A. Supplementary material

Additional information about experiments. We ran the total of 53 trainings and evaluations. All but two runs described below were run for 20 000 steps, with evaluation every 5000 steps.

For datasets from {astar, bwaves, bzip, cactusadm, gems, leslie3d, omnetpp, sphinx3}, we ran 4 experiments on the first 0.1%, 1%, 10% and 100% records of the dataset.

For datasets from {lbm, libq, milc, xalanc} we ran only two experiments, on 1% and 100% of the dataset.

For the mcf dataset, we ran 11 experiments in total. The first five of them were runs on 0.01%, 0.1%, 1%, 10% and 100% of the dataset, without DAgger. For comparison, we ran additional six experiments with a larger number of steps and with DAgger. We achieved comparable cache hit rates, and therefore we did not evaluate learning-augmented algorithms on that additional data.

On average, each experiment took around one day on a Tesla V100 GPU, occupying at most 3GB of the GPU memory.

Full results. We present the full cache hit rates of PARROT-REUSE across all evaluated datasets and fractions in Table 3. The raw unnormalized competitive ratios are shown in Table 4.

Table 3. **Cache hit rates of PARROT-CACHE.** Detailed results.

DATASET	FRACTION	DAGGER	STEPS	EVAL FREQ	CACHE REQUESTS	CACHE REQUESTS IN TRAIN SET	HIT RATE CKPT 0 ON VAL	BEST NON 0 CHECKPOINT	HIT RATE CKPT BEST ON VAL	LAST CHECKPOINT	HIT RATE CKPT LAST ON VAL	HIT RATE CKPT BEST NON 0 ON TEST
ASTAR	0.1%	FALSE	20001	5000	640,032	1,154	8.25%	5000	13.32%	20000	11.83%	14.05%
ASTAR	1%	FALSE	20001	5000	640,032	11,540	8.25%	5000	25.09%	20000	24.55%	25.75%
ASTAR	10%	FALSE	20001	5000	640,032	115,404	8.25%	10000	30.26%	20000	30.05%	30.99%
ASTAR	100%	FALSE	20001	5000	640,032	1,154,048	8.25%	20000	31.53%	20000	31.53%	32.17%
BWAVES	0.1%	FALSE	20001	5000	640,032	570	0.02%	5000	0.03%	20000	0.02%	0.00%
BWAVES	1%	FALSE	20001	5000	640,032	5,703	0.02%	10000	1.93%	20000	1.62%	0.30%
BWAVES	10%	FALSE	20001	5000	640,032	57,036	0.02%	20000	0.03%	20000	0.03%	0.00%
BWAVES	100%	FALSE	20001	5000	640,032	570,368	0.02%	10000	3.21%	20000	1.21%	0.32%
BZIP	0.1%	FALSE	20001	5000	640,032	167	52.05%	20000	48.02%	20000	48.02%	53.23%
BZIP	1%	FALSE	20001	5000	640,032	1,676	52.05%	5000	42.69%	20000	41.94%	45.12%
BZIP	10%	FALSE	20001	5000	640,032	16,768	52.05%	5000	57.09%	20000	52.84%	64.28%
BZIP	100%	FALSE	20001	5000	640,032	167,680	52.05%	5000	63.50%	20000	61.29%	68.44%
CACTUSADM	0.1%	FALSE	20001	5000	640,032	221	0.32%	20000	4.81%	20000	4.81%	0.45%
CACTUSADM	1%	FALSE	20001	5000	640,032	2,219	0.32%	15000	8.43%	20000	8.42%	20.16%
CACTUSADM	10%	FALSE	20001	5000	640,032	22,195	0.32%	5000	25.88%	20000	24.17%	30.93%
CACTUSADM	100%	FALSE	20001	5000	640,032	221,952	0.32%	5000	25.30%	20000	24.98%	32.97%
