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Datasets profile vs. Reference Dataset

The following are the profiles for the 171.swim benchmark. For more details about our profile development and dataset reduction methodology, refer to the paper by AJ KleinOsowski and David J. Lilja, "MinneSPEC: A New SPEC Benchmark Workload for Simulation−Based Computer Architecture Research", Computer Architecture Letters, Volume 1, June 2002. This paper is available in electronic form at http://www.arctic.umn.edu/~lilja/minnespec/index.html

http:// www.arctic.umn.edu

Function level execution profile at optimization level O0

The following table contains function execution profiles and goodness−of−fit chi−squared statistic values for the train, test, large (LgRed), medium (MdRed), and small (SmRed) reduced datasets as compared to the full SPEC reference datasets. Note: The test dataset is the same as the large reduced (LgRed) dataset for this benchmark. This data was gathered with the hiprof profiling utility. *90% Conf = Critical value of the chi−squared statistic at the 90 percent confidence level. Numbers in the Ref, Train, Test, LgRed, MdRed, and SmRed columns are the percent of overall execution time spent in the stated function (in the Function column). Numbers in the Train Chi, Test Chi, LgRed Chi, MdRed Chi, and SmRed Chi are the terms of the chi−squared statistic for the stated function (in the function column).

Function	Ref	Train	Train Chi	Test	Test Chi	LgRed	LgRed Chi	MdRed	MdRed Chi	SmRed	SmRed Chi
calc2_	27.80	28.40	0.01	34.70	1.71	34.80	1.76	33.70	1.25	22.50	1.01
calc3_	24.90	25.30	0.01	25.30	0.01	25.30	0.01	23.00	0.14		24.90
calc1_	24.80	24.80	0.00	30.20	1.18	30.30	1.22	31.00	1.55	20.90	0.61
shalow_	22.40	21.10	0.08	2.60	17.50	2.60	17.50	3.00	16.80	14.30	2.93
Sum	99.90	99.60	0.09	92.80	20.40	93.00	20.49	90.70	19.75	57.70	29.45
	Ref	Train	Train Chi	Test	Test Chi	LgRed	LgRed Chi	MdRed	MdRed Chi	SmRed	SmRed Chi

90% Confidence level (4 entries) = 6.251

Function level execution profile at optimization level O1

The following table contains function execution profiles and goodness−of−fit chi−squared statistic values for the train, test, large (LgRed), medium (MdRed), and small (SmRed) reduced datasets as compared to the full SPEC reference datasets. Note: The test dataset is the same as the large reduced (LgRed) dataset for this benchmark. This data was gathered with the hiprof profiling utility. *90% Conf = Critical value of the chi−squared statistic at the 90 percent confidence level. Numbers in the Ref, Train, Test, LgRed, MdRed, and SmRed columns are the percent of overall execution time spent in the stated function (in the Function column). Numbers in the Train Chi, Test Chi, LgRed Chi, MdRed Chi, and SmRed Chi are the terms of the chi−squared statistic for the stated function (in the function column).

Function	Ref	Train	Train Chi	Test	Test Chi	LgRed	LgRed Chi	MdRed	MdRed Chi	SmRed	SmRed Chi
shalow_	36.90	33.90	0.24	4.50	28.45	4.50	28.45	5.10	27.40	18.80	8.88
calc3_	23.80	24.60	0.03	27.30	0.51	27.30	0.51	23.30	0.01		23.80
calc2_	22.80	23.90	0.05	32.40	4.04	32.40	4.04	30.30	2.47	18.80	0.70
calc1_	16.30	17.00	0.03	22.80	2.59	22.80	2.59	23.50	3.18	13.40	0.52
Sum	99.80	99.40	0.35	87.00	35.60	87.00	35.60	82.20	33.06	51.00	33.90
	Ref	Train	Train Chi	Test	Test Chi	LgRed	LgRed Chi	MdRed	MdRed Chi	SmRed	SmRed Chi

90% Confidence level (4 entries) = 6.251

Function level execution profile at optimization level O2

The following table contains function execution profiles and goodness−of−fit chi−squared statistic values for the train, test, large (LgRed), medium (MdRed), and small (SmRed) reduced datasets as compared to the full SPEC reference datasets. Note: The test dataset is the same as the large reduced (LgRed) dataset for this benchmark. This data was gathered with the hiprof profiling utility. *90% Conf = Critical value of the chi−squared statistic at the 90 percent confidence level. Numbers in the Ref, Train, Test, LgRed, MdRed, and SmRed columns are the percent of overall execution time spent in the stated function (in the Function column). Numbers in the Train Chi, Test Chi, LgRed Chi, MdRed Chi, and SmRed Chi are the terms of the chi−squared statistic for the stated function (in the function column).

