tide softmax

Lucy Score = Throughput x Availability x Acc / 10,000. LPD condenses live-fit vs Acc-champ RAM.
[T]=Tween [S]=Split [FP]=FastProxy [L]=Linear [HP]=HeadProxy
idle - epoch 1/1 (1 left, 94% overall) - lr unset - 2026-08-23 13:33:01 -
This epoch 2197 / 2346 cells. Recorded 2197 results. Learning rate unset.
Score 0 usually means the cell finished before a Lucy pulse (Acc never sampled). Score is live-fit: Throughput x Availability x Acc.
SGD that blocks serve dies on Availability. SoftAcc is serve-confidence only.
pi_collection - softmax - offline report

Lucy champions (this tide)

Axis	Cell	Score	Soft	Acc	Thru	Avail
hard acc	binary|none|Step[T]Alt|single|simd	390.05	25.1	27.5	6795.9	22.8
throughput	float32|none|sgd|single|simd	2670.35	23.0	24.7	35231.2	32.9
availability	fp6|none|Mesh[T][S][FP]|single|simd	314.82	25.1	25.0	2472.0	50.8
lucy score	bfloat16|none|sgd|single|simd	3796.90	25.0	28.7	33666.2	45.1
mobile score (trap)	binary|none|sgd|single|simd	2637.40	23.4	22.8	30946.0	36.4
t->50%	float16|none|sgd|single|simd	1125.61	19.9	22.7	19740.5	28.6
acc/sec	bfloat16|none|sgd|single|simd	3796.90	25.0	28.7	33666.2	45.1

Lucy axis champions (this tide)

Axis	Mode	DType	Arch	Value
hard_acc	Step[T]Alt	complex64	bicameralx2	45.83
throughput	sgd	float32	singlex1	35231.18
availability	Mesh[T][S][FP]	fp6	singlex1	50.83
score	sgd	bfloat16	singlex1	3796.90
soft_acc	Step[T]Alt	binary	singlex1	25.14
acc_thru	sgd	bfloat16	singlex1	9645.46
realtime	sgd	bfloat16	singlex1	15183.51
adapt	[T][S][HP]	complex128	singlex1	25.14
keep_learn	sgd	int	bicameralx2	16.56
acc_per_sec	sgd	bfloat16	singlex1	12.49
time_to_50	sgd	float16	singlex1	0.27
consistency	sgd	bfloat16	singlex1	100.00
stability	step_sgd	fp4	singlex1	100.00
mobile_score	sgd	binary	singlex1	69137909~
lpd	[T][S]	fp8e4m3	singlex1	26.05
mspeed	MeshBP	int8	singlex1	1.00
mavail	Mesh[T][S]	bfloat16	tricameralx3	1.00
mix	[T][S]	fp8e4m3	singlex1	0.81
gold_std	[T][S][HP]	uint8	singlex1	0.04

Best settings per train mode

Mode	DType	Format	Score	Soft	Acc	Avail	n
sgd	bfloat16	none	3796.9	25.0	28.7	45.1	102
[T][S]	uint64	none	2889.3	25.0	26.1	47.0	102
step_sgd	fp4	none	2816.7	25.0	24.5	33.9	102
tween_chain	ternary	none	2640.2	25.0	21.9	34.2	102
step_tween	uint4	none	2530.3	25.0	24.4	40.5	102
tween	binary	none	2467.0	25.0	26.6	34.7	102
Step[T][S]	binary	none	2369.5	25.0	19.8	39.2	102
step_tween_chain	uint32	none	2240.8	25.0	24.9	42.4	102
MeshBP	uint8	none	2106.6	25.0	21.1	35.9	102

Mesh[T]Chain	float16	none	2043.3	25.0	28.5	34.5	102
Mesh[T]	int8	none	1978.4	25.0	26.0	35.2	102
[T][S][FP]	fp8e5m2	none	1116.7	24.9	18.9	45.4	102
[T][S][L]	uintptr	none	1094.0	25.0	27.4	46.4	102
[T][S][HP]	uint8	none	1053.4	25.1	37.2	36.9	102
[T]Alt	uint8	none	1044.0	25.0	21.9	27.6	102
Step[T]Alt	fp4	none	963.6	25.0	25.7	31.1	102
[T][S][L]Cache	fp8e4m3	none	835.9	25.0	28.5	41.0	102
[T][S][HP]Async	float32	none	820.2	25.0	23.0	34.9	102
[T][S]Sparse	int4	none	767.0	24.9	22.3	42.1	102
Mesh[T][S]	float32	none	571.3	24.9	20.4	37.3	102
Mesh[T]Alt	binary	none	560.4	24.9	20.1	45.8	102
Mesh[T][S][FP]	bfloat16	none	508.4	25.0	21.3	42.6	55

Best dtype per mode

Mode	Winner dtype	Score	Soft	Acc
sgd	bfloat16	3796.9	25.0	28.7
[T][S]	uint64	2889.3	25.0	26.1
step_sgd	fp4	2816.7	25.0	24.5
tween_chain	ternary	2640.2	25.0	21.9
step_tween	uint4	2530.3	25.0	24.4
tween	binary	2467.0	25.0	26.6
Step[T][S]	binary	2369.5	25.0	19.8
step_tween_chain	uint32	2240.8	25.0	24.9
MeshBP	uint8	2106.6	25.0	21.1
Mesh[T]Chain	float16	2043.3	25.0	28.5
Mesh[T]	int8	1978.4	25.0	26.0
[T][S][FP]	fp8e5m2	1116.7	24.9	18.9
[T][S][L]	uintptr	1094.0	25.0	27.4
[T][S][HP]	uint8	1053.4	25.1	37.2
[T]Alt	uint8	1044.0	25.0	21.9
Step[T]Alt	fp4	963.6	25.0	25.7
[T][S][L]Cache	fp8e4m3	835.9	25.0	28.5
[T][S][HP]Async	float32	820.2	25.0	23.0
[T][S]Sparse	int4	767.0	24.9	22.3
Mesh[T][S]	float32	571.3	24.9	20.4
Mesh[T]Alt	binary	560.4	24.9	20.1
Mesh[T][S][FP]	bfloat16	508.4	25.0	21.3

Best mode per dtype

DType	Winner mode	Score	Soft	Acc
bfloat16	sgd	3796.9	25.0	28.7
uint64	[T][S]	2889.3	25.0	26.1
fp4	step_sgd	2816.7	25.0	24.5
float32	sgd	2670.3	23.0	24.7
int8	sgd	2648.4	22.3	23.0
ternary	tween_chain	2640.2	25.0	21.9
binary	sgd	2637.4	23.4	22.8
uint8	tween_chain	2583.5	25.0	26.6
uint4	step_tween	2530.3	25.0	24.4
uint	tween_chain	2382.1	25.0	31.0
int	[T][S]	2367.6	24.9	23.7

fp8e5m2	tween	2358.9	25.0	23.5
int4	tween_chain	2354.8	25.0	23.9
int2	sgd	2337.7	21.0	19.5
float16	tween	2324.7	25.0	27.4
uint32	[T][S]	2258.1	25.0	26.1
uint2	sgd	2233.0	25.0	23.4
uint16	tween_chain	2228.3	25.0	23.3
fp8e4m3	[T][S]	2221.9	25.0	32.1
complex128	[T][S]	2128.6	25.0	23.3
nf4	[T][S]	2035.4	25.0	24.6
int64	step_tween	2030.4	25.0	24.9
float64	MeshBP	2011.1	25.0	27.3
uintptr	tween	1881.7	25.0	30.8
int3	[T][S]	1823.5	25.0	22.5
complex64	tween_chain	1818.8	25.0	25.2
int32	[T][S]	1752.3	25.0	30.8
int5	[T][S]	1668.8	25.0	26.6
int16	[T][S]	1624.9	25.0	31.9
fp6	[T][S]	1525.1	25.0	21.4
uint6	step_sgd	1475.8	24.1	25.6
uint5	tween_chain	1451.9	25.0	24.4
uint3	MeshBP	1325.6	25.0	20.6
int6	[T][S]	1034.1	25.0	21.7

Leaderboard (Lucy Score)

#	Cell	Score	Soft	Acc	Thru	Avail
1	bfloat16|none|sgd|single|simd	3796.9	25.0	28.7	33666.2	45.1
2	uint64|none|[T][S]|single|simd	2889.3	25.0	26.1	24554.0	47.0
3	fp4|none|step_sgd|single|simd	2816.7	25.0	24.5	33201.6	33.9
4	float32|none|sgd|single|simd	2670.3	23.0	24.7	35231.2	32.9
5	int8|none|sgd|single|simd	2648.4	22.3	23.0	33541.1	35.4
6	ternary|none|tween_chain|single|simd	2640.2	25.0	21.9	30911.4	34.2
7	binary|none|sgd|single|simd	2637.4	23.4	22.8	30946.0	36.4
8	float32|none|[T][S]|single|simd	2585.4	25.0	25.7	30350.7	34.1
9	uint8|none|tween_chain|single|simd	2583.5	25.0	26.6	26110.3	39.6
10	uint8|none|[T][S]|single|simd	2547.1	25.0	25.9	27419.2	37.2
11	uint4|none|step_tween|single|simd	2530.3	25.0	24.4	24935.2	40.5
12	ternary|none|[T][S]|single|simd	2525.9	25.0	28.3	25158.2	40.2
13	int8|none|step_tween|single|simd	2480.6	25.0	22.5	26538.9	37.4
14	fp4|none|sgd|single|simd	2479.0	24.1	24.0	29063.1	35.4
15	binary|none|tween|single|simd	2467.0	25.0	26.6	28494.3	34.7
16	float32|none|step_tween|single|simd	2450.1	25.0	28.2	26187.6	37.4
17	uint|none|tween_chain|single|simd	2382.1	25.0	31.0	21493.2	44.3
18	uint|none|[T][S]|single|simd	2370.0	25.0	23.3	20849.5	45.6
19	binary|none|Step[T][S]|single|simd	2369.5	25.0	19.8	24178.3	39.2
20	int|none|[T][S]|single|simd	2367.6	24.9	23.7	20668.5	46.0

Leaderboard (SoftAcc)

#	Cell	Score	Soft	Acc	Thru	Avail
1	uint32|none|[T][S]|single|simd	2258.1	25.0	26.1	23192.7	38.9
2	uint4|none|step_tween|single|simd	2530.3	25.0	24.4	24935.2	40.5
3	bfloat16|none|[T][S]|single|simd	2163.2	25.0	17.1	28257.3	30.6

4	binary|none|tween_chain|single|simd	2160.2	25.0	27.8	27887.5	30.9
5	float16|none|tween|single|simd	2324.7	25.0	27.4	25371.9	36.6
6	uint64|none|[T][S]|single|simd	2889.3	25.0	26.1	24554.0	47.0
7	uint|none|tween_chain|single|simd	2382.1	25.0	31.0	21493.2	44.3
8	uint8|none|tween_chain|single|simd	2583.5	25.0	26.6	26110.3	39.6
9	fp8e4m3|none|[T][S]|single|simd	2221.9	25.0	32.1	21696.7	40.9
10	float32|none|tween_chain|single|simd	2272.0	25.0	28.9	28456.5	31.9
11	bfloat16|none|sgd|single|simd	3796.9	25.0	28.7	33666.2	45.1
12	binary|none|Step[T][S]|single|simd	2369.5	25.0	19.8	24178.3	39.2
13	float32|none|step_tween|single|simd	2450.1	25.0	28.2	26187.6	37.4
14	int8|none|step_tween|single|simd	2480.6	25.0	22.5	26538.9	37.4
15	fp4|none|step_sgd|single|simd	2816.7	25.0	24.5	33201.6	33.9
16	fp4|none|tween|single|simd	2224.7	25.0	26.9	30084.8	29.6
17	ternary|none|tween_chain|single|simd	2640.2	25.0	21.9	30911.4	34.2
18	fp8e5m2|none|tween|single|simd	2358.9	25.0	23.5	24028.8	39.3
19	binary|none|step_tween|single|simd	2334.1	25.0	20.4	28162.5	33.2
20	bfloat16|none|tween_chain|single|simd	2217.0	25.0	25.5	22856.8	38.8

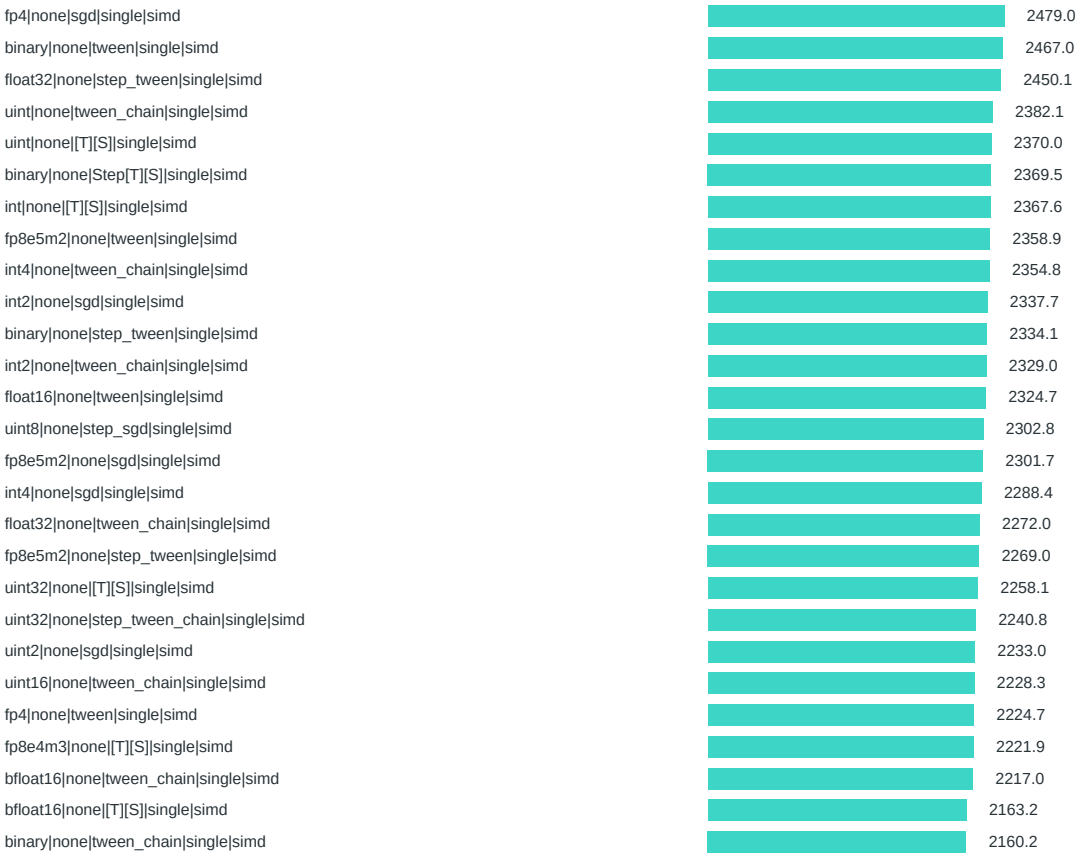
Leaderboard (hard Acc)

#	Cell	Score	Soft	Acc	Thru	Avail
1	fp8e4m3|none|[T][S]|single|simd	2221.9	25.0	32.1	21696.7	40.9
2	uint|none|tween_chain|single|simd	2382.1	25.0	31.0	21493.2	44.3
3	float32|none|tween_chain|single|simd	2272.0	25.0	28.9	28456.5	31.9
4	bfloat16|none|sgd|single|simd	3796.9	25.0	28.7	33666.2	45.1
5	ternary|none|[T][S]|single|simd	2525.9	25.0	28.3	25158.2	40.2
6	float32|none|step_tween|single|simd	2450.1	25.0	28.2	26187.6	37.4
7	binary|none|tween_chain|single|simd	2160.2	25.0	27.8	27887.5	30.9
8	float16|none|tween|single|simd	2324.7	25.0	27.4	25371.9	36.6
9	fp8e5m2|none|step_tween|single|simd	2269.0	25.0	27.3	25690.5	35.3
10	fp4|none|tween|single|simd	2224.7	25.0	26.9	30084.8	29.6
11	binary|none|tween|single|simd	2467.0	25.0	26.6	28494.3	34.7
12	uint8|none|tween_chain|single|simd	2583.5	25.0	26.6	26110.3	39.6
13	uint64|none|[T][S]|single|simd	2889.3	25.0	26.1	24554.0	47.0
14	uint32|none|[T][S]|single|simd	2258.1	25.0	26.1	23192.7	38.9
15	uint8|none|[T][S]|single|simd	2547.1	25.0	25.9	27419.2	37.2
16	float32|none|[T][S]|single|simd	2585.4	25.0	25.7	30350.7	34.1
17	bfloat16|none|tween_chain|single|simd	2217.0	25.0	25.5	22856.8	38.8
18	uint32|none|step_tween_chain|single|simd	2240.8	25.0	24.9	21149.8	42.4
19	float32|none|sgd|single|simd	2670.3	23.0	24.7	35231.2	32.9
20	fp4|none|step_sgd|single|simd	2816.7	25.0	24.5	33201.6	33.9