GEMS	0.1%	FALSE	20001	5000	640,032	723	2.96%	15000	3.14%	20000	3.11%	3.09%
GEMS	1%	FALSE	20001	5000	640,032	7,234	2.96%	20000	3.12%	20000	3.12%	3.09%
GEMS	10%	FALSE	20001	5000	640,032	72,345	2.96%	20000	3.13%	20000	3.13%	3.08%
GEMS	100%	FALSE	20001	5000	640,032	723,456	2.96%	20000	1.77%	20000	1.77%	3.10%
LBM	1%	FALSE	20001	5000	640,032	7,820	0.02%	5000	0.19%	20000	0.13%	0.00%
LBM	100%	FALSE	20001	5000	640,032	782,080	0.02%	5000	1.22%	20000	0.29%	0.00%
LESLIE3D	0.1%	FALSE	20001	5000	640,032	716	0.81%	15000	1.29%	20000	1.01%	9.10%
LESLIE3D	1%	FALSE	20001	5000	640,032	7,160	0.81%	5000	1.62%	20000	1.21%	9.31%
LESLIE3D	10%	FALSE	20001	5000	640,032	71,603	0.81%	5000	2.09%	20000	1.00%	11.73%
LESLIE3D	100%	FALSE	20001	5000	640,032	716,032	0.81%	5000	4.99%	20000	4.89%	11.41%
LIBQ	1%	FALSE	20001	5000	640,032	5,798	0.00%	5000	0.00%	20000	0.00%	0.00%
LIBQ	100%	FALSE	20001	5000	640,032	579,840	0.00%	10000	0.01%	20000	0.00%	0.01%
MCF	0.01%	FALSE	20001	5000	640,032	296	2.61%	5000	15.79%	20000	11.02%	15.27%
MCF	0.01%	TRUE	20001	5000	640,032	296	2.61%	5000	15.79%	20000	11.02%	15.28%
MCF	0.1%	FALSE	20001	5000	640,032	2,965	2.61%	15000	22.19%	20000	22.16%	27.33%
MCF	0.1%	TRUE	20001	5000	640,032	2,965	2.61%	10000	21.64%	20000	21.40%	27.02%
MCF	1%	FALSE	20001	5000	640,032	29,655	2.61%	5000	40.00%	20000	39.44%	41.31%
MCF	1%	TRUE	20001	5000	640,032	29,655	2.61%	5000	40.35%	20000	39.93%	41.42%
MCF	10%	FALSE	20001	5000	640,032	296,550	2.61%	5000	42.09%	20000	41.49%	43.45%
MCF	100%	FALSE	20001	5000	640,032	2,965,504	2.61%	20000	43.05%	20000	43.05%	43.89%
MCF	100%	TRUE	20001	5000	640,032	2,965,504	2.61%	15000	42.65%	20000	42.49%	43.46%
MCF	100%	FALSE	120001	30000	3,840,032	2,965,504	2.61%	30000	43.10%	120000	43.10%	43.89%
MCF	100%	TRUE	120001	30000	3,840,032	2,965,504	2.61%	30000	42.60%	120000	42.60%	43.11%
MILC	1%	FALSE	20001	5000	640,032	5,568	0.22%	10000	0.23%	20000	0.23%	0.01%
MILC	100%	FALSE	20001	5000	640,032	556,800	0.22%	5000	0.34%	20000	0.23%	0.01%
OMNETPP	0.1%	FALSE	20001	5000	640,032	555	8.24%	5000	16.92%	20000	16.60%	17.90%
OMNETPP	1%	FALSE	20001	5000	640,032	5,555	8.24%	10000	13.85%	20000	13.62%	16.85%
OMNETPP	10%	FALSE	20001	5000	640,032	55,552	8.24%	5000	18.60%	20000	14.83%	19.28%
OMNETPP	100%	FALSE	20001	5000	640,032	555,520	8.24%	5000	22.23%	20000	15.46%	21.91%
SPHINX3	0.1%	FALSE	20001	5000	640,032	328	36.60%	20000	36.33%	20000	36.33%	53.78%
SPHINX3	1%	FALSE	20001	5000	640,032	3,287	36.60%	5000	43.84%	20000	42.71%	59.48%
SPHINX3	10%	FALSE	20001	5000	640,032	32,870	36.60%	5000	45.68%	20000	45.49%	66.55%
SPHINX3	100%	FALSE	20001	5000	640,032	328,704	36.60%	20000	55.18%	20000	55.18%	70.54%
XALANC	1%	FALSE	20001	5000	640,032	691	14.73%	15000	15.02%	20000	14.46%	32.38%
XALANC	100%	FALSE	20001	5000	640,032	69,120	14.73%	5000	27.01%	20000	26.42%	49.71%

