CS622A

Advanced Computer Architecture

Assignment II

Instrumentation Using PIN

GROUP 24

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1 Problem

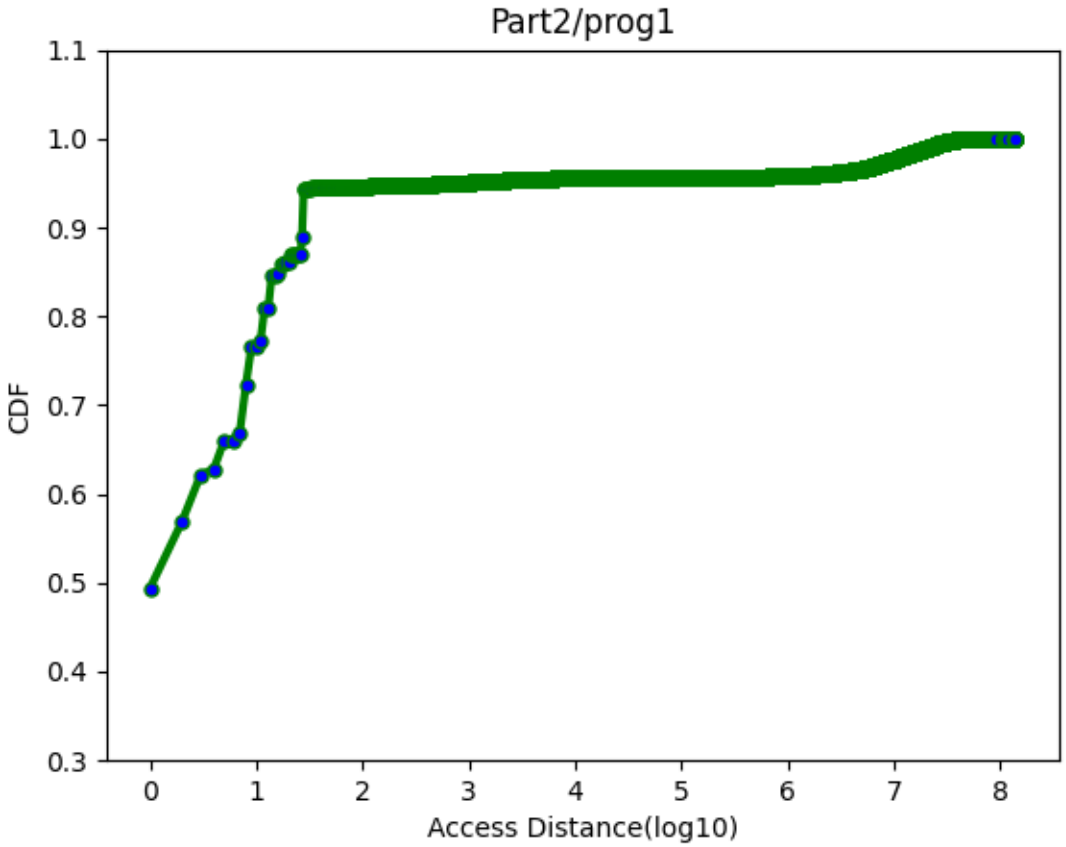
In this assignment, we will conduct some studies to understand the reuse and sharing profiles of a set of parallel program. We will instrument these shared memory parallel programs using PIN and capture the per-thread memory access traces. Next, we will write a couple of analysis codes (outside PIN) to understand the reuse and sharing behavior.