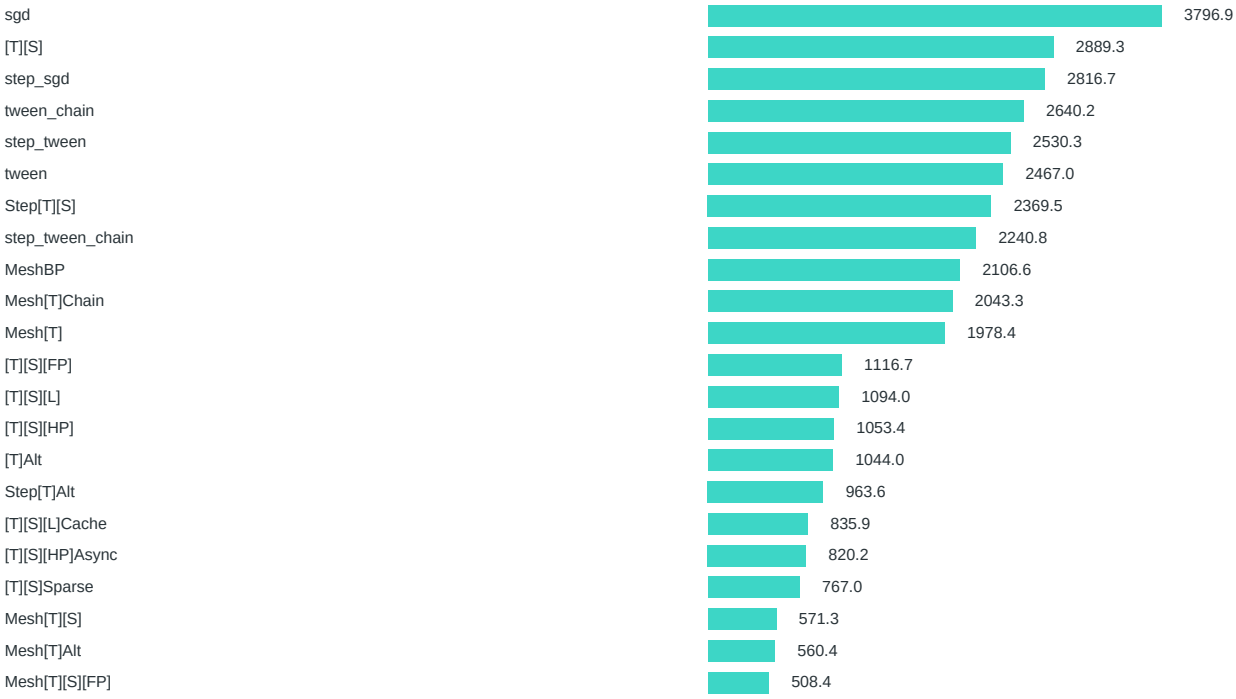
Top scores



Top scores



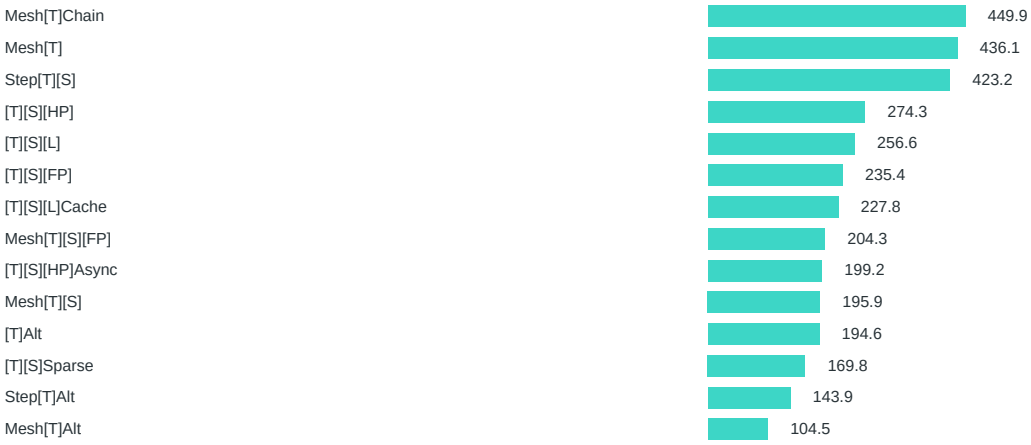
Best settings per mode



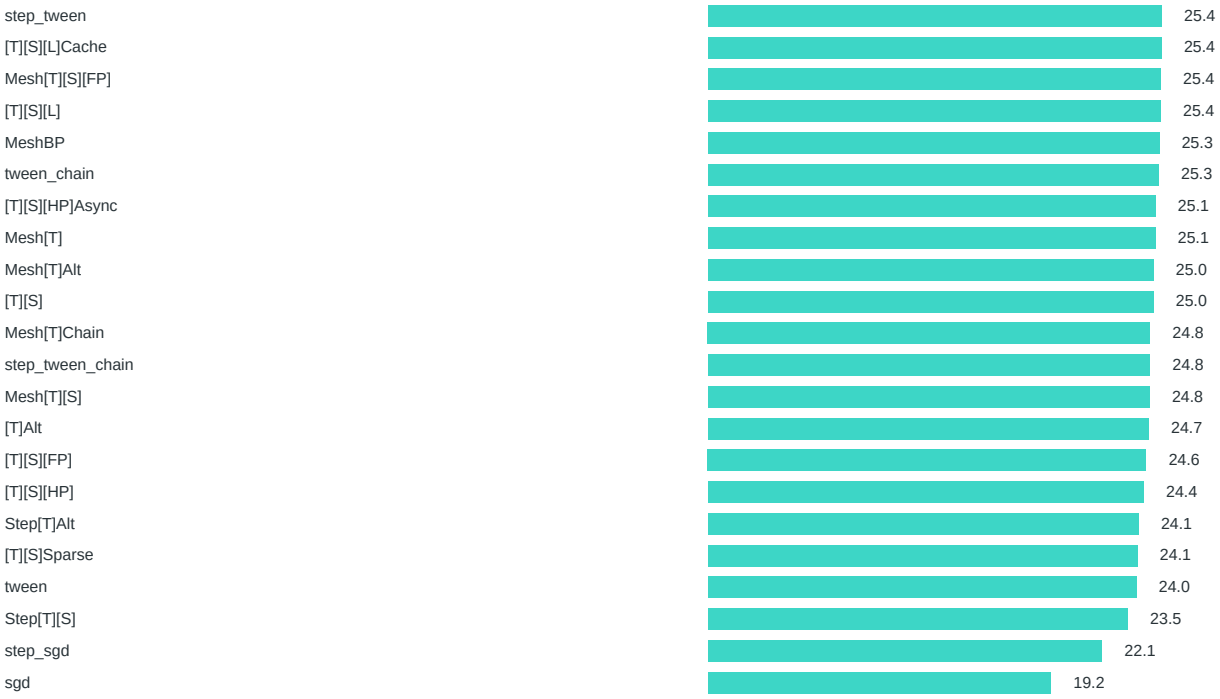
Mean Score by train mode



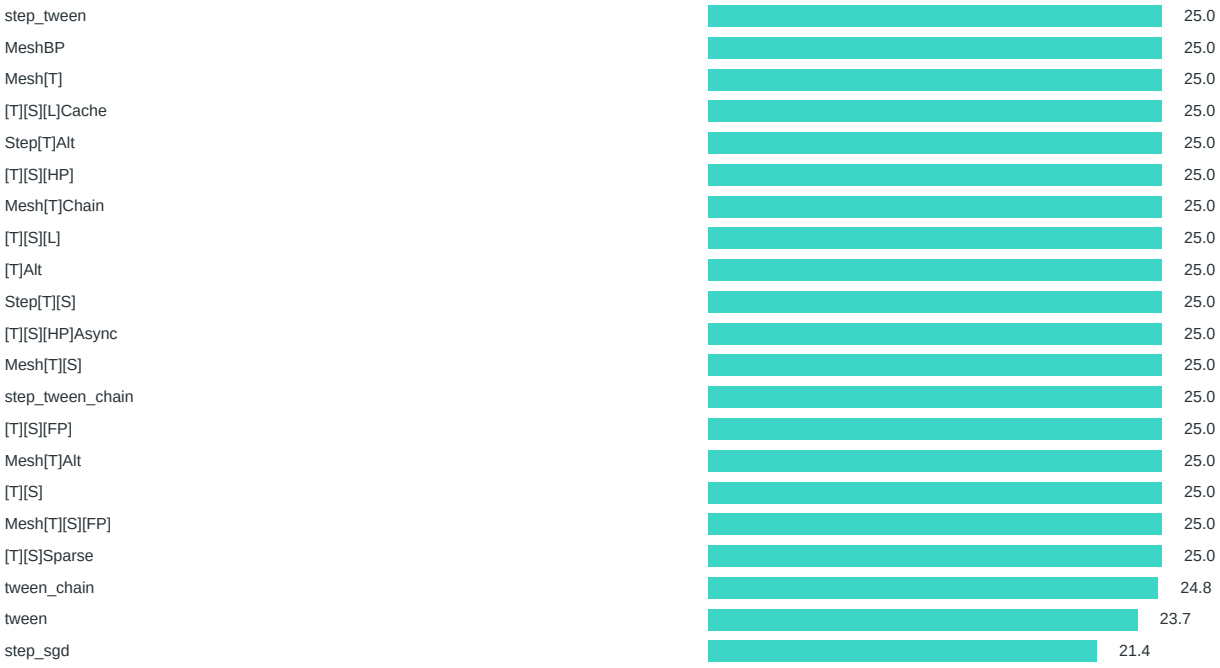
Mean Score by train mode



Mean hard Acc by train mode



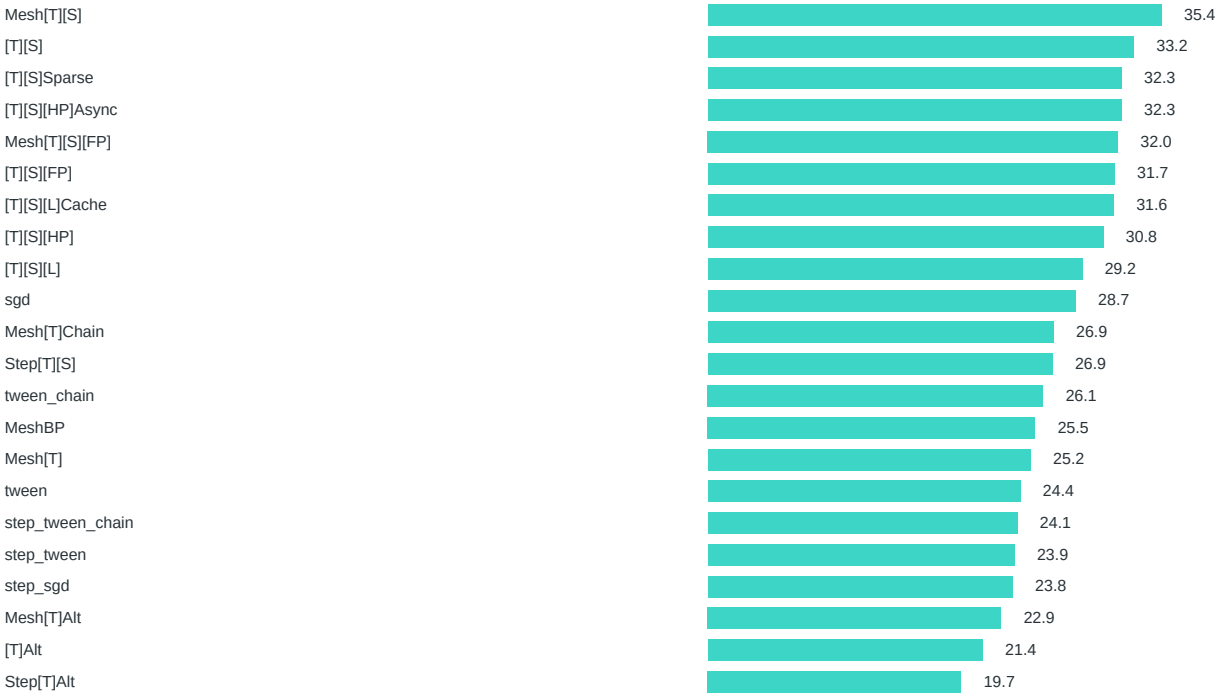
Mean SoftAcc by train mode



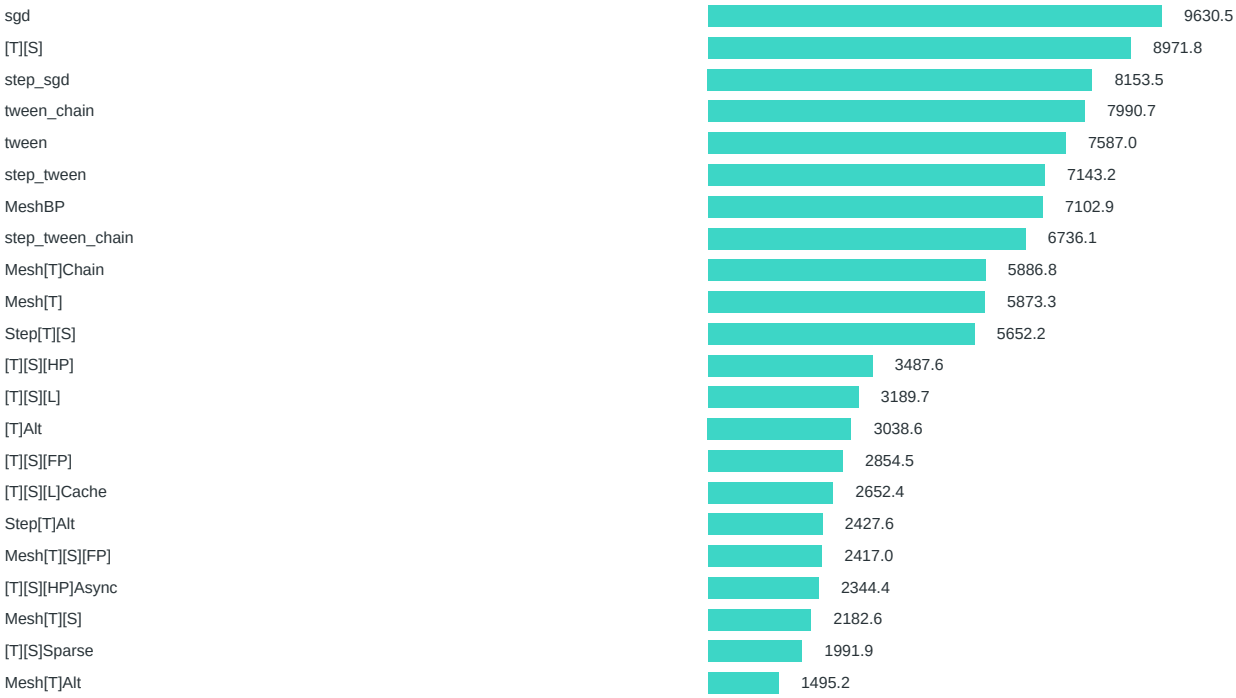
Mean SoftAcc by train mode



Mean Availability by train mode



Mean Throughput by train mode



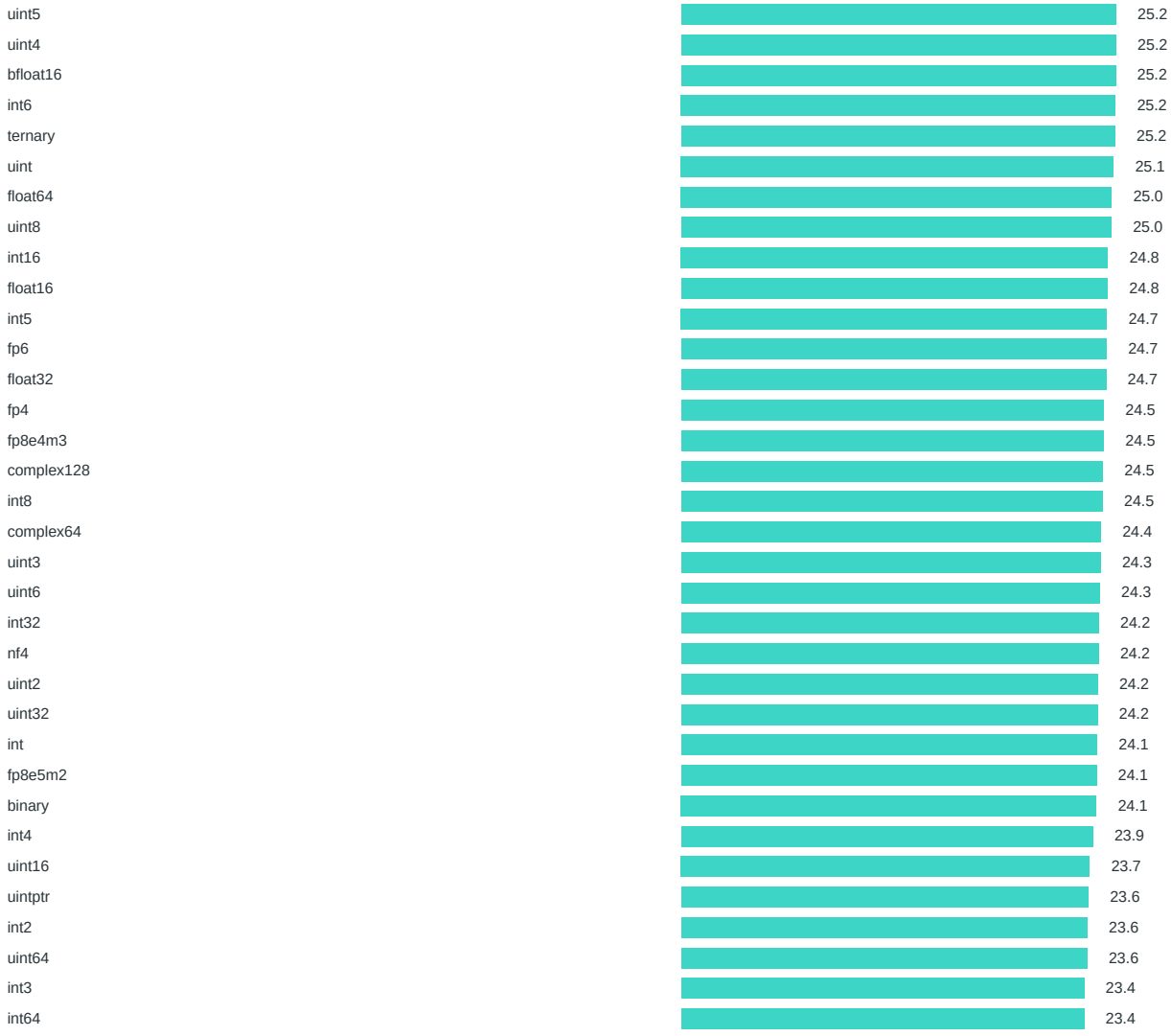
Mean Score by dtype



Mean Score by dtype



Mean hard Acc by dtype



Mean Score by arch



Honesty - mean Score, every mode x dtype (cols 1-12)