Table 4. **Competitive ratios.** Detailed results.

DATASET	FRACTION	OPT	LRU	MARKER	RANDOM	PARROT-REUSE	PREDICTIVEMARKER	LMARKER	LNONMARKERR	LNONMARKERD	BLINDORACLER	BLINDORACLED	PARROT-CACHE	TRUST&DOUBT	ROBUSTFTPR	ROBUSTFTPD
ASTAR	0.1%	1.00	1.53	1.52	1.47	1.26	1.51	1.51	1.51	1.51	1.32	1.27	1.37	1.53	1.42	1.38
ASTAR	1%	1.00	1.53	1.52	1.47	1.16	1.50	1.50	1.50	1.49	1.22	1.17	1.19	1.47	1.24	1.19
ASTAR	10%	1.00	1.53	1.52	1.47	1.15	1.50	1.50	1.50	1.49	1.19	1.15	1.10	1.45	1.14	1.11
ASTAR	100%	1.00	1.53	1.52	1.46	1.14	1.50	1.50	1.50	1.49	1.19	1.14	1.08	1.45	1.14	1.09
BWAVES	0.1%	1.00	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05
BWAVES	1%	1.00	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05
BWAVES	10%	1.00	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05
BWAVES	100%	1.00	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05
BZIP	0.1%	1.00	1.88	1.93	2.23	2.96	2.00	1.98	2.00	1.97	2.36	1.92	2.43	2.00	2.17	1.98
BZIP	1%	1.00	1.88	1.96	2.22	2.92	1.98	1.97	1.98	1.98	2.26	1.92	2.85	2.03	2.32	2.00
BZIP	10%	1.00	1.88	1.93	2.26	2.39	1.93	1.93	1.97	1.95	2.12	1.92	1.86	1.81	1.90	1.84
BZIP	100%	1.00	1.88	1.94	2.26	2.19	1.94	1.94	1.98	1.96	2.06	1.92	1.64	1.69	1.78	1.66
CACTUSADM	0.1%	1.00	1.51	1.49	1.44	1.46	1.47	1.47	1.48	1.47	1.48	1.47	1.50	1.51	1.49	1.50
CACTUSADM	1%	1.00	1.51	1.49	1.44	1.36	1.46	1.46	1.47	1.47	1.42	1.37	1.20	1.46	1.34	1.22
CACTUSADM	10%	1.00	1.51	1.49	1.44	1.19	1.45	1.45	1.47	1.45	1.33	1.20	1.04	1.40	1.21	1.05
CACTUSADM	100%	1.00	1.51	1.49	1.44	1.18	1.44	1.44	1.46	1.45	1.31	1.19	1.01	1.40	1.15	1.02
GEMS	0.1%	1.00	1.11	1.09	1.09	1.13	1.09	1.09	1.09	1.09	1.11	1.11	1.10	1.10	1.10	1.09
GEMS	1%	1.00	1.11	1.09	1.10	1.13	1.09	1.09	1.09	1.09	1.11	1.11	1.10	1.10	1.10	1.09
GEMS	10%	1.00	1.11	1.09	1.09	1.13	1.08	1.09	1.09	1.09	1.11	1.11	1.10	1.10	1.10	1.09
GEMS	100%	1.00	1.11	1.09	1.10	1.13	1.09	1.09	1.09	1.09	1.11	1.11	1.10	1.10	1.10	1.09
LBM	1%	1.00	1.33	1.33	1.30	1.32	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33
LBM	100%	1.00	1.33	1.33	1.30	1.32	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33
