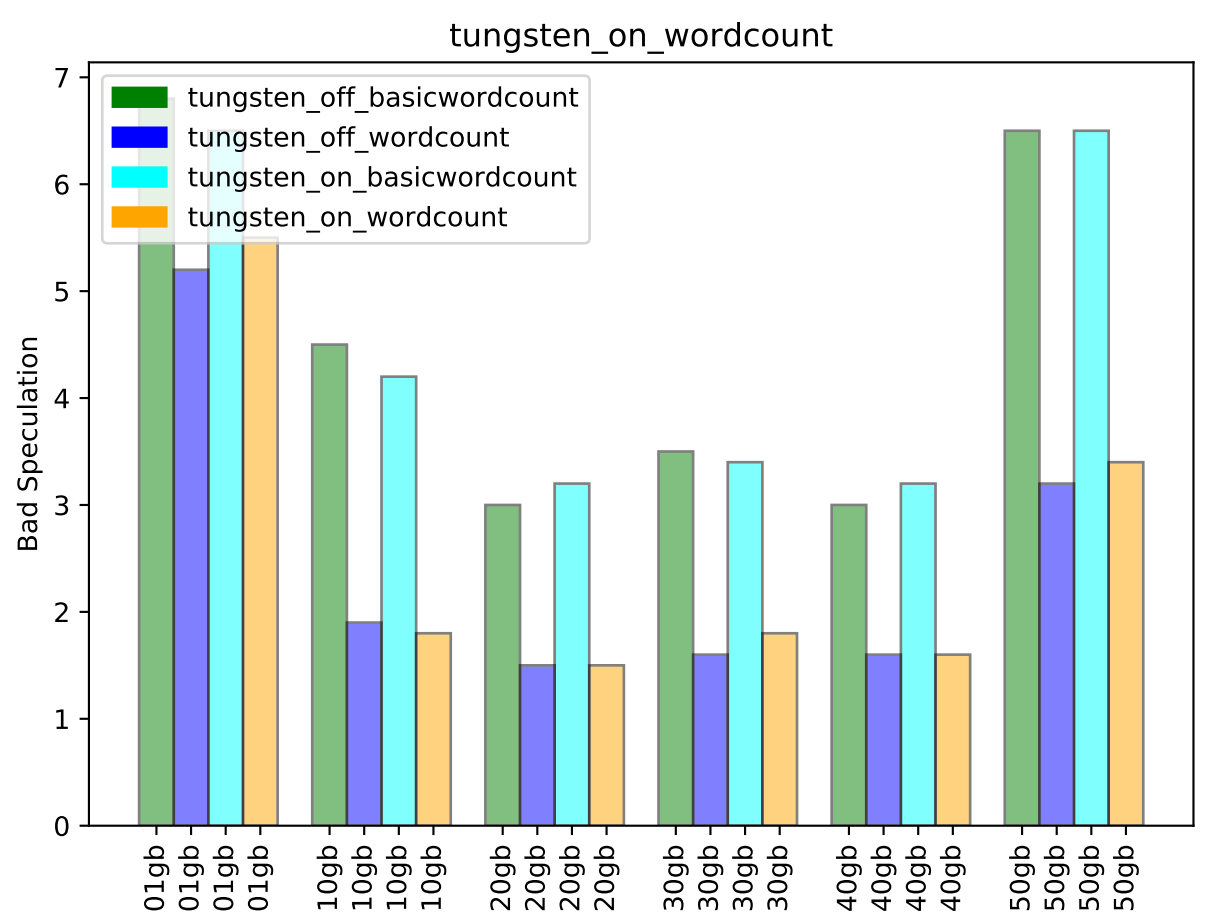
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Bad Speculation
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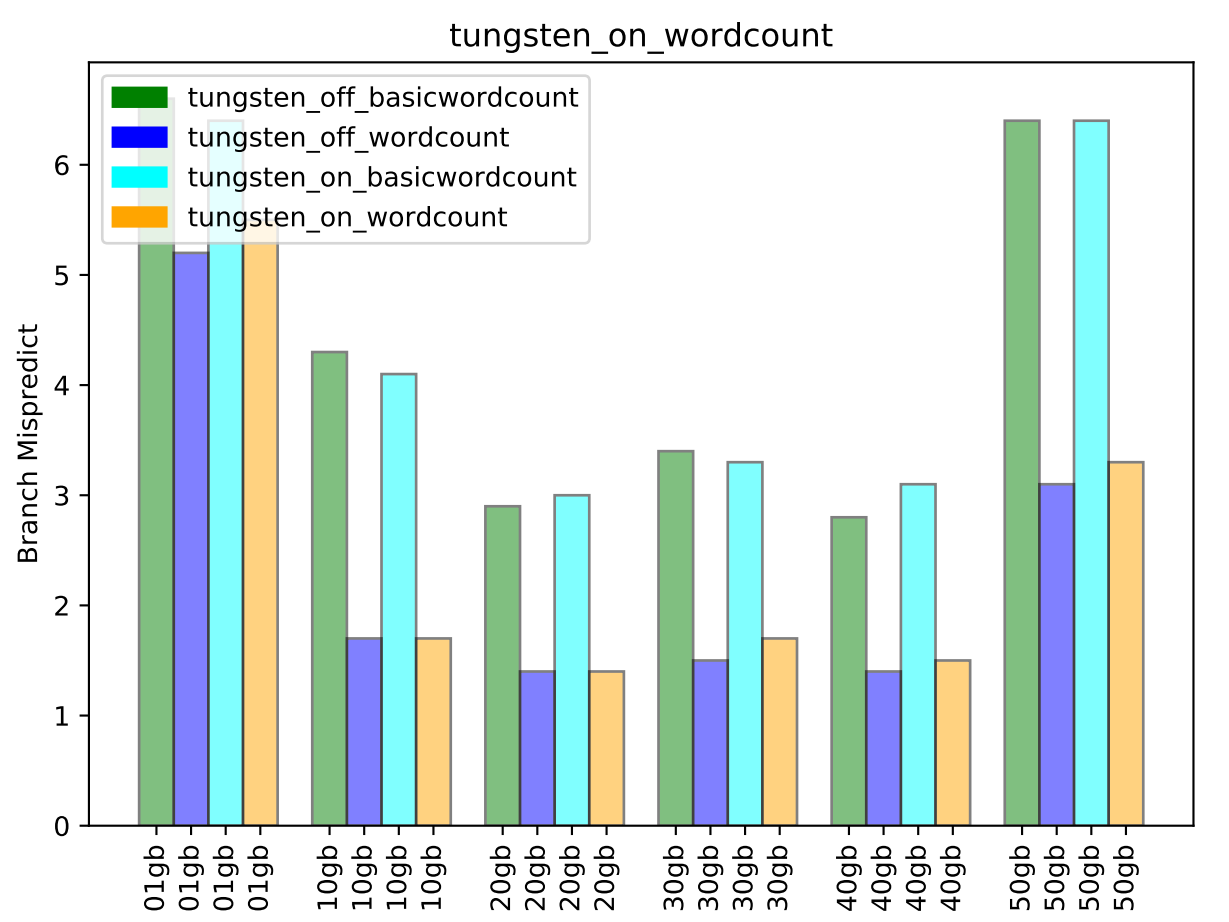
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tungsten_on_basicwordcount
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Branch Mispredict
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1
2
3
4
5
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01gb
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01gb
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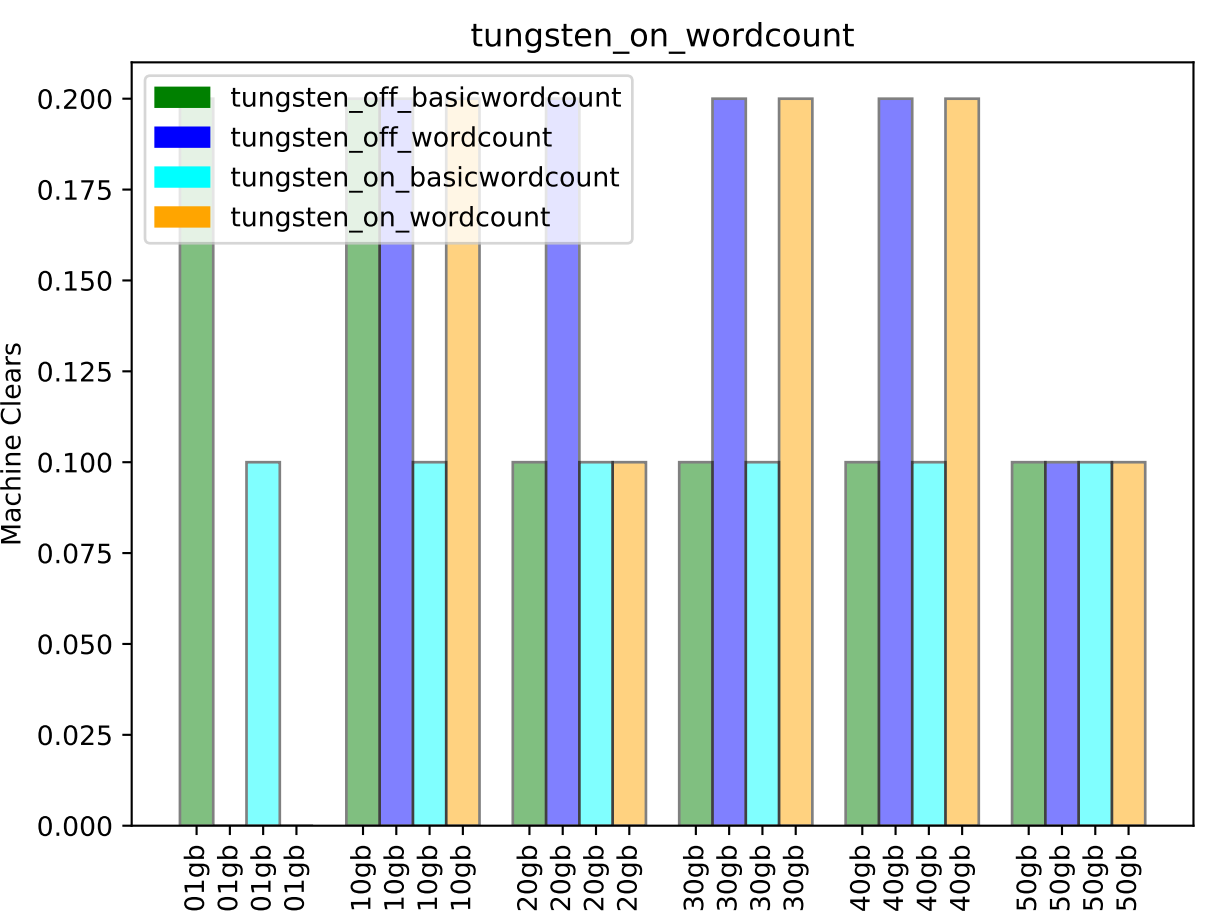
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Machine Clears
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0.025
0.050
0.075
0.100
0.125
0.150
0.175
0.200
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01gb
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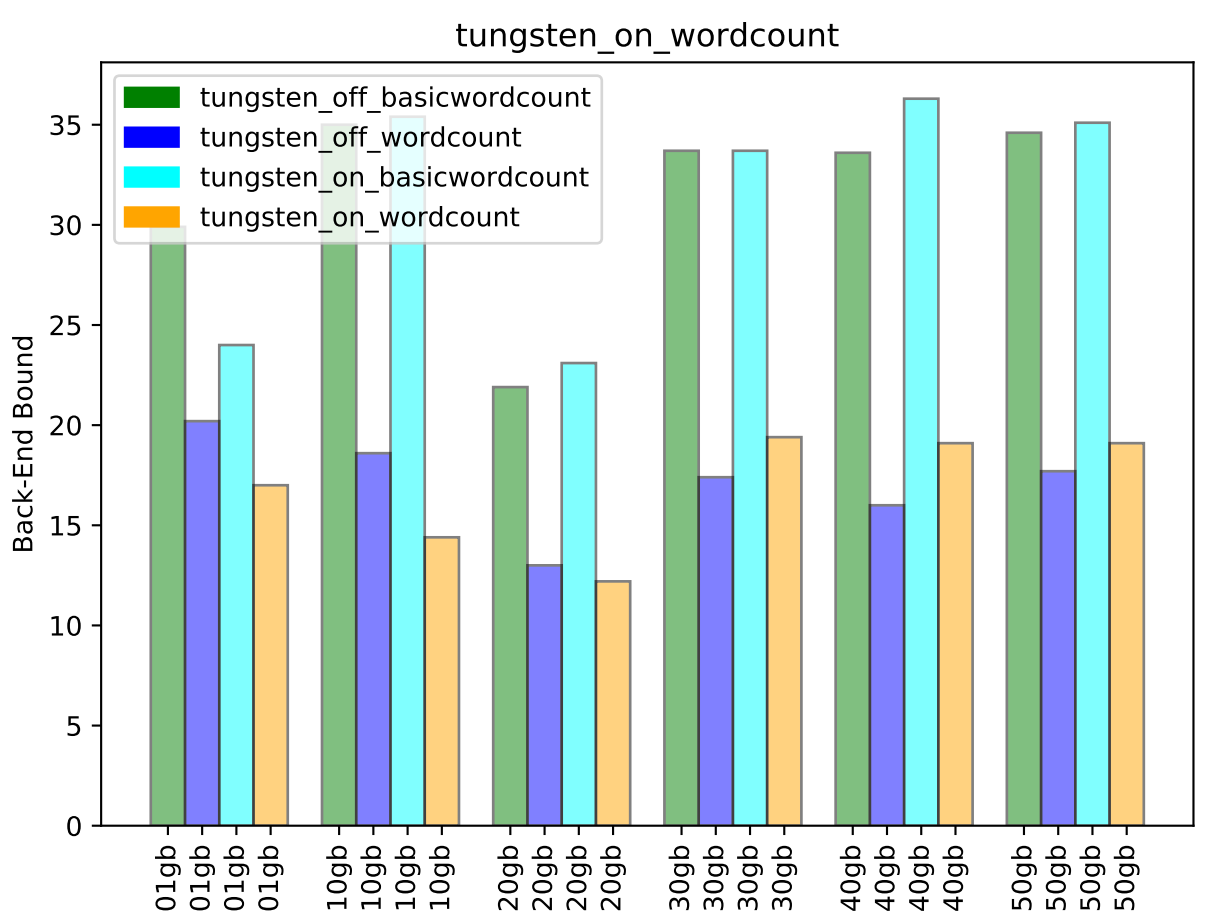
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Back-End Bound
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5
10
15
20
25
30
35
01gb
01gb
01gb
01gb
10gb
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10gb
10gb
20gb
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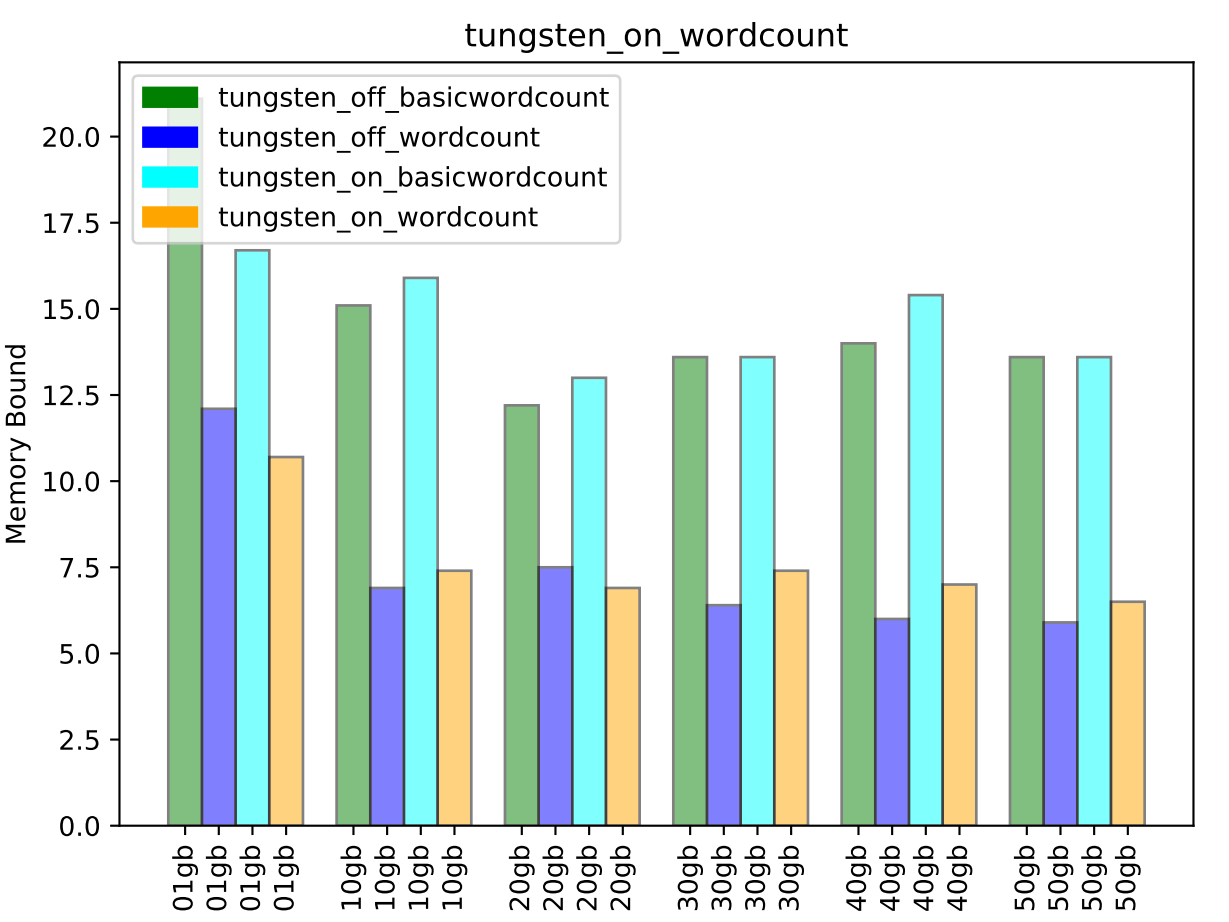
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tungsten_on_wordcount
Memory Bound
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2.5
5.0
7.5
10.0
12.5
15.0
17.5
20.0
01gb
01gb
01gb
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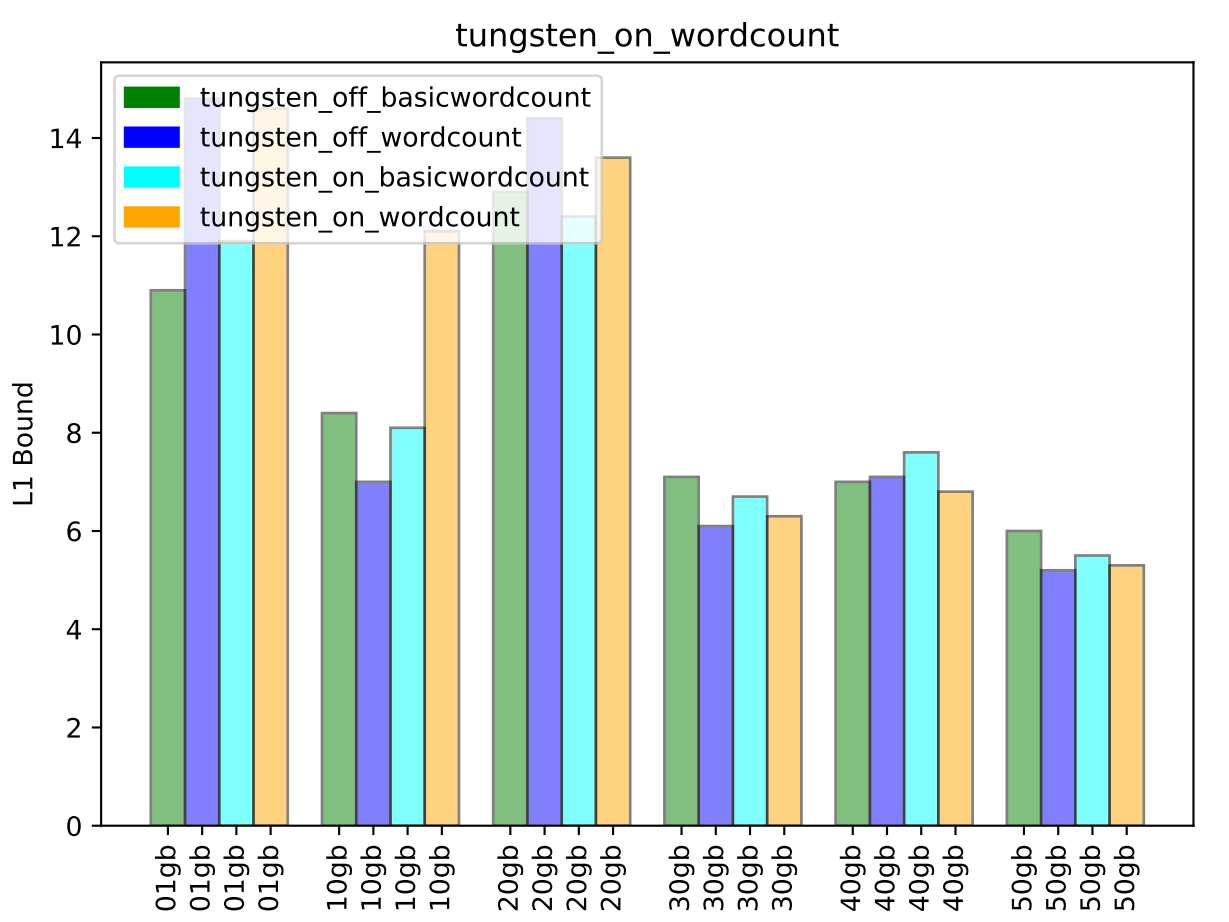
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tungsten_on_wordcount
L1 Bound
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2
4
6
8
10
12
14
01gb
01gb
01gb
01gb
10gb
10gb
10gb
10gb
20gb
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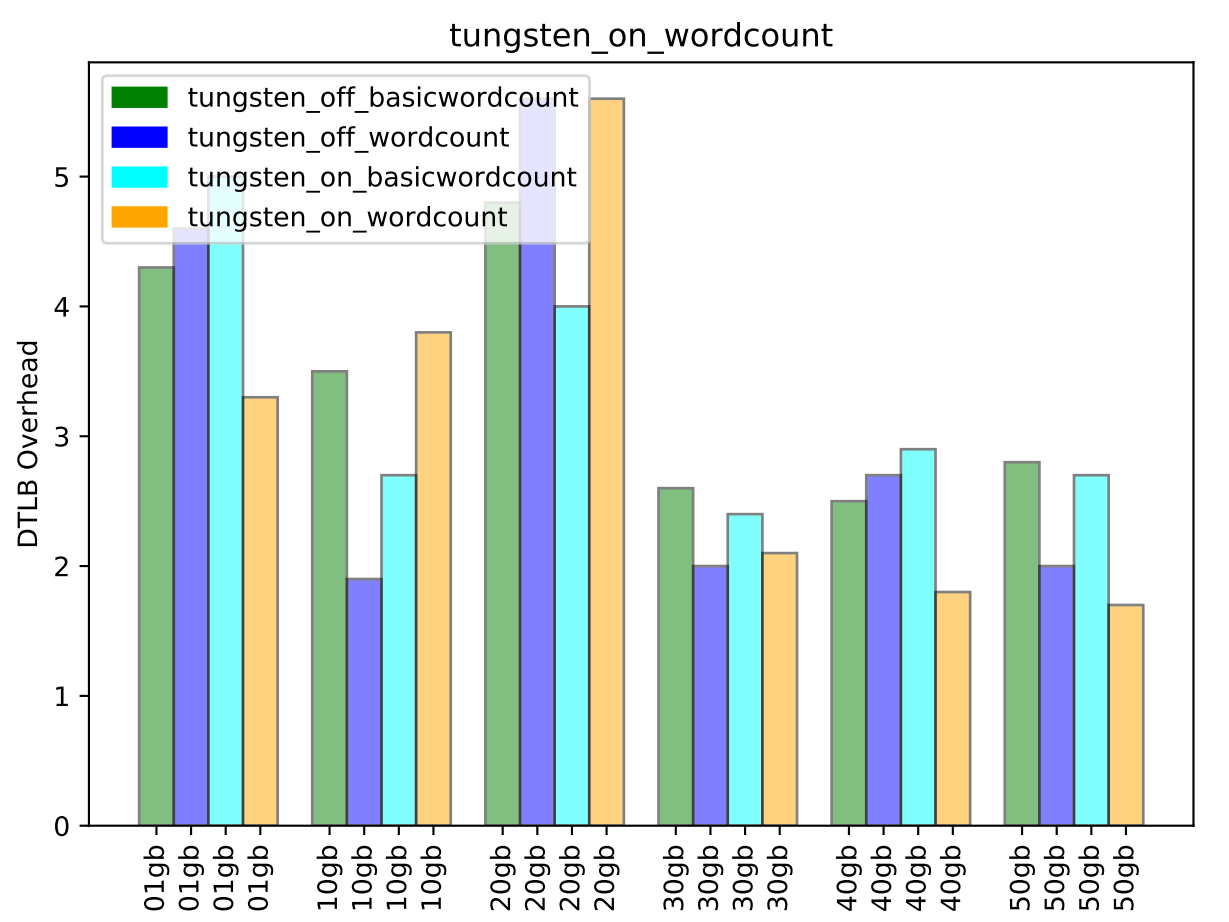
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DTLB Overhead
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1
2
3
4
5
01gb
01gb
01gb
01gb
10gb
10gb
10gb
10gb
20gb
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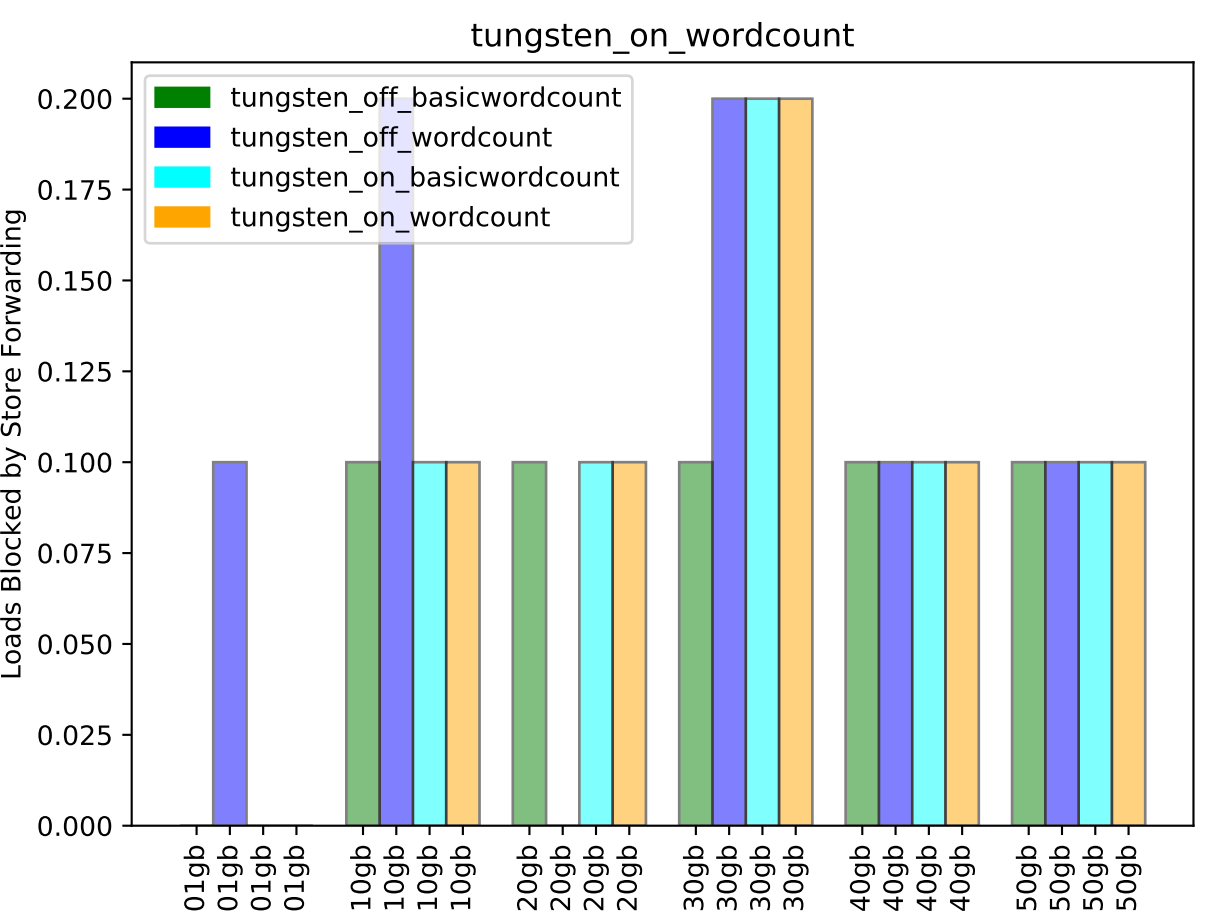