Function	Ref	Train	Train Chi	Test	Test Chi	LgRed	LgRed Chi	MdRed	MdRed Chi	SmRed	SmRed Chi
shalow_	36.70	34.70	0.11	4.70	27.90	4.80	27.73	5.80	26.02	21.70	6.13
calc2_	26.70	27.30	0.01	37.60	4.45	37.70	4.53	35.80	3.10	26.10	0.01
calc3_	20.50	20.90	0.01	23.70	0.50	24.00	0.60	21.40	0.04		20.50
calc1_	16.00	16.60	0.02	23.40	3.42	22.80	2.89	21.80	2.10	14.50	0.14
Sum	99.90	99.50	0.15	89.40	36.27	89.30	35.75	84.80	31.26	62.30	26.78
	Ref	Train	Train Chi	Test	Test Chi	LgRed	LgRed Chi	MdRed	MdRed Chi	SmRed	SmRed Chi

90% Confidence level (4 entries) = 6.251

Function level execution profile at optimization level O3

The following table contains function execution profiles and goodness−of−fit chi−squared statistic values for the train, test, large (LgRed), medium (MdRed), and small (SmRed) reduced datasets as compared to the full SPEC reference datasets. Note: The test dataset is the same as the large reduced (LgRed) dataset for this benchmark. This data was gathered with the hiprof profiling utility. *90% Conf = Critical value of the chi−squared statistic at the 90 percent confidence level. Numbers in the Ref, Train, Test, LgRed, MdRed, and SmRed columns are the percent of overall execution time spent in the stated function (in the Function column). Numbers in the Train Chi, Test Chi, LgRed Chi, MdRed Chi, and SmRed Chi are the terms of the chi−squared statistic for the stated function (in the function column).

Function	Ref	Train	Train Chi	Test	Test Chi	LgRed	LgRed Chi	MdRed	MdRed Chi	SmRed	SmRed Chi
shalow_	42.20	40.50	0.07	6.00	31.05	5.90	31.22	7.10	29.19	25.90	6.30
calc3_	21.30	20.50	0.03	25.70	0.91	25.30	0.75	20.40	0.04		21.30
calc2_	19.20	19.90	0.03	29.10	5.10	28.90	4.90	27.00	3.17	22.20	0.47
calc1_	17.10	18.30	0.08	27.40	6.20	26.60	5.28	26.50	5.17	5.60	7.73
Sum	99.80	99.20	0.21	88.20	43.27	86.70	42.15	81.00	37.57	53.70	35.80
	Ref	Train	Train Chi	Test	Test Chi	LgRed	LgRed Chi	MdRed	MdRed Chi	SmRed	SmRed Chi

90% Confidence level (4 entries) = 6.251

Function level execution profile at optimization level O4

The following table contains function execution profiles and goodness−of−fit chi−squared statistic values for the train, test, large (LgRed), medium (MdRed), and small (SmRed) reduced datasets as compared to the full SPEC reference datasets. Note: The test dataset is the same as the large reduced (LgRed) dataset for this benchmark. This data was gathered with the hiprof profiling utility. *90% Conf = Critical value of the chi−squared statistic at the 90 percent confidence level. Numbers in the Ref, Train, Test, LgRed, MdRed, and SmRed columns are the percent of overall execution time spent in the stated function (in the Function column). Numbers in the Train Chi, Test Chi, LgRed Chi, MdRed Chi, and SmRed Chi are the terms of the chi−squared statistic for the stated function (in the function column).

Function	Ref	Train	Train Chi	Test	Test Chi	LgRed	LgRed Chi	MdRed	MdRed Chi	SmRed	SmRed Chi
shalow_	48.40	45.90	0.13	7.10	35.24	7.00	35.41	7.90	33.89	25.40	10.93
calc3_	21.60	21.20	0.01	28.50	2.20	27.60	1.67	20.90	0.02		21.60
calc2_	17.40	19.00	0.15	30.10	9.27	29.90	8.98	27.10	5.41	18.60	0.08
calc1_	12.40	13.20	0.05	21.30	6.39	21.10	6.10	19.20	3.73	6.80	2.53
Sum	99.80	99.30	0.34	87.00	53.10	85.60	52.16	75.10	43.05	50.80	35.14
	Ref	Train	Train Chi	Test	Test Chi	LgRed	LgRed Chi	MdRed	MdRed Chi	SmRed	SmRed Chi

