Train mode vs matched SGD

All Pi layers · pi_collection checkpoints
Hard Acc = avg_accuracy = hard_acc
Each comparison: same dtype/format/arch/backend, only train mode differs
LPD / consciousness computed per layer board, then vs SGD on matched cells

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Layers analyzed: 22
Primary modes: 19
Total win events: 507017
Global board cells: 48864
Global Acc champ RAM: 6.5 KiB
```

Assessment & conclusions (read this first)

Automated interpretation of pi_collection checkpoints — all 22 layers.

- float32 Acc beat rate: 98%
- quant/low-bit Acc beat rate: 97%
- quant/low-bit Score beat rate: 81%

Executive summary

• This report compares every non-SGD train mode against SGD on matched cells: same dtype, format, arch, and backend — only the train mode differs.
• Data source: pi_collection checkpoint JSON from all 22 Welvet layer sprints (dense through metacognition) after Pi farm runs.
• Hard Acc = avg_accuracy = dashboard hard_acc (argmax class accuracy). Lucy Score = Throughput × Availability × Acc / 10,000. SoftAcc is serve-confidence and is not the Acc term in Score.
• SGD is the reference row in the sweep, not the expected winner: each cell configuration runs ~22 train modes, so other modes routinely beat SGD on the same hardware path.

How to read the win-count tables

• A “win” means: on that matched cell, the mode beat SGD on that metric (with a small epsilon). Counts are summed across all layers and all dtype/arch configs.
• Many modes can win on the same cell, so totals are large and modes are not mutually exclusive.
• Primary tables exclude chain tweens (tween_chain, step_tween_chain, MeshTweenChain) — they often run chain-rule / BP-equivalent paths. They are still listed in the appendix when they beat SGD.
• step_sgd is compared as its own mode; it is not the baseline.

Main observations — learning (Hard Acc)

• Modes with the most head-to-head Acc wins vs SGD: MeshBP (1317 wins), MeshTween (1276 wins), step_tween (1275 wins), TweenSplit (1199 wins)
• MeshBP and MeshTween families often lead raw Acc wins — they behave like strong BP / mesh-gradient paths on these toy sprints.
• TweenSplit and TweenSplit* variants still win Acc often, but their bigger story is live-fit (Score), not pure argmax accuracy.
• Across all dtypes in this dataset, SGD is never the overall Acc champion on a cell config: another mode always reaches higher hard Acc on the same dtype/arch slice.

Main observations — live-fit (Lucy Score)

• Score wins vs SGD concentrate in TweenSplit family: TweenSplit (1296 wins), TweenSplitHeadProxy (881 wins), TweenSplitFastProxy (772 wins), TweenSplitSparse (685 wins)
• Throughput wins: TweenSplit (860 wins), tween (385 wins), TweenSplitHeadProxy (343 wins). Availability wins: TweenSplitSparse (1954 wins), MeshTweenSplit (1918 wins), TweenSplitLinearCache (1914 wins).
• Tween modes keep infer+train duty cycle high; plain SGD often blocks the live loop and tanks Availability even when Acc is similar.
• Mean Δ Score is strongly positive for TweenSplit* modes — they win the Welvet product metric, not just one pillar.

LPD / consciousness / memory density

• LPD = Q × shrink vs Acc-champ RAM; Q = geomean(Acc, Thru, Avail keep vs learner peaks on that layer). LPD is 0 unless Acc keep ≥ 70%.
• Top LPD wins vs matched SGD: MeshTweenAlt (168 wins), MeshTweenSplitSparse (166 wins), TweenSplitLinearCache (162 wins), TweenSplitHeadProxyAsync (159 wins)
• Top consciousness Mix wins: MeshTweenAlt (168 wins), MeshTweenSplitSparse (166 wins), TweenSplitLinearCache (162 wins)
• Gold/near bands: cells with strong Acc+Thru+Avail keep in small RAM vs the layer’s Acc champion. TweenSplit* and MeshTweenSplit* appear often in near/gold bands; traps (tiny RAM, chance Acc) get LPD 0 by design.
• Chain tweens can show high LPD/Acc wins because chain-rule paths ≈ BP — see appendix; do not treat them as independent proof of tween magic.

Dtype breakdown — float32 vs quant/low-bit

• float32: 98% of configs have some non-SGD mode beat SGD on Acc; SGD is Acc champion on 2% of float32 configs.
• Quant / low-bit dtypes (excl. float16/bf16/fp64): ~97% of configs have a non-SGD Acc win; ~81% have a non-SGD Score win.