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tungsten_on_basicwordcount
tungsten_on_wordcount
Loads Blocked by Store Forwarding
0.200
0.175
0.150
0.125
0.100
0.075
0.050
0.025
0.000
01gb
01gb
01gb
01gb
10gb
10gb
10gb
10gb
20gb
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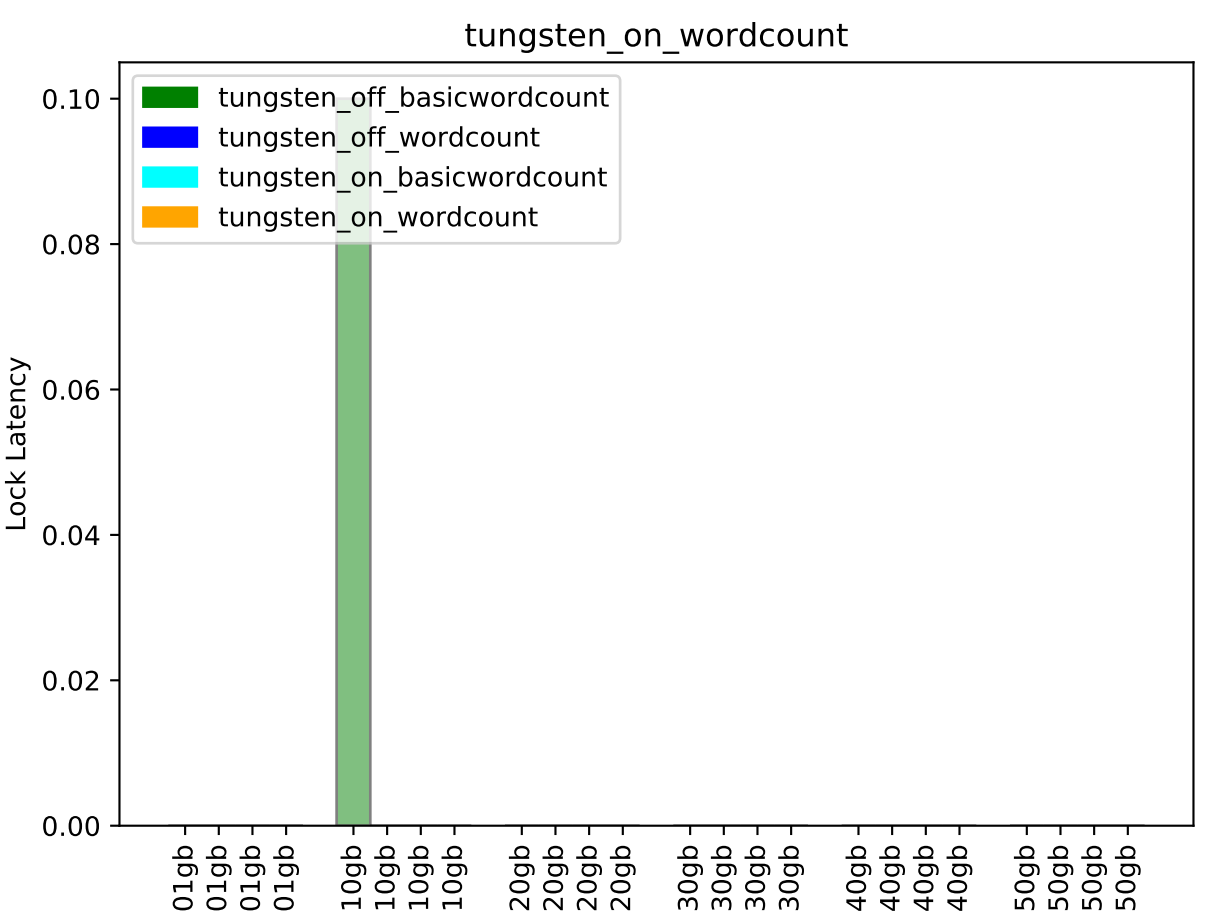
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tungsten_off_wordcount
tungsten_on_basicwordcount
tungsten_on_wordcount
Lock Latency
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0.02
0.04
0.06
0.08
0.10
01gb
01gb
01gb
01gb
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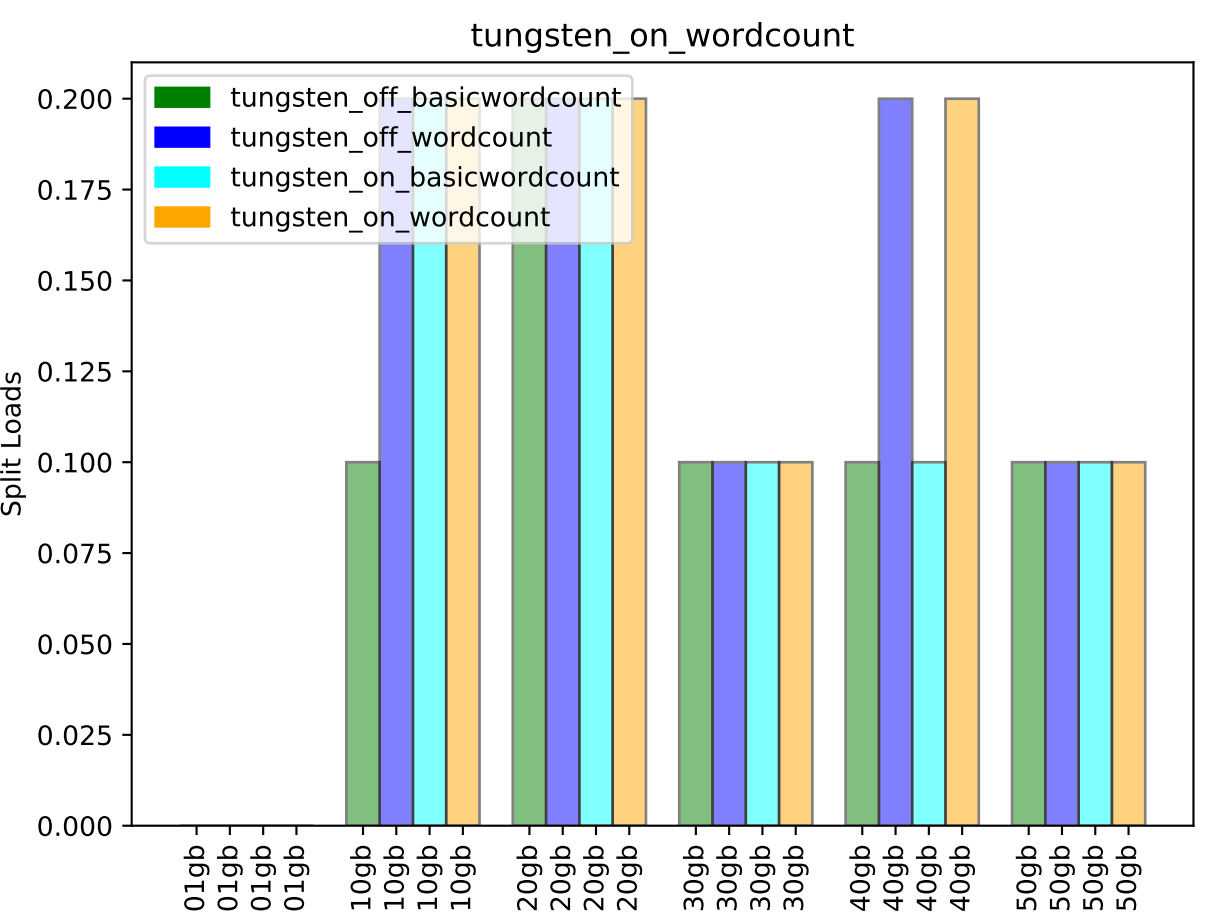
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tungsten_off_wordcount
tungsten_on_basicwordcount
tungsten_on_wordcount
Split Loads
0.200
0.175
0.150
0.125
0.100
0.075
0.050
0.025
0.000
01gb
01gb
01gb
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10gb
10gb
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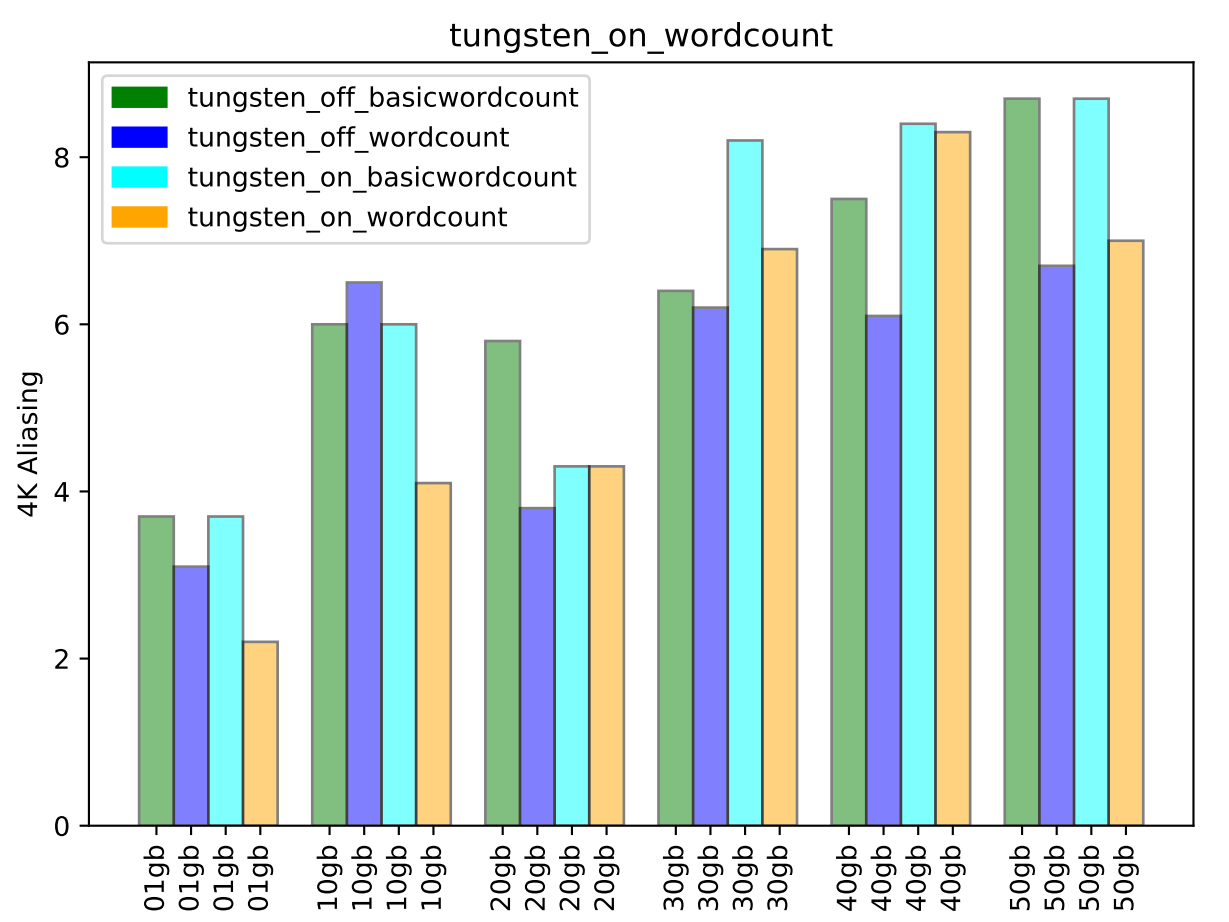
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tungsten_off_wordcount
tungsten_on_basicwordcount
tungsten_on_wordcount
4K Aliasing
0
2
4
6
8
01gb
01gb
01gb
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10gb
10gb
10gb
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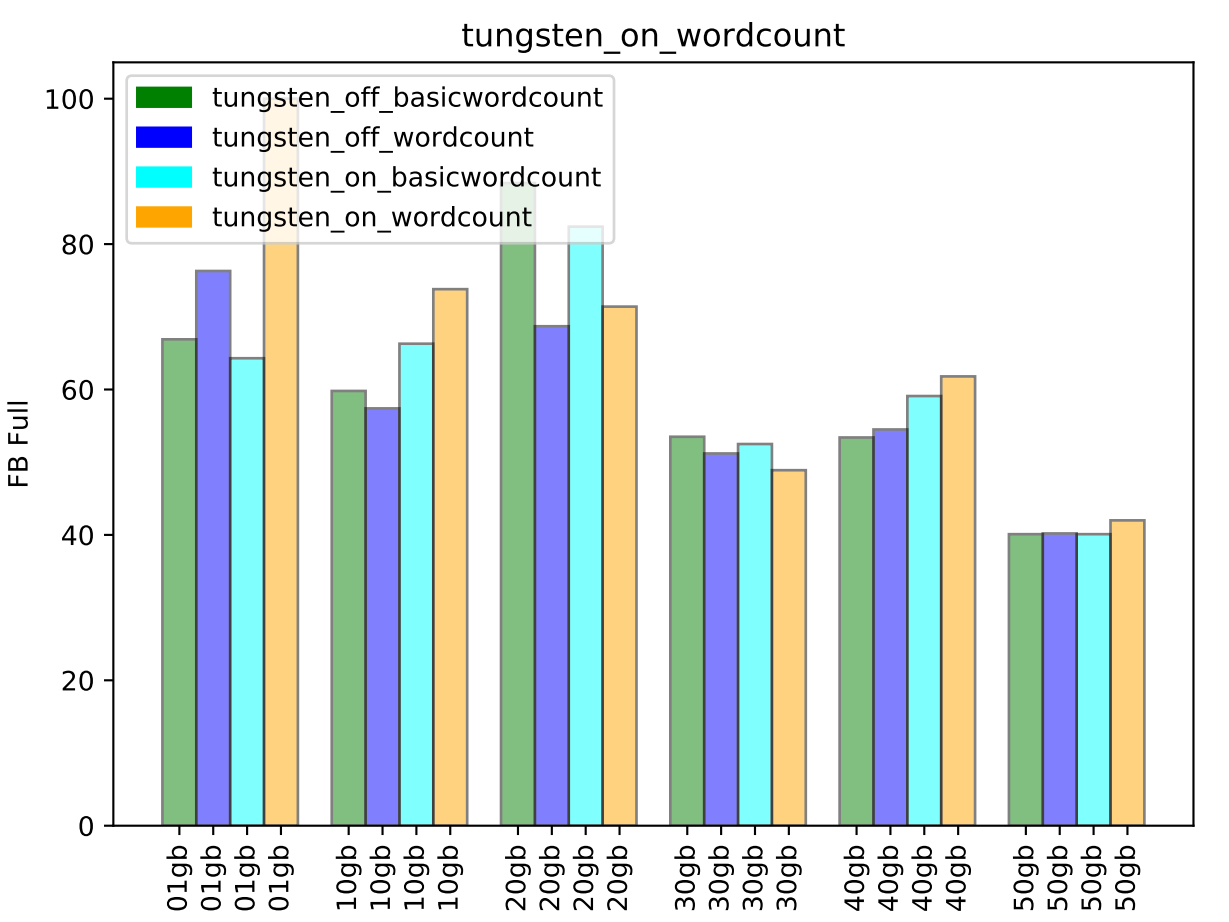
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tungsten_on_wordcount
FB Full
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20
40
60
80
100
01gb
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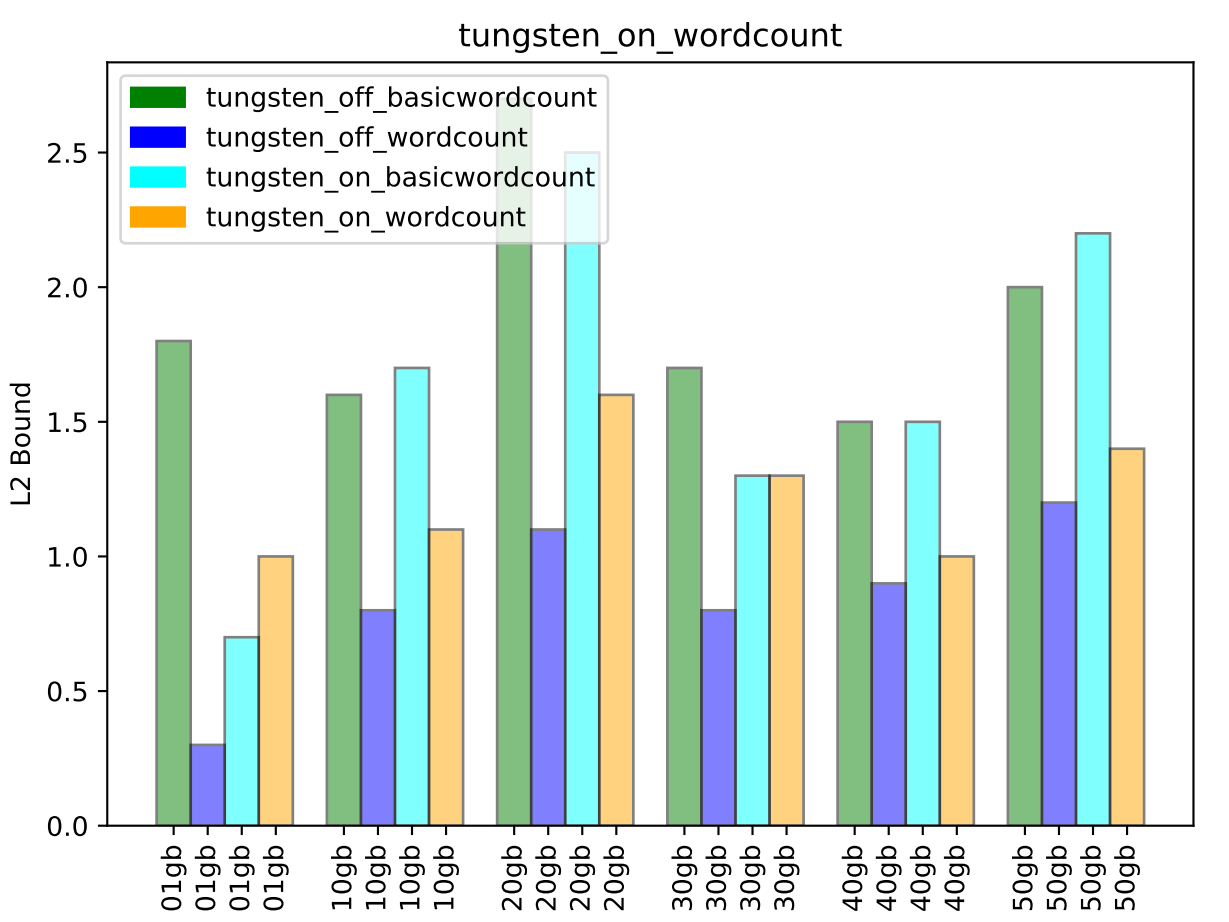
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tungsten_off_wordcount
tungsten_on_basicwordcount
tungsten_on_wordcount
L2 Bound
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0.5
1.0
1.5
2.0
2.5
01gb
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01gb
01gb
10gb
10gb
10gb
10gb
20gb
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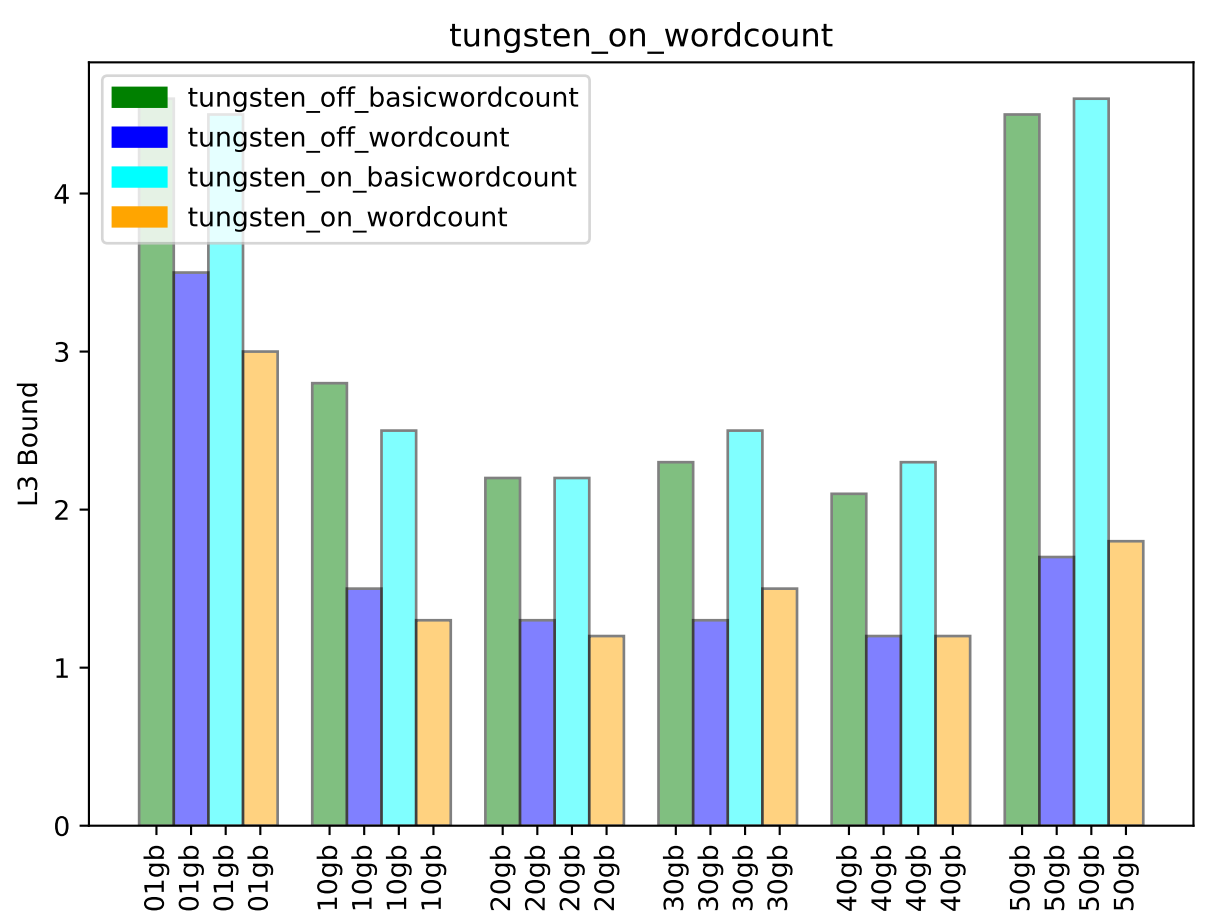
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tungsten_off_wordcount
tungsten_on_basicwordcount
tungsten_on_wordcount
L3 Bound
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1