1.1 Collection of traces

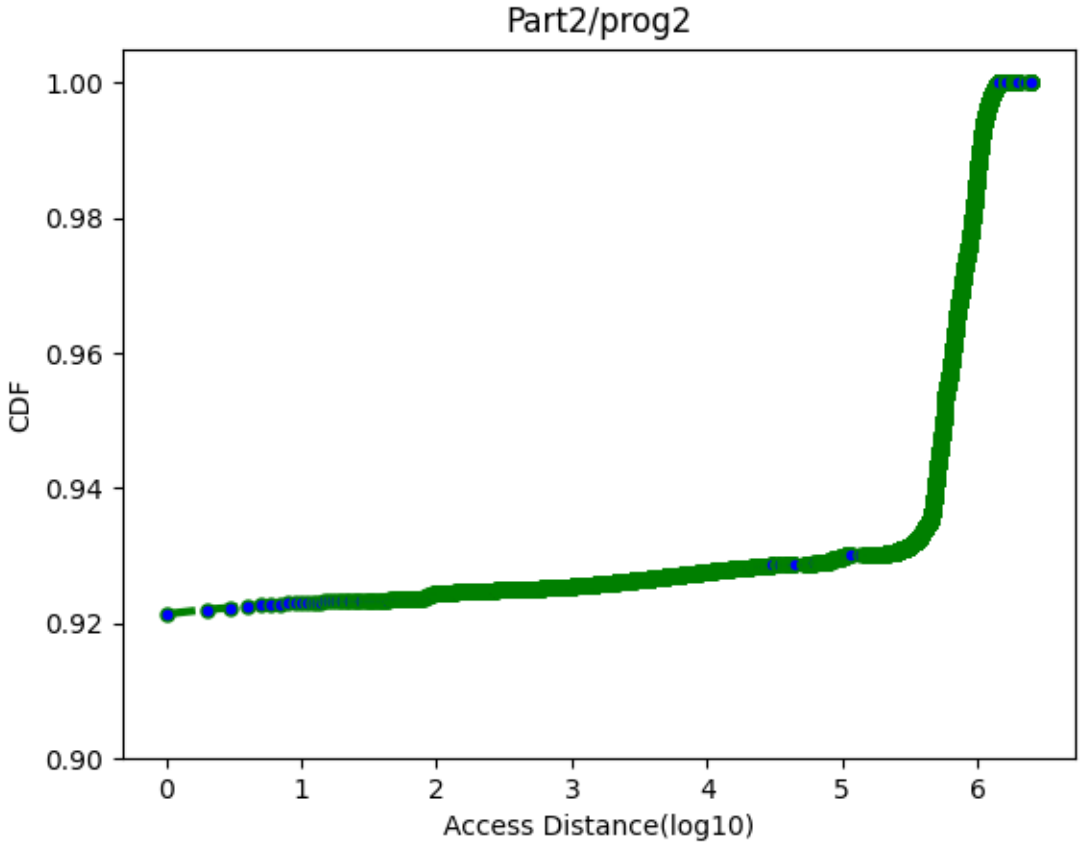
The total number of machine accesses recorded in the trace for each of the four programs are:

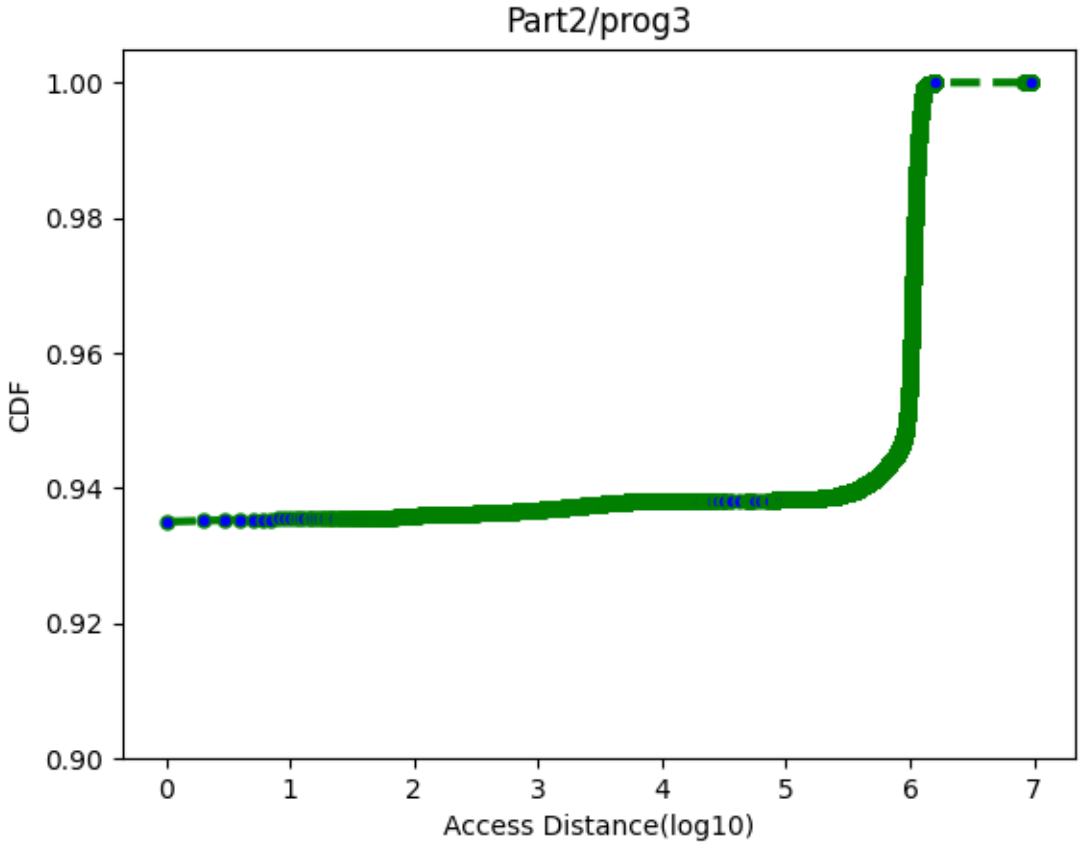
Program	**Number of Machine Accesses**
prog1.c	140526351
prog2.c	2532135
prog3.c	9623814
prog4.c	1065497