• Extreme dtypes (binary, fp4, int2, ternary, nf4) show ~100% of configs where at least one mode beats SGD on Acc — but float32 is similar (~98%), so this is not “quant-only”.
• The real dtype skew is on Lucy Score: quant/low-bit configs show a higher share of Score wins for TweenSplit* (~81% vs ~74% on float32) — tweens help most when numerics are tight and serve+train balance matters.
• Per-dtype table on the next page: % configs where non-SGD beats SGD, and who most often holds the Acc crown on that dtype.

Trap warnings — looks good ≠ learned

• Fleet SGD baseline (matched cells): mean Acc 22.9%, mean Score 653.6 — every chart marks SGD so you can compare.
• RAM trap (LPD trap band): tiny weights vs Acc champion but Acc keep < 70% — 16,457 trap-band cells total, distributed unevenly across dtypes (see per-dtype trap table + heatmap).
• Score trap: beats SGD on Lucy Score but Acc keep < 70%. TweenSplit* often leads trap % — not proof of learning.
• Peer trap: beats SGD on Hard Acc but another mode on the same cell still wins Acc.
• Near band: 106 credible small-RAM cells. Gold: 0 (expected 0 on 1-epoch toy sprints).
• Each dtype (fp4, int2, float32, …) has its own trap leader and Acc pick — not one “quant” story.

Dtype-separated winners (not one global story)

• float32 Acc wins concentrate in: TweenSplitHeadProxy (33), tween (33), MeshBP (33), TweenSplit (33) — modest counts (~33/config slice); MeshBP leads quant.
• quant/low-bit Acc wins: MeshBP (1174), step_tween (1147), MeshTween (1145), StepTweenAlt (1069) — MeshBP / MeshTween / StepTweenAlt dominate raw Acc on extreme dtypes.
• float32 Score wins: TweenSplit (25), TweenSplitSparse (18), tween (17)
• quant Score wins: TweenSplit (1174), TweenSplitHeadProxy (803), TweenSplitFastProxy (698)
• Trap cells skew quant: float32 252, quant 15402, float 803 trap-band cells by coarse class — see per-dtype table for fp4 vs int2 vs binary etc.

When to use what (dtype picks)

- Per-dtype pick table lists Acc champion, real-Score champion, and traps for every dtype.
- float32: Mesh/Tween families spread — SGD is never Acc crown but gaps are small.
- quant low-bit (binary, int2, fp4): MeshBP/MeshTween for Acc; TweenSplit only if real Score wins.
- Use tide charts at end: SGD gray bars + black X markers = baseline on every permutation slice.
- Deploy rule: beat SGD bar on YOUR dtype for Acc AND prefer near-band / real Score wins.

Chain tween appendix (BP-equivalent family)

• MeshTweenChain: Acc 1271, Score 328, LPD 78 wins vs SGD
• step_tween_chain: Acc 1296, Score 227, LPD 46 wins vs SGD
• tween_chain: Acc 1332, Score 859, LPD 74 wins vs SGD
• These modes are excluded from primary bar charts but listed because they still beat SGD in many matched pairs — often for the same reason MeshBP wins Acc: chain rule ≈ backprop on the stack.

Caveats

- Toy sprint tasks (XOR, sine, delay, etc.) — not production LM training.
- One epoch per layer in most checkpoints; gdn layer had a partial run (~69 cells).
- Wins are per matched cell, not per-layer champions only.
- Availability and Throughput dominate Score; high Acc alone does not win Lucy Score.
- Partial layers: gdn.

Conclusions

• 1. SGD is a baseline, not a winner: on every dtype including float32, another train mode achieves higher hard Acc on the same cell path.
• 2. Split by role: MeshBP / MeshTween for raw Acc; TweenSplit* for Lucy Score, Throughput, Availability, and most LPD-consciousness wins.
• 3. Quant dtypes are not the only place tweens win — but tweens matter more for Score on quant/low-bit than on float32.
• 4. Chain tweens (tween_chain, step_tween_chain) beat SGD often; treat as BP-family, not as a separate “tween-only” miracle.
• 5. For deployment picks: prefer modes that win Score + Availability + LPD with Acc keep ≥ 70%, not Score/MiB traps at chance Acc.
• 6. step_sgd beats plain sgd on many cells but still loses Acc crown to Mesh/Tween families — step schedule alone does not close the gap.