2
3
4
01gb
01gb
01gb
01gb
10gb
10gb
10gb
10gb
20gb
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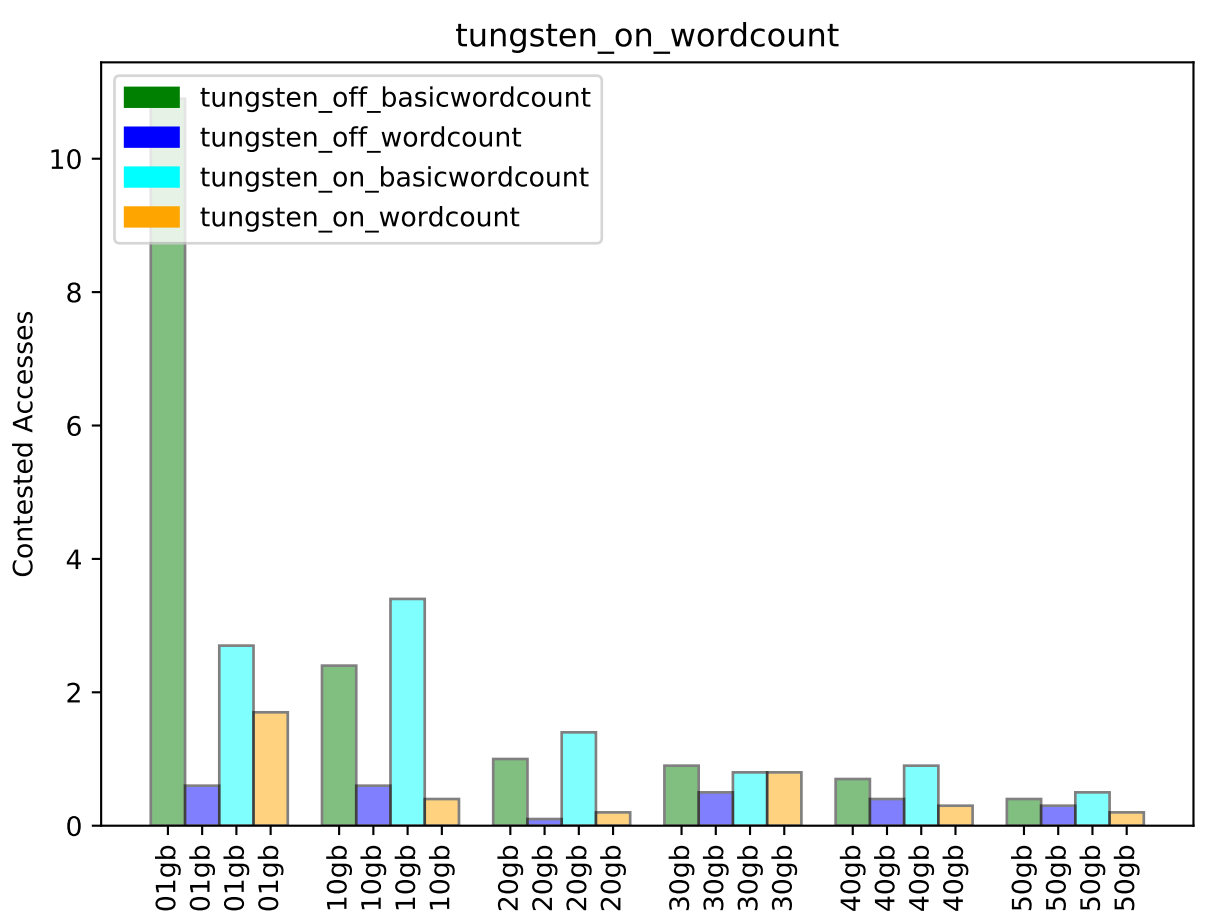
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tungsten_on_wordcount
Contested Accesses
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2
4
6
8
10
01gb
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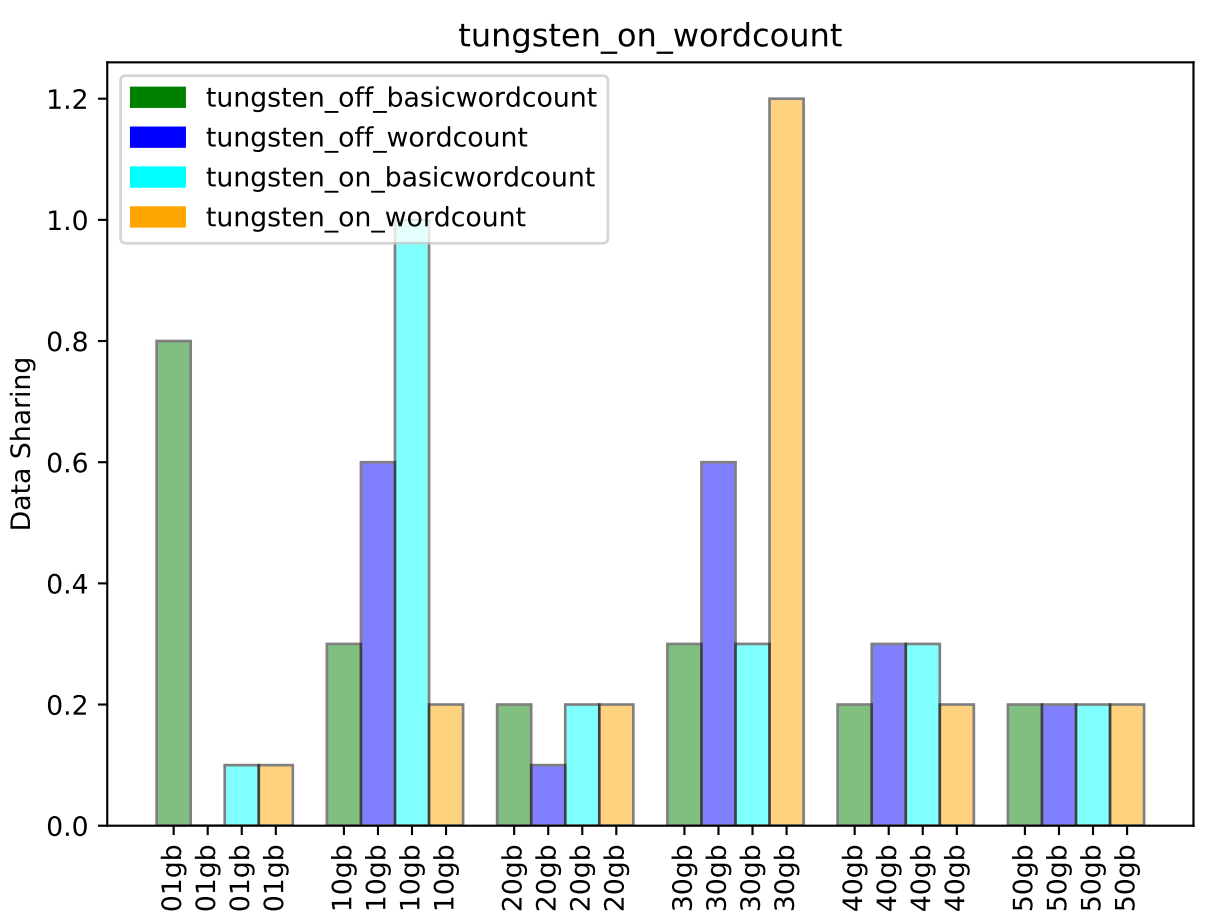
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tungsten_on_basicwordcount
tungsten_on_wordcount
Data Sharing
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0.4
0.6
0.8
1.0
1.2
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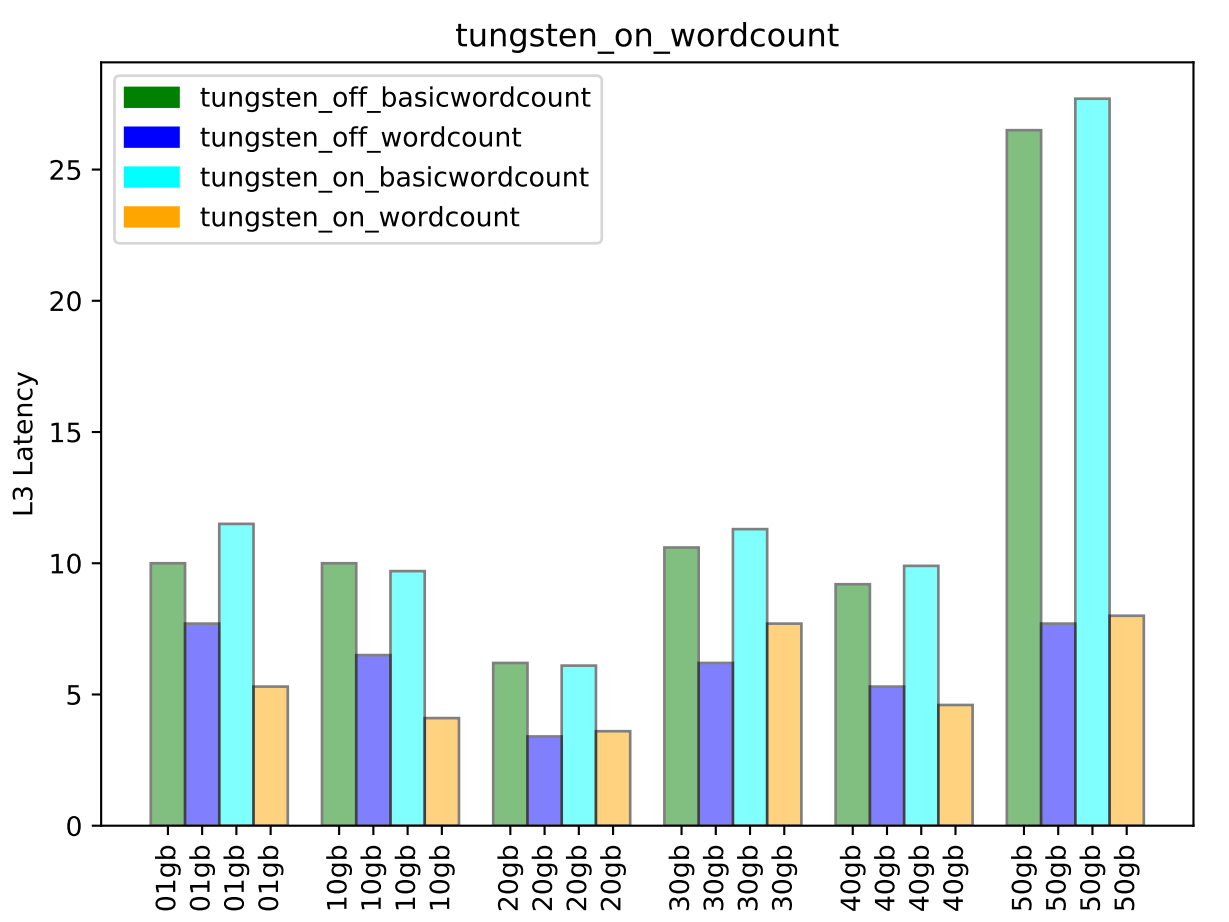
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tungsten_on_wordcount
L3 Latency
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5
10
15
20
25
01gb
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01gb
01gb
10gb
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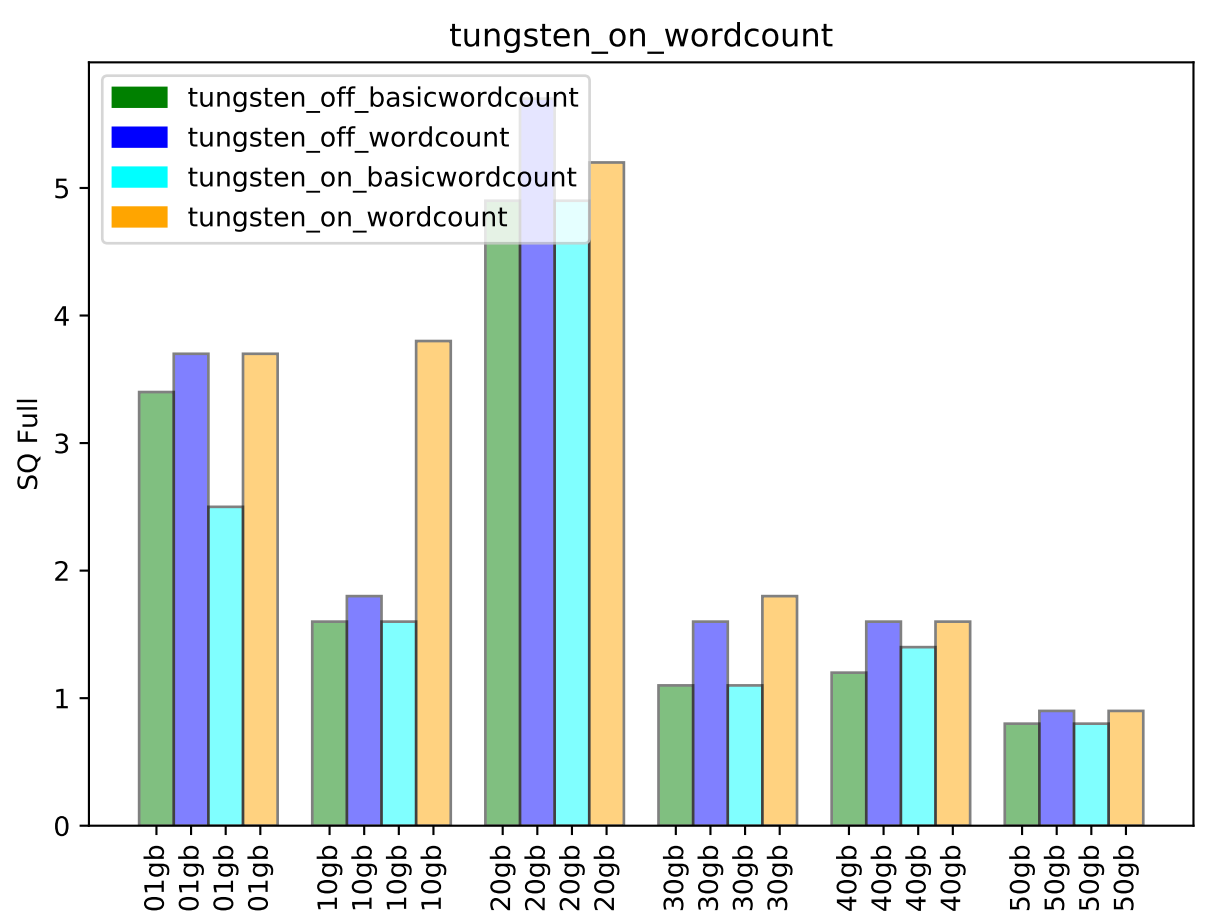
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tungsten_on_wordcount
SQ Full
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2
3
4
5
01gb
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01gb
01gb
10gb
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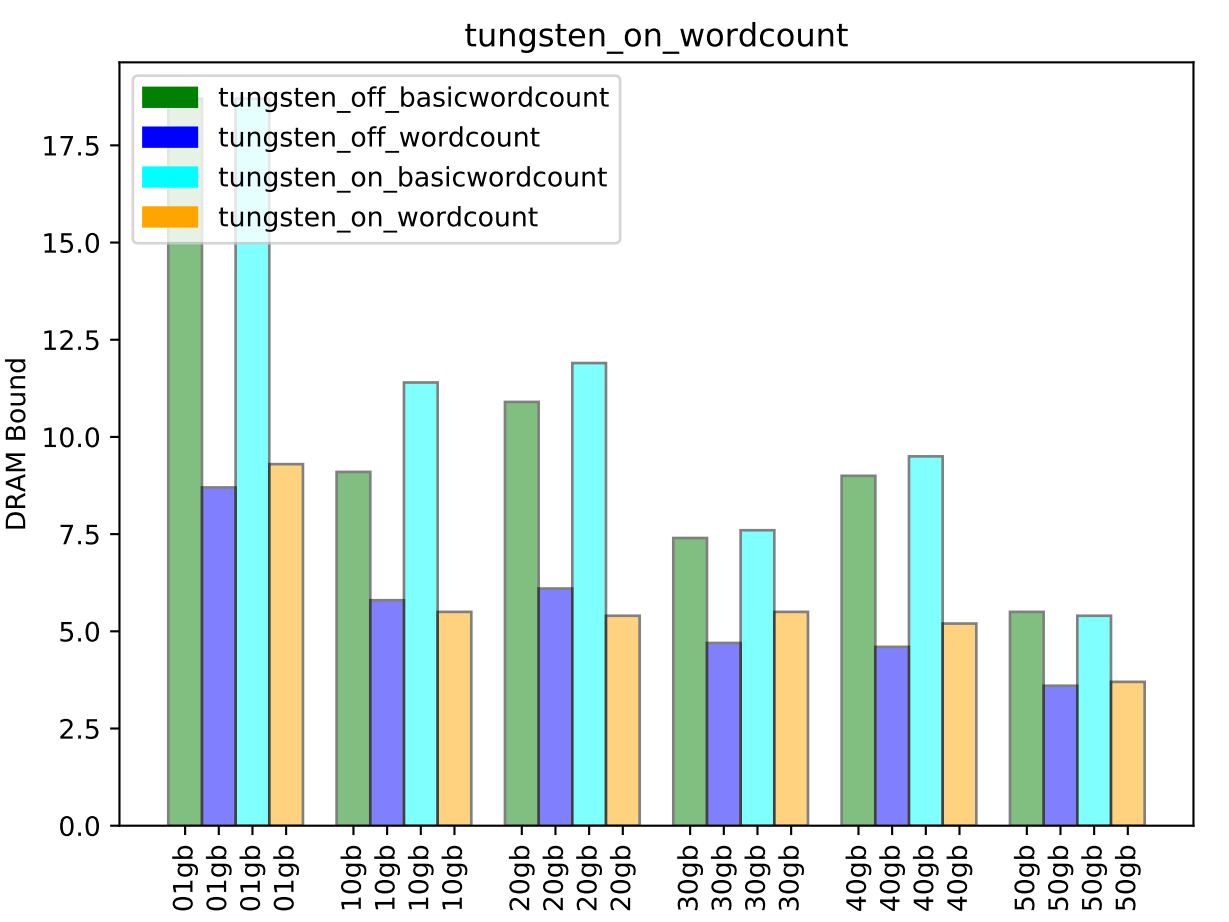
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DRAM Bound
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2.5
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10.0
12.5
15.0
17.5
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01gb
01gb
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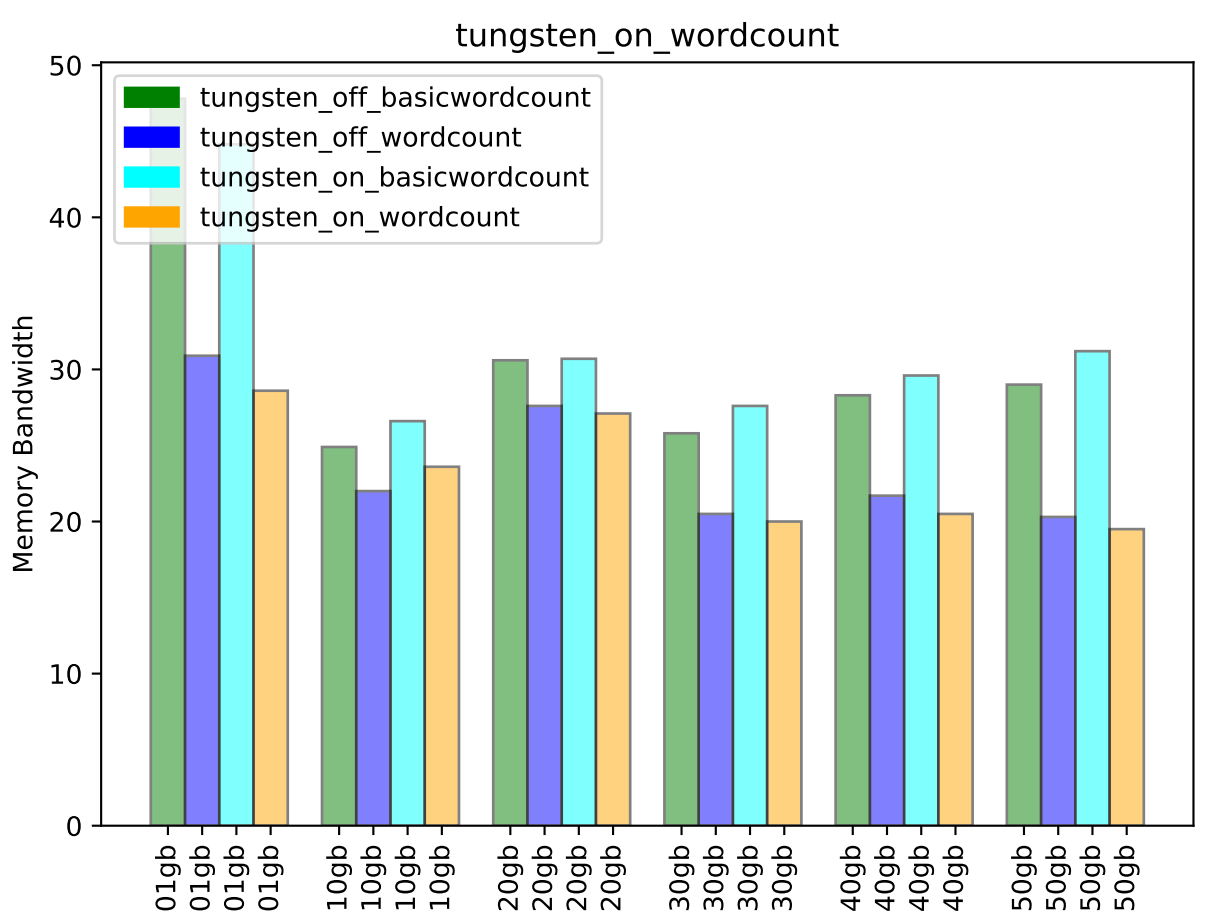
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tungsten_on_wordcount
Memory Bandwidth
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50
01gb
01gb
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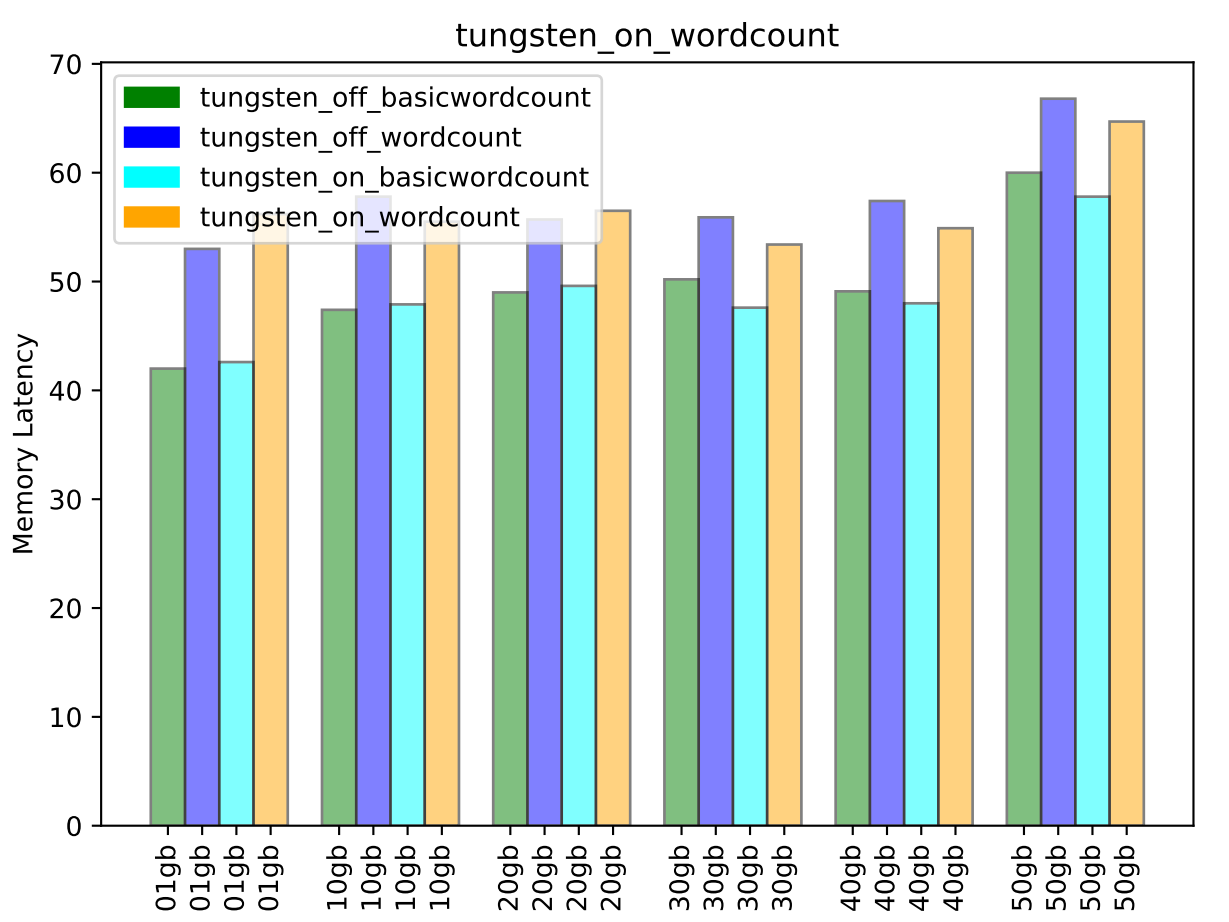
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tungsten_off_wordcount
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tungsten_on_wordcount
Memory Latency
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60