	bfloat16	binary	complex128	complex64	float16	float32	float64	fp4	fp6	fp8e4m3	fp8e5m2	int
MeshBP	589	762	254	605	714	799	942	731	284	670	654	437
Mesh[T]	802	457	288	303	563	539	358	226	234	475	490	369
Mesh[T]Alt	126	173	144	175	136	153	141	39	113	118	50	101
Mesh[T]Chain	340	819	252	424	886	694	586	368	186	472	638	342
Mesh[T][S]	322	276	182	125	222	282	309	245	118	174	125	130
Mesh[T][S][FP]	257	227	240	376	240	141	285	238	314	195	131	251
Step[T]Alt	294	190	20	53	123	250	269	371	90	210	145	90
Step[T][S]	523	708	288	373	604	757	845	609	414	676	414	498
[T]Alt	222	324	205	192	276	308	173	316	56	378	111	117
[T][S]	697	898	773	540	694	1078	783	975	500	1169	819	922
[T][S][FP]	285	342	272	223	194	388	242	321	153	436	360	281
[T][S][HP]	394	233	136	357	328	468	172	464	114	262	333	248
[T][S][HP]Async	338	257	194	124	222	347	272	243	143	164	239	103
[T][S][L]	377	303	200	228	250	452	281	406	223	272	321	176
[T][S][L]Cache	192	337	145	148	305	232	259	266	114	397	318	216
[T][S]Sparse	314	295	164	88	209	90	367	124	76	115	226	101
sgd	1675	982	615	213	643	1239	837	1027	289	684	801	562
step_sgd	524	585	596	461	572	371	665	1019	467	692	561	358
step_tween	880	780	571	443	555	1162	608	631	260	276	925	325
step_tween_chain	594	730	537	416	556	949	310	593	265	698	560	251
tween	433	1014	791	195	936	841	370	950	76	750	850	276
tween_chain	965	1015	540	736	891	1126	866	492	346	214	635	356

Honesty - mean Score, every mode x dtype (cols 13-24)

Honesty - mean Score, every mode x dtype (cols 13-24)

	int16	int2	int3	int32	int4	int5	int6	int64	int8	nf4	ternary	uint
MeshBP	635	549	346	391	381	73	326	132	981	317	743	736
Mesh[T]	511	671	129	508	556	138	126	433	824	289	600	332
Mesh[T]Alt	97	110	130	84	105	109	102	60	67	120	77	97
Mesh[T]Chain	481	731	277	340	542	213	152	784	725	446	552	256
Mesh[T][S]	128	210	136	188	220	108	145	217	303	175	355	162
Mesh[T][S][FP]	144	121	222	140	58	200	147	148	276	173	222	309
Step[T]Alt	102	80	89	127	303	31	109	90	73	106	174	170
Step[T][S]	146	742	332	314	591	281	115	395	471	181	507	394
[T]Alt	257	128	157	214	96	80	123	115	398	163	140	95
[T][S]	879	808	653	834	907	686	433	733	1024	830	1178	883
[T][S][FP]	111	169	110	362	349	127	175	206	250	128	455	209
[T][S][HP]	179	300	233	151	259	188	241	281	326	173	399	139
[T][S][HP]Async	95	181	185	244	215	100	77	167	334	218	267	208
[T][S][L]	315	397	63	209	271	138	117	261	278	258	368	206
[T][S][L]Cache	249	107	153	274	298	124	170	179	432	246	324	96
[T][S]Sparse	237	257	85	216	316	108	99	99	295	145	146	53
sgd	639	996	246	599	962	395	217	388	1039	618	670	741
step_sgd	203	590	67	685	857	427	205	451	773	486	195	476
step_tween	559	716	474	165	620	337	345	739	862	140	758	679
step_tween_chain	453	719	427	240	176	248	92	635	368	302	277	684
tween	589	791	348	587	607	76	430	485	578	411	843	838
tween_chain	800	867	255	184	995	493	320	557	1128	558	800	1020

Honesty - mean Score, every mode x dtype (cols 25-34)

Honesty - mean Score, every mode x dtype (cols 25-34)

	uint16	uint2	uint3	uint32	uint4	uint5	uint6	uint64	uint8	uintptr
MeshBP	892	133	411	238	640	378	387	660	775	552
Mesh[T]	570	180	305	669	388	212	341	728	773	438
Mesh[T]Alt	53	111	105	133	64	81	97	66	83	133
Mesh[T]Chain	556	333	249	471	382	210	345	543	442	259
Mesh[T][S]	208	205	101	97	225	155	132	207	302	172
Mesh[T][S][FP]	154	154	318	193	272	314	170	140	246	235
Step[T]Alt	42	150	55	182	291	53	143	255	70	94
Step[T][S]	191	333	265	394	516	328	215	203	487	278
[T]Alt	286	169	97	123	200	194	87	188	365	265
[T][S]	825	534	407	935	836	388	358	1207	1219	575
[T][S][FP]	283	71	167	200	227	151	87	132	320	219
[T][S][HP]	297	357	116	309	322	122	163	336	611	318
[T][S][HP]Async	210	170	109	177	145	124	83	243	275	301
[T][S][L]	189	212	148	196	235	127	218	284	301	449
[T][S][L]Cache	175	263	165	152	246	185	150	208	329	286
[T][S]Sparse	166	150	141	193	212	75	66	132	241	172
sgd	592	799	392	327	321	490	196	595	968	397
step_sgd	525	565	391	483	322	369	553	767	908	470
step_tween	646	415	317	664	934	316	171	266	333	201
step_tween_chain	928	693	166	839	635	288	475	582	720	394
tween	430	195	148	811	201	410	373	649	765	869
tween_chain	809	294	562	574	295	497	327	422	1107	525

Honesty - mean hard Acc, every mode x dtype (cols 1-12)

Honesty - mean hard Acc, every mode x dtype (cols 1-12)

	bfloat16	binary	complex128	complex64	float16	float32	float64	fp4	fp6	fp8e4m3	fp8e5m2	int
MeshBP	28	24	28	24	25	31	26	25	24	24	29	22
Mesh[T]	28	25	23	26	20	26	26	26	23	26	22	22
Mesh[T]Alt	25	22	21	27	27	25	27	26	25	26	21	26
Mesh[T]Chain	28	25	25	22	25	26	28	25	24	29	27	19
Mesh[T][S]	30	25	27	26	28	23	26	25	26	24	25	24
Mesh[T][S][FP]	26	19	30	28	28	31	28	25	25	23	24	30
Step[T]Alt	20	23	21	30	25	23	24	25	25	21	29	24
Step[T][S]	22	21	21	20	25	25	24	17	24	23	24	27
[T]Alt	24	26	26	27	25	28	23	23	27	26	25	27
[T][S]	22	24	24	26	24	25	22	26	23	28	23	27
[T][S][FP]	24	23	27	25	19	24	22	26	22	31	22	28
[T][S][HP]	28	20	28	23	23	25	24	25	27	20	25	25
[T][S][HP]Async	24	29	22	26	23	24	22	25	33	23	23	21
[T][S][L]	29	28	22	26	25	24	26	26	30	26	26	25
[T][S][L]Cache	26	26	32	24	26	27	26	25	26	25	23	26
[T][S]Sparse	30	27	28	24	27	22	27	25	22	25	24	21
sgd	24	19	21	18	21	20	22	21	16	17	15	19
step_sgd	19	21	21	22	25	19	23	24	23	22	24	18
step_tween	26	24	24	25	27	27	27	25	26	25	26	26
step_tween_chain	24	26	21	21	26	24	25	25	24	25	22	28
tween	23	24	27	25	25	22	22	26	25	25	27	22
tween_chain	26	26	22	25	26	24	28	26	24	24	24	27

Honesty - mean hard Acc, every mode x dtype (cols 13-24)

Honesty - mean hard Acc, every mode x dtype (cols 13-24)

	int16	int2	int3	int32	int4	int5	int6	int64	int8	nf4	ternary	uint
MeshBP	27	23	23	23	20	27	26	22	26	23	26	29
Mesh[T]	27	27	27	24	27	25	24	24	29	29	25	26
Mesh[T]Alt	27	20	27	23	24	24	26	23	23	25	23	29
Mesh[T]Chain	25	29	19	21	22	27	26	22	25	27	25	25
Mesh[T][S]	25	23	26	26	23	26	24	24	23	25	28	24
Mesh[T][S][FP]	29	25	25	28	21	26	23	24	24	18	24	29
Step[T]Alt	20	19	19	27	26	27	26	22	23	22	26	24
Step[T][S]	24	25	28	23	24	27	22	21	22	20	25	27
[T]Alt	21	19	26	27	25	23	27	22	23	24	24	25
[T][S]	26	23	24	24	26	26	30	21	28	26	26	25
[T][S][FP]	26	26	20	27	22	25	28	23	24	17	31	22
[T][S][HP]	24	26	21	23	25	24	27	21	23	20	24	25
[T][S][HP]Async	25	21	24	26	26	23	31	28	26	29	25	27
[T][S][L]	32	27	20	20	25	23	25	29	27	26	28	26
[T][S][L]Cache	22	21	23	25	24	29	26	26	27	30	29	23
[T][S]Sparse	25	23	23	22	24	20	25	21	25	24	25	26
sgd	19	21	15	21	21	17	16	18	18	20	20	23
step_sgd	21	22	20	24	24	23	24	21	24	22	21	23
step_tween	28	26	26	26	24	29	24	25	24	26	25	24
step_tween_chain	23	27	28	25	22	26	24	29	22	25	24	23
tween	24	22	22	23	24	21	24	23	25	24	23	26
tween_chain	25	24	27	27	25	25	26	24	26	26	25	24

Honesty - mean hard Acc, every mode x dtype (cols 25-34)

Honesty - mean hard Acc, every mode x dtype (cols 25-34)

	uint16	uint2	uint3	uint32	uint4	uint5	uint6	uint64	uint8	uintptr
MeshBP	28	23	23	27	26	25	26	28	24	26
Mesh[T]	26	25	25	25	26	24	26	25	23	24
Mesh[T]Alt	22	26	24	26	29	26	25	22	28	27
Mesh[T]Chain	28	24	27	29	24	23	24	22	22	26
Mesh[T][S]	22	21	20	23	21	28	27	24	24	26
Mesh[T][S][FP]	22	25	26	28	28	26	25	23	27	20
Step[T]Alt	22	28	22	26	30	23	24	24	29	23
Step[T][S]	22	27	22	24	23	25	23	24	23	23
[T]Alt	22	32	23	22	28	32	27	16	25	20
[T][S]	24	25	28	27	26	29	24	26	23	19
[T][S][FP]	28	22	25	23	30	31	22	22	24	26
[T][S][HP]	25	25	24	29	23	33	23	22	31	17
[T][S][HP]Async	23	23	25	21	24	24	26	27	24	29
[T][S][L]	24	26	31	22	24	25	21	23	26	23
[T][S][L]Cache	24	26	25	24	22	28	28	23	26	22
[T][S]Sparse	24	17	24	25	28	19	23	22	23	26
sgd	18	19	20	17	20	19	17	19	22	18
step_sgd	21	20	22	21	22	21	25	23	21	25
step_tween	24	26	22	24	26	26	23	26	27	25
step_tween_chain	26	25	24	25	25	27	28	25	26	23
tween	23	24	26	20	26	23	23	24	25	27
tween_chain	24	23	27	25	26	24	25	27	27	24

Honesty - mean SoftAcc, every mode x dtype (cols 1-12)

Honesty - mean SoftAcc, every mode x dtype (cols 1-12)

	bfloat16	binary	complex128	complex64	float16	float32	float64	fp4	fp6	fp8e4m3	fp8e5m2	int
MeshBP	25	25	25	25	25	25	25	25	25	25	25	25
Mesh[T]	25	25	25	25	25	25	25	25	25	25	25	25
Mesh[T]Alt	25	25	25	25	25	25	25	25	25	25	25	25
Mesh[T]Chain	25	25	25	25	25	25	25	25	25	25	25	25
Mesh[T][S]	25	25	25	25	25	25	25	25	25	25	25	25
Mesh[T][S][FP]	25	25	25	25	25	25	25	25	25	25	25	25
Step[T]Alt	25	25	25	25	25	25	25	25	25	25	25	25
Step[T][S]	25	25	25	25	25	25	25	25	25	25	25	25
[T]Alt	25	25	25	25	25	25	25	25	25	25	25	25
[T][S]	25	25	25	25	25	25	25	25	25	25	25	25
[T][S][FP]	25	25	25	25	25	25	25	25	25	25	25	25
[T][S][HP]	25	25	25	25	25	25	25	25	25	25	25	25
[T][S][HP]Async	25	25	25	25	25	25	25	25	25	25	25	25
[T][S][L]	25	25	25	25	25	25	25	25	25	25	25	25
[T][S][L]Cache	25	25	25	25	25	25	25	25	25	25	25	25
[T][S]Sparse	25	25	25	25	25	25	25	25	25	25	25	25
sgd	22	20	21	17	20	21	24	22	17	21	18	20
step_sgd	21	22	20	21	22	20	22	23	22	21	23	19
step_tween	25	25	25	25	25	25	25	25	25	25	25	25
step_tween_chain	25	25	25	25	25	25	25	25	25	25	25	25
tween	24	24	24	24	23	23	23	25	23	23	24	23
tween_chain	25	25	23	25	25	25	25	25	25	25	24	25

Honesty - mean SoftAcc, every mode x dtype (cols 13-24)

Honesty - mean SoftAcc, every mode x dtype (cols 13-24)

	int16	int2	int3	int32	int4	int5	int6	int64	int8	nf4	ternary	uint
MeshBP	25	25	25	25	25	25	25	25	25	25	25	25
Mesh[T]	25	25	25	25	25	25	25	25	25	25	25	25
Mesh[T]Alt	25	25	25	25	25	25	25	25	25	25	25	25
Mesh[T]Chain	25	25	25	25	25	25	25	25	25	25	25	25
Mesh[T][S]	25	25	25	25	25	25	25	25	25	25	25	25
Mesh[T][S][FP]	25	25	25	25	25	25	25	25	25	25	25	25
Step[T]Alt	25	25	25	25	25	25	25	25	25	25	25	25
Step[T][S]	25	25	25	25	25	25	25	25	25	25	25	25
[T]Alt	25	25	25	25	25	25	25	25	25	25	25	25
[T][S]	25	25	25	25	25	25	25	25	25	25	25	25
[T][S][FP]	25	25	25	25	25	25	25	25	25	25	25	25
[T][S][HP]	25	25	25	25	25	25	25	25	25	25	25	25
[T][S][HP]Async	25	25	25	25	25	25	25	25	25	25	25	25
[T][S][L]	25	25	25	25	25	25	25	25	25	25	25	25
[T][S][L]Cache	25	25	25	25	25	25	25	25	25	25	25	25
[T][S]Sparse	25	25	25	25	25	25	25	25	25	25	25	25
sgd	19	21	15	20	21	20	17	18	18	21	18	21
step_sgd	19	20	19	23	23	24	21	22	21	22	20	22
step_tween	25	25	25	25	25	25	25	25	25	25	25	25
step_tween_chain	25	25	25	25	25	25	25	25	25	25	25	25
tween	25	24	22	22	23	22	23	22	25	25	24	25
tween_chain	25	25	25	25	25	25	25	25	25	25	23	23

