Comparison Paragraph:

The hit rate between FIFO, RAND, LRU, CLOCK are fairly similar, in tr-matmul test, RAND is fairly significantly higher than the rest, this is probably due to the randomness in the file (since there are a lot of things generated by randon()), thus FIFO, LRU, CLOCK won't really have any atvantage over RAND, even though they are choosing frame more carefully. However, RAND does not preform very well in tests where the program is performing operations on a small set of memory, this is probably because FIFO, LRU, CLOCK are all evicting frames that is being carefully selected using what humans think to be logical. We can see that RAND performs particularly worst in tr-simpleloop, this is because the program is performing operations on an array many times, it is more logical to keep the memory that was just used, then to just throw out any randomly selecting frame. OPT always has the highest hit rate (as it was proven to be optimal). Sometimes OPT only has a small advantage, but sometimes OPT is sometimes significantly higher than the rest. (Side note: the fourth program we selected is merge sort, and it did not need a lot of memory, and we see that when everything fits in the memory, everything performs the same, because there are no evicting of memory needed!)

Paragraph about data obtained from LRU as memory increases:

The hit rate of LRU increases as the size of memory increases, which makes perfect sense. The more storage we have in the memory, the more likely the next reference to a memory location is actually in memory (instead of in swap file). In particular, LRU performs well when the program is performing lots of operation on a small set of memory, if that 'small set of memory' is able to fit entirely with in LRU. However, if the memory size is a little bit smaller than the 'small set of memory' that a program is performing tasks repeatedly, then the hit rate of LRU drops drastically. We can see this by looking at the hit rate of jump from 65% to 98% as the memory size increase from 100 to 150. In additional, LRU does not suffer from belady's anomaly (FIFO suffers from it), meaning that the hit rate will always increase (or at least not decrease) as memory size grows.

50 memory size tr-matmul	FIFO	RAND	LRU	CLOCK	OPT
Hit Rate	60.9648	65.5242	63.9442	63.9441	79.6575
Hit count	1760552	1892219	1846591	1846587	2300361
Miss count	1127264	995597	1041225	1041229	587455
Overall eviction count	1127214	995547	1042329	1041179	587405
Clean eviction count	1083226	956097	1041225	1040078	586320
Dirty eviction count	43988	39450	1104	1101	1085

100 memory size tr-matmul	FIFO	RAND	LRU	CLOCK	OPT
Hit Rate	62.4788	88.8112	65.1483	65.3097	96.7867
Hit count	1804273	2564703	1881362	1886024	2795021
Miss count	1083543	323113	1006454	1001792	92795
Overall eviction count	1083443	323009	1006354	1001692	92695
Clean eviction count	1061223	315399	1005278	1000615	91612
Dirty eviction count	22220	7614	1076	1077	1083

150 memory size tr-matmul	FIFO	RAND	LRU	CLOCK	OPT
Hit Rate	98.8085	96.6763	98.8613	98.7983	99.0785
Hit count	2853409	2791834	2854931	2853114	2861204
Miss count	34407	95982	32885	34702	26612
Overall eviction count	34257	95832	32735	34552	26462
Clean eviction count	32945	93470	31659	33475	25379
Dirty eviction count	1312	2362	1076	1077	1083

200 memory size tr-matmul	FIFO	RAND	LRU	CLOCK	OPT
Hit Rate	98.8266	98.0460	98.8617	98.8612	99.3330
Hit count	2853930	2831389	2854943	2854930	2868554
Miss count	33886	56426	32873	32886	19262
Overall eviction count	33686	56227	32673	32686	19062
Clean eviction count	32435	54575	31597	31610	17979
Dirty eviction count	1251	1652	1076	1076	1083

50 memory size tr-blocked	FIFO	RAND	LRU	CLOCK	OPT
Hit Rate	99.7320	99.6565	99.7842	99.7620	99.8467
Hit count	2411575	2409751	2412837	2412300	2414348
Miss count	6481	8305	5219	5756	3708
Overall eviction count	6431	8255	5169	5436	3658
Clean eviction count	4176	5746	2820	3291	2574
Dirty eviction count	2255	2509	2349	2415	1084

100 memory size tr-blocked	FIFO	RAND	LRU	CLOCK	OPT
Hit Rate	99.8208	99.7838	99.8435	99.8242	99.8756
Hit count	2413722	2412829	2414272	2413805	2415048
Miss count	4334	5277	3784	4251	3008
Overall eviction count	4234	5127	3684	4151	2908
Clean eviction count	2758	3402	2607	2623	1834
Dirty eviction count	1476	1725	1077	1528	1074