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01gb
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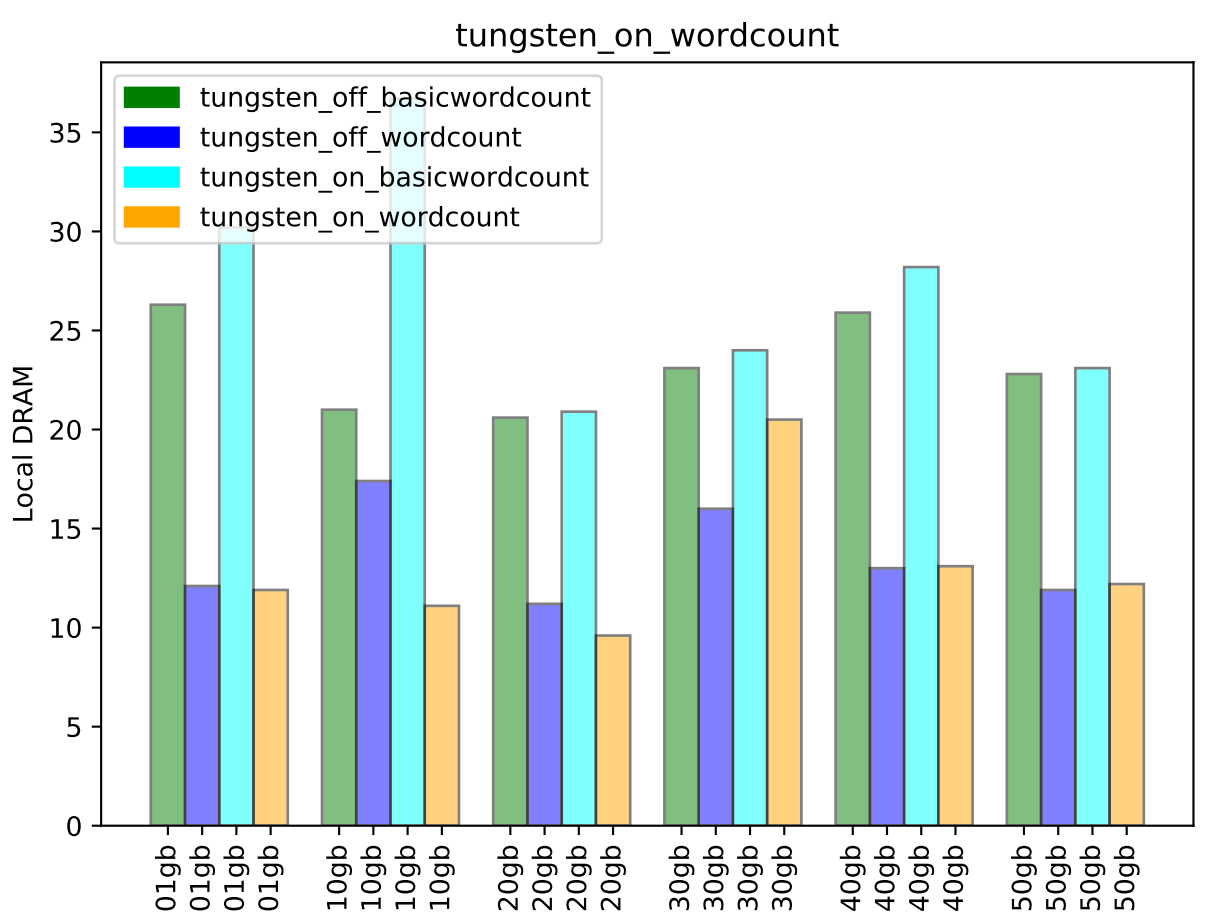
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tungsten_on_wordcount
Local DRAM
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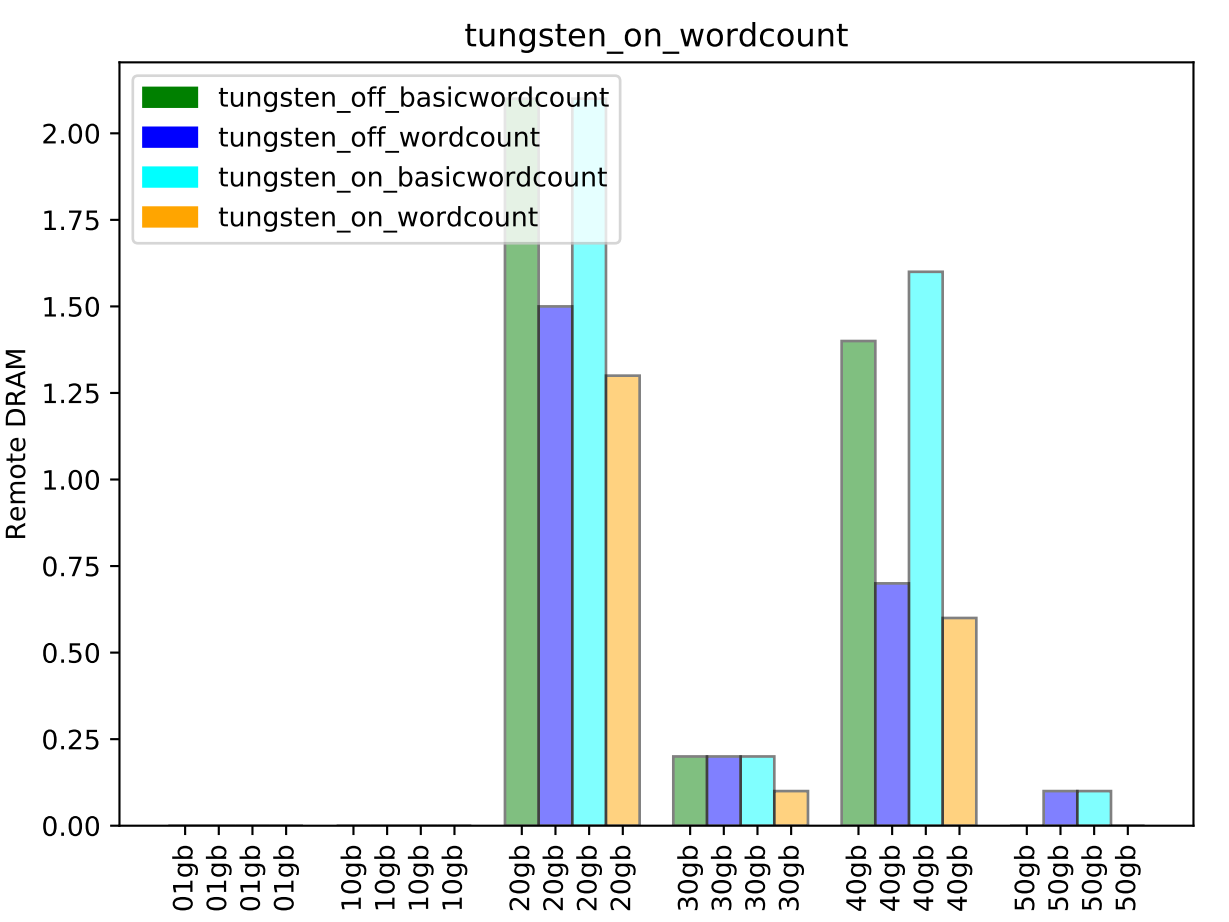
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tungsten_on_wordcount
Remote DRAM
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0.25
0.50
0.75
1.00
1.25
1.50
1.75
2.00
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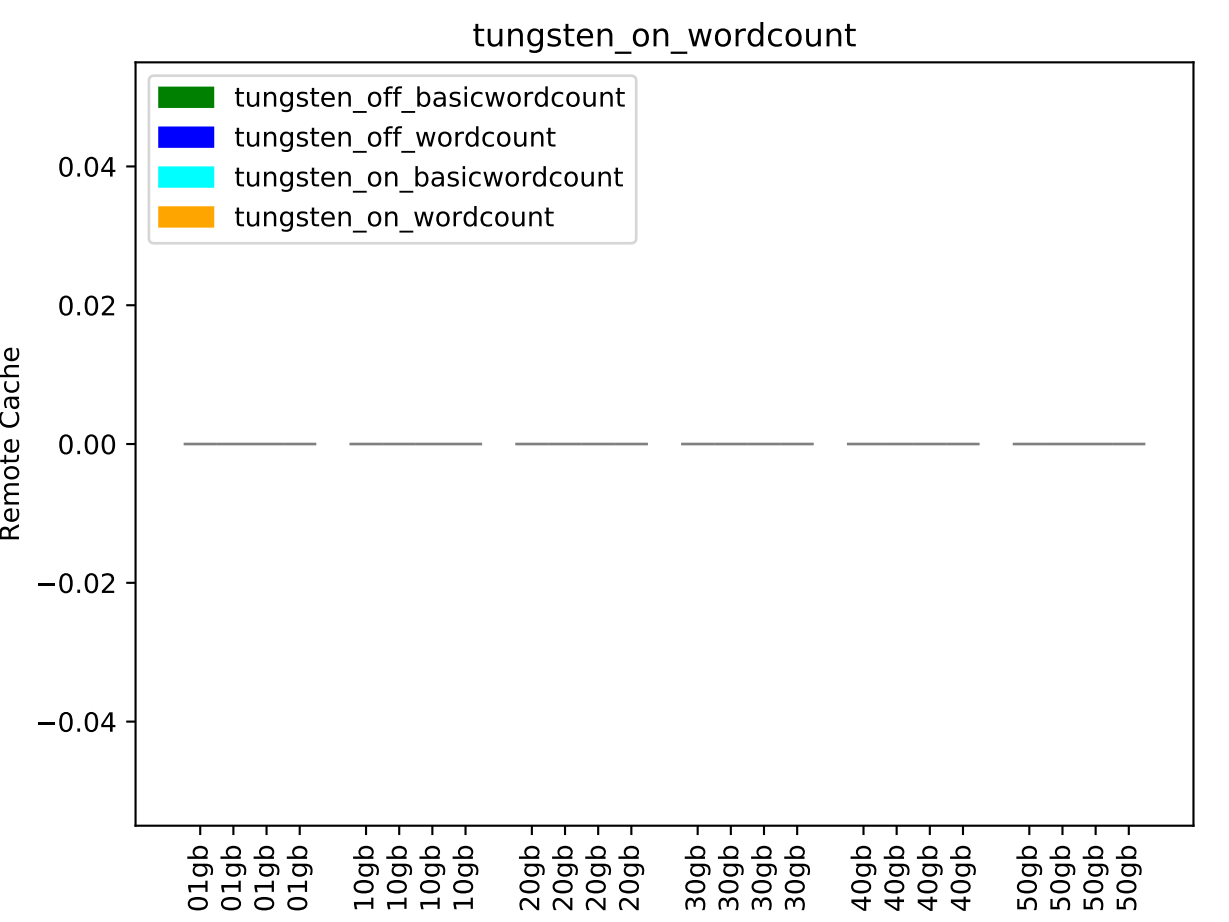
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tungsten_on_wordcount
Remote Cache
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0.02
0.00
−0.02
−0.04
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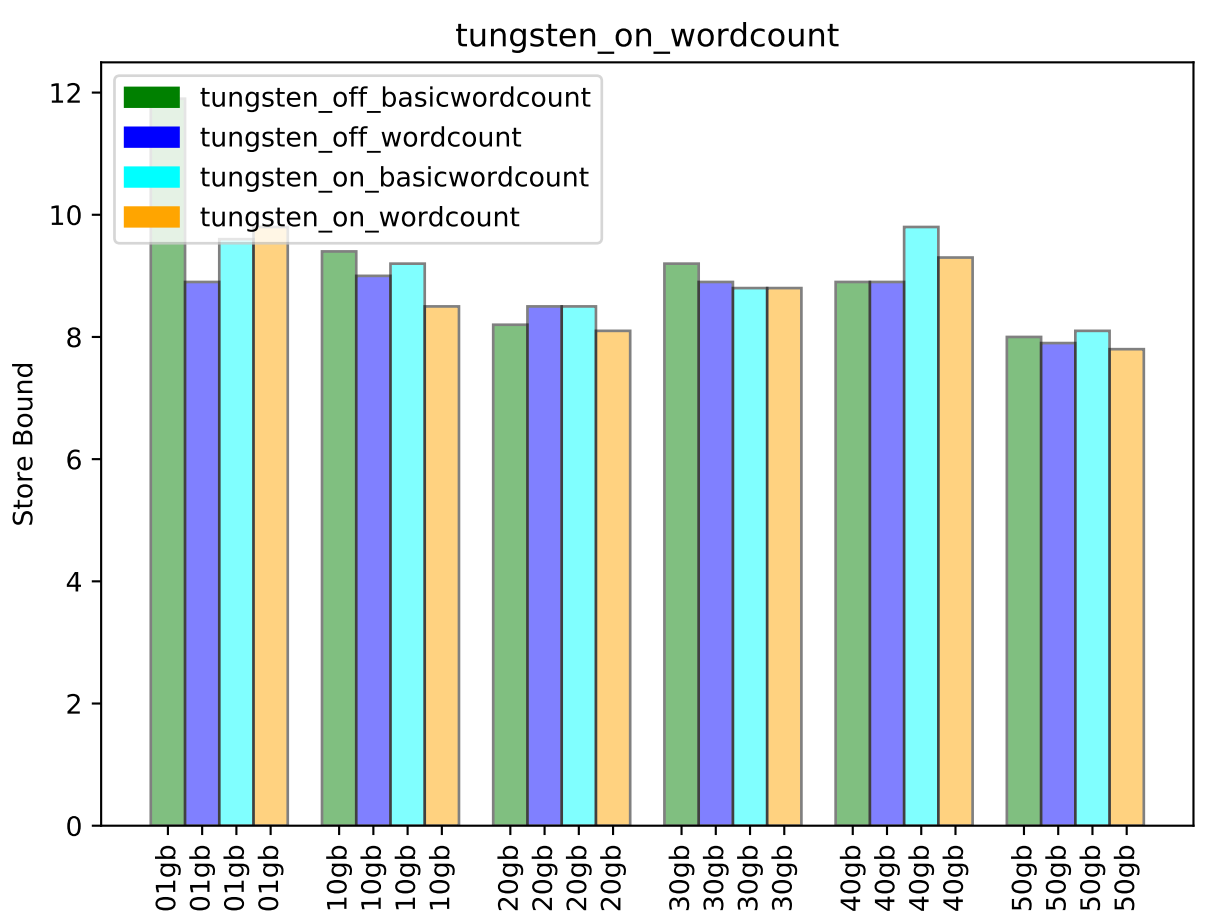
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tungsten_off_basicwordcount
tungsten_off_wordcount
tungsten_on_basicwordcount
tungsten_on_wordcount
Store Bound
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6
8
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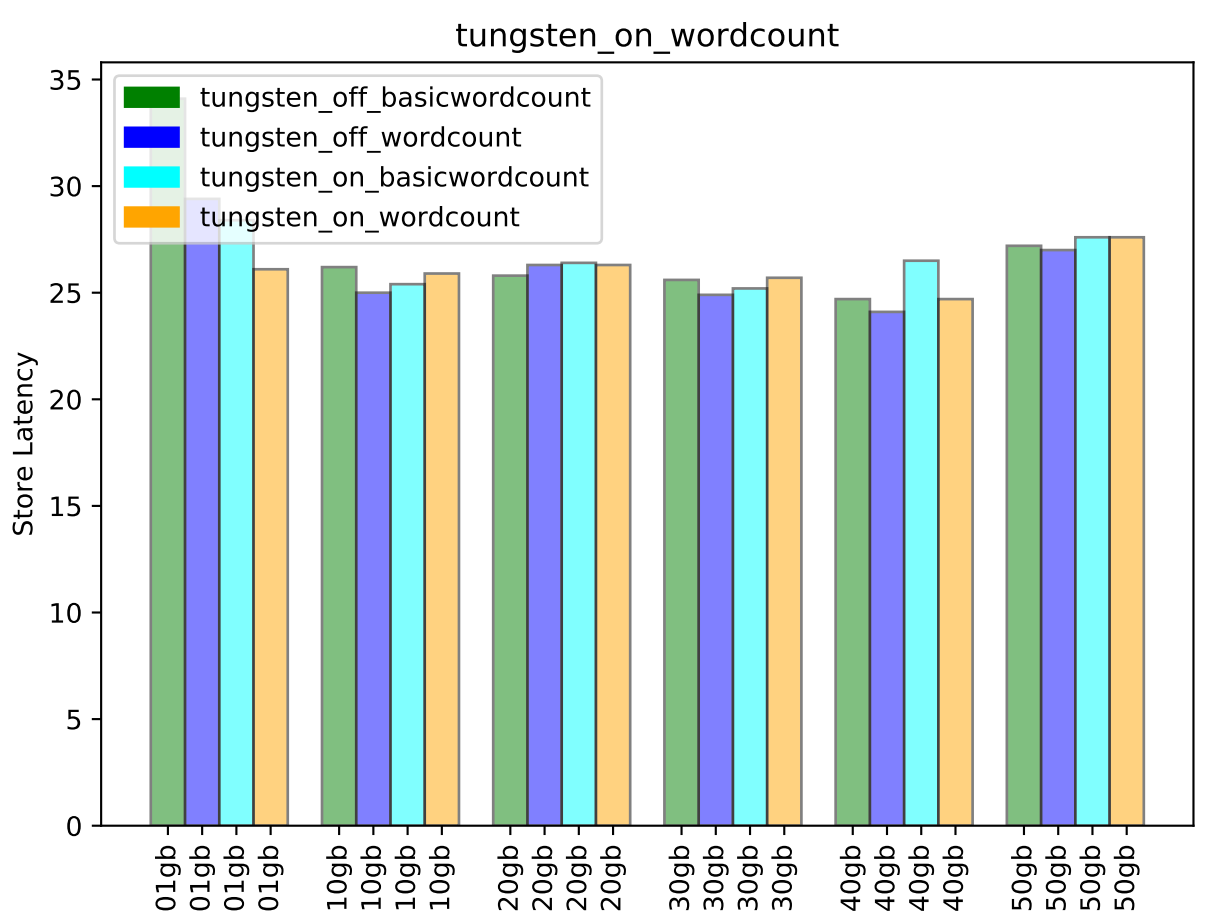
tungsten_on_wordcount
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tungsten_off_wordcount
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tungsten_on_wordcount
Store Latency
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01gb
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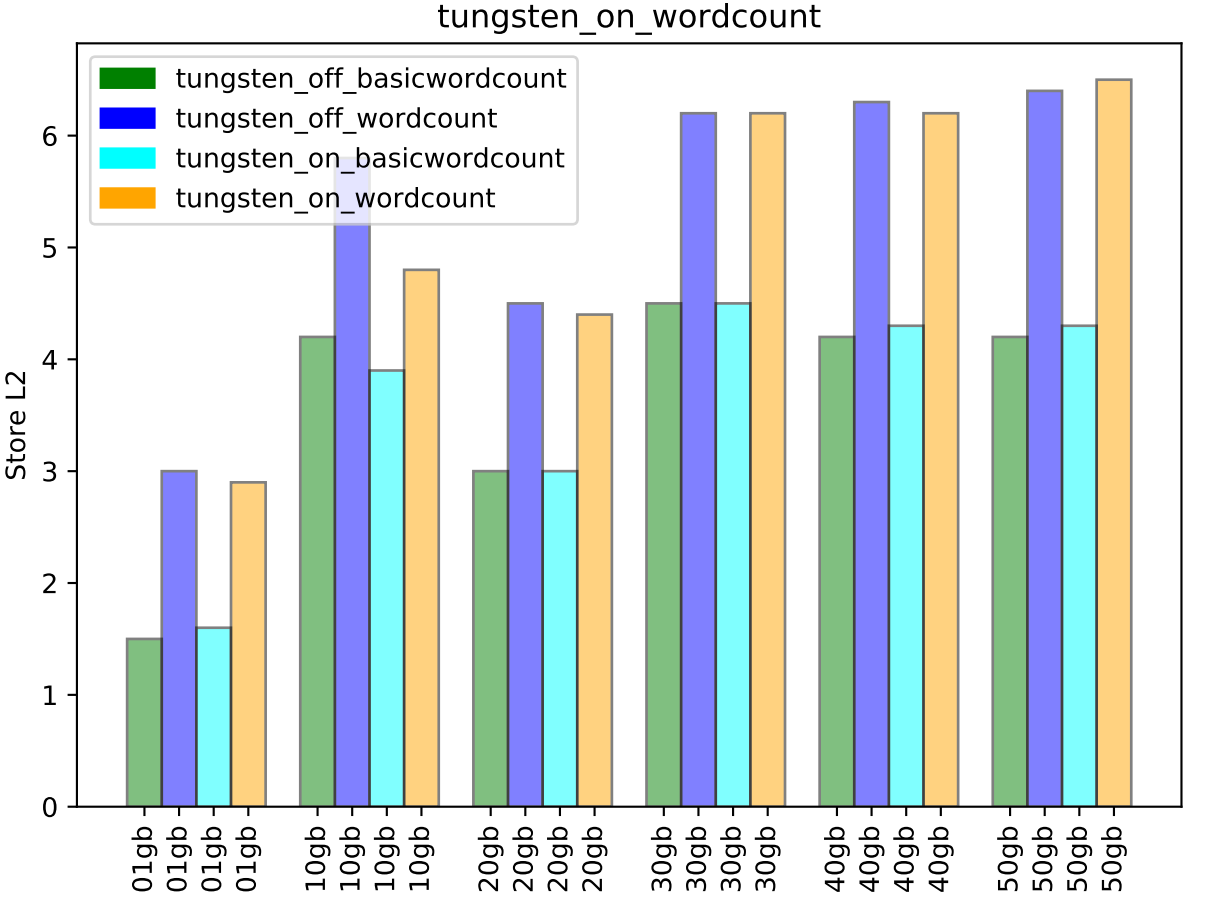
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tungsten_on_basicwordcount
tungsten_on_wordcount
Store L2
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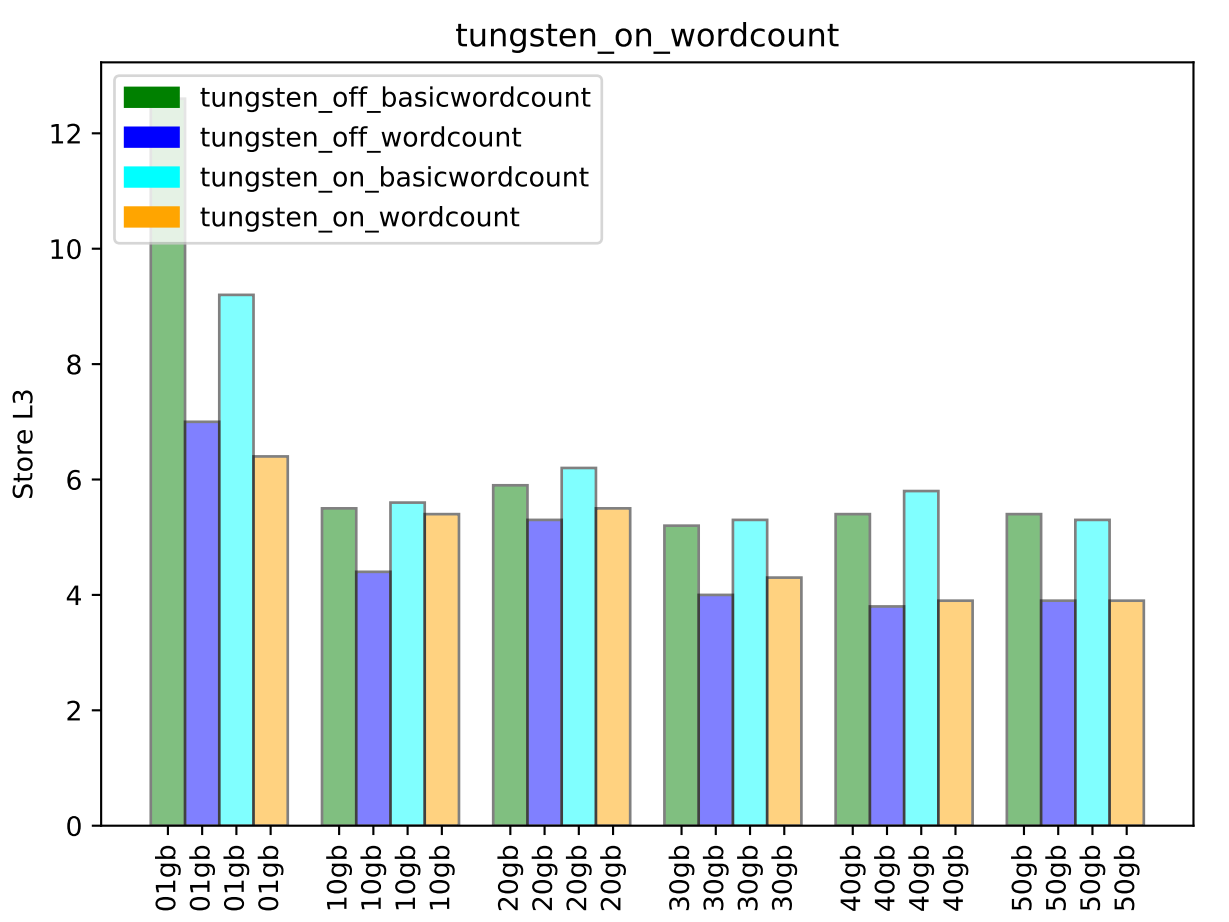
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tungsten_on_wordcount
Store L3
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6
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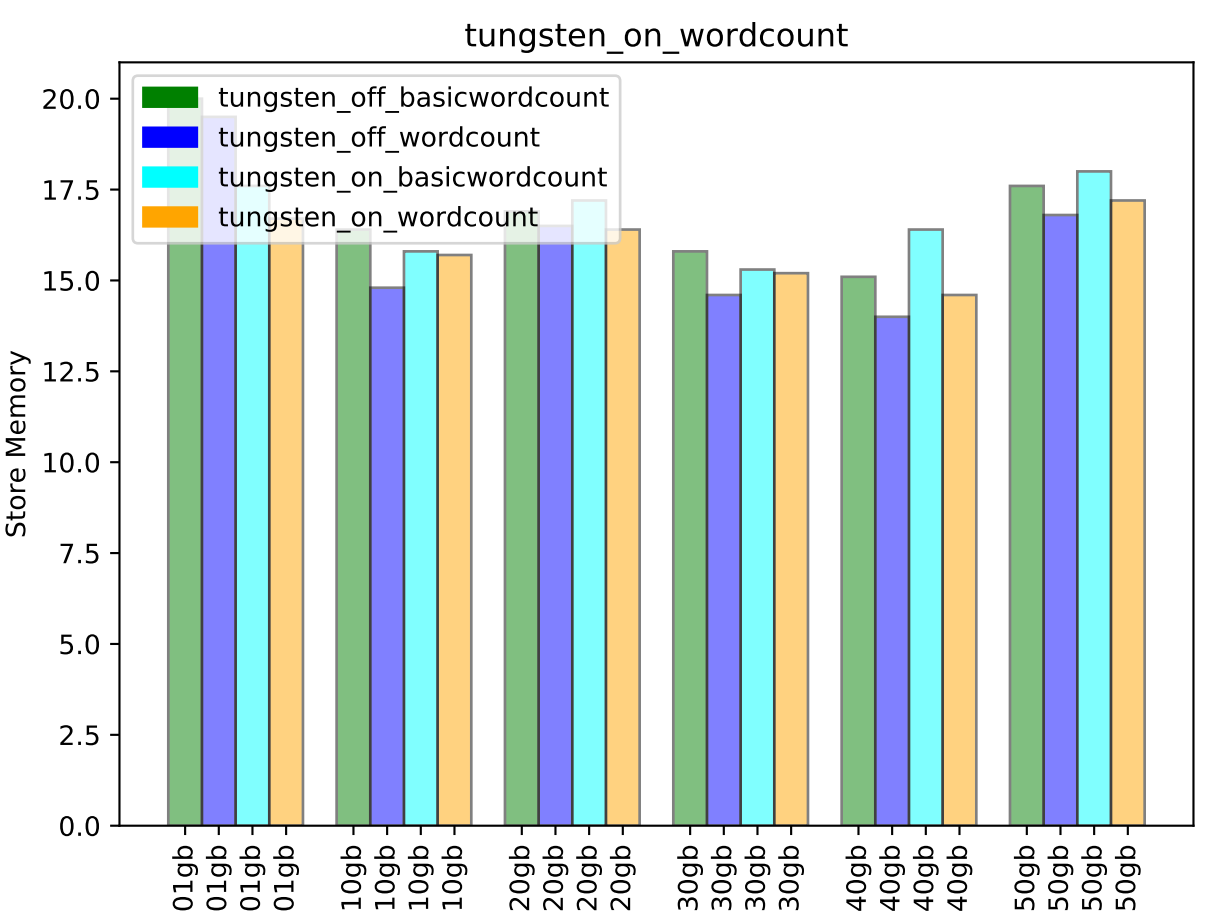
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tungsten_off_basicwordcount
tungsten_off_wordcount
tungsten_on_basicwordcount
tungsten_on_wordcount
Store Memory