90% Confidence level (4 entries) = 6.251

Instruction Mix profile at optimization level o0

The following table contains instruction mix breakdown and goodness−of−fit chi−squared statistic values for the train, test, large (LgRed), medium (MdRed), and small (SmRed) reduced datasets, as compared to the full SPEC dataset. Note: The test dataset is the same as the large reduced (LgRed) dataset for this benchmark. This data was gathered with the sim−profile simulator for the SimpleScalar suite. *90% Conf = Critical value of the chi−squared statistic at the 90 percent confidence level. Numbers in the Ref, Train, Test, LgRed, MdRed, and SmRed columns are the percent of overall instructions of the stated instruction type (in the Inst Type column). Numbers in the Train Chi, Test Chi, LgRed Chi, MdRed Chi, and SmRed Chi columns are the terms of the chi−squared statistic for the stated instruction type (in the Inst Type column).

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O0 Program

Inst Type	Ref	Train	Train Chi	Test	Test Chi	Lgred	Lgred Chi	Mdred	Mdred Chi	Smred	Smred Chi
load	46.12	46.09	0.00	45.36	0.01	45.36	0.01	45.24	0.02	42.72	0.25
store	1.83	1.84	0.00	1.70	0.01	1.70	0.01	1.74	0.00	2.42	0.19
unconditional branch	0.00	0.01	0.00	0.07	0.00	0.07	0.00	0.09	0.00	0.50	0.00
conditional branch	0.37	0.37	0.00	0.35	0.00	0.35	0.00	0.36	0.00	0.64	0.20
int computation	45.20	45.16	0.00	44.82	0.00	44.82	0.00	44.53	0.01	37.61	1.27
fp computation	6.49	6.53	0.00	7.70	0.23	7.70	0.23	8.03	0.37	16.11	14.26
trap	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sum	100.01	100.00	0.00	100.00	0.25	100.00	0.25	99.99	0.40	100.00	16.17
	Ref	Train	Train Chi	Test	Test Chi	Lgred	Lgred Chi	Mdred	Mdred Chi	Smred	Smred Chi

90% Confidence level (7 entries) = 10.645

Instruction Mix profile at optimization level o1

The following table contains instruction mix breakdown and goodness−of−fit chi−squared statistic values for the train, test, large (LgRed), medium (MdRed), and small (SmRed) reduced datasets, as compared to the full SPEC dataset. Note: The test dataset is the same as the large reduced (LgRed) dataset for this benchmark. This data was gathered with the sim−profile simulator for the SimpleScalar suite. *90% Conf = Critical value of the chi−squared statistic at the 90 percent confidence level. Numbers in the Ref, Train, Test, LgRed, MdRed, and SmRed columns are the percent of overall instructions of the stated instruction type (in the Inst Type column). Numbers in the Train Chi, Test Chi, LgRed Chi, MdRed Chi, and SmRed Chi columns are the terms of the chi−squared statistic for the stated instruction type (in the Inst Type column).

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O1 Program

Inst Type	Ref	Train	Train Chi	Test	Test Chi	Lgred	Lgred Chi	Mdred	Mdred Chi	Smred	Smred Chi
load	27.26	27.30	0.00	28.57	0.06	28.57	0.06	28.83	0.09	32.27	0.92
store	6.19	6.18	0.00	5.35	0.11	5.35	0.11	5.27	0.14	3.99	0.78
unconditional branch	0.00	0.02	0.00	0.24	0.00	0.24	0.00	0.29	0.00	0.87	0.00
conditional branch	1.24	1.25	0.00	1.10	0.02	1.10	0.02	1.11	0.01	1.11	0.01
int Computation	43.64	43.58	0.00	40.59	0.21	40.59	0.21	40.21	0.27	34.09	2.09
fp Computation	21.66	21.67	0.00	24.16	0.29	24.16	0.29	24.29	0.32	27.68	1.67
trap	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sum	99.99	100.00	0.00	100.01	0.69	100.01	0.69	100.00	0.83	100.01	5.48
	Ref	Train	Train Chi	Test	Test Chi	Lgred	Lgred Chi	Mdred	Mdred Chi	Smred	Smred Chi

90% Confidence level (7 entries) = 10.645

Instruction Mix profile at optimization level o2

The following table contains instruction mix breakdown and goodness−of−fit chi−squared statistic values for the train, test, large (LgRed), medium (MdRed), and small (SmRed) reduced datasets, as compared to the full SPEC dataset. Note: The test dataset is the same as the large reduced (LgRed) dataset for this benchmark. This data was gathered with the sim−profile simulator for the SimpleScalar suite. *90% Conf = Critical value of the chi−squared statistic at the 90 percent confidence level. Numbers in the Ref, Train, Test, LgRed, MdRed, and SmRed columns are the percent of overall instructions of the stated instruction type (in the Inst Type column). Numbers in the Train Chi, Test Chi, LgRed Chi, MdRed Chi, and SmRed Chi columns are the terms of the chi−squared statistic for the stated instruction type (in the Inst Type column).

