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**The tables prepared in Task 2:**

| 50 (tr-simpleloop.ref) | Hit rate | Hit count | Miss count | Overall eviction count | Clean eviction count | Dirty eviction count |
|---|---|---|---|---|---|---|
| RAND | 70.7157 | 7213 | 2987 | 2937 | 234 | 2703 |
| FIFO | 70.3529 | 7176 | 3024 | 2974 | 258 | 2716 |
| LRU | 72.7647 | 7422 | 2778 | 2728 | 88 | 2640 |
| CLOCK | 72.7157 | 7417 | 2783 | 2733 | 92 | 2641 |
| OPT | 73.8235 | 7530 | 2670 | 2620 | 20 | 2600 |

| 100 (tr-simpleloop.ref) | Hit rate | Hit count | Miss count | Overall eviction count | Clean eviction count | Dirty eviction count |
|---|---|---|---|---|---|---|
| RAND | 72.9804 | 7444 | 2756 | 2656 | 47 | 2609 |
| FIFO | 72.9608 | 7442 | 2758 | 2658 | 46 | 2612 |
| LRU | 73.6961 | 7517 | 2683 | 2583 | 2 | 2581 |
| CLOCK | 73.6765 | 7515 | 2685 | 2585 | 3 | 2582 |
| OPT | 74.1176 | 7560 | 2640 | 2540 | 0 | 2540 |

| 150 (tr-simpleloop.ref) | Hit rate | Hit count | Miss count | Overall eviction count | Clean eviction count | Dirty eviction count |
|---|---|---|---|---|---|---|
| RAND | 73.3922 | 7486 | 2714 | 2564 | 17 | 2547 |
| FIFO | 73.5686 | 7504 | 2696 | 2546 | 0 | 2546 |
| LRU | 73.7255 | 7520 | 2680 | 2530 | 0 | 2530 |
| CLOCK | 73.7157 | 7519 | 2681 | 2531 | 0 | 2531 |
| OPT | 74.1176 | 7560 | 2640 | 2490 | 0 | 2490 |

| 200 (tr-simpleloop.ref) | Hit rate | Hit count | Miss count | Overall eviction count | Clean eviction count | Dirty eviction count |
|---|---|---|---|---|---|---|
| RAND | 73.4412 | 7491 | 2709 | 2509 | 16 | 2493 |
| FIFO | 73.6275 | 7510 | 2690 | 2490 | 0 | 2490 |
| LRU | 73.7255 | 7520 | 2680 | 2480 | 0 | 2480 |
| CLOCK | 73.7157 | 7519 | 2681 | 2481 | 0 | 2481 |
| OPT | 74.1176 | 7560 | 2640 | 2440 | 0 | 2440 |

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| 50 (tr-matmul.ref) | Hit rate | Hit count | Miss count | Overall eviction count | Clean eviction count | Dirty eviction count |
|---|---|---|---|---|---|---|
| RAND | 65.5167 | 1892038 | 995834 | 995784 | 956321 | 39463 |
| FIFO | 60.4442 | 1745551 | 1142321 | 1142271 | 1092798 | 49473 |
| LRU | 63.9449 | 1846648 | 1041224 | 1041174 | 1040069 | 1105 |
| CLOCK | 63.9451 | 1846652 | 1041220 | 1041170 | 1040066 | 1104 |
| OPT | 79.2522 | 2288701 | 599171 | 599121 | 1088 | 598033 |

| 100 (tr-matmul.ref) | Hit rate | Hit count | Miss count | Overall eviction count | Clean eviction count | Dirty eviction count |
|---|---|---|---|---|---|---|
| RAND | 88.7955 | 2564299 | 323573 | 323473 | 316042 | 7431 |
| FIFO | 62.2251 | 1796980 | 1090892 | 1090792 | 1066136 | 24656 |
| LRU | 65.1489 | 1881418 | 1006454 | 1006354 | 1005277 | 1077 |
| CLOCK | 65.3104 | 1886080 | 1001792 | 1001692 | 1000614 | 1078 |
| OPT | 96.4187 | 2784448 | 103424 | 103324 | 102239 | 1085 |