Honesty - mean SoftAcc, every mode x dtype (cols 25-34)

Honesty - mean SoftAcc, every mode x dtype (cols 25-34)

	uint16	uint2	uint3	uint32	uint4	uint5	uint6	uint64	uint8	uintptr
MeshBP	25	25	25	25	25	25	25	25	25	25
Mesh[T]	25	25	25	25	25	25	25	25	25	25
Mesh[T]Alt	25	25	25	25	25	25	25	25	25	25
Mesh[T]Chain	25	25	25	25	25	25	25	25	25	25
Mesh[T][S]	25	25	25	25	25	25	25	25	25	25
Mesh[T][S][FP]	25	25	25	25	25	25	25	25	25	25
Step[T]Alt	25	25	25	25	25	25	25	25	25	25
Step[T][S]	25	25	25	25	25	25	25	25	25	25
[T]Alt	25	25	25	25	25	25	25	25	25	25
[T][S]	25	25	25	25	25	25	25	25	25	25
[T][S][FP]	25	25	25	25	25	25	25	25	25	25
[T][S][HP]	25	25	25	25	25	25	25	25	25	25
[T][S][HP]Async	25	25	25	25	25	25	25	25	25	25
[T][S][L]	25	25	25	25	25	25	25	25	25	25
[T][S][L]Cache	25	25	25	25	25	25	25	25	25	25
[T][S]Sparse	25	25	25	25	25	25	25	25	25	25
sgd	18	21	19	18	19	20	17	20	20	19
step_sgd	20	20	23	22	21	21	23	22	20	23
step_tween	25	25	25	25	25	25	25	25	25	25
step_tween_chain	25	25	25	25	25	25	25	25	25	25
tween	24	23	25	21	25	23	24	25	24	25
tween_chain	25	25	25	25	25	25	25	25	25	25

Honesty - mean Avail, every mode x dtype (cols 1-12)

Honesty - mean Avail, every mode x dtype (cols 1-12)

	bfloat16	binary	complex128	complex64	float16	float32	float64	fp4	fp6	fp8e4m3	fp8e5m2	int
MeshBP	25	32	21	26	25	27	31	24	21	27	24	29
Mesh[T]	27	26	27	28	29	27	23	18	25	24	25	24
Mesh[T]Alt	24	30	28	21	25	26	23	18	23	22	24	24
Mesh[T]Chain	25	27	23	30	27	30	31	25	22	28	26	26
Mesh[T][S]	37	37	32	35	37	38	40	36	31	35	30	31
Mesh[T][S][FP]	37	36	27	37	30	28	34	33	51	33	32	27
Step[T]Alt	17	21	21	13	21	19	22	24	26	22	14	20
Step[T][S]	28	27	27	29	28	35	27	27	28	27	30	26
[T]Alt	24	21	27	20	24	23	22	23	20	25	19	21
[T][S]	32	33	34	30	31	33	36	33	37	33	29	36
[T][S][FP]	34	34	38	32	29	36	36	33	34	31	34	30
[T][S][HP]	28	28	27	35	30	33	28	30	29	32	29	35
[T][S][HP]Async	35	35	29	32	33	33	36	32	32	34	35	30
[T][S][L]	29	32	29	27	27	29	30	30	29	25	32	28
[T][S][L]Cache	31	32	28	27	33	31	31	29	29	38	32	34
[T][S]Sparse	33	33	29	29	33	26	38	33	35	31	39	23
sgd	35	31	31	25	30	31	34	32	25	30	27	30
step_sgd	25	24	24	24	26	21	23	25	25	26	30	21
step_tween	32	26	27	26	25	28	20	26	21	19	26	23
step_tween_chain	24	25	27	22	24	29	24	29	21	27	25	24
tween	25	27	29	21	26	23	24	26	19	26	28	24
tween_chain	33	28	20	31	29	30	29	17	26	23	24	24

Honesty - mean Avail, every mode x dtype (cols 13-24)

Honesty - mean Avail, every mode x dtype (cols 13-24)

	int16	int2	int3	int32	int4	int5	int6	int64	int8	nf4	ternary	uint
MeshBP	28	24	27	26	20	16	25	21	28	23	25	29
Mesh[T]	25	26	18	27	22	18	19	32	26	24	26	28
Mesh[T]Alt	23	23	25	21	23	23	25	21	22	22	21	19
Mesh[T]Chain	30	28	28	29	28	23	21	34	28	26	27	26
Mesh[T][S]	34	39	32	36	37	38	37	36	42	33	34	34
Mesh[T][S][FP]	27	23	34	27	25	34	33	28	37	36	32	35
Step[T]Alt	18	20	15	25	21	15	17	20	14	23	23	23
Step[T][S]	19	28	24	25	23	25	27	26	25	24	28	28
[T]Alt	26	18	21	20	20	19	20	22	23	17	19	16
[T][S]	36	32	35	30	31	36	33	37	34	35	31	35
[T][S][FP]	28	30	26	36	36	32	28	29	31	28	35	30
[T][S][HP]	30	28	33	28	30	31	35	30	33	30	33	26
[T][S][HP]Async	30	28	33	35	32	31	27	39	33	37	28	34
[T][S][L]	30	30	28	29	26	28	28	28	29	30	30	28
[T][S][L]Cache	31	27	31	37	29	31	32	30	36	32	30	33
[T][S]Sparse	33	35	33	34	38	34	35	31	30	30	31	26
sgd	28	31	23	29	30	29	24	28	27	32	27	31
step_sgd	19	23	17	29	28	26	21	23	25	24	17	19
step_tween	20	25	24	21	26	21	21	25	24	21	25	29
step_tween_chain	23	21	25	25	22	23	17	25	24	20	16	31
tween	25	22	21	24	18	16	25	26	30	22	26	27
tween_chain	31	27	24	25	30	26	22	23	30	28	19	31

Honesty - mean Avail, every mode x dtype (cols 25-34)

Honesty - mean Avail, every mode x dtype (cols 25-34)

	uint16	uint2	uint3	uint32	uint4	uint5	uint6	uint64	uint8	uintptr
MeshBP	30	23	23	26	30	26	24	28	28	26
Mesh[T]	27	21	26	27	24	20	26	29	31	31
Mesh[T]Alt	18	22	26	24	21	19	23	22	19	25
Mesh[T]Chain	27	25	24	28	29	26	22	33	29	23
Mesh[T][S]	39	35	35	31	38	35	33	38	38	29
Mesh[T][S][FP]	33	29	37	31	34	41	30	28	32	35
Step[T]Alt	18	19	17	22	29	15	19	21	19	18
Step[T][S]	30	24	27	30	33	23	25	29	26	25
[T]Alt	26	19	19	22	20	20	25	21	22	25
[T][S]	35	30	29	31	29	30	29	38	41	32
[T][S][FP]	35	25	33	31	32	29	32	30	28	35
[T][S][HP]	34	35	30	32	34	28	29	31	30	35
[T][S][HP]Async	35	29	32	30	31	31	28	33	33	31
[T][S][L]	31	26	31	29	28	28	30	31	30	36
[T][S][L]Cache	32	33	28	27	32	35	32	29	37	38
[T][S]Sparse	27	34	35	36	37	33	29	29	32	33
sgd	29	29	27	27	28	28	24	28	31	26
step_sgd	23	23	23	23	24	23	24	29	25	26
step_tween	24	27	24	28	31	21	16	24	17	19
step_tween_chain	29	26	18	30	20	21	26	24	31	21
tween	27	22	20	27	21	24	27	27	25	30
tween_chain	28	26	22	24	24	22	26	25	31	28

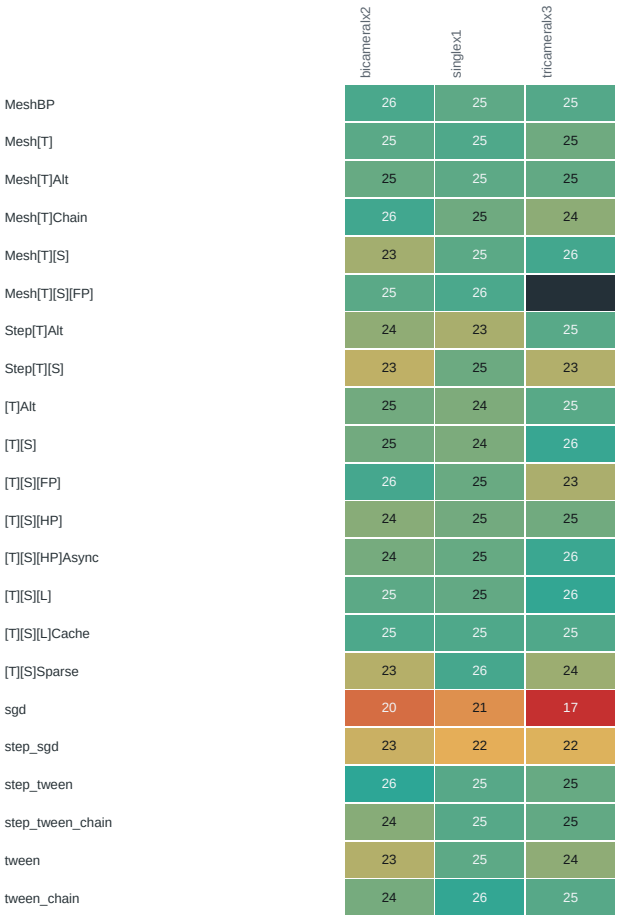
Mean Score, every mode x arch

Mean Score, every mode x arch



Mean hard Acc, every mode x arch

Mean hard Acc, every mode x arch

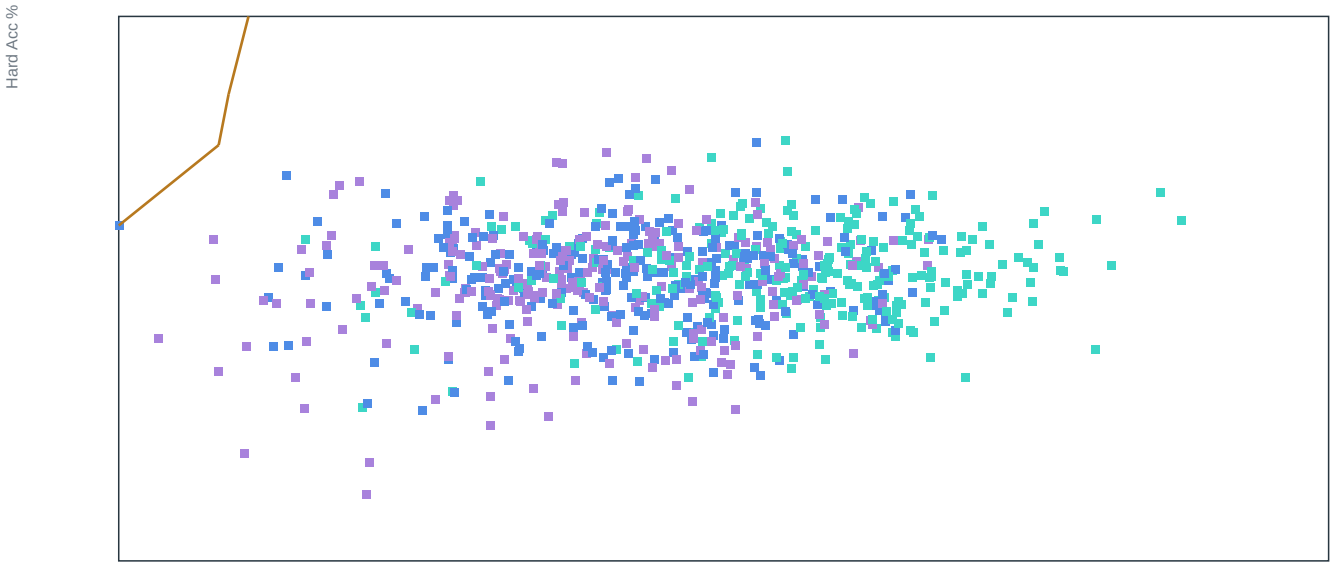


Mean Avail, every mode x arch

Mean Avail, every mode x arch

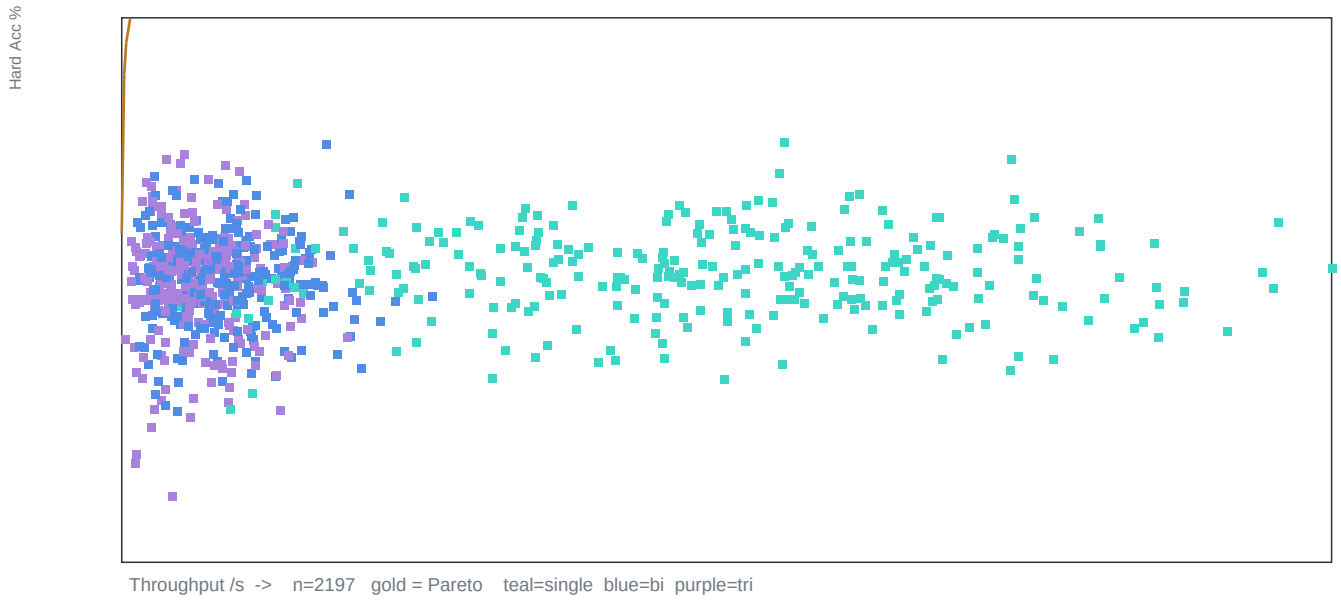
	bicamerax2	singlex1	tricamerax3
MeshBP	24	30	23
Mesh[T]	24	30	22
Mesh[T]Alt	20	29	19
Mesh[T]Chain	25	32	24
Mesh[T][S]	38	35	33
Mesh[T][S][FP]	30	33	
Step[T]Alt	18	25	17
Step[T][S]	27	31	23
[T]Alt	20	27	17
[T][S]	33	38	29
[T][S][FP]	32	33	30
[T][S][HP]	30	33	30
[T][S][HP]Async	32	34	31
[T][S][L]	28	33	26
[T][S][L]Cache	31	35	29
[T][S]Sparse	33	33	31
sgd	29	32	25
step_sgd	23	30	19
step_tween	22	30	20
step_tween_chain	21	29	22
tween	24	28	21
tween_chain	24	31	23