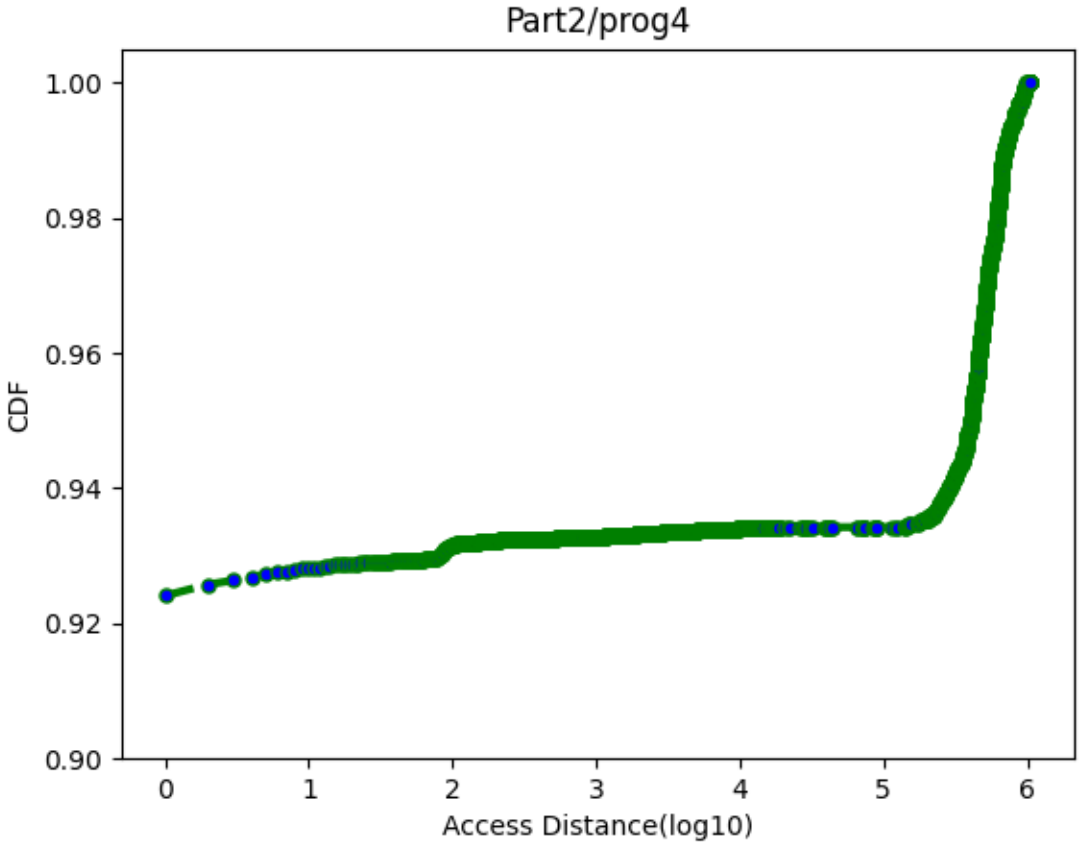
1.2 Access distance analysis



Cumulative Density function calculates the probability of an observation equal or less than a value which is often plotted as a curve from 0 to 1 for the distribution. Here we are getting the max vaue of CDF as 1.