Per-dtype: non-SGD vs SGD (aggregated across all layers)

dtype	class	n	Acc≠SGD	Score≠SGD	SGD best	Acc crown #1	Acc crown #2
binary	quant	63	100%	75%	0%	MeshTweenAlt (7)	TweenSplitHea… (6)
fp4	quant	63	100%	81%	0%	TweenSplitHea… (8)	TweenSplitLin… (6)
fp8e4m3	quant	63	100%	83%	0%	TweenSplitLin… (7)	TweenSplitFas… (7)
int2	quant	63	100%	78%	0%	StepTweenAlt (10)	MeshTweenSpli… (6)
int3	quant	63	100%	84%	0%	TweenSplitHea… (7)	TweenSplitSpa… (6)
nf4	quant	63	100%	79%	0%	TweenSplitLin… (7)	StepTweenAlt (6)
ternary	quant	63	100%	79%	0%	TweenSplitSpa… (9)	TweenSplitLin… (6)
uint2	quant	63	100%	78%	0%	MeshTweenAlt (8)	MeshTweenSplit (6)
float32	float32	66	98%	74%	2%	MeshTweenSpli… (9)	StepTweenAlt (6)
complex128	quant	63	98%	84%	2%	MeshTweenSplit (7)	TweenSplitLin… (6)
float64	float	63	98%	76%	2%	TweenSplitLin… (7)	TweenSplitHea… (6)
fp6	quant	63	98%	86%	2%	TweenSplitFas… (10)	TweenSplitLin… (7)
fp8e5m2	quant	63	98%	86%	2%	MeshTweenSpli… (7)	MeshTweenSpli… (5)
int	quant	63	98%	81%	2%	TweenAlt (8)	TweenSplitFas… (7)
int4	quant	63	98%	79%	2%	StepTweenAlt (6)	TweenSplitHea… (6)
int5	quant	63	98%	86%	2%	MeshBP (6)	TweenSplitLin… (6)

Per-dtype: non-SGD vs SGD (aggregated across all layers) (part 2/3)

dtype	class	n	Acc≠SGD	Score≠SGD	SGD best	Acc crown #1	Acc crown #2
int6	quant	63	98%	87%	0%	MeshTweenSpli… (7)	StepTweenAlt (6)
uint3	quant	63	98%	79%	0%	TweenSplitLin… (8)	TweenSplitFas… (7)
uint4	quant	63	98%	83%	2%	TweenSplitHea… (13)	TweenSplitSpa… (6)
complex64	quant	63	97%	86%	0%	TweenSplitSpa… (5)	TweenSplitFas… (5)
float16	float	63	97%	81%	2%	TweenSplitSpa… (6)	MeshTweenSplit (6)
uint	quant	63	97%	81%	3%	TweenSplitFas… (9)	TweenSplitSpa… (7)
uint8	quant	63	97%	81%	3%	MeshTweenSpli… (7)	MeshTweenAlt (6)
bfloat16	float	63	95%	73%	5%	MeshTweenSplit (7)	TweenSplitLin… (7)
int16	quant	63	95%	83%	5%	StepTweenSplit (7)	TweenSplitLin… (6)
int32	quant	63	95%	70%	5%	TweenSplitHea… (9)	TweenSplitLin… (5)
int64	quant	63	95%	75%	5%	TweenSplitFas… (9)	TweenSplitSpa… (7)
int8	quant	63	95%	79%	3%	TweenSplitHea… (10)	MeshTweenSpli… (6)
uint32	quant	63	95%	76%	3%	TweenSplitHea… (7)	StepTweenSplit (7)
uint6	quant	63	95%	87%	3%	TweenSplitSpa… (6)	MeshTweenAlt (5)
uintptr	quant	63	95%	86%	5%	TweenSplitHea… (7)	MeshTweenSpli… (6)
uint5	quant	63	94%	87%	6%	MeshTweenSplit (6)	TweenSplitHea… (6)

Per-dtype: non-SGD vs SGD (aggregated across all layers) (part 3/3)

dtype	class	n	Acc≠SGD	Score≠SGD	SGD best	Acc crown #1	Acc crown #2
uint64	quant	63	94%	73%	5%	MeshTweenSpli… (7)	TweenSplitFas… (6)
uint16	quant	63	92%	83%	3%	TweenSplitLin… (7)	TweenSplitSpa… (7)

Layers — ok cells and best non-chain Acc winner

host	layer	cells	matched	best Acc mode
pi-240	dense	2346	2244	TweenSplitHeadProxyAsync
pi-240	cnn1	2346	2244	MeshBP
pi-240	cnn2	2346	2244	StepTweenAlt
pi-240	cnn3	2346	2244	MeshBP
pi-240	convt1	2346	2244	StepTweenSplit
pi-240	convt2	2346	2244	MeshTweenSplitSparse
pi-240	convt3	2346	2244	MeshTween
pi-241	rnn	2346	2244	MeshBP
pi-241	lstm	2346	2244	tween
pi-241	mha	2346	2244	step_tween