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O2 Program

Inst Type	Ref	Train	Train Chi	Test	Test Chi	Lgred	Lgred Chi	Mdred	Mdred Chi	Smred	Smred Chi
load	23.80	23.86	0.00	25.79	0.17	25.79	0.17	26.11	0.22	30.30	1.78
store	7.92	7.91	0.00	7.76	0.00	7.76	0.00	7.58	0.01	4.54	1.44
unconditional branch	0.00	0.02	0.00	0.23	0.00	0.23	0.00	0.28	0.00	0.93	0.00
conditional branch	2.45	2.46	0.00	1.99	0.09	1.99	0.09	2.01	0.08	1.87	0.14
int computation	23.23	23.35	0.00	23.43	0.00	23.43	0.00	23.76	0.01	26.27	0.40
fp computation	42.59	42.40	0.00	40.80	0.08	40.80	0.08	40.25	0.13	36.10	0.99
trap	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sum	99.99	100.00	0.00	100.00	0.33	100.00	0.33	99.99	0.46	100.01	4.74
	Ref	Train	Train Chi	Test	Test Chi	Lgred	Lgred Chi	Mdred	Mdred Chi	Smred	Smred Chi

90% Confidence level (7 entries) = 10.645

Instruction Mix profile at optimization level o3

The following table contains instruction mix breakdown and goodness−of−fit chi−squared statistic values for the train, test, large (LgRed), medium (MdRed), and small (SmRed) reduced datasets, as compared to the full SPEC dataset. Note: The test dataset is the same as the large reduced (LgRed) dataset for this benchmark. This data was gathered with the sim−profile simulator for the SimpleScalar suite. *90% Conf = Critical value of the chi−squared statistic at the 90 percent confidence level. Numbers in the Ref, Train, Test, LgRed, MdRed, and SmRed columns are the percent of overall instructions of the stated instruction type (in the Inst Type column). Numbers in the Train Chi, Test Chi, LgRed Chi, MdRed Chi, and SmRed Chi columns are the terms of the chi−squared statistic for the stated instruction type (in the Inst Type column).

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O3 Program

Inst Type	Ref	Train	Train Chi	Test	Test Chi	Lgred	Lgred Chi	Mdred	Mdred Chi	Smred	Smred Chi
load	32.66	32.66	0.00	32.31	0.00	32.31	0.00	32.42	0.00	33.72	0.03
store	10.23	10.19	0.00	9.83	0.02	9.83	0.02	9.53	0.05	5.38	2.30
unconditional branch	0.01	0.02	0.01	0.26	6.25	0.26	6.25	0.32	9.61	0.99	96.04
conditional branch	0.73	0.77	0.00	0.70	0.00	0.70	0.00	0.75	0.00	0.95	0.07
int computation	7.57	7.81	0.01	10.54	1.17	10.54	1.17	11.42	1.96	20.53	22.19
fp computation	48.80	48.55	0.00	46.36	0.12	46.36	0.12	45.55	0.22	38.43	2.20
trap	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sum	100.00	100.00	0.02	100.00	7.56	100.00	7.56	99.99	11.83	100.00	122.83
	Ref	Train	Train Chi	Test	Test Chi	Lgred	Lgred Chi	Mdred	Mdred Chi	Smred	Smred Chi

90% Confidence level (7 entries) = 10.645

Instruction Mix profile at optimization level o4

The following table contains instruction mix breakdown and goodness−of−fit chi−squared statistic values for the train, test, large (LgRed), medium (MdRed), and small (SmRed) reduced datasets, as compared to the full SPEC dataset. Note: The test dataset is the same as the large reduced (LgRed) dataset for this benchmark. This data was gathered with the sim−profile simulator for the SimpleScalar suite. *90% Conf = Critical value of the chi−squared statistic at the 90 percent confidence level. Numbers in the Ref, Train, Test, LgRed, MdRed, and SmRed columns are the percent of overall instructions of the stated instruction type (in the Inst Type column). Numbers in the Train Chi, Test Chi, LgRed Chi, MdRed Chi, and SmRed Chi columns are the terms of the chi−squared statistic for the stated instruction type (in the Inst Type column).