Pillars - Availability vs hard Acc

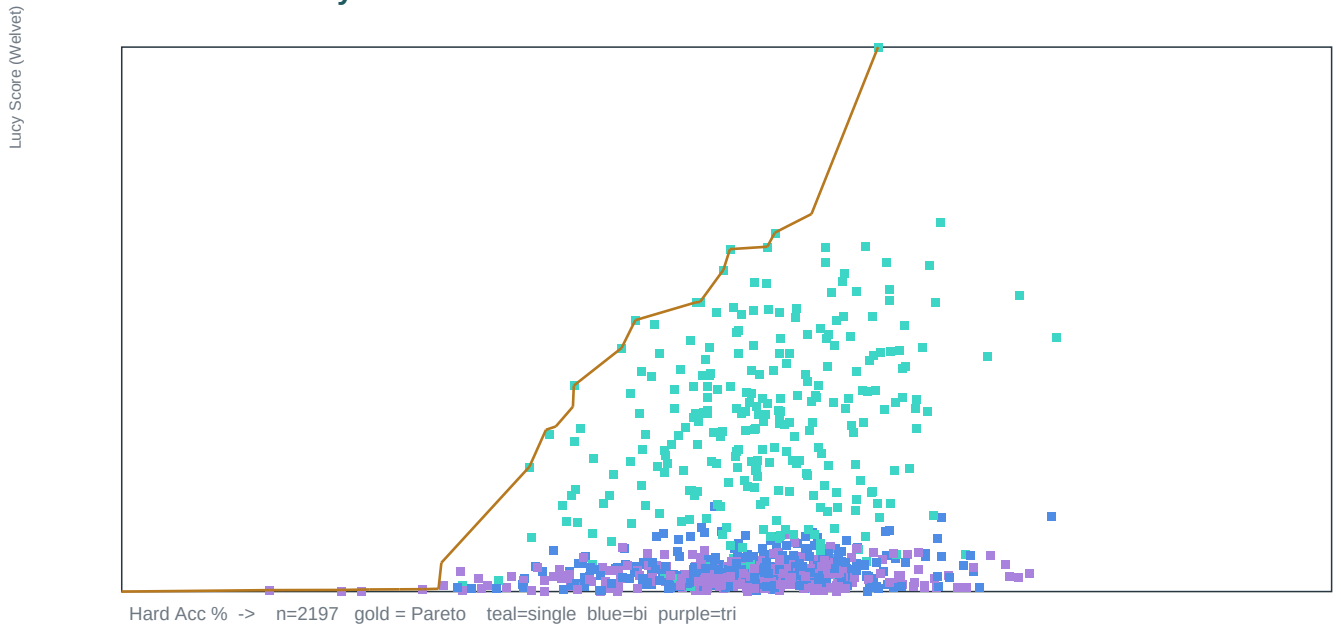


Pillars - Throughput vs hard Acc

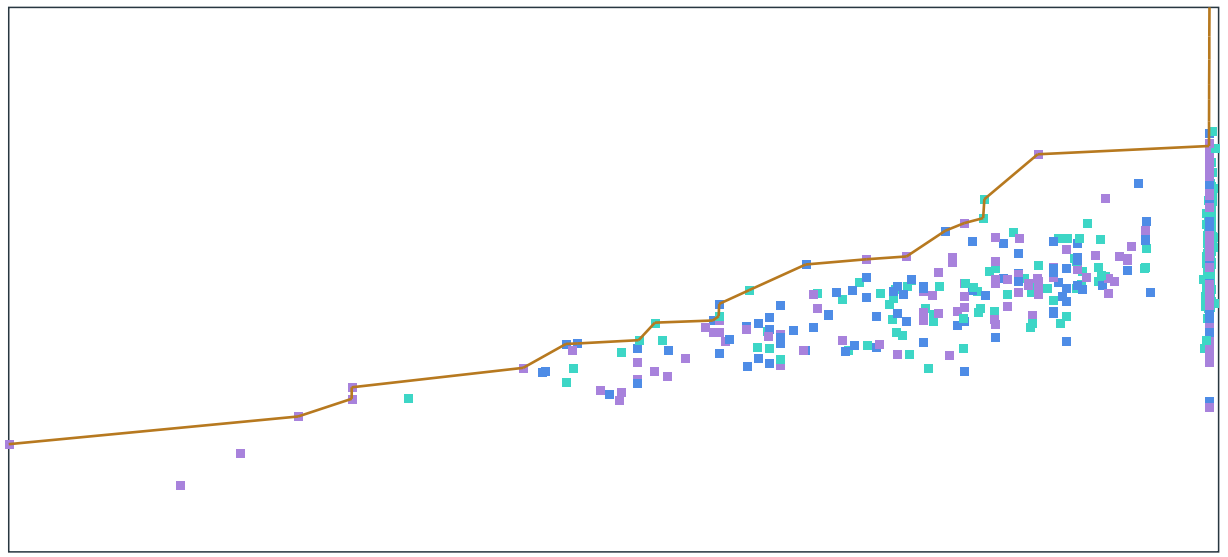
Pillars - Throughput vs hard Acc



Pareto - hard Acc vs Lucy Score

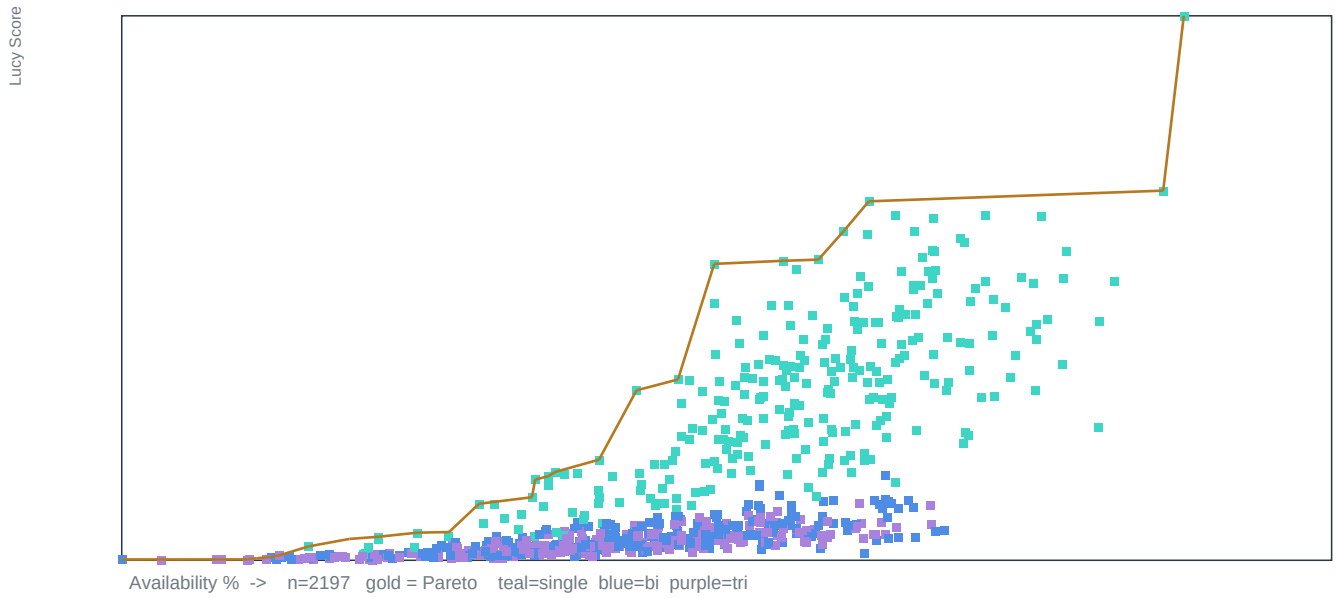


SoftAcc (serve-confidence) vs hard Acc

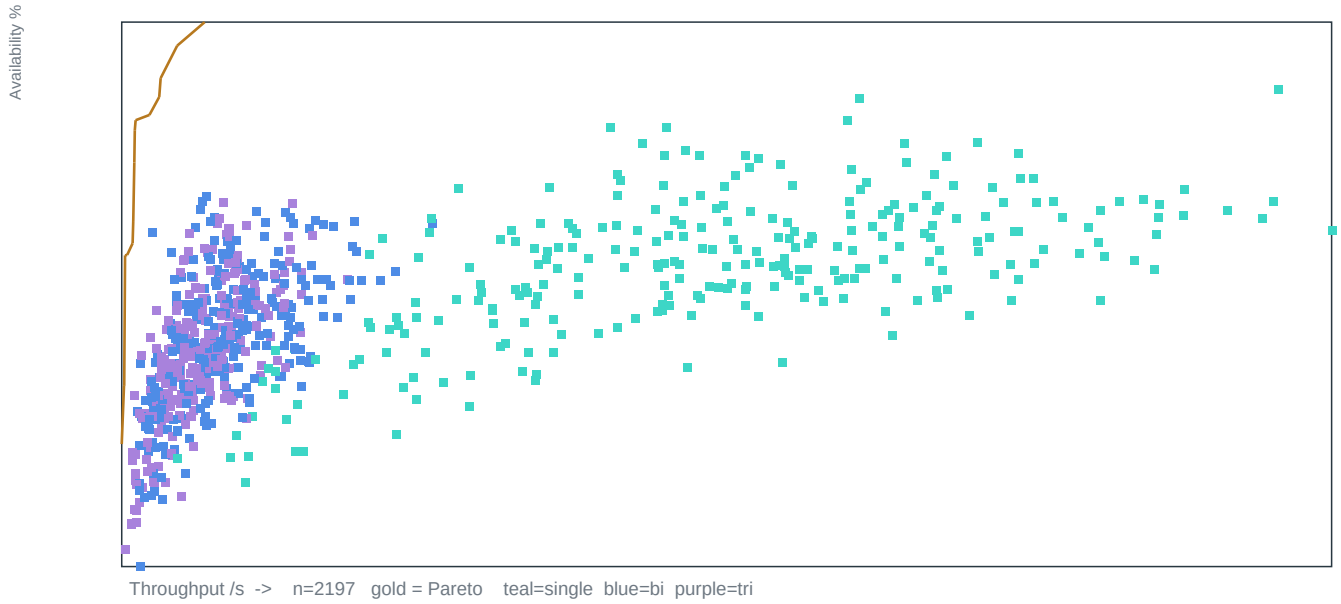



SoftAcc % -> n=2197 gold = Pareto teal=single blue=bi purple=tri
Hard Acc %

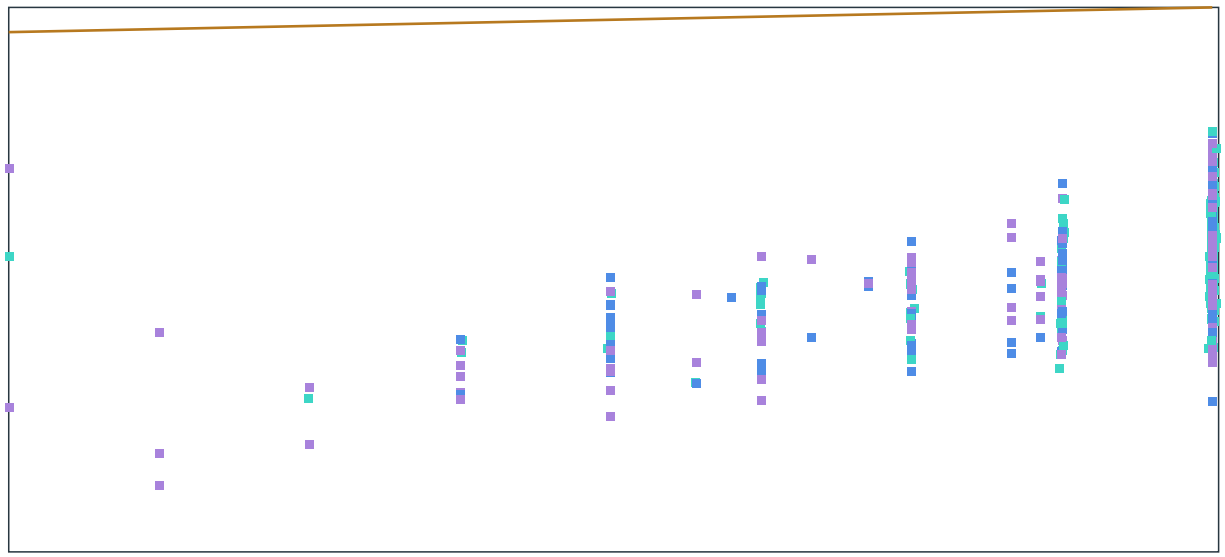
Avail vs Lucy Score (duty clock)



Pillars - Throughput vs Availability



AdaptPct vs hard Acc



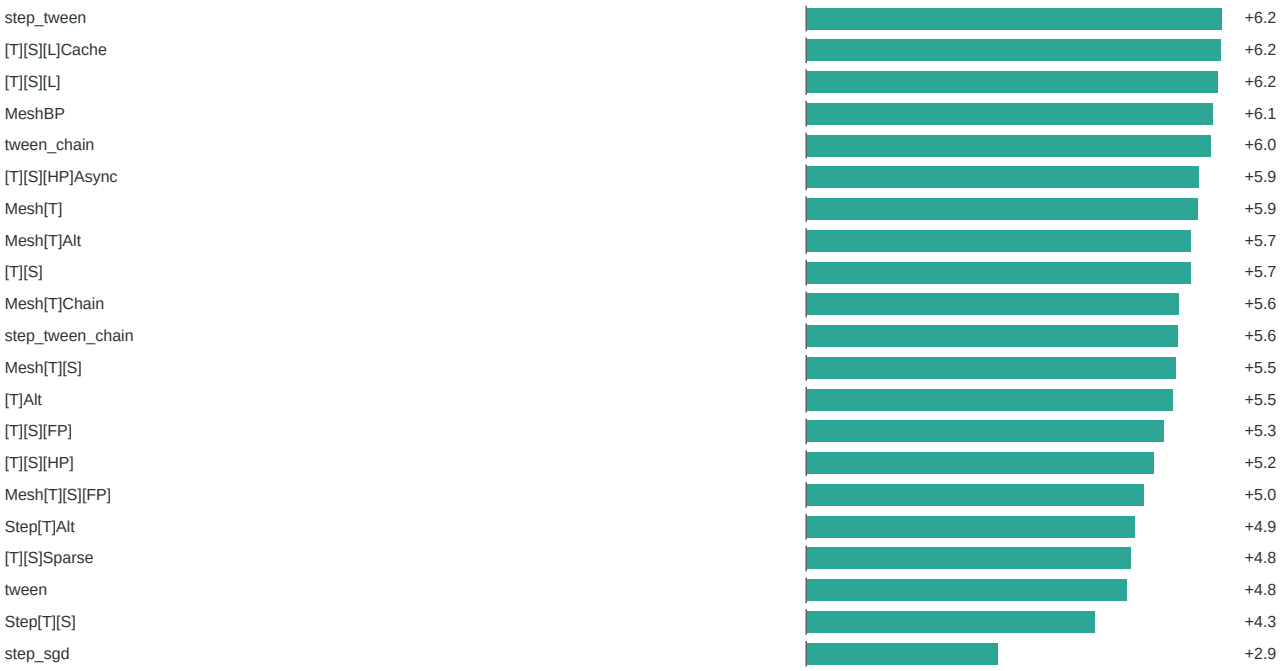

AdaptPct % -> n=2197 gold = Pareto teal=single blue=bi purple=tri
Hard Acc %

vs sgd - matched dtype x format x arch

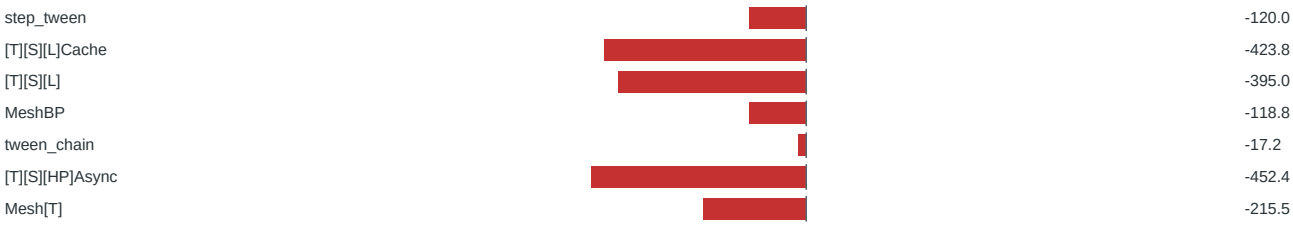
AccDelta is the honest column. ScoreDelta is usually Availability (duty clock), not a better chain rule. Acc win = AccDelta > 0.5. Score win = ScoreDelta > 1. Baseline is discovered from the board, not a frozen StepBP list.