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
20.0
01gb
01gb
01gb
01gb
10gb
10gb
10gb
10gb
20gb
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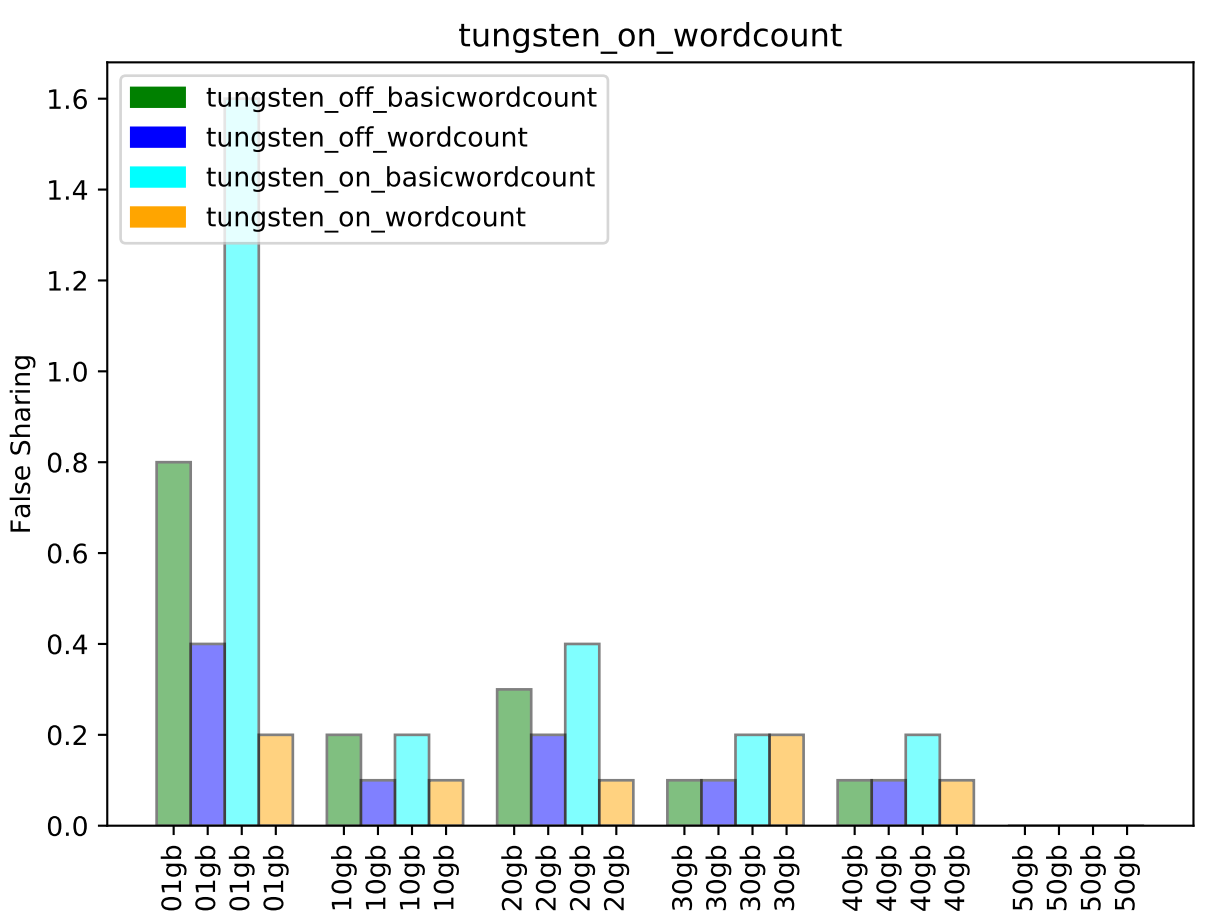
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tungsten_on_basicwordcount
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False Sharing
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0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
01gb
01gb
01gb
01gb
10gb
10gb
10gb
10gb
20gb
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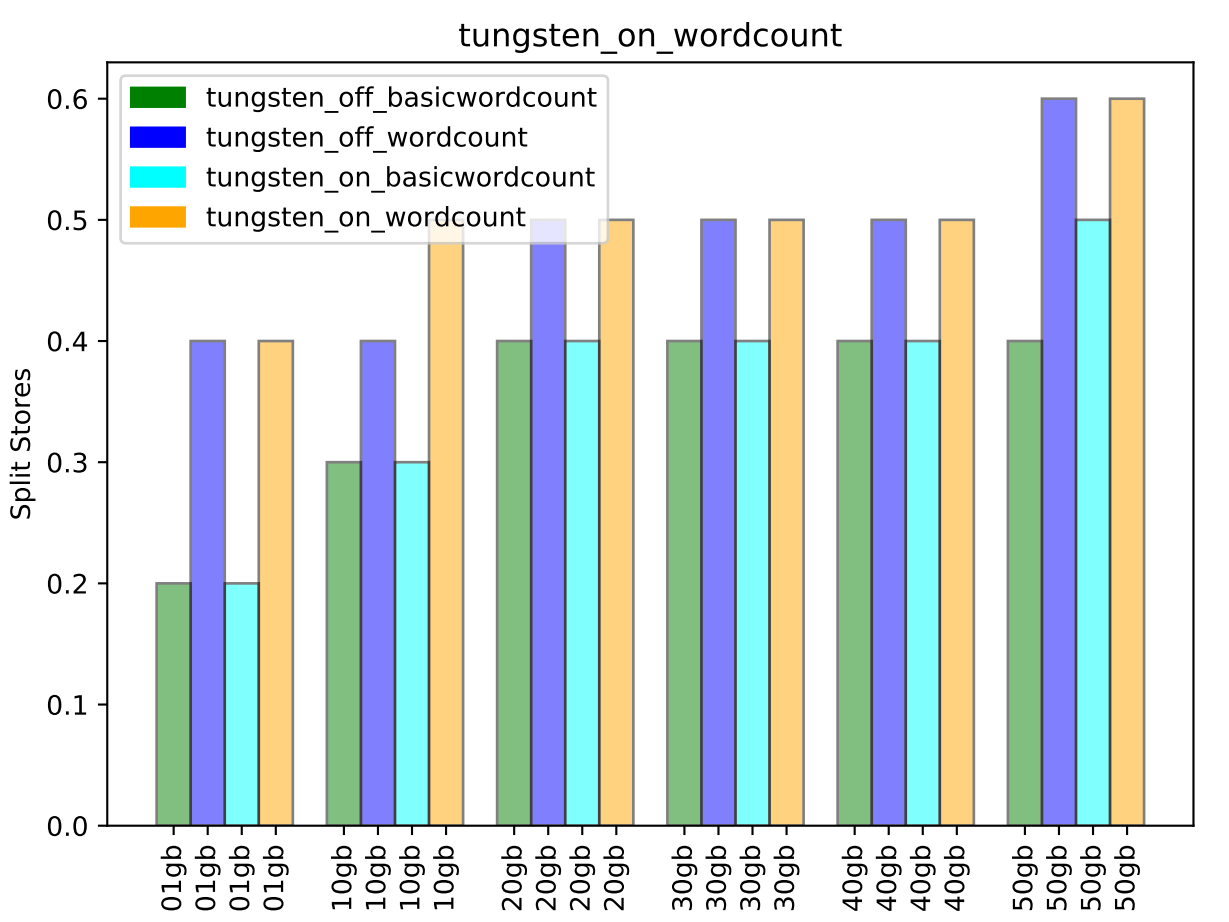
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tungsten_off_wordcount
tungsten_on_basicwordcount
tungsten_on_wordcount
Split Stores
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0.1
0.2
0.3
0.4
0.5
0.6
01gb
01gb
01gb
01gb
10gb
10gb
10gb
10gb
20gb
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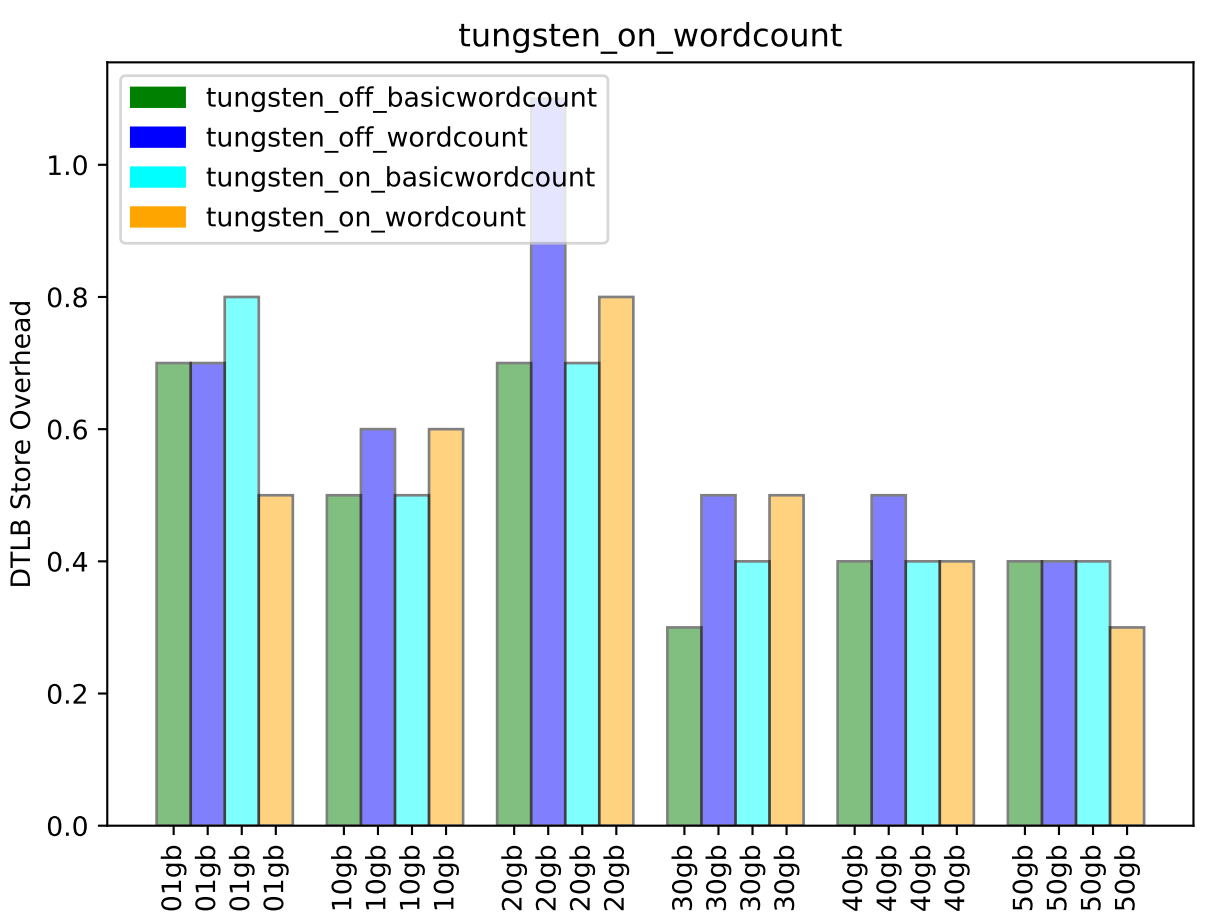
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tungsten_off_wordcount
tungsten_on_basicwordcount
tungsten_on_wordcount
DTLB Store Overhead
0.0
0.2
0.4
0.6
0.8
1.0
01gb
01gb
01gb
01gb
10gb
10gb
10gb
10gb
20gb
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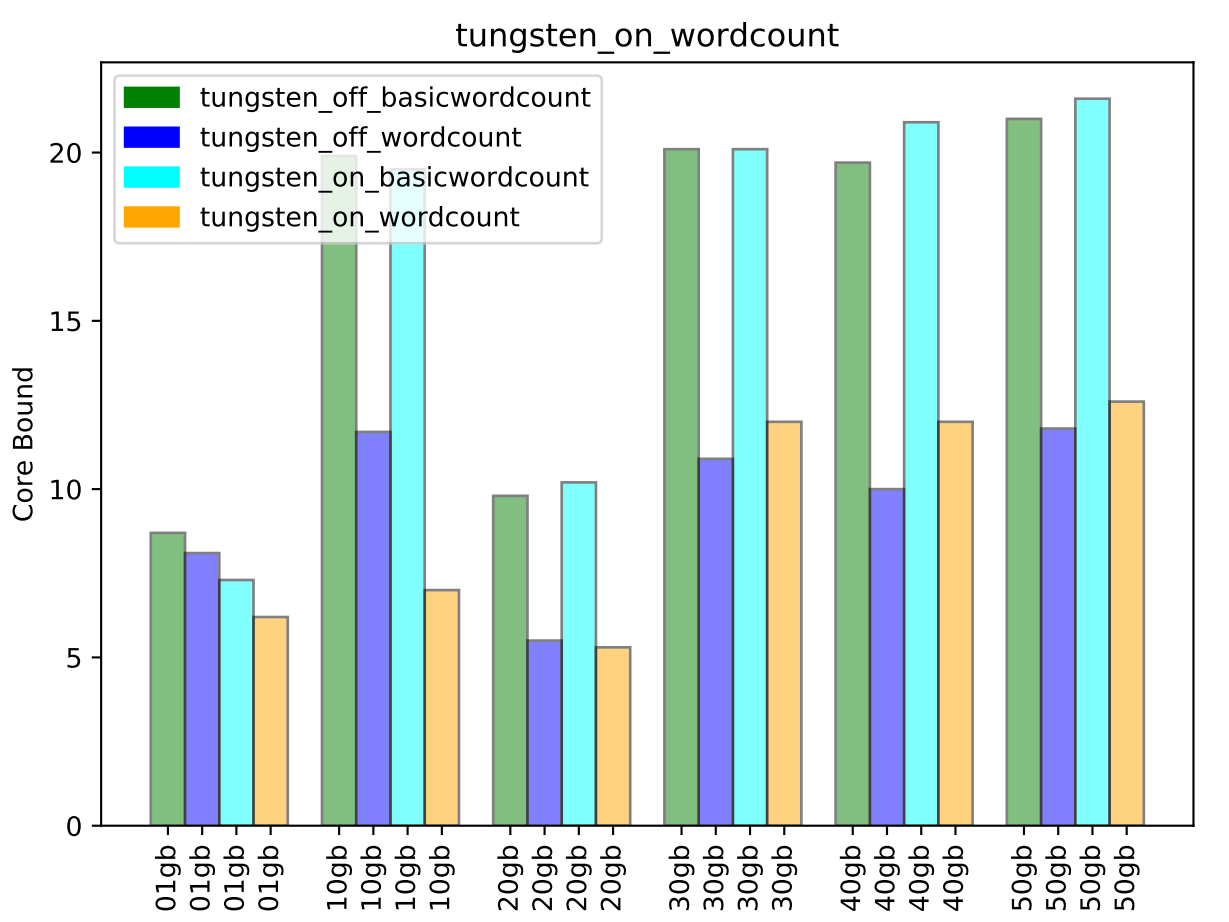
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tungsten_off_wordcount
tungsten_on_basicwordcount
tungsten_on_wordcount
Core Bound
0
5
10
15
20
01gb
01gb
01gb
01gb
10gb
10gb
10gb
10gb
20gb
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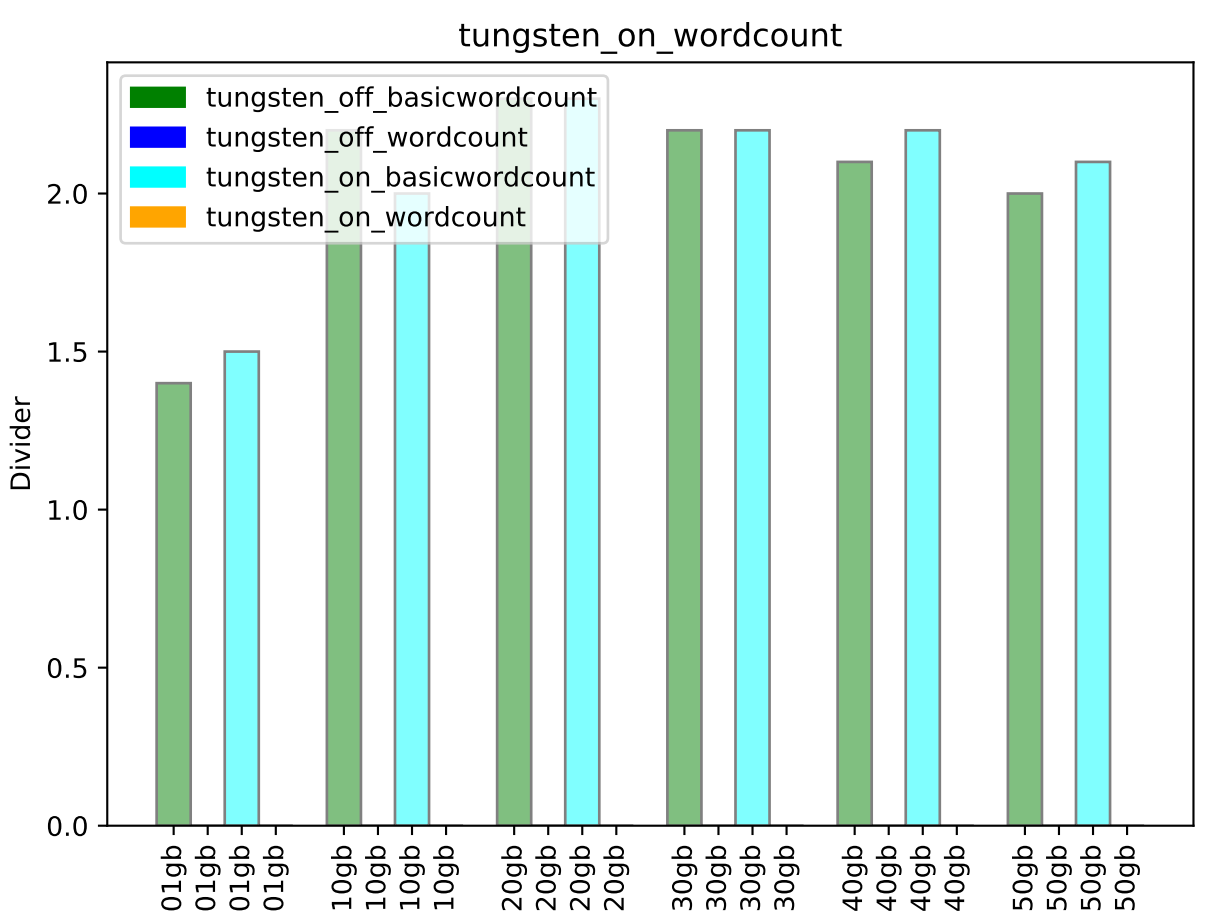
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tungsten_off_wordcount
tungsten_on_basicwordcount
tungsten_on_wordcount
Divider
0.0
0.5
1.0
1.5
2.0
01gb
01gb
01gb
01gb
10gb
10gb
10gb
10gb
20gb
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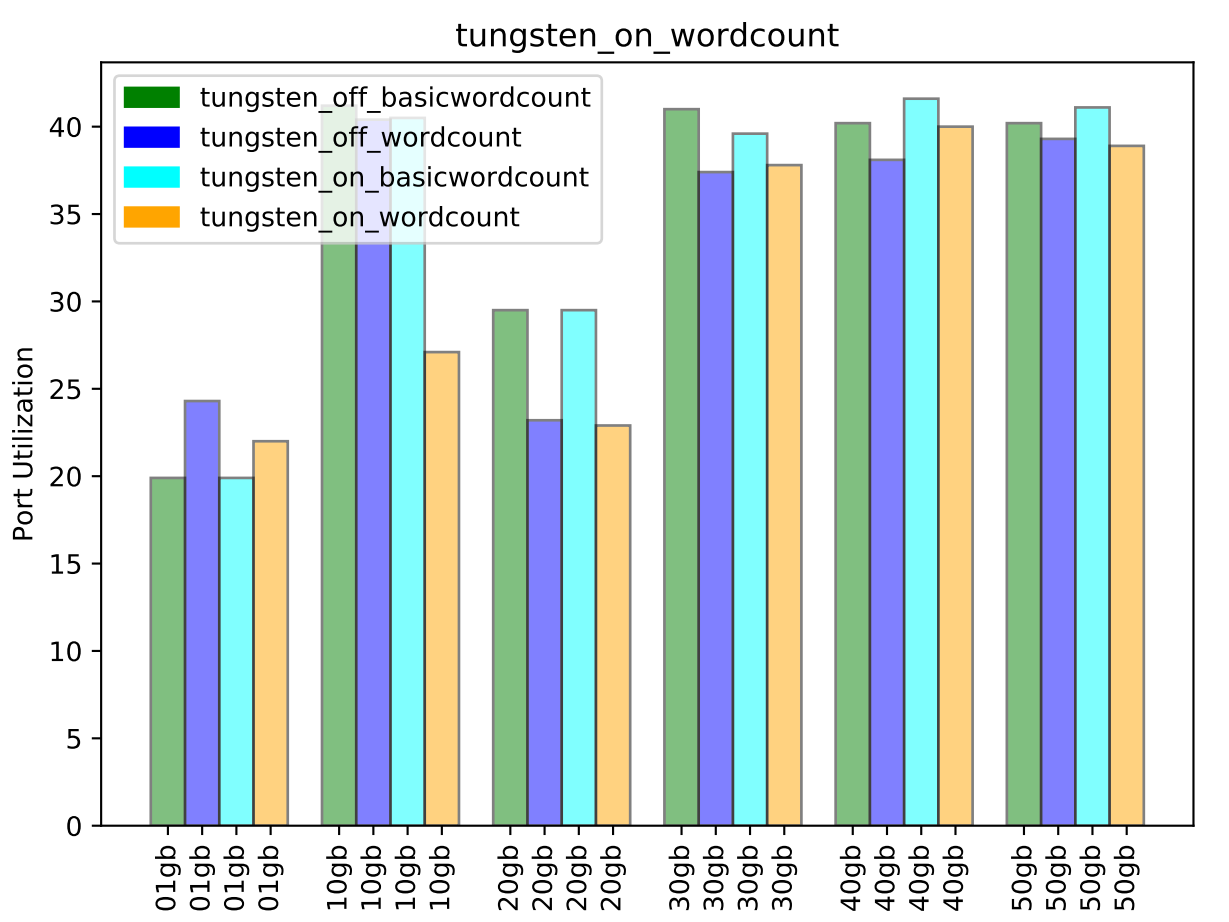
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tungsten_off_wordcount
tungsten_on_basicwordcount
tungsten_on_wordcount
Port Utilization
0
5
10
15
20
25
30
35
40
01gb
01gb
01gb
01gb
10gb
10gb
10gb
10gb
20gb
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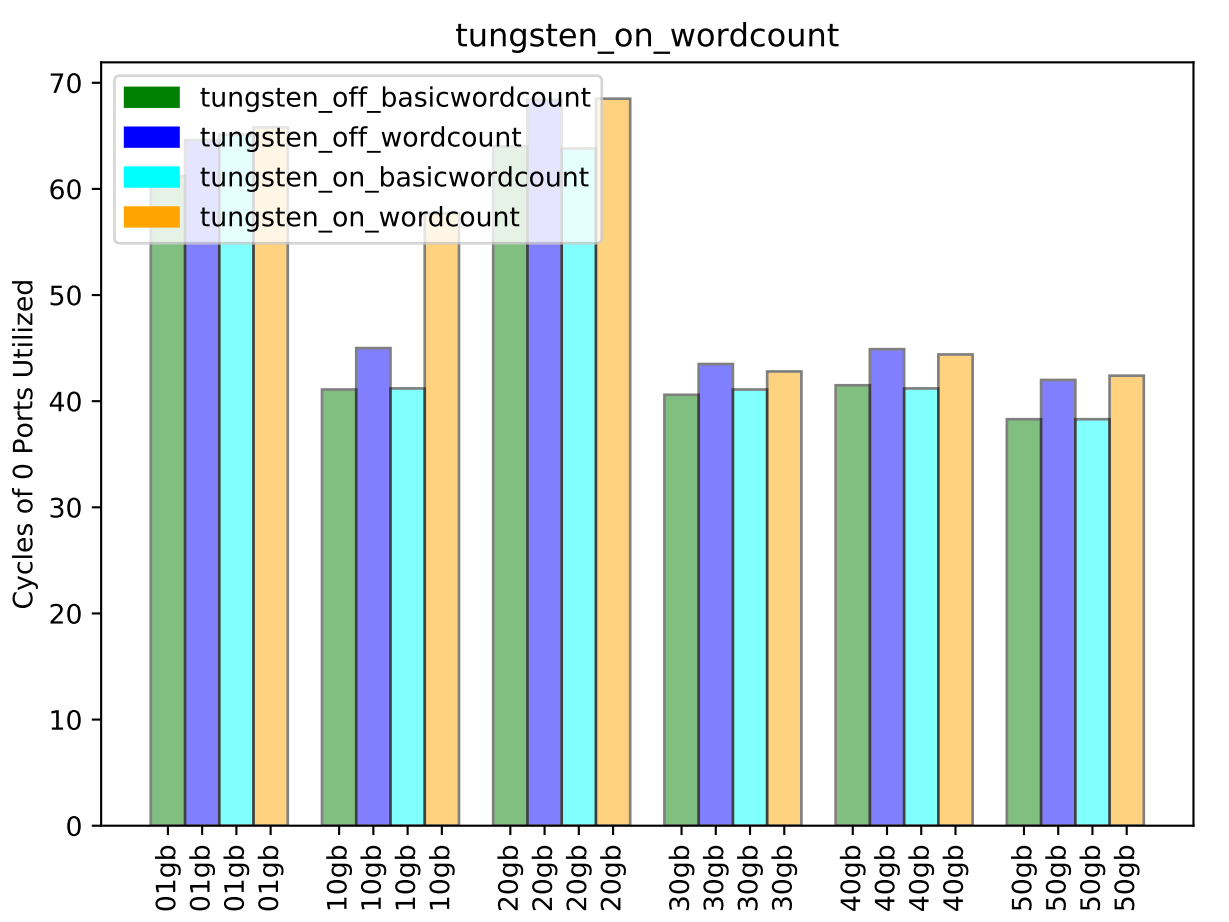