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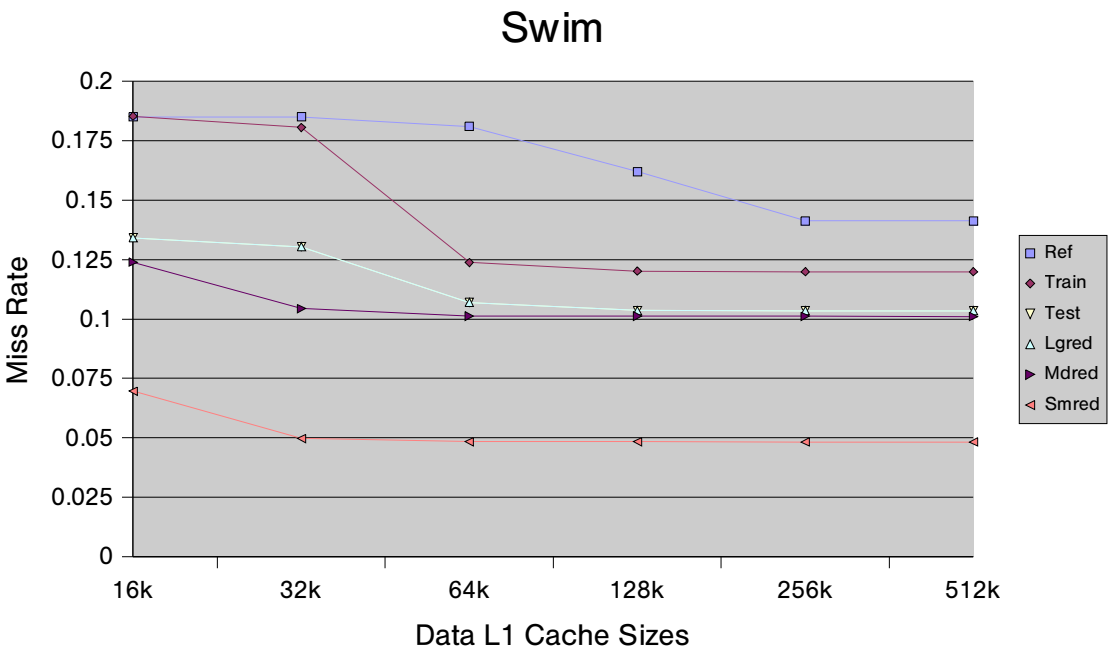
O4 Program

Inst Type	Ref	Train	Train Chi	Test	Test Chi	Lgred	Lgred Chi	Mdred	Mdred Chi	Smred	Smred Chi
load	32.66	32.66	0.00	32.31	0.00	32.31	0.00	32.42	0.00	33.72	0.03
store	10.23	10.19	0.00	9.83	0.02	9.83	0.02	9.53	0.05	5.38	2.30
unconditional branch	0.01	0.02	0.01	0.26	6.25	0.26	6.25	0.32	9.61	0.99	96.04
conditional branch	0.73	0.77	0.00	0.70	0.00	0.70	0.00	0.75	0.00	0.95	0.07
int computation	7.57	7.81	0.01	10.54	1.17	10.54	1.17	11.42	1.96	20.53	22.19
fp computation	48.80	48.55	0.00	46.36	0.12	46.36	0.12	45.55	0.22	38.43	2.20
trap	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sum	100.00	100.00	0.02	100.00	7.56	100.00	7.56	99.99	11.83	100.00	122.83
	Ref	Train	Train Chi	Test	Test Chi	Lgred	Lgred Chi	Mdred	Mdred Chi	Smred	Smred Chi

90% Confidence level (7 entries) = 10.645

Cache profile

The following chart shows level 1 data cache miss rates for the Ref, Train, Test, LgRed, MdRed, and SmRed datasets. Note: The test dataset is the same as the large reduced (LgRed) dataset for this benchmark. This data was gathered with the sim−cache simulator from the SimpleScalar suite. Miss rate is stated as the ratio of level 1 misses to total level 1 accesses.



Instruction Counts for all Datasets

The following table shows the instruction counts and estimated simulation time for the reference (Ref), train, test, large (LgRed), medium(MdRed), and small (SmRed) reduced datasets. Note: The test dataset is the same as the large reduced (LgRed) dataset for this benchmark. Instruction counts are from the simulated benchmark, compiled at optimization level O0 and run with each input dataset. Estimated simulation times are calculated using a 45,000 instructions per second factor. This factor was determined by observing the simulation rate of a simulator similar to sim−outorder, run on a machine similar to the SPEC 2000 reference machine (a 333 Mhz Sparc).

	Ref	Train	Test	LgRed	MdRed	SmRed
Instruction Count (in millions)	1583419	57716	2837	2837	575	107
Simulation Time (in hours)	9650.7	356.3	17.5	17.5	3.5	0.6