mode	n	AccD	Acc win%	SoftD	AvailD	ThruD	ScoreD	Score win%
step_tween	102	+6.2	89	+5.5	-4.8	-2487	-120.0	26
[T][S][L]Cache	102	+6.2	85	+5.5	+3.0	-6978	-423.8	12
[T][S][L]	102	+6.2	86	+5.5	+0.5	-6441	-395.0	9
MeshBP	102	+6.1	83	+5.5	-3.2	-2528	-118.8	36
tween_chain	102	+6.0	91	+5.3	-2.5	-1640	-17.2	53
[T][S][HP]Async	102	+5.9	79	+5.5	+3.6	-7286	-452.4	7
Mesh[T]	102	+5.9	83	+5.5	-3.5	-3757	-215.5	25
Mesh[T]Alt	102	+5.7	81	+5.5	-5.8	-8135	-547.1	3
[T][S]	102	+5.7	83	+5.5	+4.5	-659	+141.9	72
Mesh[T]Chain	102	+5.6	77	+5.5	-1.7	-3744	-201.7	31
step_tween_chain	102	+5.6	87	+5.5	-4.5	-2894	-157.4	27
Mesh[T][S]	102	+5.5	75	+5.5	+6.7	-7448	-455.7	12
[T]Alt	102	+5.5	80	+5.5	-7.3	-6592	-457.0	4
[T][S][FP]	102	+5.3	74	+5.5	+3.0	-6776	-416.2	11
[T][S][HP]	102	+5.2	78	+5.5	+2.1	-6143	-377.3	20
Mesh[T][S][FP]	55	+5.0	87	+4.5	+0.9	-12958	-873.1	0
Step[T]Alt	102	+4.9	76	+5.5	-8.9	-7203	-507.7	3
[T][S]Sparse	102	+4.8	78	+5.5	+3.6	-7639	-481.8	5
tween	102	+4.8	78	+4.1	-4.3	-2044	-95.3	37
Step[T][S]	102	+4.3	73	+5.5	-1.8	-3978	-228.4	22
step_sgd	102	+2.9	70	+1.9	-4.9	-1477	-132.8	37

mean AccD vs sgd



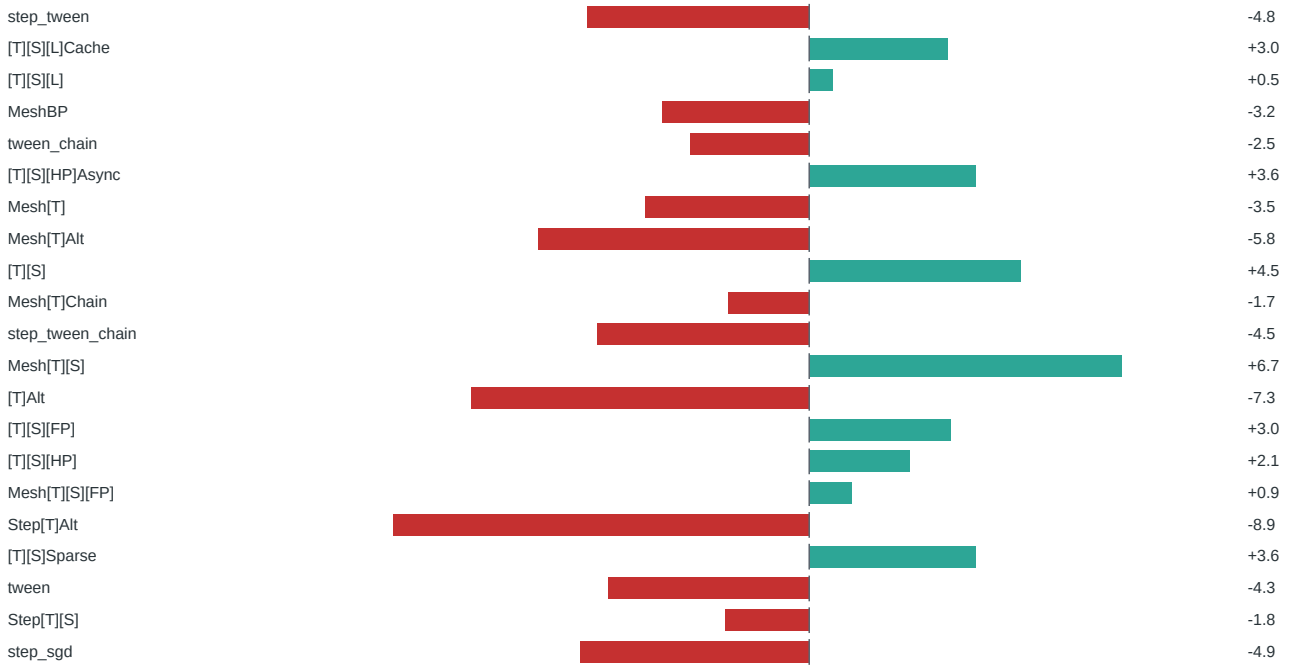
mean ScoreD vs sgd (duty clock)



mean ScoreD vs sgd (duty clock)



mean AvailD vs sgd



AccD vs sgd, every mode x dtype (cols 1-12)

AccD vs sgd, every mode x dtype (cols 1-12)

	bfloat16	binary	complex128	complex64	float16	float32	float64	fp4	fp6	fp8e4m3	fp8e5m2	int
MeshBP	+5	+5	+7	+7	+3	+11	+4	+4	+9	+7	+14	+3
Mesh[T]	+4	+6	+2	+8	-1	+6	+3	+4	+7	+9	+7	+3
Mesh[T]Alt	+2	+2	-1	+9	+6	+5	+5	+5	+9	+9	+6	+7
Mesh[T]Chain	+5	+6	+3	+4	+3	+6	+6	+3	+9	+12	+11	-0
Mesh[T][S]	+6	+6	+6	+8	+7	+3	+4	+4	+11	+7	+10	+5
Mesh[T][S][FP]	-1	-0	+8	+10	+4	+7	+7	+2	+8	+6	+4	+9
Step[T]Alt	-4	+4	+0	+13	+4	+3	+2	+4	+9	+4	+14	+5
Step[T][S]	-1	+1	-0	+2	+4	+5	+2	-4	+9	+6	+9	+8
[T]Alt	+0	+7	+5	+9	+4	+8	+1	+2	+11	+9	+10	+8
[T][S]	-2	+5	+3	+8	+2	+5	+0	+5	+8	+11	+8	+8
[T][S][FP]	+0	+4	+6	+7	-2	+4	-0	+5	+7	+14	+7	+8
[T][S][HP]	+5	+1	+7	+6	+1	+5	+2	+4	+12	+3	+10	+6
[T][S][HP]Async	+0	+9	+0	+8	+2	+4	-0	+4	+17	+6	+8	+2
[T][S][L]	+6	+9	+0	+8	+3	+4	+3	+5	+14	+9	+10	+6
[T][S][L]Cache	+2	+7	+11	+6	+5	+7	+4	+3	+10	+8	+8	+7
[T][S]Sparse	+7	+8	+7	+7	+6	+2	+4	+4	+7	+8	+8	+2
step_sgd	-4	+2	+0	+4	+3	-1	+1	+3	+7	+5	+9	-1
step_tween	+2	+4	+3	+8	+5	+7	+5	+4	+11	+8	+10	+7
step_tween_chain	+0	+6	-1	+3	+5	+4	+3	+4	+8	+8	+6	+9
tween	-1	+5	+6	+8	+4	+2	+0	+5	+9	+8	+11	+3
tween_chain	+2	+7	+1	+7	+4	+5	+5	+5	+8	+7	+8	+8

AccD vs sgd, every mode x dtype (cols 13-24)

AccD vs sgd, every mode x dtype (cols 13-24)

	int16	int2	int3	int32	int4	int5	int6	int64	int8	nf4	ternary	uint
MeshBP	+8	+2	+8	+2	-1	+10	+9	+4	+9	+2	+6	+6
Mesh[T]	+8	+6	+12	+2	+6	+8	+8	+6	+11	+9	+5	+3
Mesh[T]Alt	+8	-1	+12	+2	+3	+7	+10	+5	+6	+5	+3	+6
Mesh[T]Chain	+6	+8	+4	+0	+0	+10	+10	+4	+7	+6	+5	+1
Mesh[T][S]	+6	+2	+10	+4	+2	+9	+7	+7	+5	+4	+8	+0
Mesh[T][S][FP]	+8	+4	+8	+5	+0	+10	+3	+6	+4	-4	+4	+7
Step[T]Alt	+1	-2	+3	+6	+5	+10	+10	+4	+5	+2	+6	+0
Step[T][S]	+5	+4	+13	+2	+3	+10	+6	+3	+5	-1	+5	+3
[T]Alt	+2	-2	+11	+5	+3	+6	+10	+4	+5	+4	+4	+2
[T][S]	+7	+2	+9	+3	+4	+9	+13	+3	+10	+5	+6	+2
[T][S][FP]	+7	+5	+4	+6	+0	+8	+11	+5	+7	-3	+11	-2
[T][S][HP]	+5	+5	+6	+1	+3	+7	+11	+3	+5	-0	+4	+2
[T][S][HP]Async	+6	-0	+9	+5	+5	+6	+15	+10	+9	+8	+5	+4
[T][S][L]	+13	+6	+5	-1	+3	+6	+9	+11	+9	+6	+8	+2
[T][S][L]Cache	+3	-0	+8	+4	+3	+12	+9	+8	+10	+9	+9	-0
[T][S]Sparse	+6	+2	+8	+1	+3	+3	+8	+4	+7	+3	+5	+2
step_sgd	+2	+1	+5	+3	+2	+6	+7	+3	+6	+2	+1	-1
step_tween	+9	+5	+11	+5	+3	+12	+8	+7	+6	+5	+5	+1
step_tween_chain	+4	+6	+13	+3	+1	+9	+7	+12	+5	+5	+4	-0
tween	+5	+1	+7	+2	+3	+4	+8	+5	+7	+4	+3	+3
tween_chain	+6	+3	+12	+6	+3	+8	+9	+7	+8	+6	+5	+0

AccD vs sgd, every mode x dtype (cols 25-34)

AccD vs sgd, every mode x dtype (cols 25-34)

	uint16	uint2	uint3	uint32	uint4	uint5	uint6	uint64	uint8	uintptr
MeshBP	+10	+4	+3	+9	+6	+6	+8	+9	+3	+7
Mesh[T]	+9	+5	+5	+7	+6	+5	+8	+6	+1	+6
Mesh[T]Alt	+4	+7	+4	+8	+8	+7	+8	+3	+6	+9
Mesh[T]Chain	+10	+4	+7	+11	+3	+4	+7	+3	+1	+8
Mesh[T][S]	+4	+2	-0	+5	+0	+9	+10	+4	+3	+8
Mesh[T][S][FP]	+2	+3	+5	+11	+11	+4	+9	+4	+6	+2
Step[T]Alt	+4	+9	+2	+8	+10	+4	+7	+4	+7	+5
Step[T][S]	+4	+7	+3	+7	+2	+6	+6	+5	+2	+5
[T]Alt	+4	+13	+4	+5	+8	+13	+10	-4	+3	+2
[T][S]	+6	+5	+8	+10	+5	+10	+7	+7	+1	+1
[T][S][FP]	+10	+2	+5	+5	+9	+12	+5	+3	+3	+7
[T][S][HP]	+8	+6	+4	+11	+3	+14	+5	+3	+9	-2
[T][S][HP]Async	+5	+4	+6	+4	+3	+5	+8	+8	+2	+11
[T][S][L]	+6	+7	+11	+5	+3	+6	+4	+4	+4	+5
[T][S][L]Cache	+6	+6	+5	+7	+2	+9	+11	+4	+5	+4
[T][S]Sparse	+6	-3	+4	+8	+8	-0	+6	+3	+2	+8
step_sgd	+4	+0	+3	+3	+2	+2	+8	+4	-1	+6
step_tween	+6	+6	+3	+7	+6	+7	+6	+7	+5	+6
step_tween_chain	+8	+6	+4	+8	+5	+8	+11	+6	+4	+5
tween	+6	+4	+6	+3	+5	+4	+6	+5	+4	+8
tween_chain	+6	+4	+8	+8	+6	+5	+8	+7	+5	+6

ScoreD vs sgd, every mode x dtype (cols 1-12)

ScoreD vs sgd, every mode x dtype (cols 1-12)

	bfloat16	binary	complex128	complex64	float16	float32	float64	fp4	fp6	fp8e4m3	fp8e5m2	int
MeshBP	-1086	-219	-361	+392	+71	-440	+105	-296	-5	-14	-147	-125
Mesh[T]	-872	-525	-327	+91	-80	-700	-479	-801	-55	-209	-311	-193
Mesh[T]Alt	-1548	-809	-471	-37	-507	-1086	-696	-988	-176	-566	-751	-461
Mesh[T]Chain	-1335	-163	-363	+212	+242	-545	-251	-659	-103	-212	-163	-221
Mesh[T][S]	-1352	-706	-433	-88	-421	-957	-528	-783	-172	-509	-676	-433
Mesh[T][S][FP]	-2156	-1160	-1189	-29	-629	-1635	-750	-1204	-453	-741	-1065	-1061
Step[T]Alt	-1381	-792	-595	-159	-520	-989	-568	-657	-199	-474	-656	-472
Step[T][S]	-1151	-274	-327	+160	-39	-483	+8	-419	+125	-8	-388	-64
[T]Alt	-1452	-658	-410	-21	-367	-931	-664	-711	-233	-306	-690	-446
[T][S]	-978	-83	+158	+328	+51	-161	-54	-52	+211	+485	+18	+360
[T][S][FP]	-1390	-640	-343	+10	-449	-851	-595	-706	-136	-248	-442	-281
[T][S][HP]	-1281	-749	-479	+144	-315	-771	-665	-564	-175	-422	-468	-314
[T][S][HP]Async	-1337	-725	-421	-88	-421	-892	-564	-784	-146	-520	-562	-460
[T][S][L]	-1298	-679	-415	+16	-393	-787	-555	-621	-66	-412	-481	-387
[T][S][L]Cache	-1483	-645	-469	-64	-338	-1007	-578	-762	-175	-286	-483	-346
[T][S]Sparse	-1361	-687	-451	-124	-434	-1149	-470	-903	-213	-569	-575	-461
step_sgd	-1151	-396	-19	+248	-71	-868	-172	-9	+178	+9	-240	-204
step_tween	-795	-202	-44	+230	-88	-77	-229	-396	-29	-408	+124	-237
step_tween_chain	-1081	-252	-78	+204	-87	-290	-527	-434	-24	+14	-241	-311
tween	-1241	+32	+176	-18	+293	-399	-467	-77	-213	+67	+49	-286
tween_chain	-710	+34	-75	+523	+248	-113	+29	-535	+57	-470	-166	-206

ScoreD vs sgd, every mode x dtype (cols 13-24)

ScoreD vs sgd, every mode x dtype (cols 13-24)

	int16	int2	int3	int32	int4	int5	int6	int64	int8	nf4	ternary	uint
MeshBP	-4	-447	+100	-207	-581	-322	+109	-256	-58	-301	+73	-5
Mesh[T]	-128	-326	-117	-90	-406	-257	-91	+45	-215	-329	-70	-410
Mesh[T]Alt	-542	-886	-116	-514	-857	-285	-116	-328	-972	-499	-594	-644
Mesh[T]Chain	-158	-265	+31	-259	-419	-182	-65	+396	-314	-172	-118	-485
Mesh[T][S]	-510	-786	-111	-411	-742	-286	-72	-170	-736	-443	-315	-579
Mesh[T][S][FP]	-754	-1222	-330	-698	-1246	-797	-400	-362	-1255	-1252	-635	-1424
Step[T]Alt	-537	-917	-157	-471	-658	-364	-109	-297	-966	-512	-497	-571
Step[T][S]	-493	-254	+86	-285	-371	-114	-102	+7	-568	-438	-164	-347
[T]Alt	-382	-868	-89	-384	-866	-314	-95	-272	-641	-456	-531	-646
[T][S]	+240	-188	+407	+236	-54	+291	+216	+345	-15	+212	+507	+142
[T][S][FP]	-528	-827	-136	-236	-613	-268	-42	-182	-789	-490	-216	-532
[T][S][HP]	-460	-696	-14	-448	-703	-207	+24	-106	-713	-446	-272	-603
[T][S][HP]Async	-543	-816	-61	-355	-746	-295	-140	-221	-705	-401	-403	-534
[T][S][L]	-324	-600	-183	-390	-691	-257	-100	-127	-761	-360	-303	-535
[T][S][L]Cache	-389	-889	-93	-324	-663	-270	-48	-208	-607	-373	-346	-645
[T][S]Sparse	-402	-739	-161	-383	-646	-286	-119	-289	-744	-474	-525	-688
step_sgd	-436	-407	-179	+87	-105	+32	-12	+63	-266	-132	-475	-265
step_tween	-80	-281	+228	-433	-342	-58	+128	+351	-177	-478	+88	-62
step_tween_chain	-185	-278	+181	-359	-785	-146	-126	+247	-671	-316	-393	-57
tween	-50	-205	+102	-11	-354	-318	+213	+97	-462	-207	+172	+97
tween_chain	+161	-129	+8	-414	+33	+98	+103	+170	+89	-61	+129	+279

ScoreD vs sgd, every mode x dtype (cols 25-34)