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tungsten_off_wordcount
tungsten_on_basicwordcount
tungsten_on_wordcount
Cycles of 0 Ports Utilized
0
10
20
30
40
50
60
70
01gb
01gb
01gb
01gb
10gb
10gb
10gb
10gb
20gb
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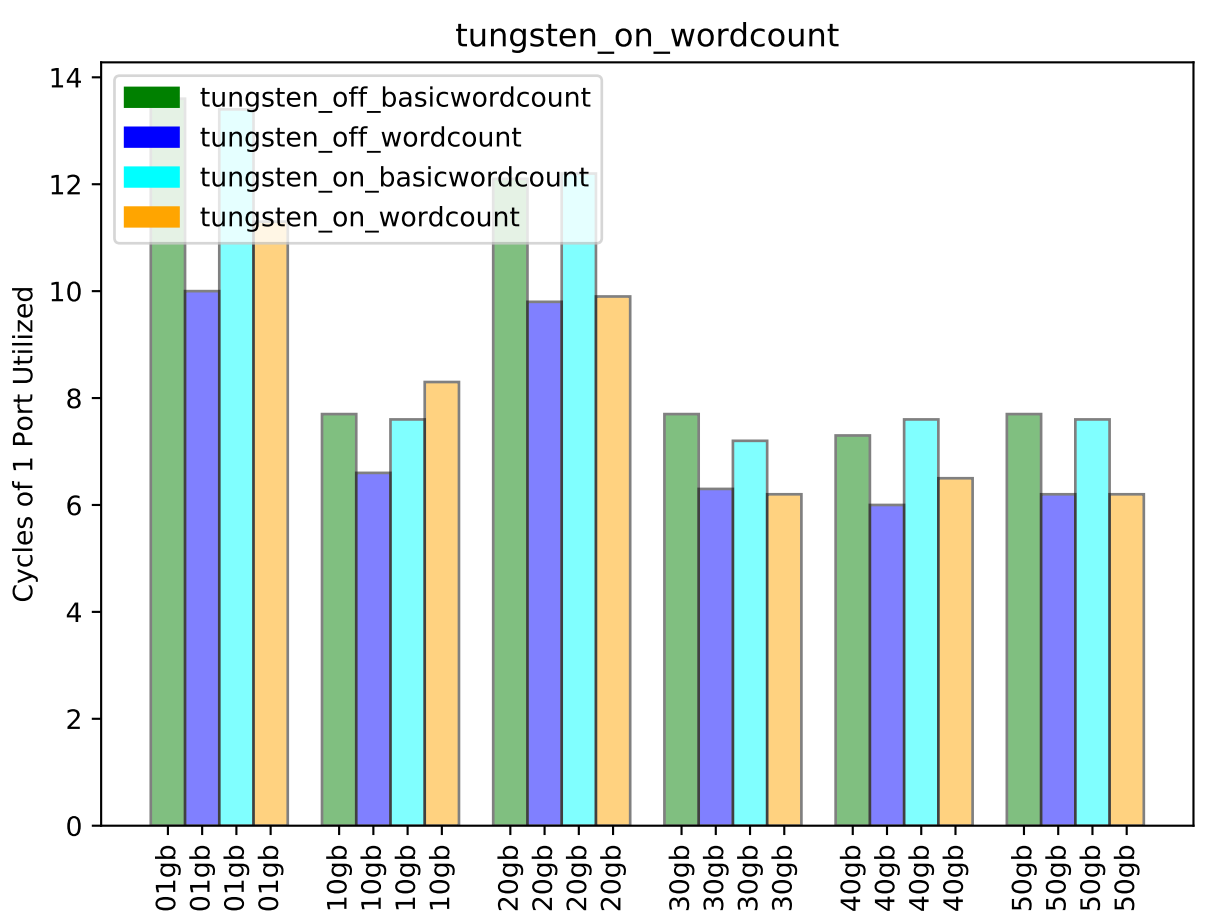
tungsten_on_wordcount
tungsten_off_basicwordcount
tungsten_off_wordcount
tungsten_on_basicwordcount
tungsten_on_wordcount
Cycles of 1 Port Utilized
0
2
4
6
8
10
12
14
01gb
01gb
01gb
01gb
10gb
10gb
10gb
10gb
20gb
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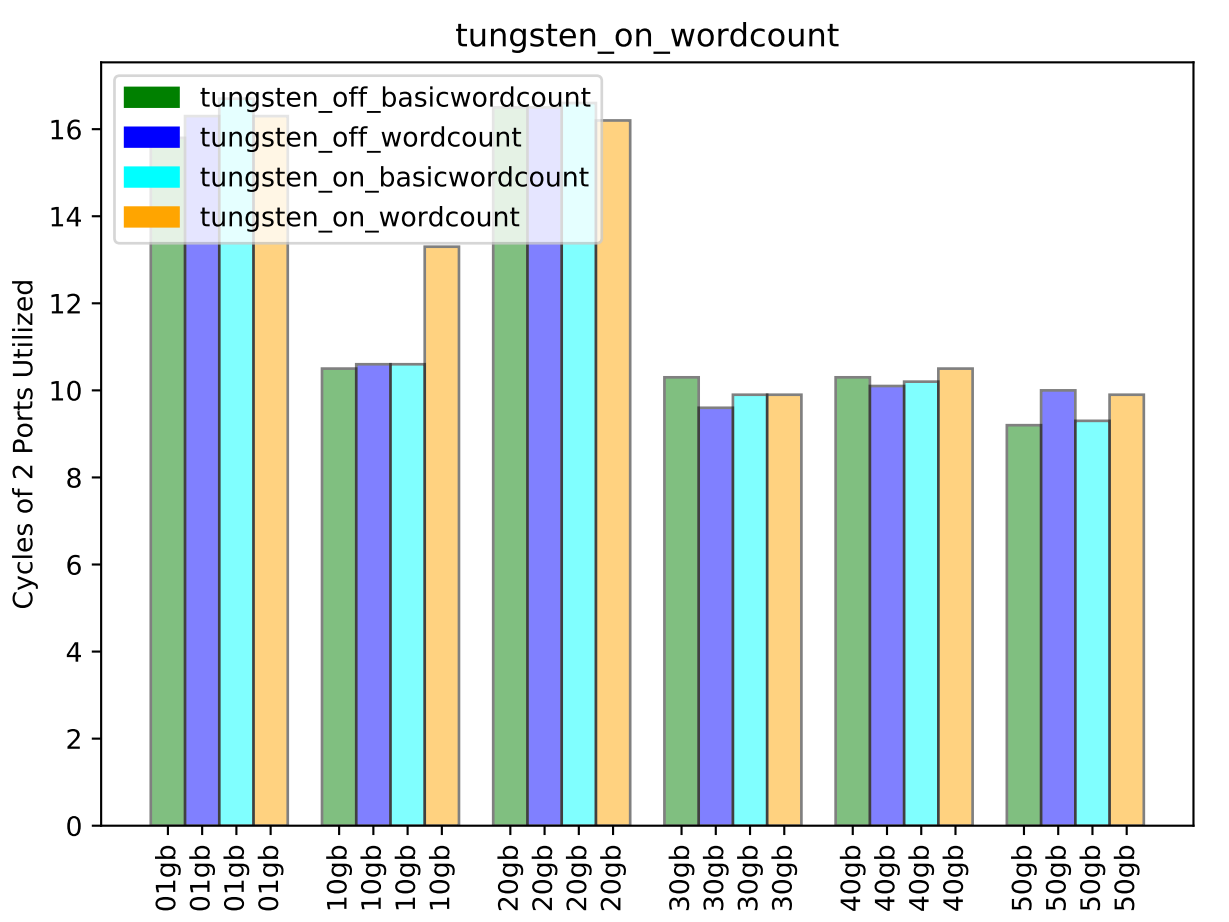
tungsten_on_wordcount
tungsten_off_basicwordcount
tungsten_off_wordcount
tungsten_on_basicwordcount
tungsten_on_wordcount
Cycles of 2 Ports Utilized
0
2
4
6
8
10
12
14
16
01gb
01gb
01gb
01gb
10gb
10gb
10gb
10gb
20gb
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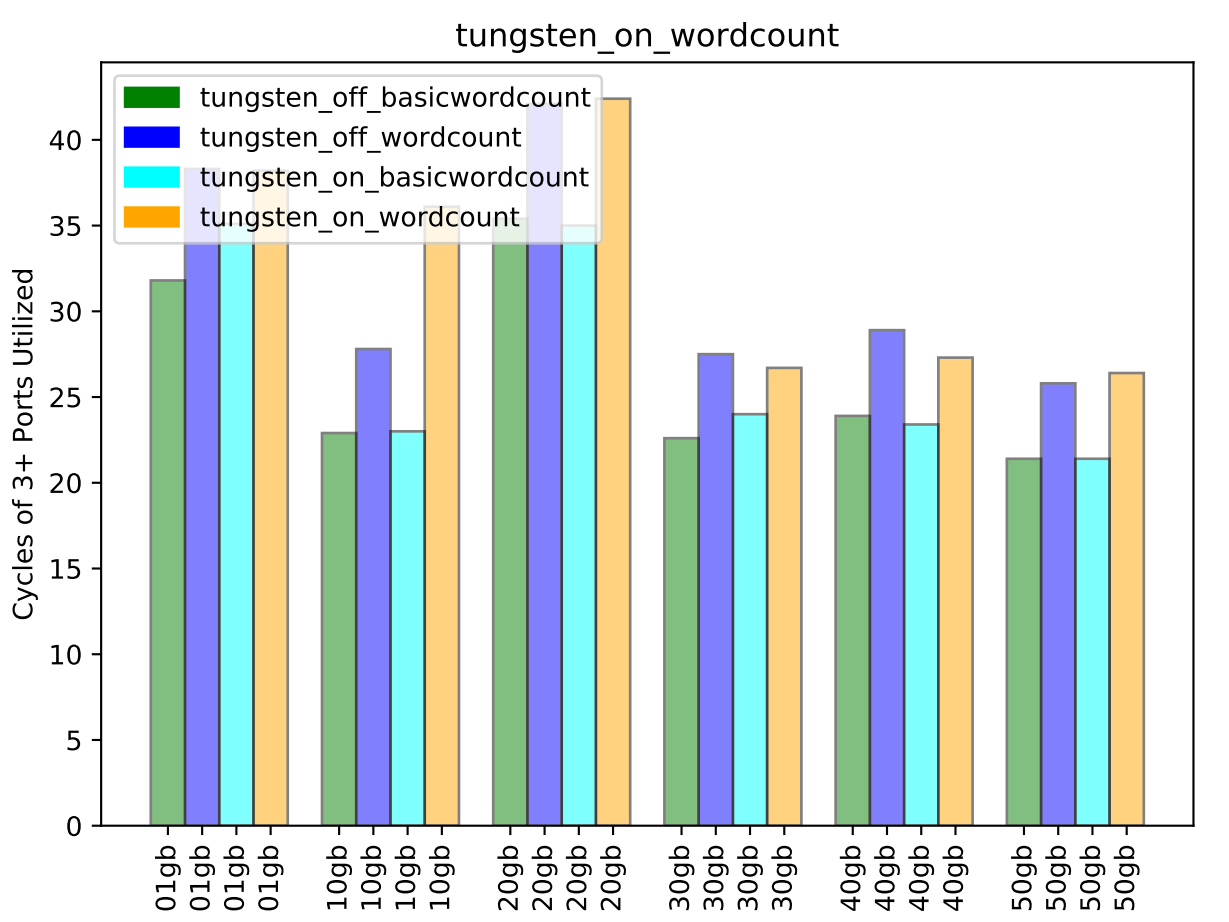
tungsten_on_wordcount
tungsten_off_basicwordcount
tungsten_off_wordcount
tungsten_on_basicwordcount
tungsten_on_wordcount
Cycles of 3+ Ports Utilized
0
5
10
15
20
25
30
35
40
01gb
01gb
01gb
01gb
10gb
10gb
10gb
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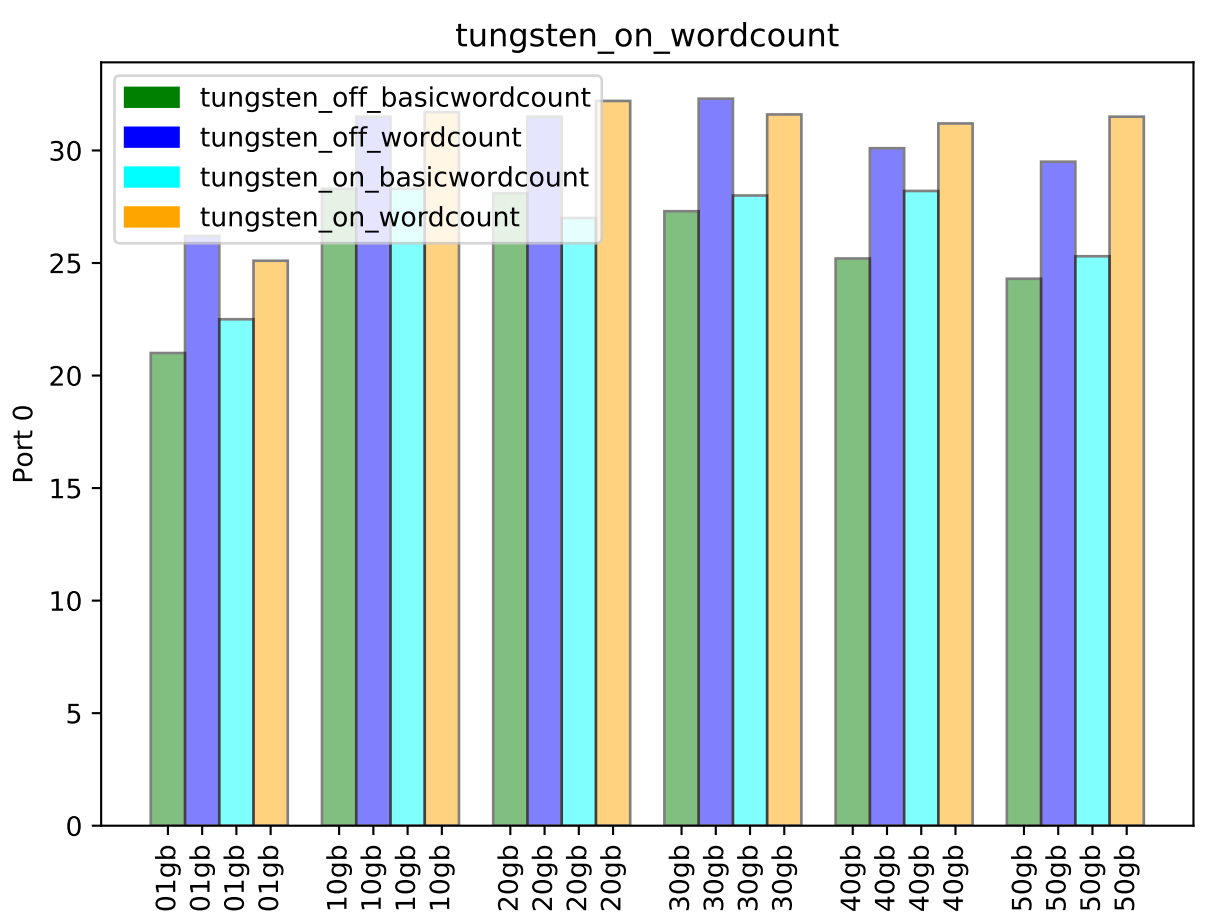
tungsten_on_wordcount
tungsten_off_basicwordcount
tungsten_off_wordcount
tungsten_on_basicwordcount
tungsten_on_wordcount
Port 0
0
5
10
15
20
25
30
01gb
01gb
01gb
01gb
10gb
10gb
10gb
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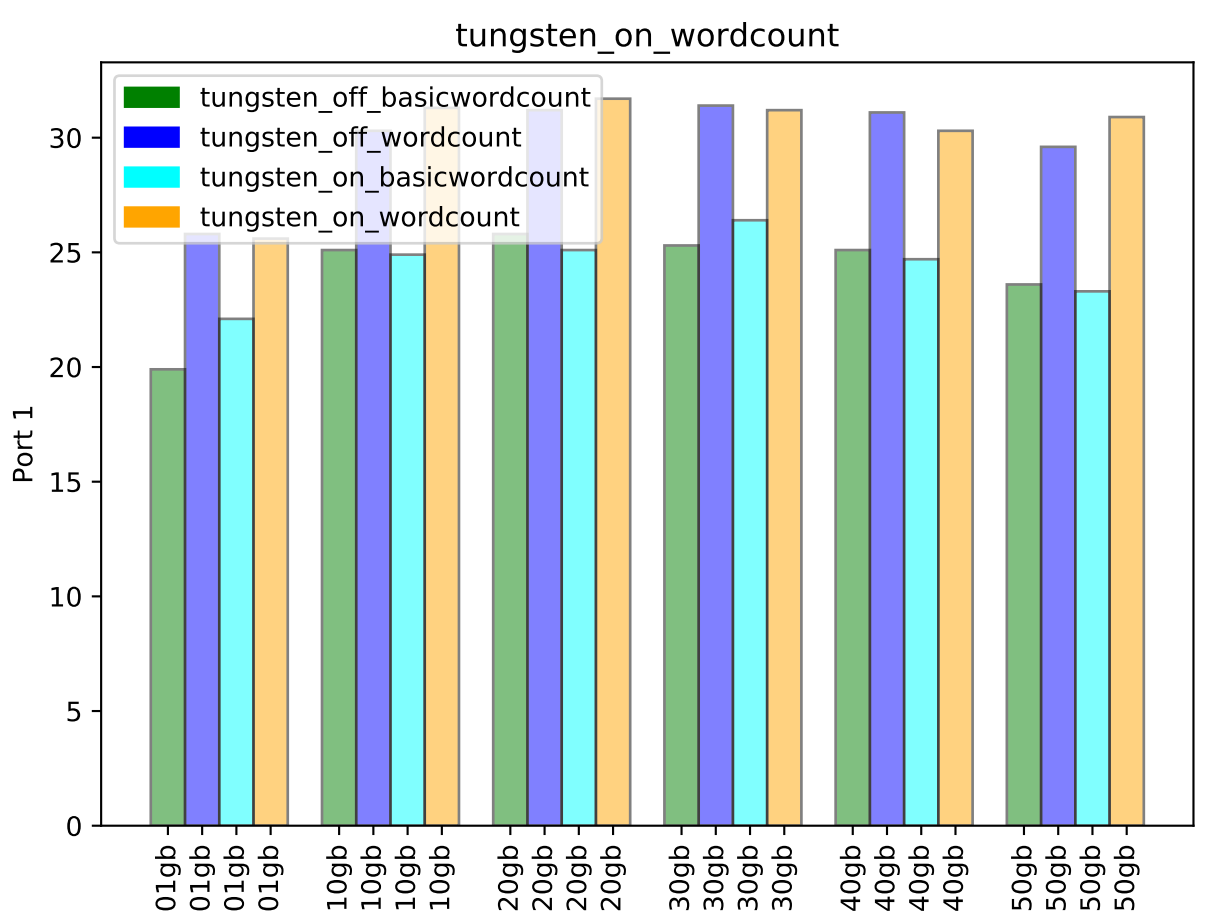
tungsten_on_wordcount
tungsten_off_basicwordcount
tungsten_off_wordcount
tungsten_on_basicwordcount
tungsten_on_wordcount
Port 1
0
5
10
15
20
25
30
01gb
01gb
01gb
01gb
10gb
10gb
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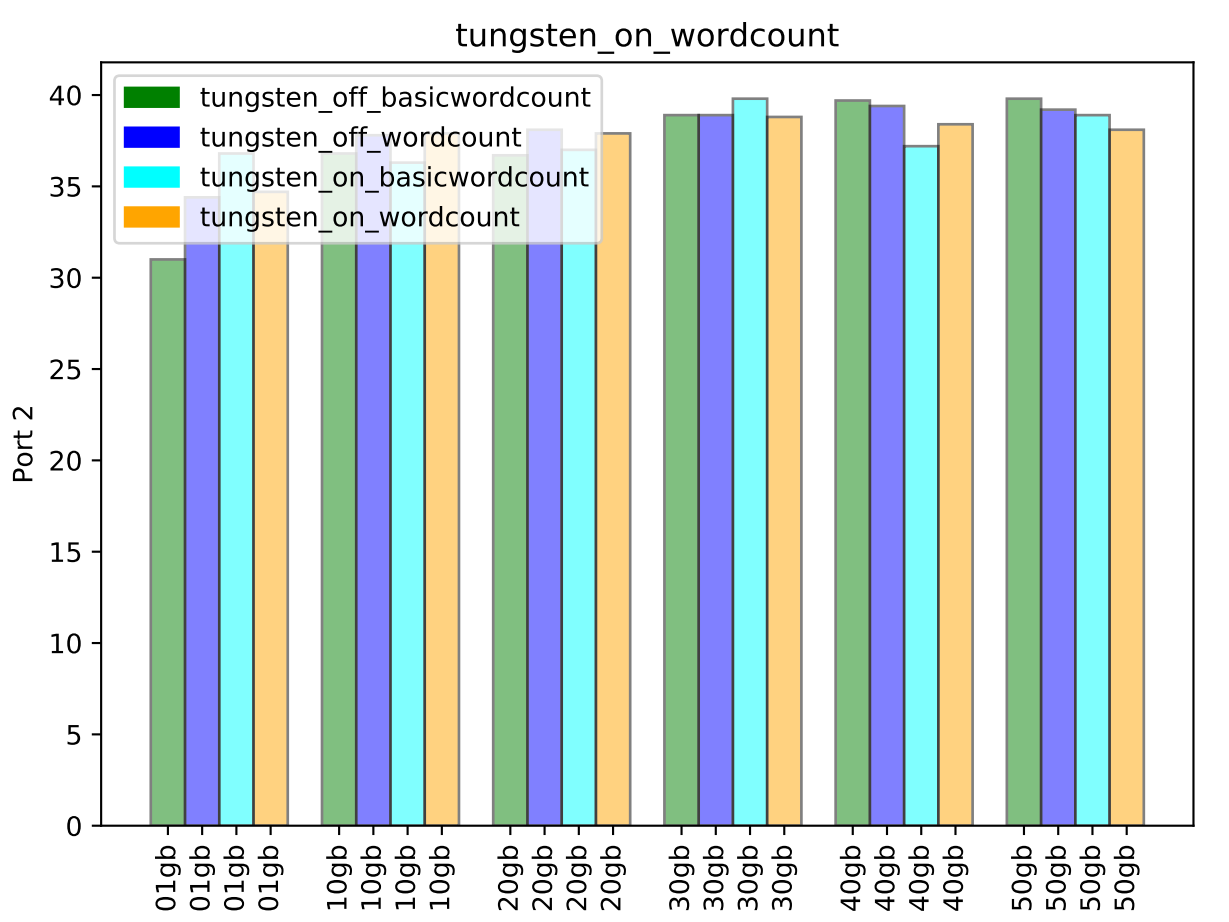
tungsten_on_wordcount
tungsten_off_basicwordcount
tungsten_off_wordcount
tungsten_on_basicwordcount
tungsten_on_wordcount
Port 2
0
5
10
15
20
25
30
35
40
01gb
01gb
01gb
01gb
10gb
10gb
10gb
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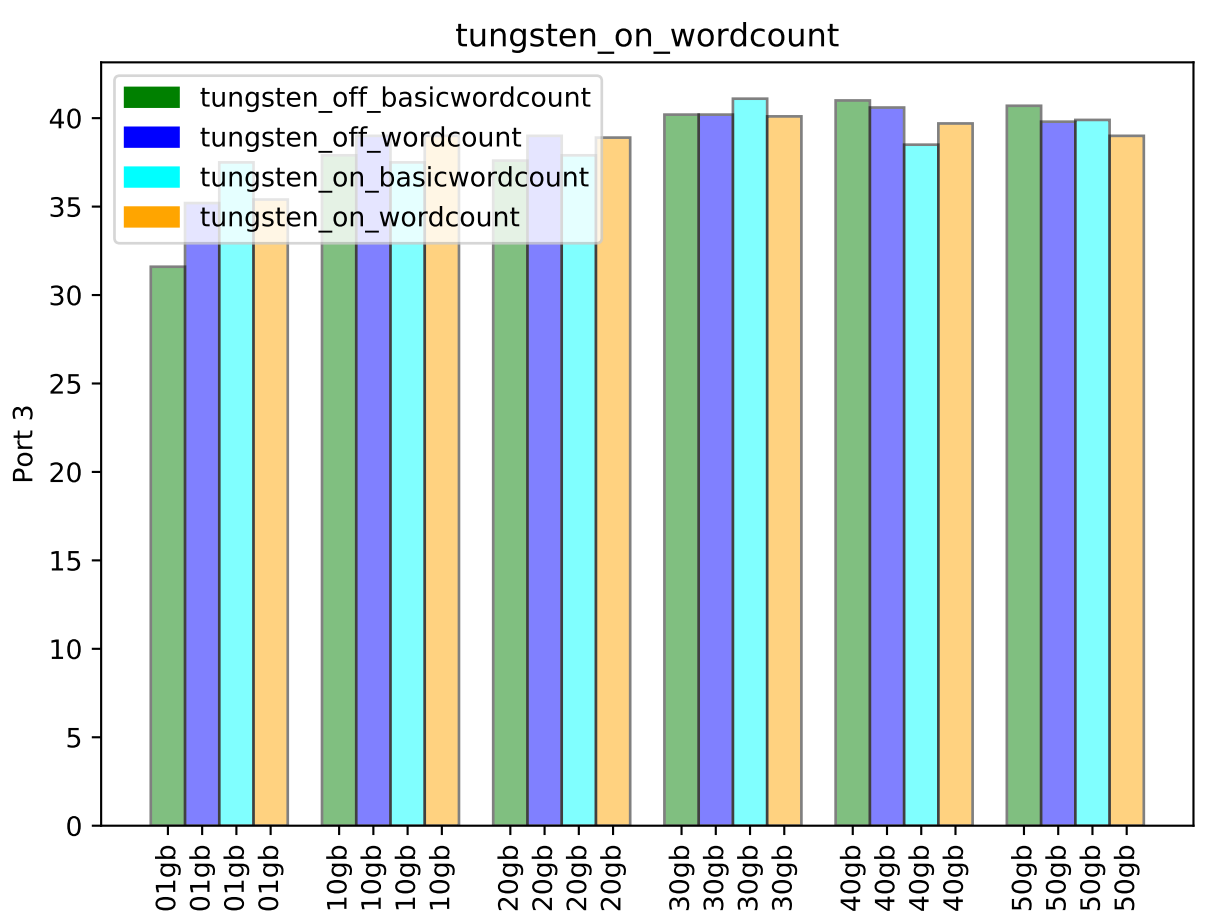
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tungsten_off_wordcount
tungsten_on_basicwordcount