150 memory size tr-blocked	FIFO	RAND	LRU	CLOCK	OPT
Hit Rate	99.8253	99.8217	99.8442	99.8437	99.8955
Hit count	2413832	2413745	2414289	2414277	2415530
Miss count	4224	4311	3767	3779	2526
Overall eviction count	4074	4161	3617	3629	2376
Clean eviction count	2654	2727	2560	2572	1302
Dirty eviction count	1420	1434	1057	1057	1074

200 memory size tr-blocked	FIFO	RAND	LRU	CLOCK	OPT
Hit Rate	99.8687	99.8408	99.8472	99.	99.9059
Hit count	2414882	2414207	2414362	2414848	2415780
Miss count	3174	3849	3694	3208	2276
Overall eviction count	2974	3649	3594	3008	2076
Clean eviction count	1879	2307	2437	1940	1009
Dirty eviction count	1095	1342	1057	1068	1067

50 memory size tr-simpleloop	FIFO	RAND	LRU	CLOCK	OPT
Hit Rate	70.8825	70.4599	72.6317	72.6219	73.7912
Hit count	7213	7170	7391	7390	7509
Miss count	2963	3006	2785	2786	2667
Overall eviction count	2922	2956	2735	2736	2617
Clean eviction count	201	252	90	92	21
Dirty eviction count	2712	2704	2645	2644	2596

100 memory size tr-simpleloop	FIFO	RAND	LRU	CLOCK	OPT
Hit Rate	72.9265	72.8381	73.6340	73.6144	74.0566
Hit count	7421	7412	7493	7491	7536
Miss count	2755	2764	2683	2685	2640
Overall eviction count	2655	2664	2583	2585	2940
Clean eviction count	44	60	2	3	0
Dirty eviction count	2611	2604	2581	2582	2940

150 memory size tr-simpleloop	FIFO	RAND	LRU	CLOCK	OPT
Hit Rate	73.3196	73.2803	73.6537	73.6537	74.0566
Hit count	7461	7457	7495	7495	7536
Miss count	2715	2719	2681	2681	2640
Overall eviction count	2565	2039	2531	2531	2540
Clean eviction count	16	22	0	0	0
Dirty eviction count	2549	2017	2531	2531	2540

150 memory size tr-simpleloop	FIFO	RAND	LRU	CLOCK	OPT
Hit Rate	73.3982	73.3785	73.6537	73.6537	74.0566
Hit count	7469	7467	7495	7495	7536
Miss count	2707	2709	2681	2681	2640
Overall eviction count	2507	2509	2481	2481	2440
Clean eviction count	12	15	0	0	0
Dirty eviction count	2495	2494	2481	2481	2440

50 memory size mergesort.out	FIFO	RAND	LRU	CLOCK	OPT
Hit Rate	95.7219	95.4013	96.7113	96.7949	97.7843
Hit count	6869	6846	6940	6946	7017
Miss count	307	330	236	230	159
Overall eviction count	257	280	186	180	109
Clean eviction count	105	129	66	62	16
Dirty eviction count	152	151	120	118	93

100 memory size mergesort.out	FIFO	RAND	LRU	CLOCK	OPT
Hit Rate	97.7425	97.6867	98.0769	97.9933	98.0909
Hit count	7014	7010	7038	7032	7039
Miss count	162	166	138	144	137
Overall eviction count	62	66	38	44	37
Clean eviction count	0	10	0	0	0
Dirty eviction count	62	56	38	44	37

150 memory size mergesort.out	FIFO	RAND	LRU	CLOCK	OPT
Hit Rate	98.0909	98.0909	98.0909	98.0909	98.0909
Hit count	7039	7039	7039	7039	7039
Miss count	137	137	137	137	137
Overall eviction count	0	0	0	0	0
Clean eviction count	0	0	0	0	0
Dirty eviction count	0	0	0	0	0

200 memory size mergesort.out	FIFO	RAND	LRU	CLOCK	OPT
Hit Rate	98.0909	98.0909	98.0909	98.0909	98.0909
Hit count	7039	7039	7039	7039	7039
Miss count	137	137	137	137	137
Overall eviction count	0	0	0	0	0
Clean eviction count	0	0	0	0	0
Dirty eviction count	0	0	0	0	0