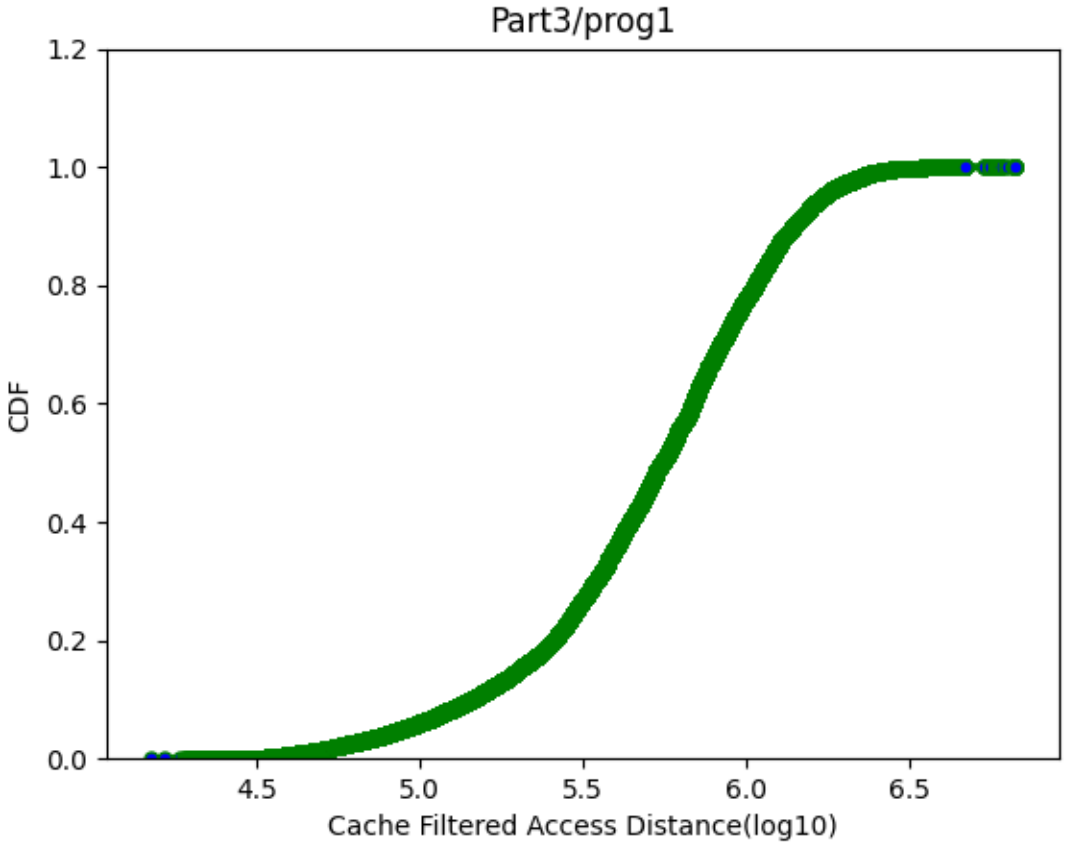

Part2/prog2
1.00
0.98
0.96
0.94
0.92
0.90
CDF
0
1
2
3
4
5
6
Access Distance(log10)


Part2/prog3
1.00
0.98
0.96
0.94
0.92
0.90
CDF
0
1
2
3
4
5
6
7
Access Distance(log10)