ScoreD vs sgd, every mode x dtype (cols 25-34)

	uint16	uint2	uint3	uint32	uint4	uint5	uint6	uint64	uint8	uintptr
MeshBP	+300	-666	+19	-89	+319	-113	+191	+65	-194	+155
Mesh[T]	-21	-619	-87	+342	+67	-278	+145	+133	-195	+41
Mesh[T]Alt	-539	-688	-287	-194	-257	-409	-99	-529	-885	-264
Mesh[T]Chain	-36	-467	-143	+144	+61	-280	+149	-52	-526	-137
Mesh[T][S]	-384	-594	-291	-230	-96	-335	-64	-388	-666	-224
Mesh[T][S][FP]	-679	-1000	-638	-212	-66	-1045	-267	-665	-1081	-706
Step[T]Alt	-550	-650	-337	-145	-30	-437	-53	-340	-898	-302
Step[T][S]	-401	-466	-127	+68	+195	-162	+19	-392	-482	-119
[T]Alt	-306	-631	-295	-204	-121	-297	-109	-407	-603	-132
[T][S]	+233	-266	+15	+608	+515	-102	+162	+612	+251	+178
[T][S][FP]	-309	-728	-225	-127	-94	-339	-109	-462	-648	-178
[T][S][HP]	-294	-442	-276	-18	+1	-368	-33	-259	-357	-79
[T][S][HP]Async	-382	-629	-283	-150	-176	-366	-113	-352	-693	-96
[T][S][L]	-403	-587	-244	-131	-87	-364	+22	-311	-668	+52
[T][S][L]Cache	-417	-536	-227	-175	-75	-305	-46	-387	-639	-111
[T][S]Sparse	-426	-649	-251	-134	-109	-416	-130	-462	-727	-225
step_sgd	-67	-234	-1	+156	+1	-122	+357	+172	-60	+73
step_tween	+54	-384	-75	+337	+612	-175	-25	-328	-635	-195
step_tween_chain	+336	-106	-226	+513	+313	-202	+280	-12	-248	-3
tween	-162	-604	-244	+484	-121	-80	+177	+54	-203	+472
tween_chain	+217	-505	+170	+247	-27	+7	+132	-173	+139	+128

AvailD vs sgd, every mode x dtype (cols 1-12)

AvailD vs sgd, every mode x dtype (cols 1-12)

	bfloat16	binary	complex128	complex64	float16	float32	float64	fp4	fp6	fp8e4m3	fp8e5m2	int
MeshBP	-10	+1	-9	+2	-5	-5	-2	-8	-4	-3	-3	-1
Mesh[T]	-8	-5	-4	+3	-1	-4	-11	-14	-1	-6	-2	-5
Mesh[T]Alt	-11	-0	-3	-4	-5	-5	-11	-14	-2	-8	-3	-6
Mesh[T]Chain	-10	-3	-8	+5	-2	-2	-3	-7	-3	-2	-1	-4
Mesh[T][S]	+2	+6	+2	+10	+7	+6	+6	+4	+6	+5	+3	+2
Mesh[T][S][FP]	-3	+4	-4	+12	-1	-5	+1	-1	+20	+2	-2	-2
Step[T]Alt	-18	-9	-10	-12	-9	-12	-12	-8	+1	-7	-13	-10
Step[T][S]	-7	-3	-4	+4	-2	+3	-6	-6	+3	-3	+3	-3
[T]Alt	-11	-10	-3	-4	-6	-8	-12	-9	-6	-5	-8	-9
[T][S]	-3	+2	+3	+5	+2	+2	+3	+1	+12	+3	+2	+6
[T][S][FP]	-1	+3	+7	+8	-1	+5	+3	+0	+9	+2	+7	-0
[T][S][HP]	-7	-2	-4	+10	+1	+1	-6	-2	+3	+2	+2	+5
[T][S][HP]Async	-0	+4	-2	+7	+4	+1	+3	-0	+7	+4	+8	-0
[T][S][L]	-7	+1	-1	+2	-3	-2	-3	-2	+3	-4	+5	-2
[T][S][L]Cache	-4	+2	-3	+2	+3	-0	-3	-3	+4	+8	+5	+4
[T][S]Sparse	-2	+2	-2	+4	+4	-5	+4	+1	+10	+2	+12	-7
step_sgd	-10	-7	-7	-1	-3	-11	-11	-8	-0	-4	+3	-9
step_tween	-4	-4	-4	+2	-5	-3	-14	-6	-5	-10	-1	-7
step_tween_chain	-11	-6	-4	-2	-6	-2	-9	-3	-4	-3	-1	-6
tween	-11	-4	-2	-4	-4	-9	-9	-6	-6	-4	+1	-5
tween_chain	-2	-2	-10	+6	-0	-2	-5	-15	+1	-6	-3	-6

AvailD vs sgd, every mode x dtype (cols 13-24)

AvailD vs sgd, every mode x dtype (cols 13-24)

	int16	int2	int3	int32	int4	int5	int6	int64	int8	nf4	ternary	uint
MeshBP	+0	-8	+4	-3	-10	-12	+1	-7	+0	-9	-2	-2
Mesh[T]	-3	-5	-6	-1	-9	-11	-5	+4	-1	-8	-2	-3
Mesh[T]Alt	-4	-8	+2	-8	-7	-6	+1	-7	-5	-10	-6	-11
Mesh[T]Chain	+3	-3	+5	-0	-2	-5	-2	+6	+1	-6	-0	-4
Mesh[T][S]	+6	+8	+9	+7	+6	+10	+13	+8	+15	+1	+7	+4
Mesh[T][S][FP]	-1	-9	+8	-4	-9	-3	+6	-0	+5	+3	+5	+2
Step[T]Alt	-10	-11	-8	-4	-10	-14	-6	-8	-13	-9	-4	-8
Step[T][S]	-9	-3	+1	-4	-7	-4	+3	-2	-3	-8	+0	-3
[T]Alt	-2	-13	-2	-9	-10	-10	-3	-5	-4	-15	-8	-14
[T][S]	+8	+1	+12	+1	+1	+7	+9	+9	+7	+3	+4	+5
[T][S][FP]	+0	-1	+3	+7	+5	+4	+5	+2	+3	-4	+7	-0
[T][S][HP]	+2	-3	+10	-1	-0	+2	+12	+2	+5	-2	+6	-5
[T][S][HP]Async	+2	-3	+9	+6	+2	+3	+4	+12	+5	+5	+1	+3
[T][S][L]	+3	-1	+5	+0	-4	-0	+4	+0	+2	-2	+2	-3
[T][S][L]Cache	+3	-4	+8	+8	-1	+2	+9	+2	+8	-0	+3	+2
[T][S]Sparse	+5	+4	+9	+5	+7	+5	+12	+4	+2	-2	+4	-4
step_sgd	-9	-8	-7	-0	-2	-2	-2	-5	-2	-8	-10	-11
step_tween	-8	-6	+1	-8	-4	-8	-3	-2	-3	-11	-2	-1
step_tween_chain	-5	-10	+2	-4	-8	-6	-6	-3	-4	-12	-12	+0
tween	-3	-9	-3	-5	-12	-12	+2	-2	+2	-10	-1	-4
tween_chain	+3	-4	+1	-4	-0	-2	-1	-5	+3	-4	-8	+0

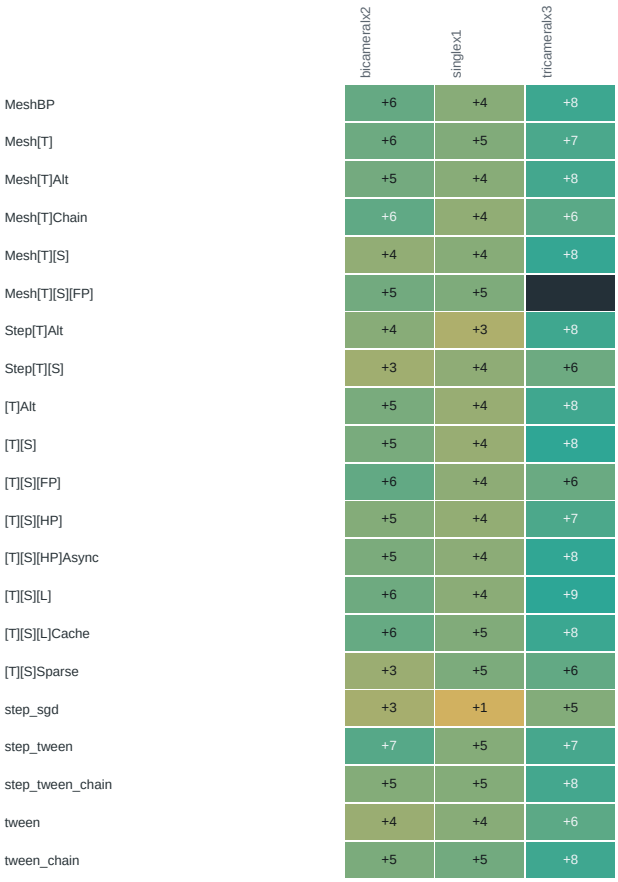
AvailD vs sgd, every mode x dtype (cols 25-34)

AvailD vs sgd, every mode x dtype (cols 25-34)

	uint16	uint2	uint3	uint32	uint4	uint5	uint6	uint64	uint8	uintptr
MeshBP	+1	-6	-3	-1	+3	-2	+0	-1	-3	-0
Mesh[T]	-2	-8	-0	+0	-4	-8	+3	+1	-0	+4
Mesh[T]Alt	-10	-8	-1	-3	-7	-9	-0	-7	-12	-2
Mesh[T]Chain	-1	-5	-3	+1	+1	-2	-2	+5	-2	-3
Mesh[T][S]	+11	+6	+9	+5	+11	+7	+10	+9	+7	+3
Mesh[T][S][FP]	+3	-4	+6	+4	+10	+2	+4	-2	+1	+8
Step[T]Alt	-11	-11	-9	-5	+2	-13	-5	-8	-12	-8
Step[T][S]	+1	-5	+0	+3	+6	-5	+2	+1	-5	-1
[T]Alt	-2	-11	-8	-4	-8	-8	+1	-8	-9	-1
[T][S]	+7	+1	+3	+4	+2	+2	+6	+10	+10	+6
[T][S][FP]	+6	-5	+6	+4	+4	+1	+8	+1	-3	+8
[T][S][HP]	+6	+5	+4	+5	+6	-0	+5	+3	-1	+8
[T][S][HP]Async	+7	-1	+6	+3	+3	+3	+5	+5	+2	+4
[T][S][L]	+2	-3	+4	+2	+0	+0	+6	+3	-1	+9
[T][S][L]Cache	+4	+4	+1	-0	+4	+7	+9	+1	+6	+11
[T][S]Sparse	-1	+4	+9	+9	+9	+5	+5	+0	+1	+7
step_sgd	-5	-6	-4	-4	-4	-5	+1	+0	-6	-0
step_tween	-5	-2	-3	+1	+3	-7	-8	-5	-14	-8
step_tween_chain	+0	-3	-9	+3	-8	-7	+2	-4	-0	-5
tween	-1	-7	-7	-0	-6	-4	+3	-1	-6	+4
tween_chain	-0	-4	-5	-3	-3	-6	+3	-3	-0	+2

AccD vs sgd, every mode x arch

AccD vs sgd, every mode x arch



Family collapse - Step* vs non-Step

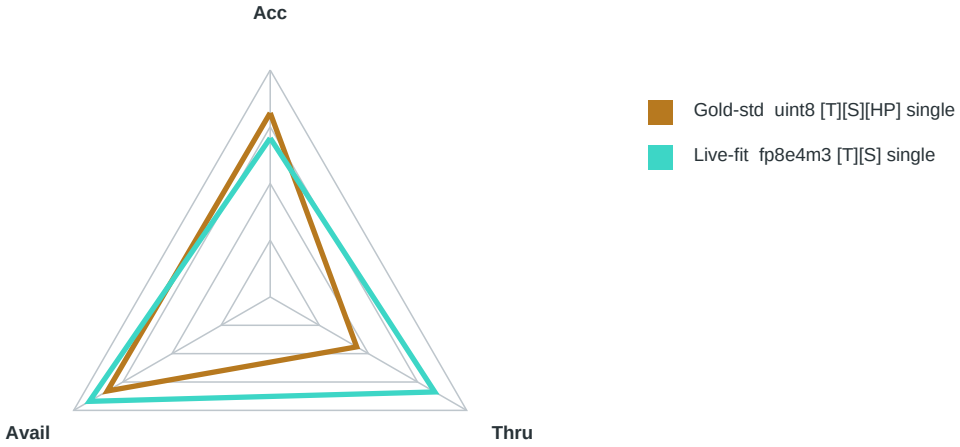
Step* is a 1D pipe (one sample enters layer 0 per tick; output is the sample that entered depth ticks ago). Non-Step of the same family is a full-chain update. AccD is a real scheduler split, not leftover warm-up forwards.

step	plain	n	mean |AccD|
Step[T]Alt	[T]Alt	102	5.77
Step[T][S]	[T][S]	102	5.72
step_sgd	sgd	102	5.12
step_tween	tween	102	3.92
step_tween_chain	tween_chain	102	3.28

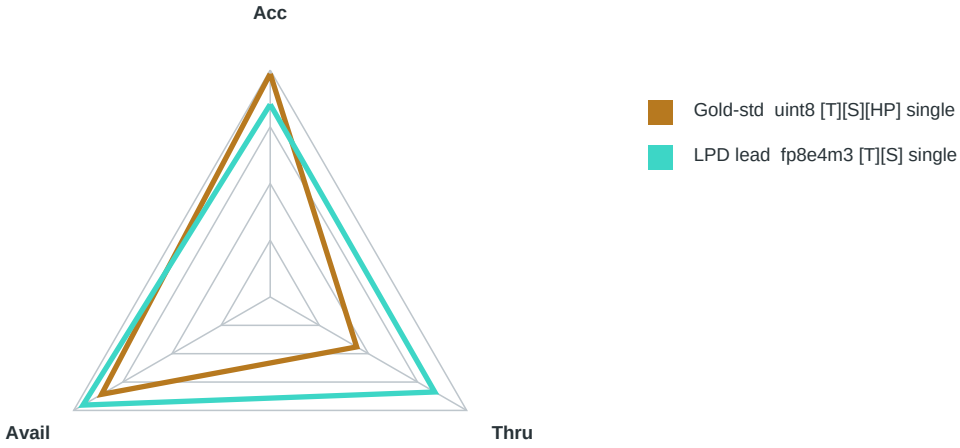
Consciousness - Acc, Throughput, Availability

Synthetic organism / Lucy density: can the net run and train at the same time in a small box. Lucy Score = Throughput x Availability x Acc / 10,000 (hard Acc; SoftAcc is serve-confidence only). SGD that blocks serve dies on Availability. Q = geomean Acc/Thru/Avail vs learner peaks (traps do not set Thru/Avail). LPD = Q x shrink vs Acc-champ RAM; 0 unless Acc keep >=70%. Gold = all 3 pillars >=80% at <=20% Acc-champ RAM. Gold-std = Acc >=80% plus Thru or Avail, then smallest then fastest. Score/MiB is the binary trap.
Acc champ complex64|none|Step[T]Alt|bicameral|simd Acc 45.8 Thru 310 Avail 9.0% 1.8 KiB (RAM reference)
Lucy Score champ (T x Avail x Acc) bfloat16|none|sgd|single|simd Score 4350.1 Acc 28.7 Soft 25 0.1 KiB
Live-fit champ (best Q) fp8e4m3|none|[T][S]|single|simd Acc 32.1 Thru 21697 Avail 40.9% 0.0 KiB
Gold-std (2+ pillars, Acc keep >= 80%, then smallest then fastest): uint8|none|[T][S][HP]|single|simd mode [T][S][HP] Acc 37.2 Thru 11401 0.0 KiB
Board fastest float32|none|sgd|single|simd Thru 35231 (traps may own this) Best availability fp6|none|Mesh[T][S][FP]|single|simd 50.8%
Learner Thru peak 25900 learner Avail peak 44.5%

Consciousness radar - Acc / Thru / Avail vs learner peaks



Memory density radar - same pillars x shrink vs Acc champ (traps sit at origin)



No gold cell yet. Need all three pillars at 80% of learner peaks in one fifth of Acc-champ RAM.