tungsten_on_wordcount
Port 3
0
5
10
15
20
25
30
35
40
01gb
01gb
01gb
01gb
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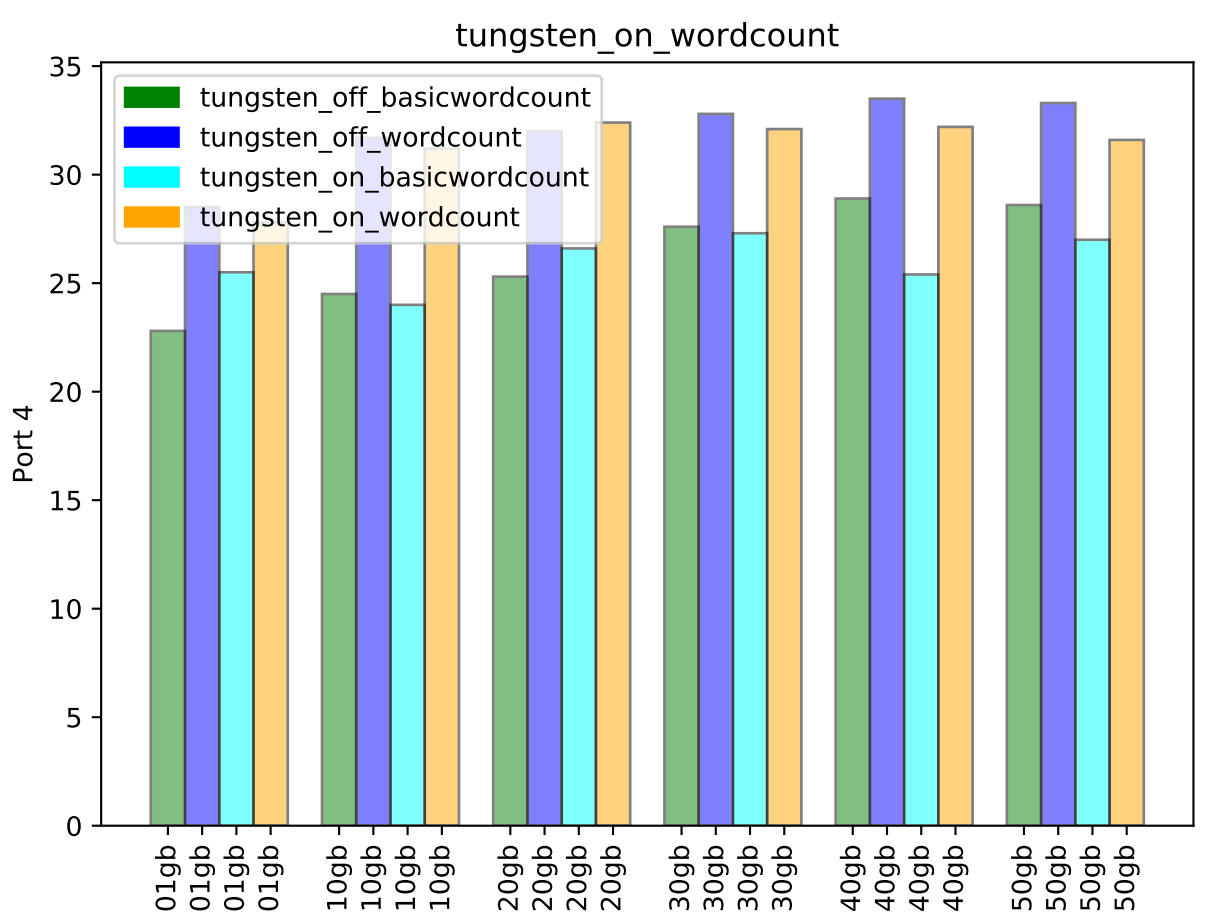
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tungsten_off_wordcount
tungsten_on_basicwordcount
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Port 4
0
5
10
15
20
25
30
35
01gb
01gb
01gb
01gb
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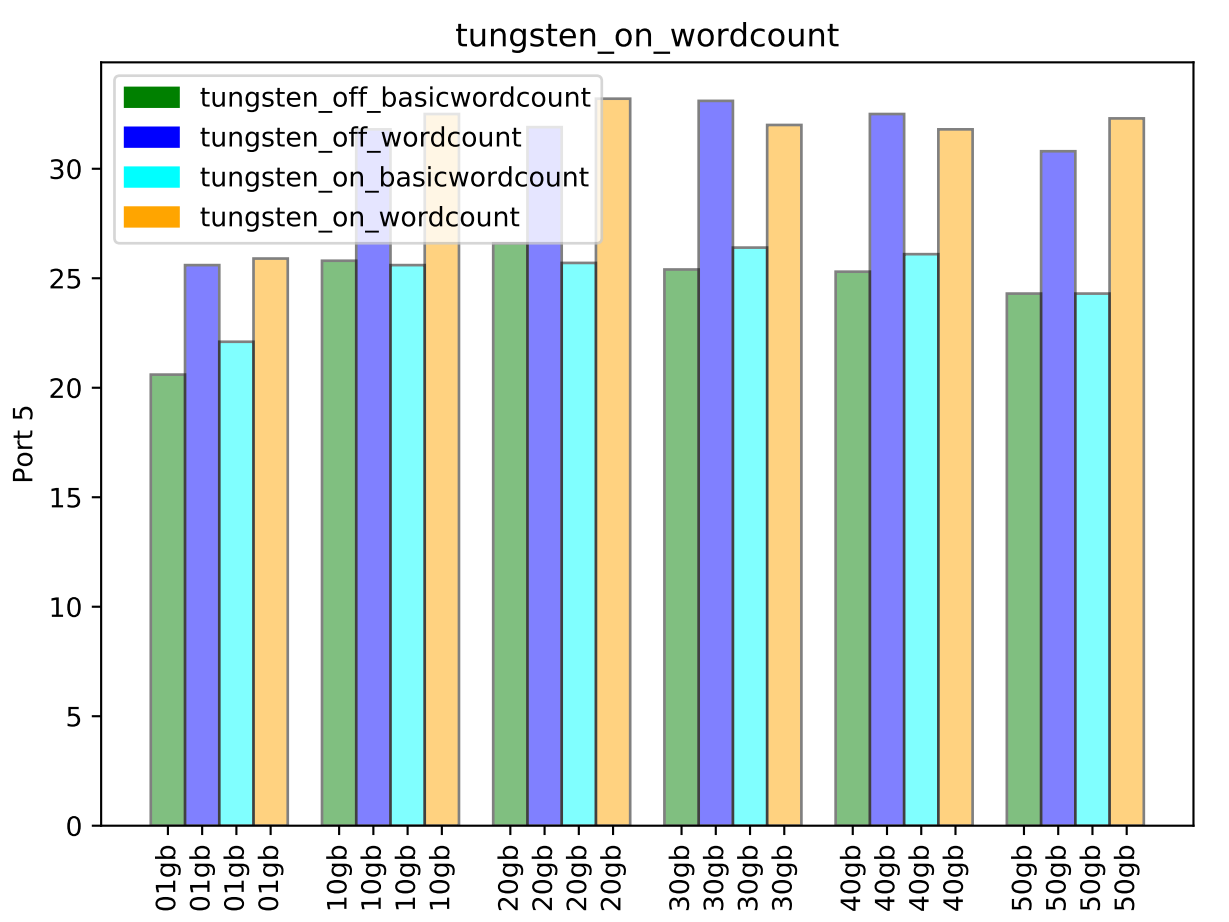
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tungsten_on_basicwordcount
tungsten_on_wordcount
Port 5
0
5
10
15
20
25
30
01gb
01gb
01gb
01gb
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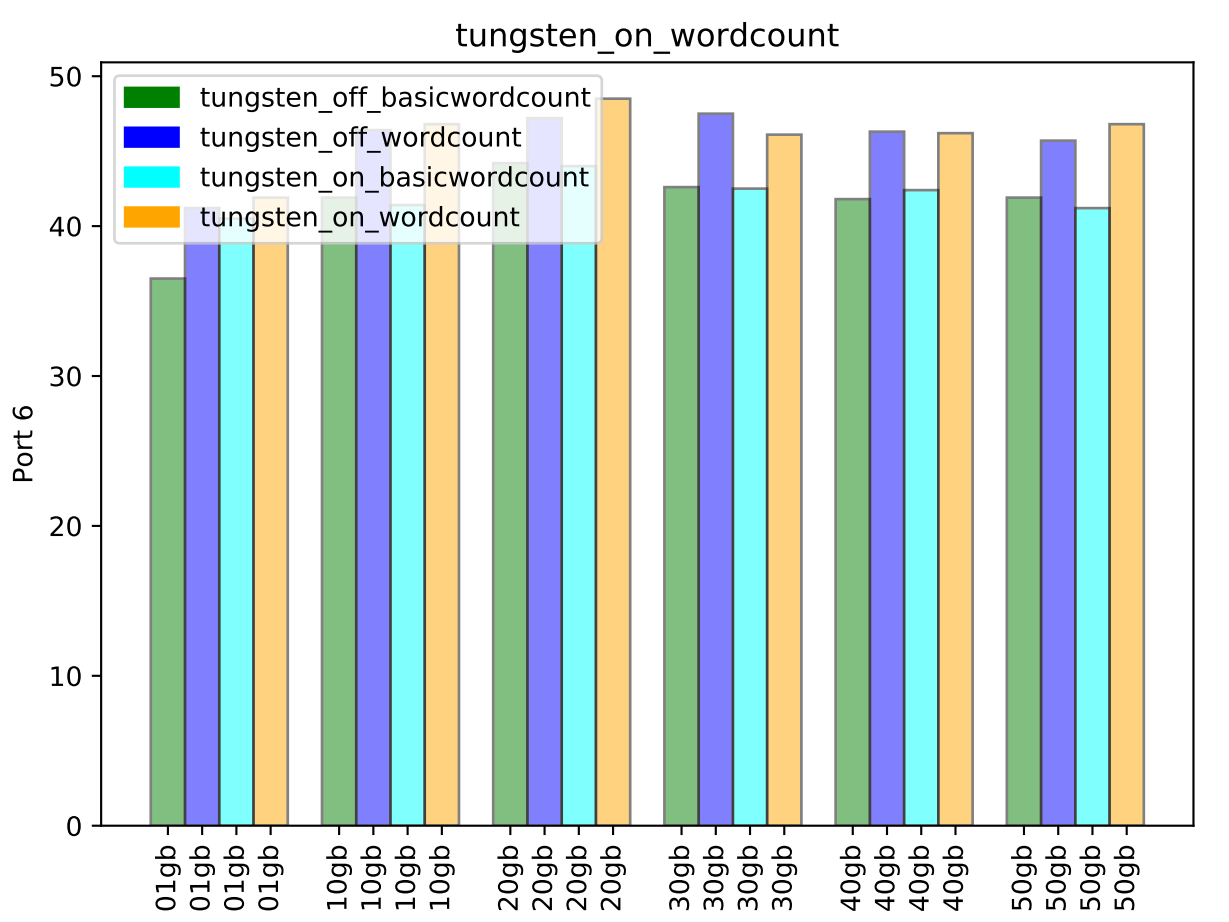
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tungsten_on_basicwordcount
tungsten_on_wordcount
Port 6
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20
30
40
50
01gb
01gb
01gb
01gb
10gb
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10gb
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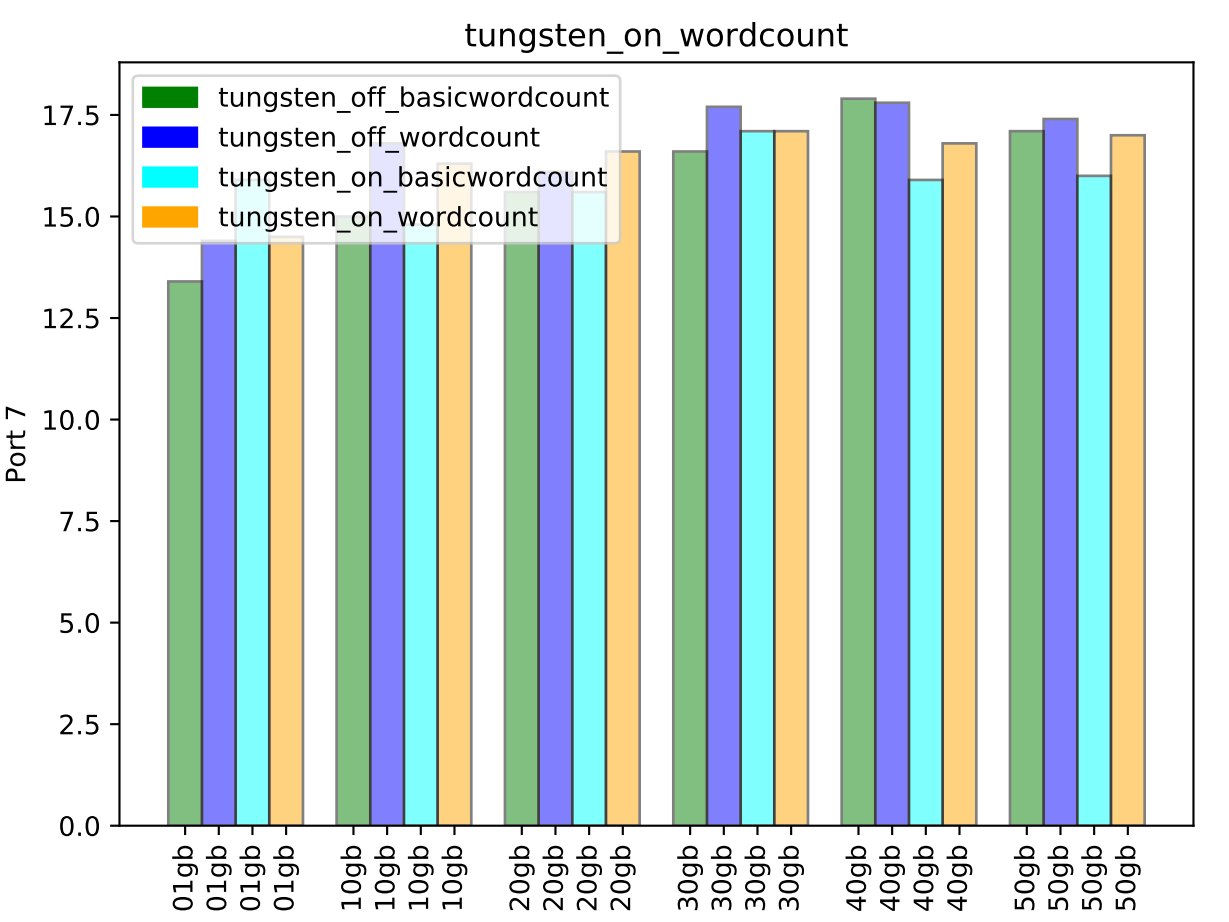
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tungsten_on_basicwordcount
tungsten_on_wordcount
Port 7
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2.5
5.0
7.5
10.0
12.5
15.0
17.5
01gb
01gb
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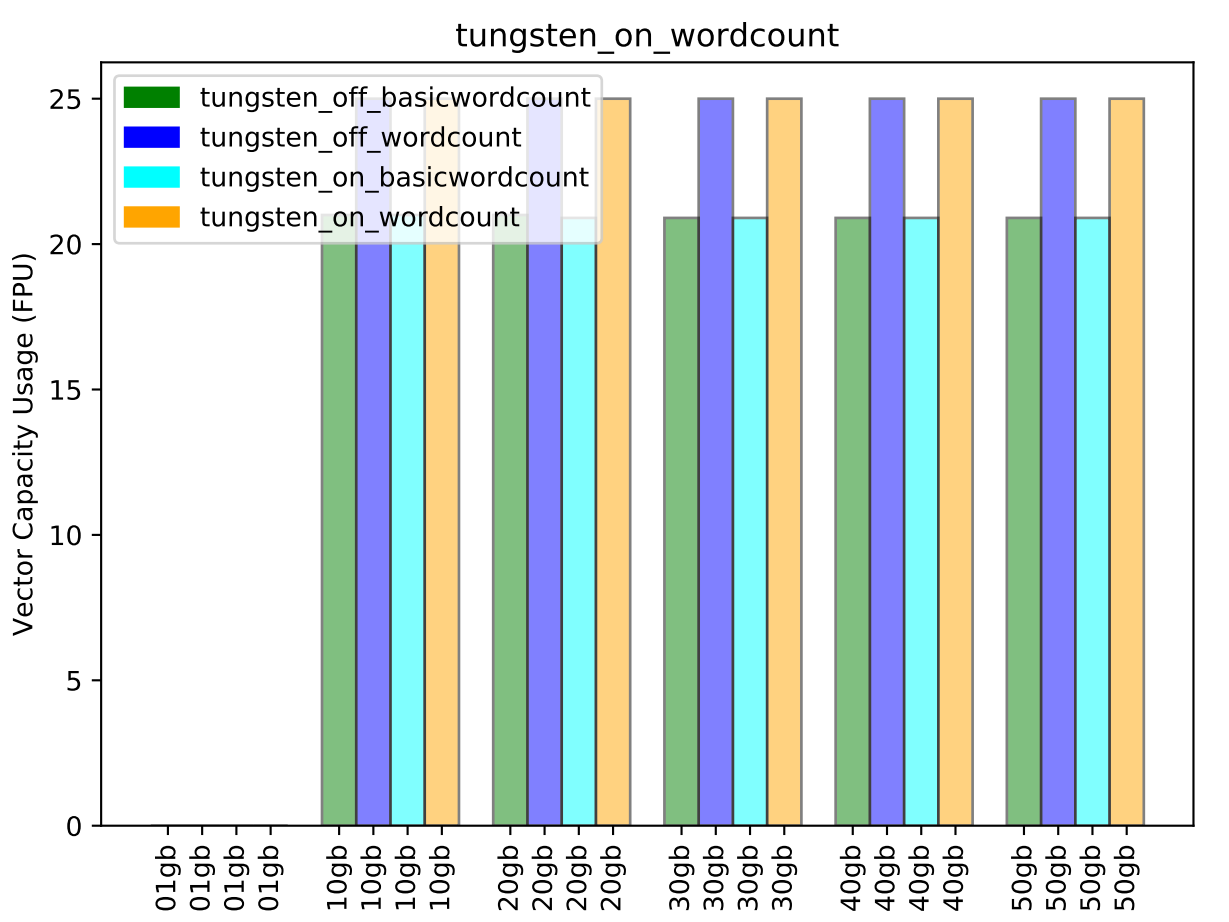
tungsten_on_wordcount
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tungsten_off_wordcount
tungsten_on_basicwordcount
tungsten_on_wordcount
Vector Capacity Usage (FPU)
0
5
10
15
20
25
01gb
01gb
01gb
01gb
10gb
10gb
10gb
10gb
20gb
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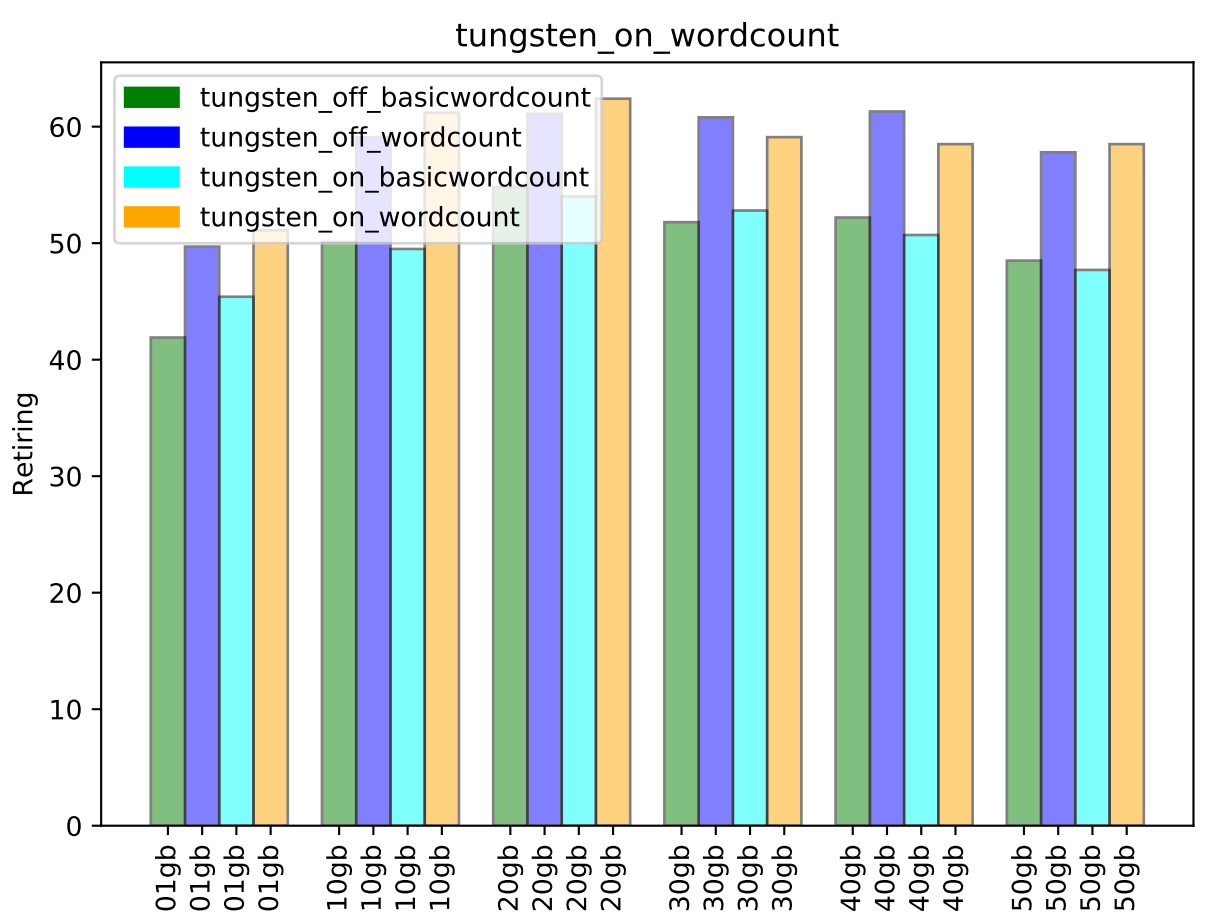
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tungsten_off_wordcount
tungsten_on_basicwordcount
tungsten_on_wordcount
Retiring
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10
20
30
40
50
60
01gb
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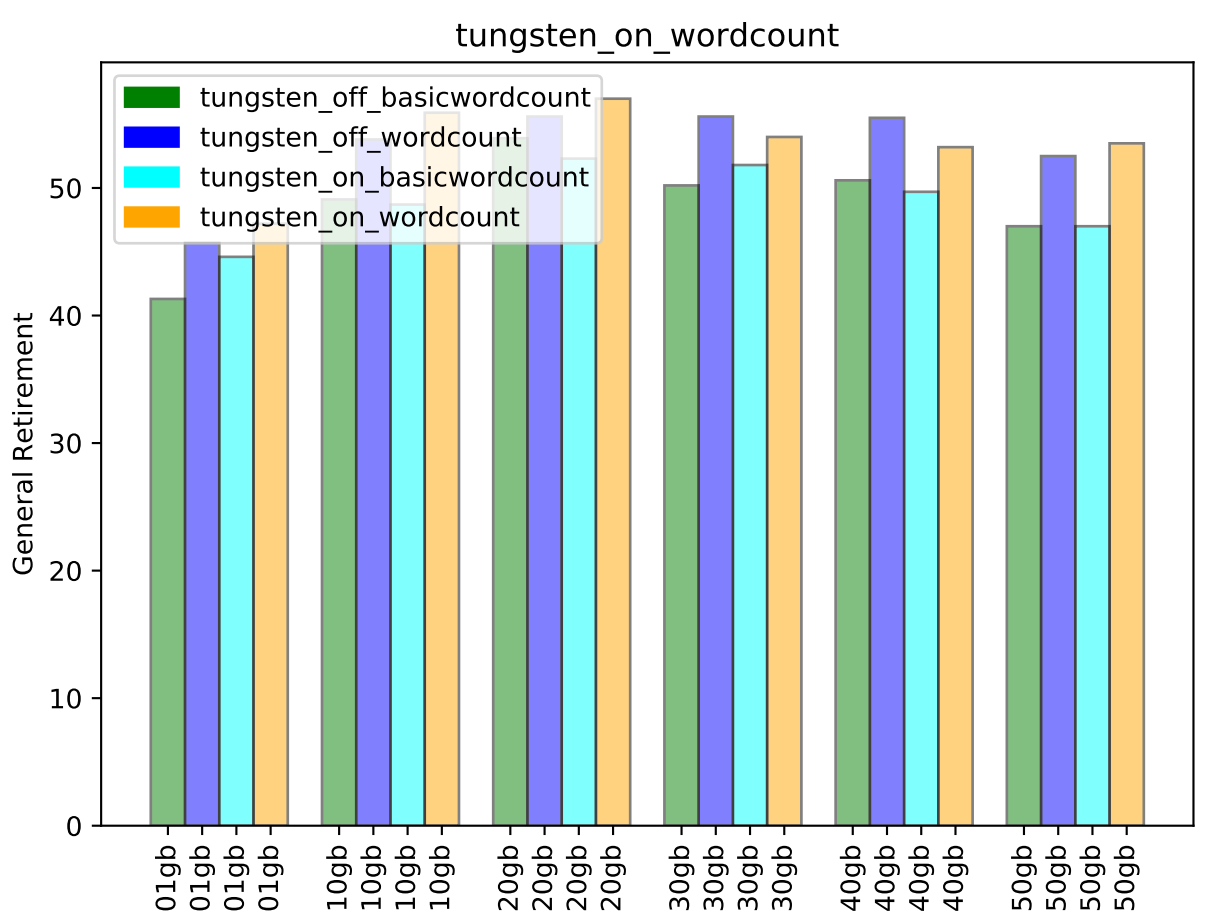
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tungsten_off_wordcount
tungsten_on_basicwordcount
tungsten_on_wordcount
General Retirement