| 150 (tr-matmul.ref) | Hit rate | Hit count | Miss count | Overall eviction count | Clean eviction count | Dirty eviction count |
|---|---|---|---|---|---|---|
| RAND | 96.6764 | 2791892 | 95980 | 95830 | 93432 | 2398 |
| FIFO | 98.7417 | 2851535 | 36337 | 36187 | 34836 | 1351 |
| LRU | 98.8613 | 2854989 | 32883 | 32733 | 31657 | 1076 |
| CLOCK | 98.7980 | 2853160 | 34712 | 34562 | 33485 | 1077 |
| OPT | 99.0080 | 2859225 | 28647 | 28497 | 27414 | 1083 |

| 200 (tr-matmul.ref) | Hit rate | Hit count | Miss count | Overall eviction count | Clean eviction count | Dirty eviction count |
|---|---|---|---|---|---|---|
| RAND | 98.0387 | 2831231 | 56641 | 56441 | 54795 | 1646 |
| FIFO | 98.7657 | 2852228 | 35644 | 35444 | 34160 | 1284 |
| LRU | 98.8617 | 2887872 | 32872 | 32672 | 31596 | 1076 |
| CLOCK | 98.8613 | 2854987 | 32885 | 32685 | 31609 | 1076 |
| OPT | 99.1873 | 2864402 | 23470 | 23270 | 22217 | 1053 |

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| 50 (tr-blocked.ref) | Hit rate | Hit count | Miss count | Overall eviction count | Clean eviction count | Dirty eviction count |
|---|---|---|---|---|---|---|
| RAND | 99.6572 | 2409854 | 8290 | 8240 | 5759 | 2481 |
| FIFO | 99.6806 | 2410421 | 7723 | 7673 | 5072 | 2601 |
| LRU | 99.7844 | 2412930 | 5214 | 5164 | 2815 | 2349 |
| CLOCK | 99.7618 | 2412385 | 5759 | 5709 | 3281 | 2428 |
| OPT | 99.8439 | 2414369 | 3775 | 3725 | 2639 | 1086 |

| 100 (tr-blocked.ref) | Hit rate | Hit count | Miss count | Overall eviction count | Clean eviction count | Dirty eviction count |
|---|---|---|---|---|---|---|
| RAND | 99.7838 | 2412917 | 5227 | 5127 | 3383 | 1744 |
| FIFO | 99.8134 | 2413631 | 4513 | 4413 | 2879 | 1534 |
| LRU | 99.8436 | 2414361 | 3783 | 3683 | 2606 | 1077 |
| CLOCK | 99.8219 | 2413837 | 4307 | 4207 | 2613 | 1594 |
| OPT | 99.8658 | 2414898 | 3246 | 3146 | 2079 | 1067 |

| 150 (tr-blocked.ref) | Hit rate | Hit count | Miss count | Overall eviction count | Clean eviction count | Dirty eviction count |
|---|---|---|---|---|---|---|
| RAND | 99.8202 | 2413796 | 4348 | 4198 | 2749 | 1449 |
| FIFO | 99.8218 | 2413834 | 4310 | 4160 | 2730 | 1430 |
| LRU | 99.8443 | 2414379 | 3765 | 3615 | 2559 | 1056 |
| CLOCK | 99.8438 | 2414367 | 3777 | 3627 | 2571 | 1056 |
| OPT | 99.8952 | 2415609 | 2535 | 2385 | 1317 | 1068 |

| 200 (tr-blocked.ref) | Hit rate | Hit count | Miss count | Overall eviction count | Clean eviction count | Dirty eviction count |
|---|---|---|---|---|---|---|
| RAND | 99.8428 | 2414342 | 3802 | 3602 | 2287 | 1315 |
| FIFO | 99.8639 | 2414852 | 3292 | 3092 | 1981 | 1111 |
| LRU | 99.8473 | 2418144 | 3692 | 3492 | 2436 | 1056 |
| CLOCK | 99.8673 | 2414935 | 3209 | 3009 | 1941 | 1068 |
| OPT | 99.9049 | 2415845 | 2299 | 2099 | 1028 | 1071 |