Gold-standard train modes - 2+ pillars, Acc keep >= 80%, smallest then fastest

Mode	n	Acc	KiB	Thru	Cell
[T][S][HP]	1	37.2	0.0	11401	uint8 [T][S][HP] single
[T][S][HP]Async	1	37.3	0.3	5807	uintptr [T][S][HP]Async single
Mesh[T][S]	1	40.9	0.6	1408	float16 Mesh[T][S] tricameral

Near-gold - 2+ pillars, RAM <= 50% of Acc champ

Band	Cell	Acc%	Thru%	Avail%	Q%	RAM%	xSmall	LPD	Acc	Thru	KiB
near	uint8 [T][S][HP] single	81	44	83	67	2	32.0	21.33	37.2	11401	0.0
near	uintptr [T][S][HP]Async single	81	22	85	54	15	6.9	3.71	37.3	5807	0.3
near	float16 Mesh[T][S] tricameral	89	5	93	36	32	3.1	1.11	40.9	1408	0.6

Lucy density (LPD) - Q x shrink vs Acc-champ RAM; 0 if Acc keep < 70%

Band	Cell	Acc%	Thru%	Avail%	Q%	RAM%	xSmall	LPD	Acc	Thru	KiB
-	fp8e4m3 [T][S] single	70	84	92	81	2	32.0	26.05	32.1	21697	0.0

-	int8 MeshBP single	74	100	61	77	2	32.0	24.49	34.0	25900	0.0
-	int2 Step[T][S] single	71	69	76	72	0	32.0	23.02	32.6	17745	0.0
near	uint8 [T][S][HP] single	81	44	83	67	2	32.0	21.33	37.2	11401	0.0
-	bfloat16 Mesh[T] single	77	75	67	73	4	28.0	20.38	35.4	19307	0.1
-	float16 MeshBP single	72	74	67	71	4	28.0	19.84	32.8	19174	0.1
-	ternary [T][S][FP] single	75	31	78	57	0	32.0	18.14	34.2	8081	0.0
acc	ternary Mesh[T][S] single	82	23	78	53	0	32.0	17.04	37.8	6054	0.0
-	fp6 [T][S][L] single	72	21	75	48	1	32.0	15.52	33.0	5483	0.0
-	int6 [T][S][FP] single	73	17	73	45	1	32.0	14.35	33.4	4388	0.0
-	float16 [T][S][L]Cache single	72	24	73	50	4	28.0	14.01	33.1	6143	0.1
-	uint2 [T]Alt single	70	21	54	43	1	32.0	13.79	32.2	5507	0.0
-	fp6 Mesh[T]Alt single	72	11	76	40	1	32.0	12.65	32.8	2936	0.0
-	binary [T][S][HP]Async tricameral	77	6	97	36	2	32.0	11.51	35.5	1614	0.0
-	uint2 [T][S] bicameral	76	16	83	46	4	24.9	11.48	34.8	4025	0.1
-	int2 Mesh[T]Chain tricameral	72	16	78	45	4	24.9	11.23	33.0	4246	0.1
-	binary [T][S][L]Cache bicameral	72	8	67	34	2	32.0	10.84	33.1	2089	0.0
-	ternary [T][S][FP] bicameral	73	7	69	33	3	32.0	10.71	33.3	1926	0.1
-	uint6 [T][S]Sparse single	75	7	61	31	2	32.0	10.04	34.5	1746	0.0
-	int2 [T][S][HP] tricameral	74	9	73	36	4	24.9	9.03	33.9	2309	0.1

Consciousness rank - Q = geomean Acc/Thru/Avail keep

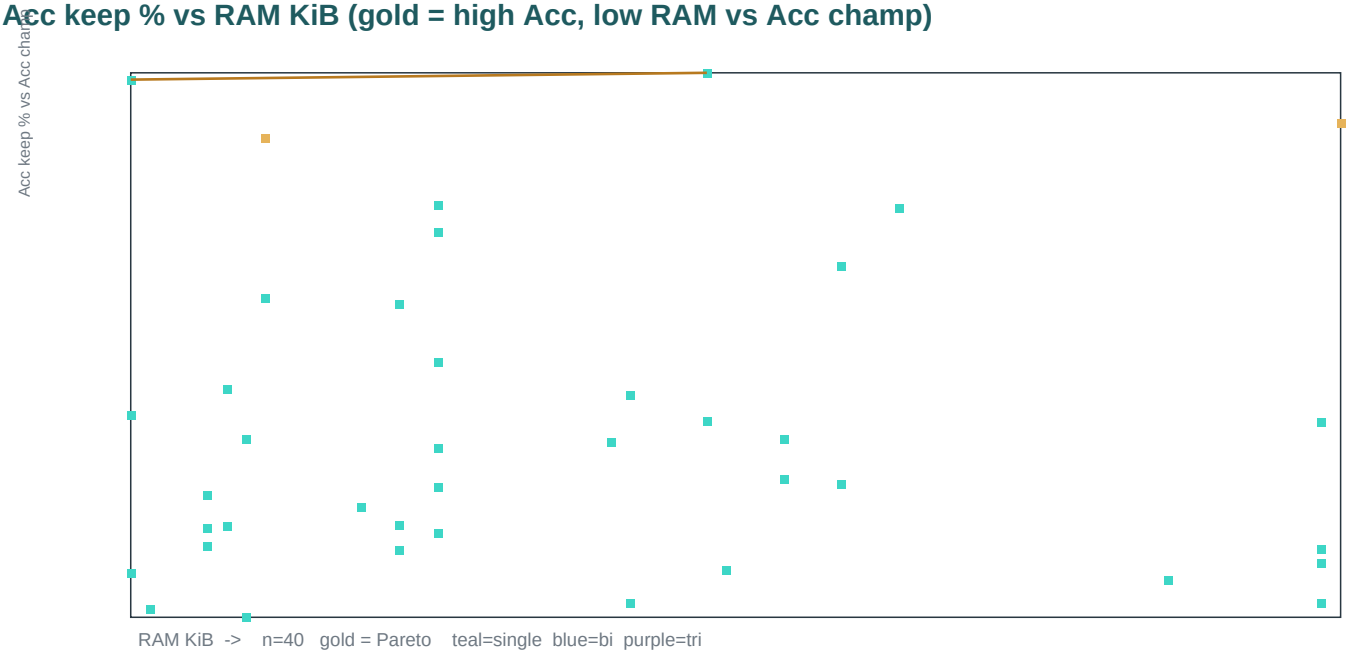
Band	Cell	Acc%	Thru%	Avail%	Q%	LPD	Thru	Avail
-	fp8e4m3 [T][S] single	70	84	92	81	26.05	21697	40.9
-	int8 MeshBP single	74	100	61	77	24.49	25900	26.9
-	float64 Step[T][S] single	71	74	83	76	5.32	19158	37.1
-	bfloat16 Mesh[T] single	77	75	67	73	20.38	19307	29.8
-	int2 Step[T][S] single	71	69	76	72	23.02	17745	34.0
-	float16 MeshBP single	72	74	67	71	19.84	19174	29.9
near	uint8 [T][S][HP] single	81	44	83	67	21.33	11401	36.9
-	ternary [T][S][FP] single	75	31	78	57	18.14	8081	34.8
-	int8 [T][S] bicameral	71	29	76	54	4.31	7524	33.8
near	uintptr [T][S][HP]Async single	81	22	85	54	3.71	5807	38.0

Trap - tiny RAM, Acc keep < 70% (Score/MiB and SoftAcc Score lie here)

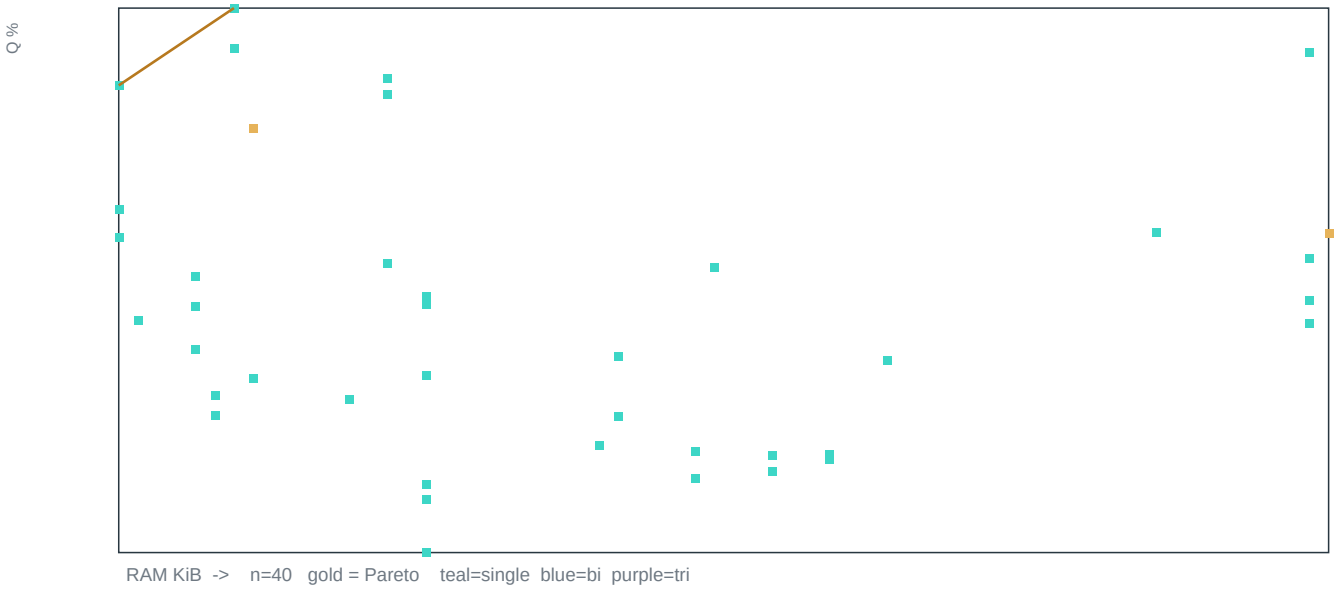
Band	Cell	Acc%	Thru%	Avail%	Q%	RAM%	xSmall	LPD	Acc	Thru	KiB
trap	binary sgd single	50	100	82	74	0	32.0	0.00	22.8	30946	0.0
trap	binary step_sgd single	38	100	64	63	0	32.0	0.00	17.4	26127	0.0
trap	binary tween single	58	100	78	77	0	32.0	0.00	26.6	28494	0.0
trap	binary tween_chain single	61	100	70	75	0	32.0	0.00	27.8	27887	0.0
trap	binary step_tween single	44	100	75	69	0	32.0	0.00	20.4	28162	0.0
trap	binary step_tween_chain single	49	96	70	69	0	32.0	0.00	22.3	24964	0.0
trap	binary MeshBP single	46	87	77	67	0	32.0	0.00	20.9	22658	0.0
trap	binary Mesh[T] single	50	58	57	55	0	32.0	0.00	23.0	14981	0.0
trap	binary Mesh[T]Chain single	51	100	68	70	0	32.0	0.00	23.5	26342	0.0
trap	binary [T][S] single	44	100	73	69	0	32.0	0.00	20.3	26352	0.0

Acc keep % vs RAM KiB (gold = high Acc, low RAM vs Acc champ)

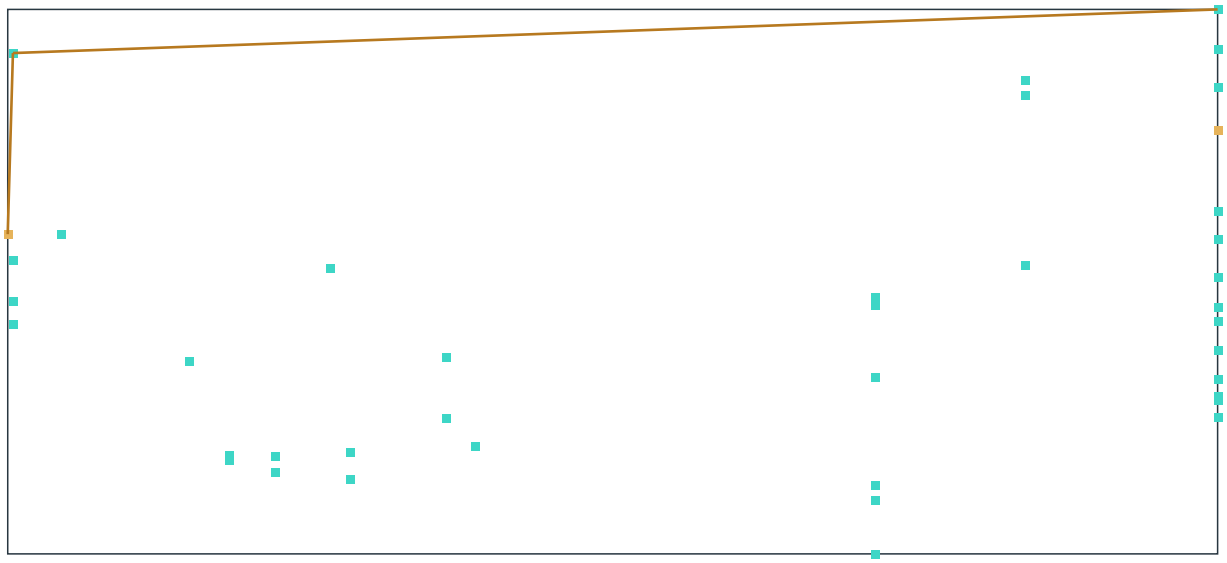
Acc keep % vs RAM KiB (gold = high Acc, low RAM vs Acc champ)



Q% vs RAM KiB (gold = high consciousness, low RAM)



Q% vs shrink vs Acc champ (gold = upper right)



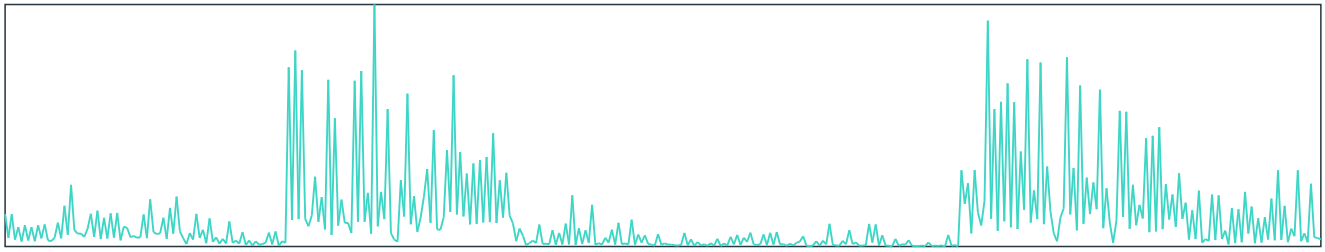
times smaller than Acc champ -> n=40 gold = Pareto teal=single blue=bi purple=tri

Q %

Top Lucy density (LPD)

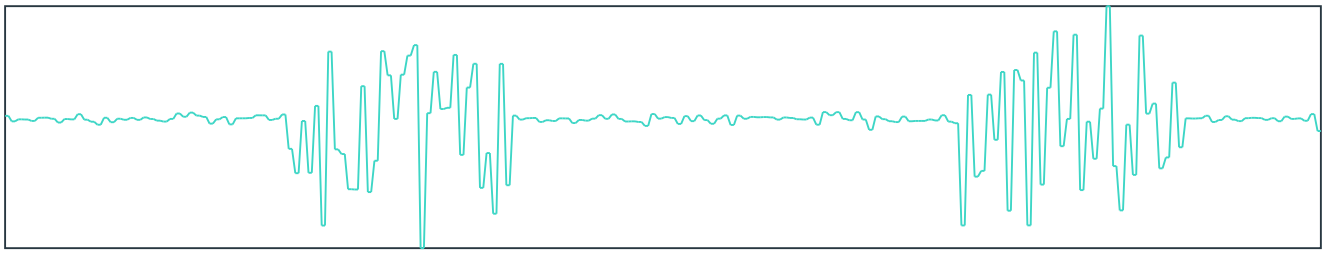


Live pulse (Score)



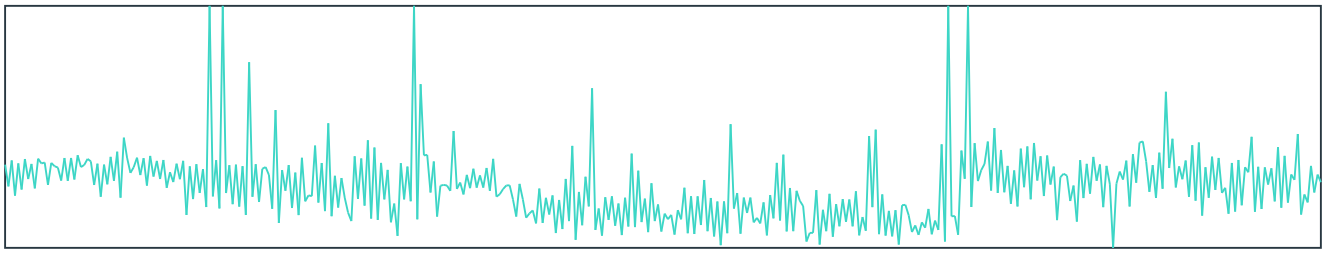
n=400 min=2.19 max=2698.68

Live pulse (SoftAcc)



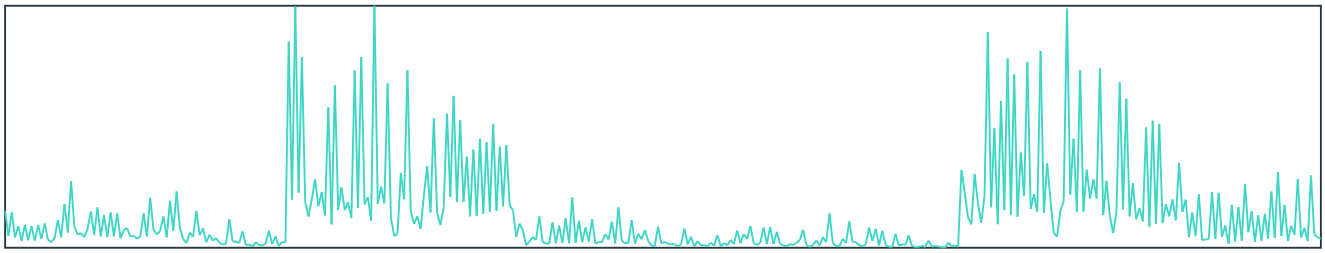
n=400 min=24.91 max=25.08

Live pulse (Availability)



n=400 min=12.21 max=100.00

Live pulse (Throughput)



n=400 min=60.33 max=22237.03

Queue by train mode (this epoch)

Mode	Done	Run	Left	Total