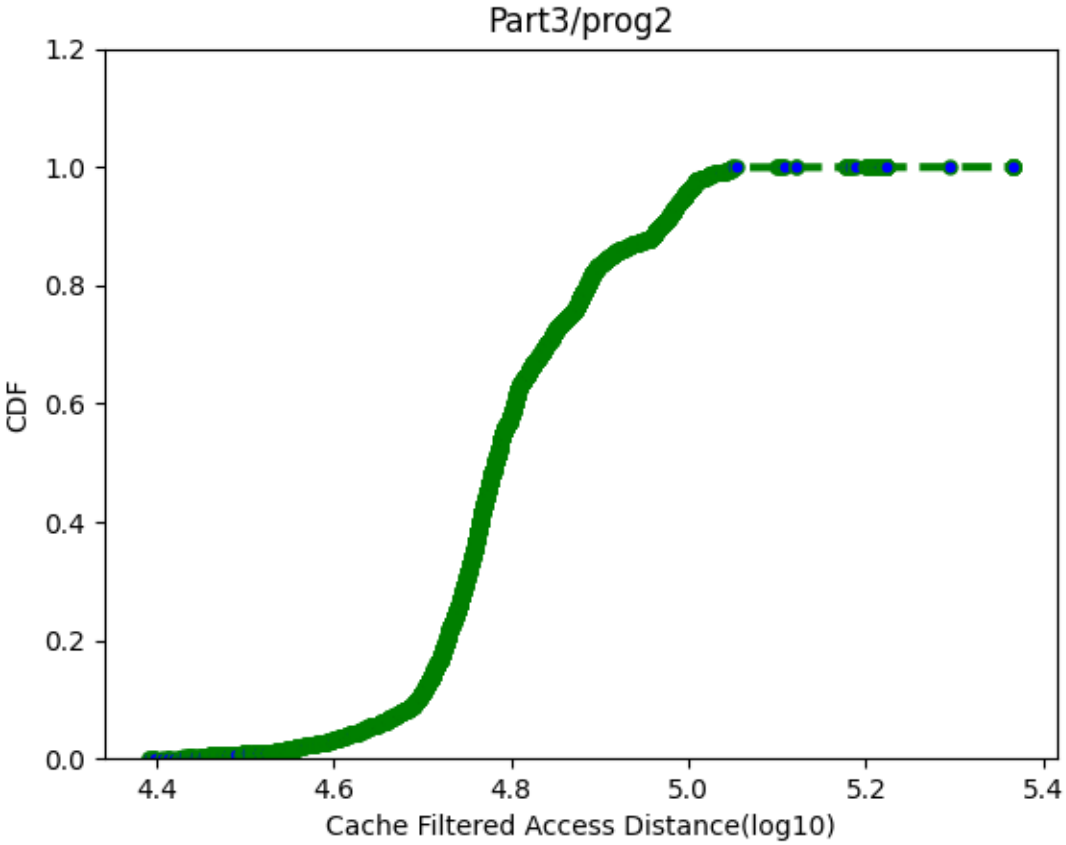


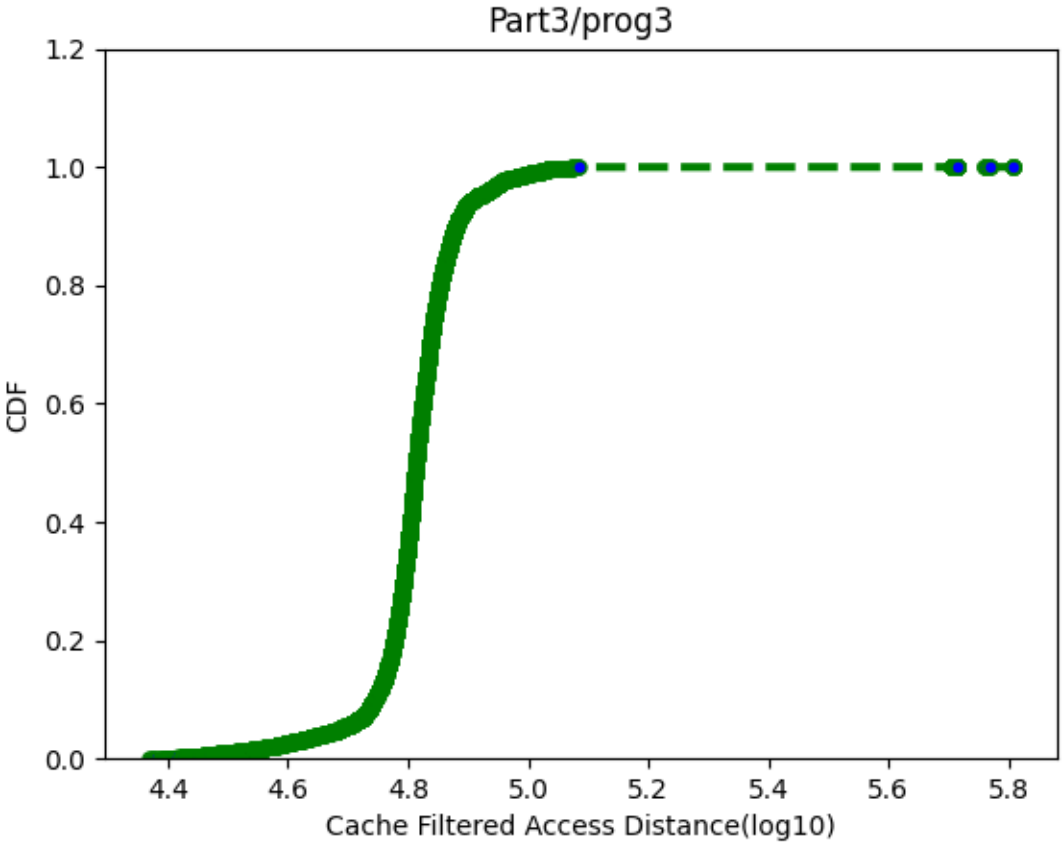
1.3 Access distance filtered by LRU cache