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**The program that we choose to run was a double linked list file in C which adds 150 nodes and then deletes the 150 nodes.**

| 50 tr-DLL.ref | Hit rate | Hit count | Miss count | Overall eviction count | Clean eviction count | Dirty eviction count |
|---|---|---|---|---|---|---|
| RAND | 97.7994 | 11955 | 269 | 219 | 94 | 125 |
| FIFO | 97.5867 | 11929 | 295 | 245 | 111 | 134 |
| LRU | 98.4457 | 12034 | 190 | 140 | 38 | 102 |
| CLOCK | 98.4293 | 12032 | 192 | 142 | 40 | 102 |
| OPT | 98.9120 | 12091 | 133 | 83 | 10 | 73 |

| 100 tr-DLL.ref | Hit rate | Hit count | Miss count | Overall eviction count | Clean eviction count | Dirty eviction count |
|---|---|---|---|---|---|---|
| RAND | 98.9202 | 12092 | 132 | 32 | 1 | 31 |
| FIFO | 98.8956 | 12089 | 135 | 35 | 2 | 33 |
| LRU | 99.0101 | 12103 | 121 | 21 | 0 | 21 |
| CLOCK | 98.9856 | 12100 | 124 | 24 | 0 | 24 |
| OPT | 99.0183 | 12104 | 120 | 20 | 0 | 20 |

| 150 tr-DLL.ref | Hit rate | Hit count | Miss count | Overall eviction count | Clean eviction count | Dirty eviction count |
|---|---|---|---|---|---|---|
| RAND | 99.0183 | 12104 | 120 | 0 | 0 | 0 |
| FIFO | 99.0183 | 12104 | 120 | 0 | 0 | 0 |
| LRU | 99.0183 | 12104 | 120 | 0 | 0 | 0 |
| CLOCK | 99.0183 | 12104 | 120 | 0 | 0 | 0 |
| OPT | 99.0183 | 12104 | 120 | 0 | 0 | 0 |

| 200 tr-DLL.ref | Hit rate | Hit count | Miss count | Overall eviction count | Clean eviction count | Dirty eviction count |
|---|---|---|---|---|---|---|
| RAND | 99.0183 | 12104 | 120 | 0 | 0 | 0 |
| FIFO | 99.0183 | 12104 | 120 | 0 | 0 | 0 |
| LRU | 99.0183 | 12104 | 120 | 0 | 0 | 0 |
| CLOCK | 99.0183 | 12104 | 120 | 0 | 0 | 0 |
| OPT | 99.0183 | 12104 | 120 | 0 | 0 | 0 |

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**Why we chose the Doubly Linked List program:**

We chose the doubly linked list program since it does not use very much space, and it allocates and frees space in a FIFO fashion. This program was interesting to us because of the variation between the algorithms' effectiveness when given more memory, and because FIFO did not perform any better than expected. We can see that when memory is increased from 50 to 100, the number of evictions drastically decreases and the OPT algorithm actually reaches the maximum hit rate here. Then, once we increase the size of memory to 150, all algorithms reach the maximum hit rate, and did not make any evictions.

**One paragraph comparing the various algorithms in terms of the results you see in the tables:**

Generally, we tend to see that FIFO is usually has the worst hit rate, CLOCK and LRU are roughly the same, and OPT is usually the best hit rate. This seems right because FIFO does not really use much logic in its algorithm, CLOCK and LRU are very similar, and OPT is the optimal algorithm. We can also see that RAND tends to outdo FIFO, CLOCK, and LRU for matmul. This is due to the fact that the data matmul produces is randomly generated and is not contiguous. With the other three trace files, we see CLOCK, LRU, and FIFO benefitting from the locality of the data.

**A second paragraph explaining the data you obtained for LRU as the size of memory increases:**

As the memory size increases, LRU's hit rate tends to increase. When the amount of memory is smaller (50 and 100), LRU's hit rate tends to be lower. In matmul once the memory size is increased to 150 and 200 the hit rate becomes higher with not much difference in hit rate between the two memory sizes. This is because with more memory, LRU is able to store more of the recently used pages, which allows LRU to better select the least recently used page. The higher memory allows LRU to look at previous patterns to get a higher hit rate and smaller eviction counts.