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10
20
30
40
50
01gb
01gb
01gb
01gb
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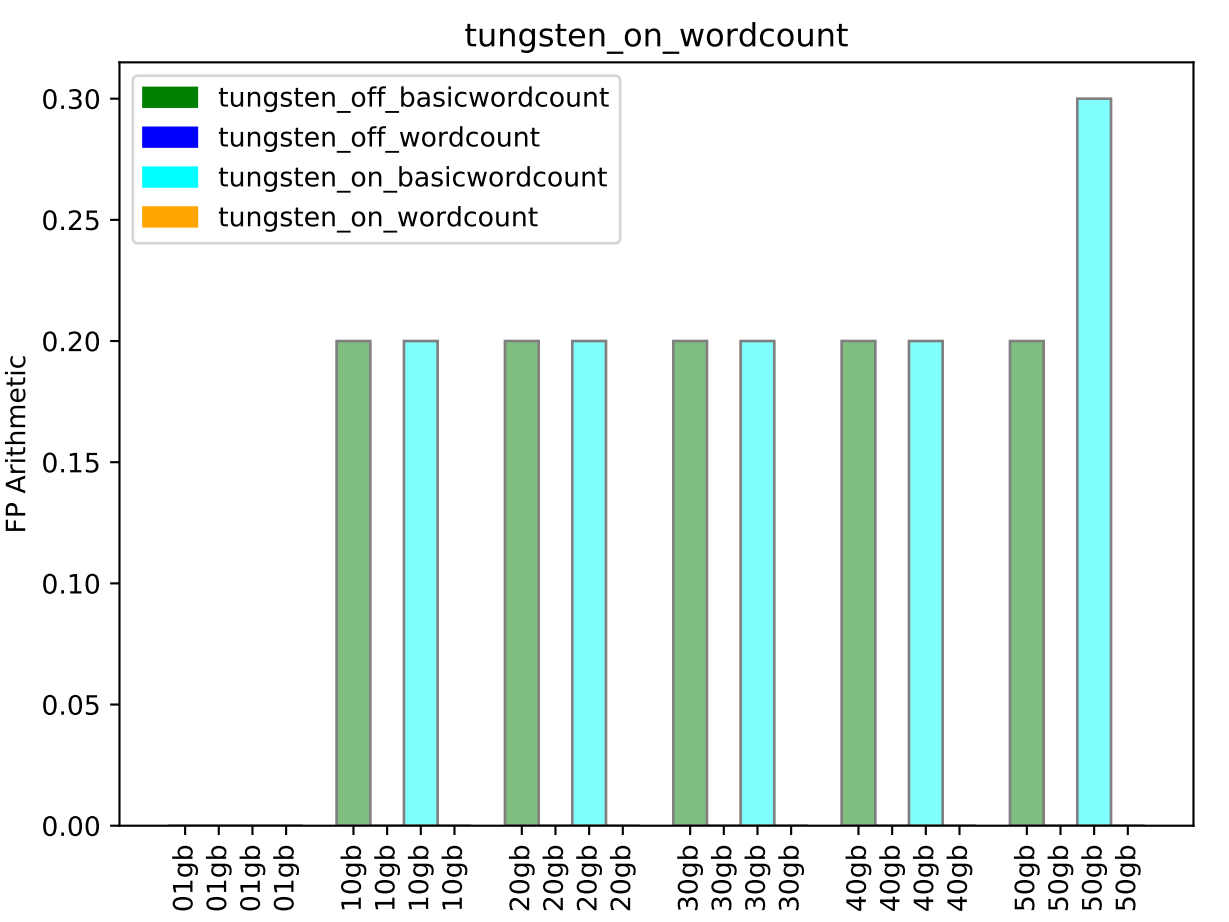
tungsten_on_wordcount
tungsten_off_basicwordcount
tungsten_off_wordcount
tungsten_on_basicwordcount
tungsten_on_wordcount
FP Arithmetic
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0.05
0.10
0.15
0.20
0.25
0.30
01gb
01gb
01gb
01gb
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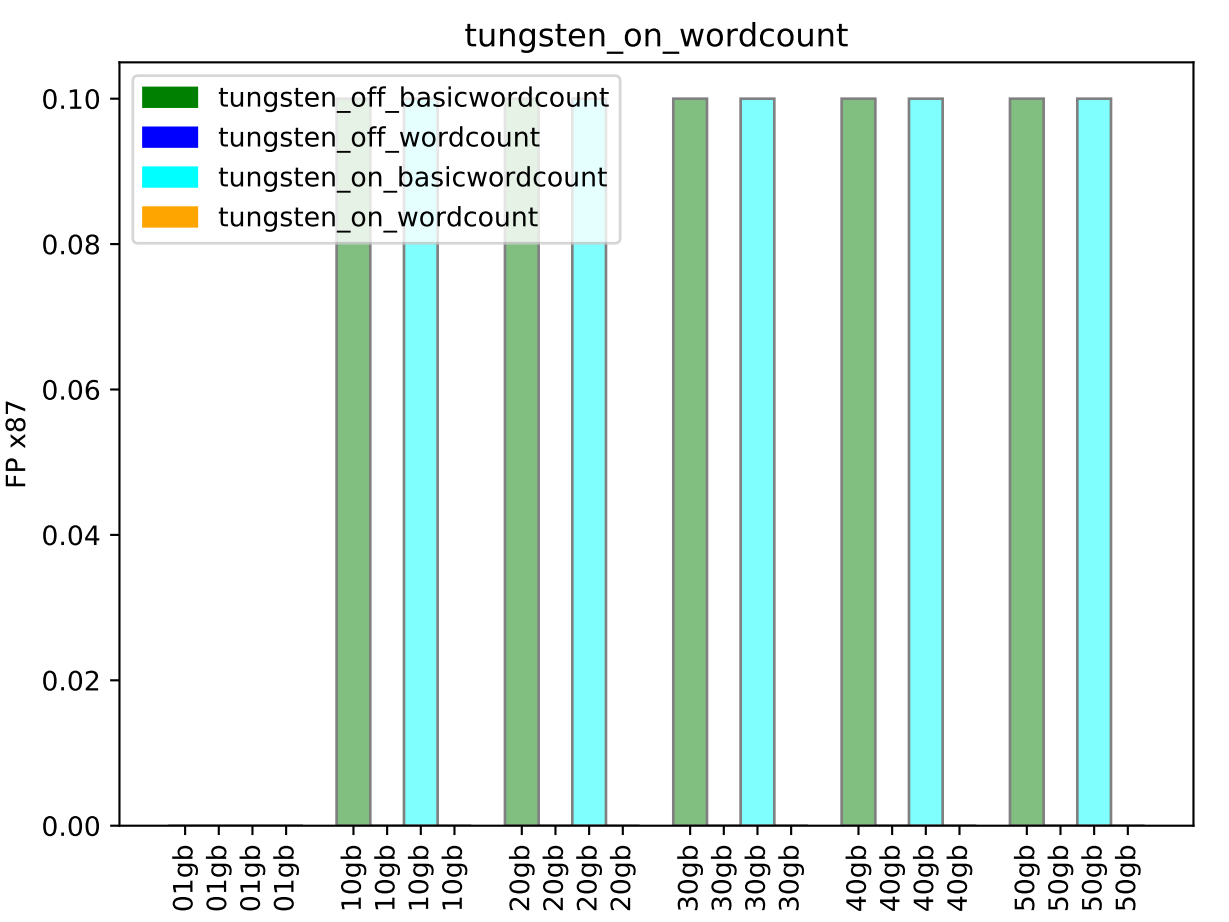
tungsten_on_wordcount
tungsten_off_basicwordcount
tungsten_off_wordcount
tungsten_on_basicwordcount
tungsten_on_wordcount
FP x87
0.00
0.02
0.04
0.06
0.08
0.10
01gb
01gb
01gb
01gb
10gb
10gb
10gb
10gb
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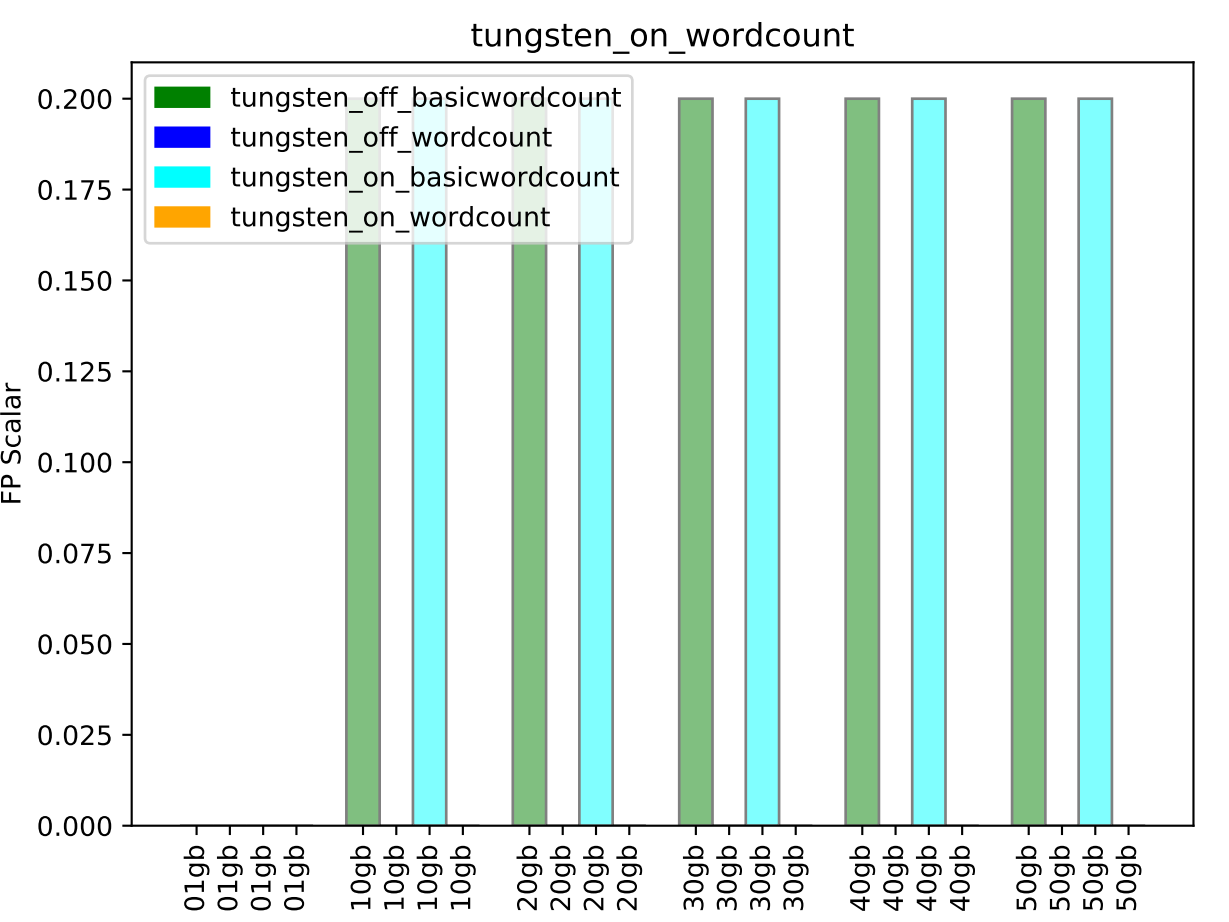
tungsten_on_wordcount
tungsten_off_basicwordcount
tungsten_off_wordcount
tungsten_on_basicwordcount
tungsten_on_wordcount
FP Scalar
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0.175
0.150
0.125
0.100
0.075
0.050
0.025
0.000
01gb
01gb
01gb
01gb
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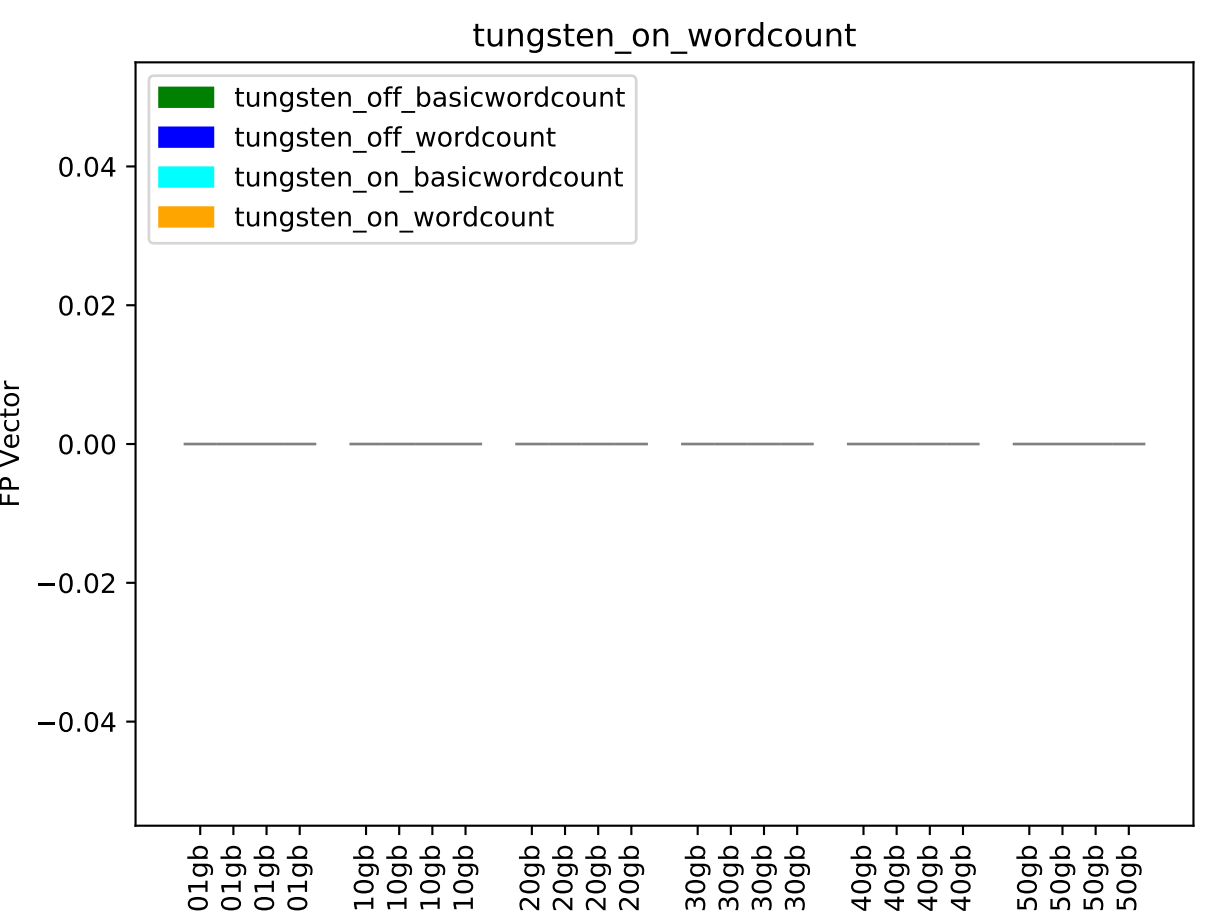
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tungsten_off_basicwordcount
tungsten_off_wordcount
tungsten_on_basicwordcount
tungsten_on_wordcount
FP Vector
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0.02
0.00
−0.02
−0.04
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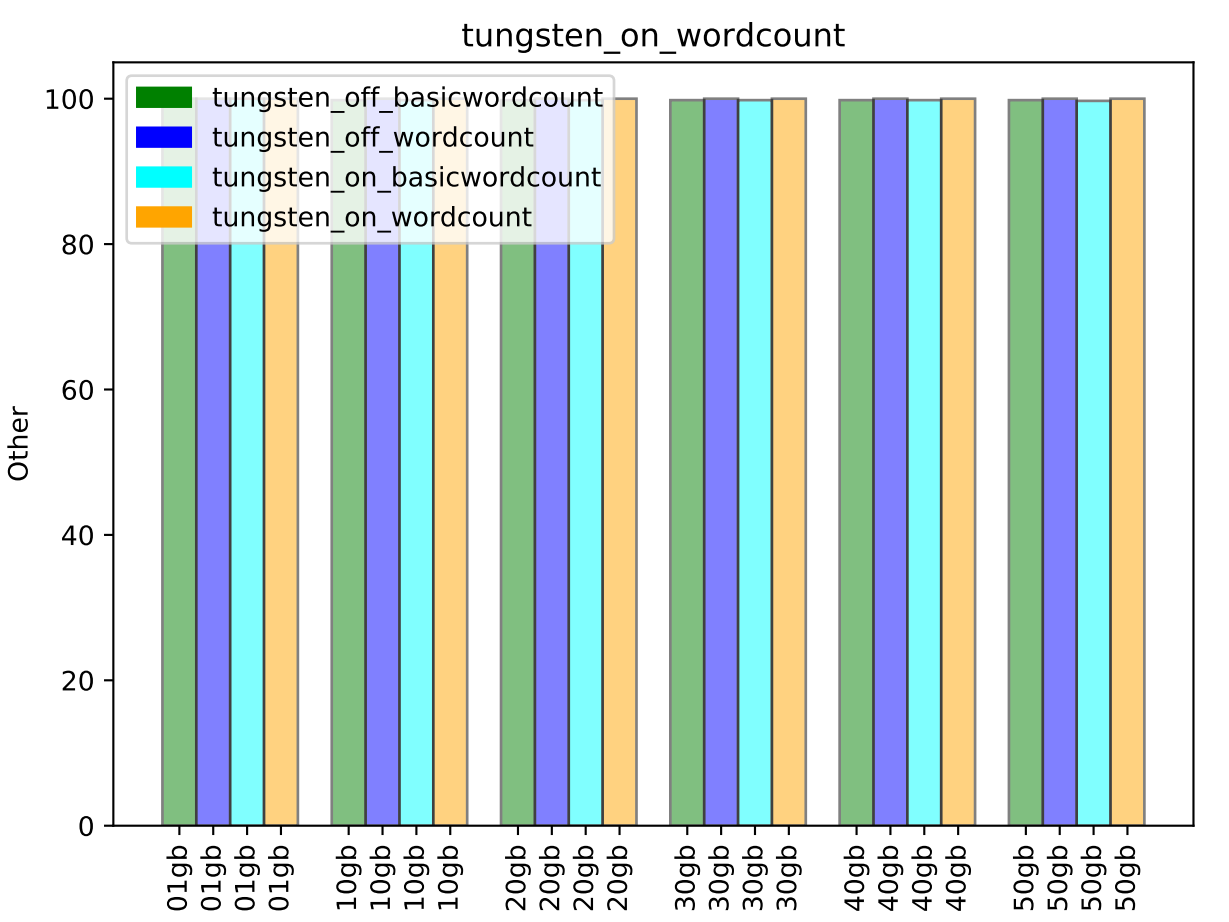
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80
100
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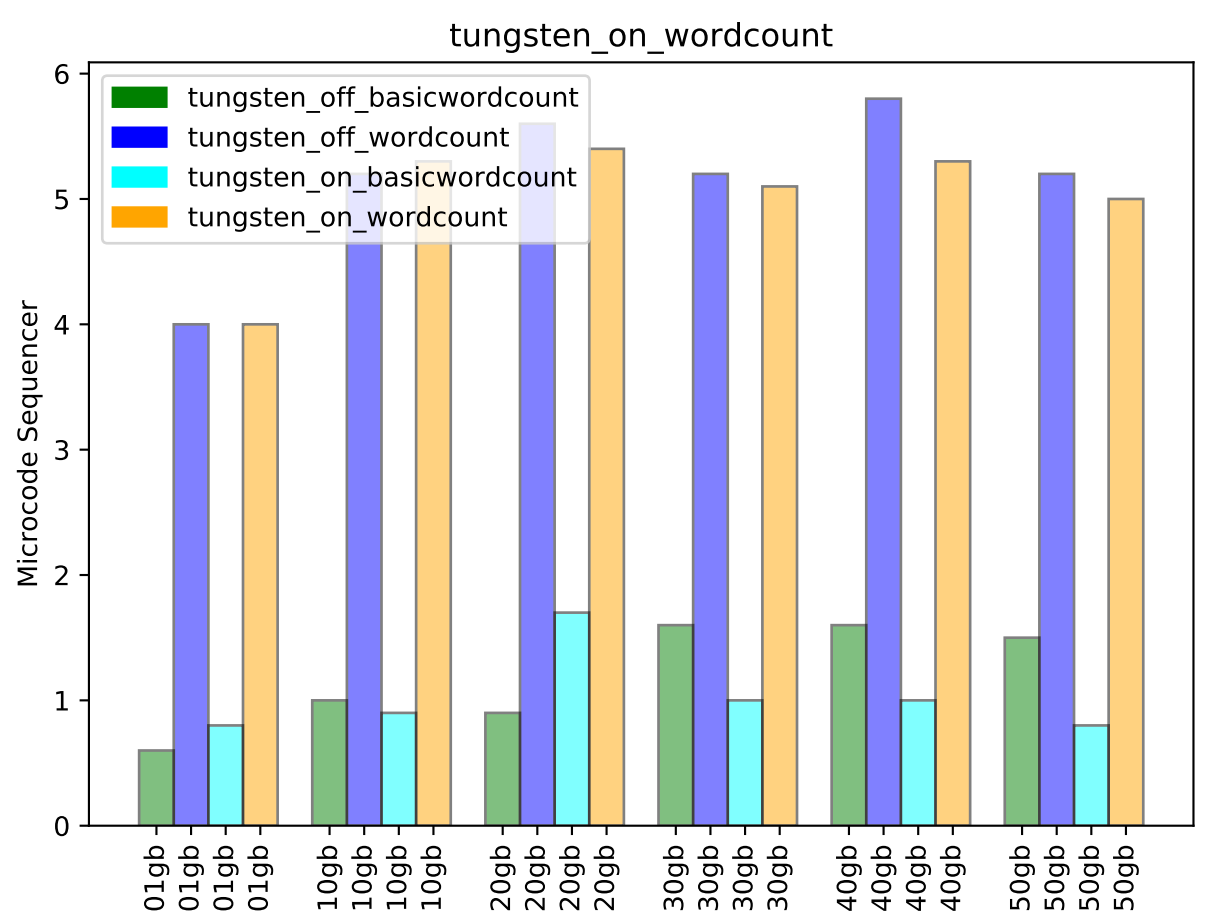
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Microcode Sequencer
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01gb
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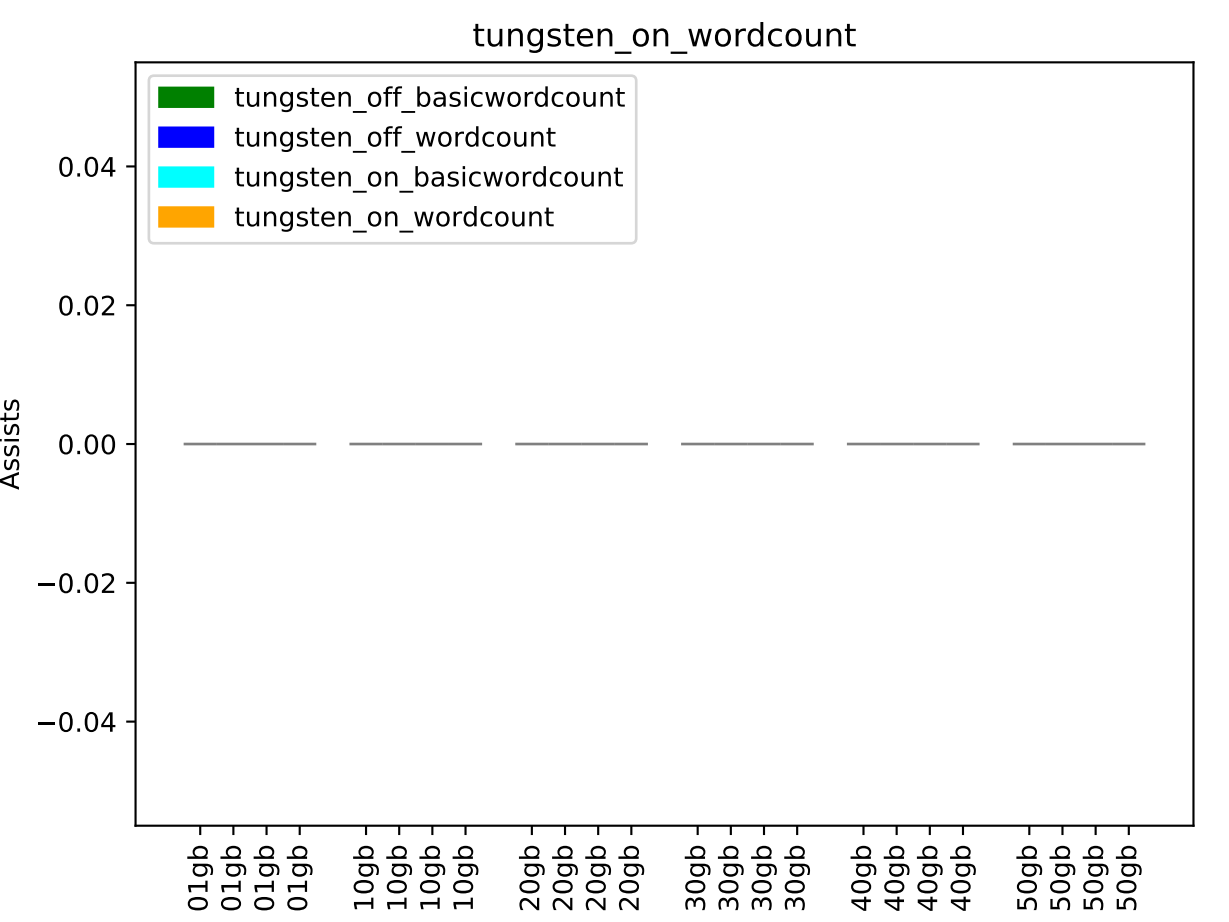
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−0.04
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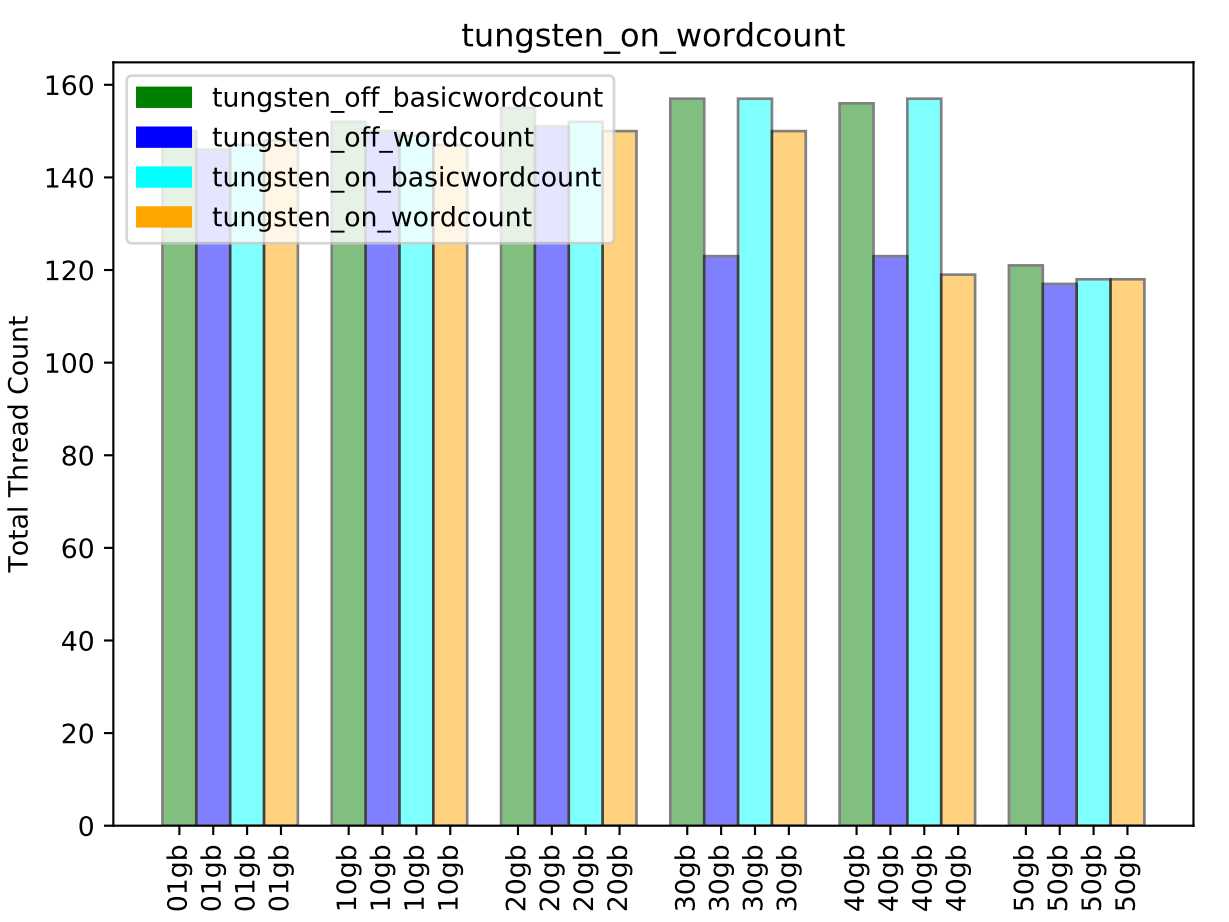
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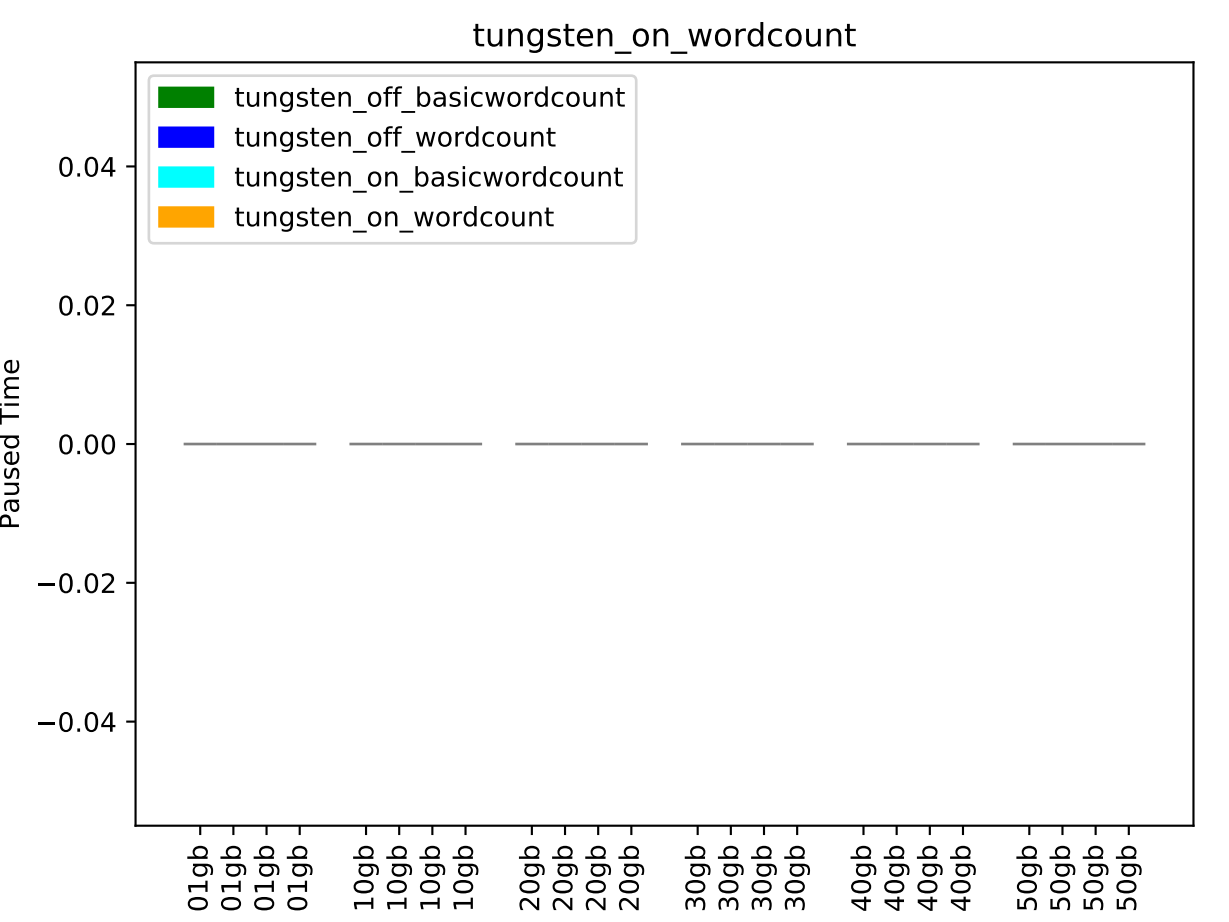
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