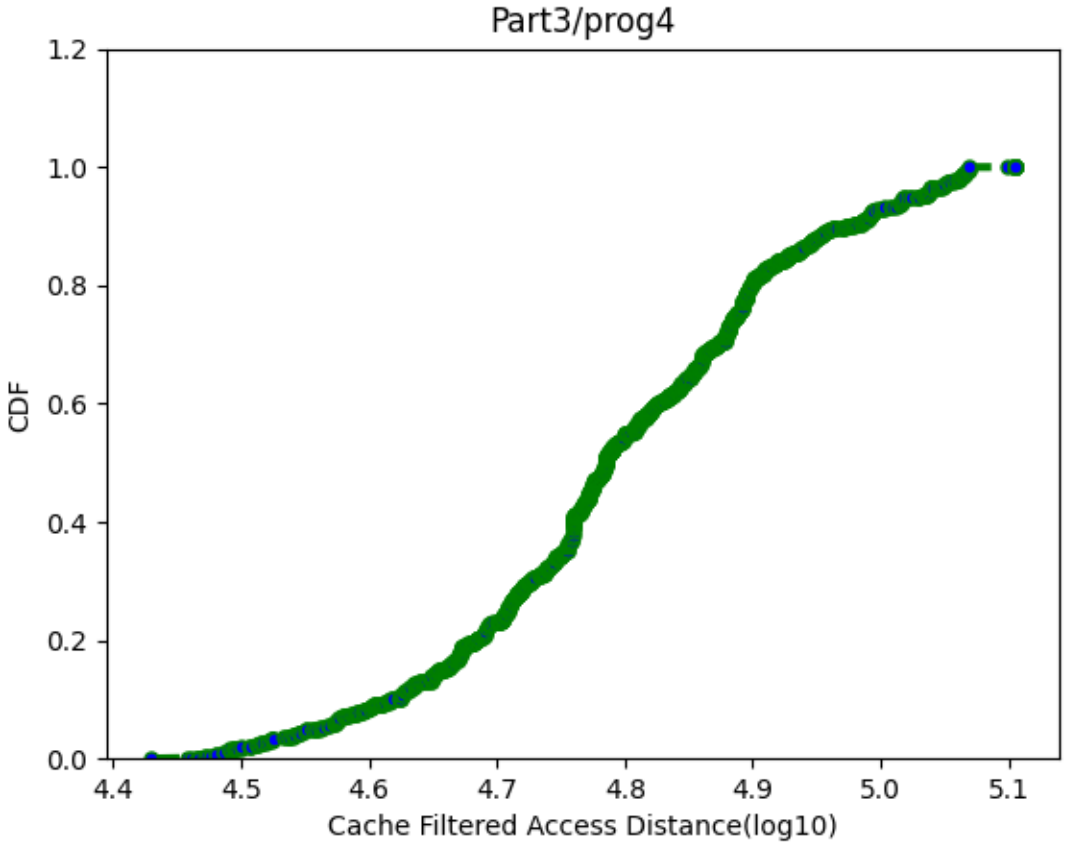
Program	Cache Hit	Cache Miss
prog1.c	133839155	6687196
prog2.c	2299395	232740
prog3.c	8981345	642469
prog4.c	937954	127543



The value of CDF varies from 0 to 1 whereas in part II the corresponding CDF values for most of the access distances lie between 0.9 to 1.


Part3/prog2
CDF
Cache Filtered Access Distance(log10)
1.2
1.0
0.8
0.6
0.4
0.2
0.0
4.4
4.6
4.8
5.0
5.2
5.4


Part3/prog3
CDF
Cache Filtered Access Distance(log10)
1.2
1.0
0.8
0.6
0.4
0.2
0.0
4.4
4.6
4.8
5.0
5.2
5.4
5.6
5.8



The shape of plots in Part2 and Part3 are not same since we are using Cache to filter the trace in Part 3 and then miss trace is used to plot commulative density function. In Part3 the block access distance which are less than the cache capacity tends to hit in the Cache. Those will lie in the same block and cause hit.In the cache filtered access distance we are not getting CDF of access distances which are less than a certain threshold(this threshold is approximately equals to the cache size).

1.4 Sharing profile

Program	**prog1.c**	**prog2.c**	**prog3.c**	**prog4.c**
Private	443	439	447	8630
2 Shared	70	8262	63	57409
3 Shared	1872	16384	0	6
4 Shared	32455	40957	0	0
5 Shared	143250	4	0	0
6 Shared	244970	0	0	1
7 Shared	173832	1	1	1
8 Shared	124529	12	65547	12