LESLIE3D	0.1%	1.00	1.31	1.31	1.31	1.39	1.32	1.32	1.32	1.32	1.34	1.32	1.32	1.32	1.31	1.31
LESLIE3D	1%	1.00	1.31	1.31	1.31	1.39	1.31	1.31	1.31	1.31	1.34	1.32	1.31	1.31	1.31	1.31
LESLIE3D	10%	1.00	1.31	1.31	1.31	1.37	1.31	1.31	1.31	1.31	1.33	1.32	1.28	1.30	1.29	1.28
LESLIE3D	100%	1.00	1.31	1.31	1.31	1.38	1.31	1.31	1.31	1.31	1.33	1.32	1.28	1.30	1.30	1.29
LIBQ	1%	1.00	1.06	1.06	1.06	1.00	1.06	1.06	1.06	1.06	1.02	1.01	1.06	1.06	1.06	1.06
LIBQ	100%	1.00	1.06	1.06	1.06	1.00	1.06	1.06	1.06	1.06	1.03	1.01	1.06	1.06	1.06	1.06
MCF	0.01%	1.00	1.32	1.36	1.43	1.72	1.34	1.34	1.35	1.35	1.37	1.32	1.53	1.50	1.36	1.34
MCF	0.1%	1.00	1.32	1.35	1.43	1.58	1.31	1.32	1.33	1.32	1.37	1.32	1.31	1.26	1.29	1.28
MCF	1%	1.00	1.32	1.35	1.43	1.29	1.26	1.26	1.28	1.26	1.27	1.26	1.06	1.21	1.08	1.06
MCF	10%	1.00	1.32	1.36	1.43	1.22	1.25	1.25	1.27	1.24	1.21	1.20	1.02	1.20	1.05	1.02
MCF	100%	1.00	1.32	1.36	1.43	1.22	1.25	1.25	1.26	1.25	1.22	1.20	1.01	1.20	1.03	1.01
MILC	1%	1.00	1.01	1.01	1.01	1.00	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
MILC	100%	1.00	1.01	1.01	1.01	1.00	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
OMNETPP	0.1%	1.00	1.38	1.39	1.43	1.56	1.38	1.38	1.39	1.39	1.44	1.39	1.43	1.39	1.40	1.39
OMNETPP	1%	1.00	1.38	1.39	1.43	1.56	1.38	1.38	1.39	1.39	1.44	1.39	1.44	1.42	1.41	1.40
OMNETPP	10%	1.00	1.38	1.39	1.43	1.55	1.38	1.38	1.39	1.38	1.45	1.39	1.40	1.40	1.40	1.39
OMNETPP	100%	1.00	1.38	1.39	1.43	1.53	1.38	1.38	1.39	1.38	1.46	1.39	1.36	1.37	1.37	1.35
SPHINX3	0.1%	1.00	3.46	2.29	1.87	1.43	1.56	1.59	1.93	1.68	1.69	1.44	1.83	2.09	2.00	1.86
SPHINX3	1%	1.00	3.46	2.30	1.88	1.40	1.84	1.92	1.98	1.85	1.62	1.41	1.60	1.87	1.82	1.62
SPHINX3	10%	1.00	3.46	2.30	1.87	1.36	1.58	1.65	1.89	1.66	1.59	1.37	1.32	1.63	1.69	1.33
SPHINX3	100%	1.00	3.46	2.3	1.88	1.28	1.52	1.56	1.87	1.61	1.63	1.29	1.16	1.47	1.46	1.17
XALANC	1%	1.00	1.27	1.32	1.48	1.87	1.34	1.34	1.34	1.33	1.61	1.30	1.56	1.37	1.42	1.34
XALANC	100%	1.00	1.27	1.32	1.47	1.45	1.29	1.28	1.31	1.30	1.38	1.29	1.17	1.17	1.23	1.19