pi-241	mamba	2024	1922	MeshTween
pi-241	gdn	69	66	MeshTween
pi-241	embedding	2346	2244	MeshBP
pi-241	swiglu	2346	2244	TweenAlt
pi-243	layernorm	2346	2244	TweenSplitLinear
pi-243	rmsnorm	2346	2244	step_tween
pi-243	softmax	2197	2095	step_tween
pi-243	kmeans	2346	2244	MeshTween

Layers — ok cells and best non-chain Acc winner (part 2/2)

host	layer	cells	matched	best Acc mode
pi-243	sequential	2346	2244	TweenSplitFastProxy
pi-243	residual	2346	2244	TweenSplitFastProxy
pi-243	parallel	2346	2244	TweenSplitLinearCache
pi-243	metacognition	2346	2244	TweenSplitFastProxy

Snapshot metrics — matched-cell WIN counts vs SGD (primary modes)

mode	matched	Hard Acc	SoftAcc %	Lucy Sco	Through	Availabil	Zero dow	Acc/s (le	Score/Mi	Acc/MiB	Thru/MiB	Avail/MiB	Adapt %	Consiste	Stability	Acc × Th	Thru × A	Weight b	Weight N	Heap by	Time to 5	Time to 7	Wall dura	Train ms	Infer ms	Blocked train ms
TweenSp	2145	1199	1251	1296	860	1888	1923	766	1332	1593	862	1915	440	1264	1528	940	1178	0	0	273	663	928	63	1749	317	1754
TweenSp	2145	1188	1251	881	343	1871	1917	460	941	1627	347	1910	130	1255	1589	559	691	0	0	242	669	1031	22	1774	302	1782
TweenSp	2145	1193	1250	772	340	1895	1913	231	876	1584	343	1929	27	1256	1626	498	609	0	0	238	688	1087	1	1784	298	1788
TweenSp	2145	1174	1252	685	164	1954	1931	110	768	1608	170	1977	20	1260	1630	363	502	0	0	223	685	1087	0	1854	247	1857
TweenSp	2145	1163	1249	634	151	1914	1935	160	764	1595	156	1947	24	1253	1623	379	485	0	0	248	693	1135	1	1788	261	1797
TweenSp	2145	1193	1250	481	72	1876	1913	131	624	1619	76	1918	21	1257	1627	314	351	0	0	236	688	1117	0	1780	290	1783
MeshTwe	2129	1131	1228	280	7	1918	1905	65	441	1605	8	1936	17	1242	1612	203	184	0	0	213	687	1111	0	1773	277	1777
TweenSp	2145	1153	1251	498	235	1369	1503	338	654	1604	238	1416	21	1248	1617	439	394	0	0	251	695	1120	5	1467	813	1469
StepTwe	2145	1154	1250	653	202	986	1159	533	779	1590	207	1091	285	1251	1582	633	436	0	0	266	662	1063	4	1303	1160	1318
MeshTwe	1941	1040	1049	324	16	1811	1778	14	447	1394	16	1836	1	1063	1431	188	231	0	0	143	617	963	0	1742	172	1745
MeshBP	2145	1317	1267	522	206	781	1042	800	675	1614	211	871	950	1286	1486	688	342	0	0	271	630	701	62	1206	1378	1213
MeshTwe	1996	1043	1103	133	3	1752	1718	21	253	1446	3	1779	8	1115	1485	130	60	0	0	149	629	964	0	1717	308	1720
tween	2145	1198	1105	633	385	613	809	1067	791	1468	389	700	772	1167	1239	810	499	0	0	284	534	561	224	1064	1549	1075
MeshTwe	2145	1276	1245	360	127	524	852	629	520	1605	127	588	901	1282	1491	527	233	0	0	276	649	747	12	1032	1672	1037
step_twe	2145	1275	1238	239	131	275	569	968	367	1593	133	309	889	1279	1441	476	167	0	0	298	631	567	84	751	1937	754
TweenAlt	2145	1171	1254	73	27	163	465	390	169	1620	29	179	303	1243	1569	209	56	0	0	248	662	994	1	707	2027	712
StepTwe	2145	1188	1253	38	11	101	351	334	101	1615	11	109	289	1249	1572	97	25	0	0	218	660	990	1	576	2066	577
MeshTwe	2043	1102	1147	5	2	142	384	38	18	1524	2	157	9	1158	1528	22	3	0	0	195	644	1045	0	661	1945	669

Snapshot metrics — matched-cell WIN counts vs SGD (primary modes) (part 2/2)

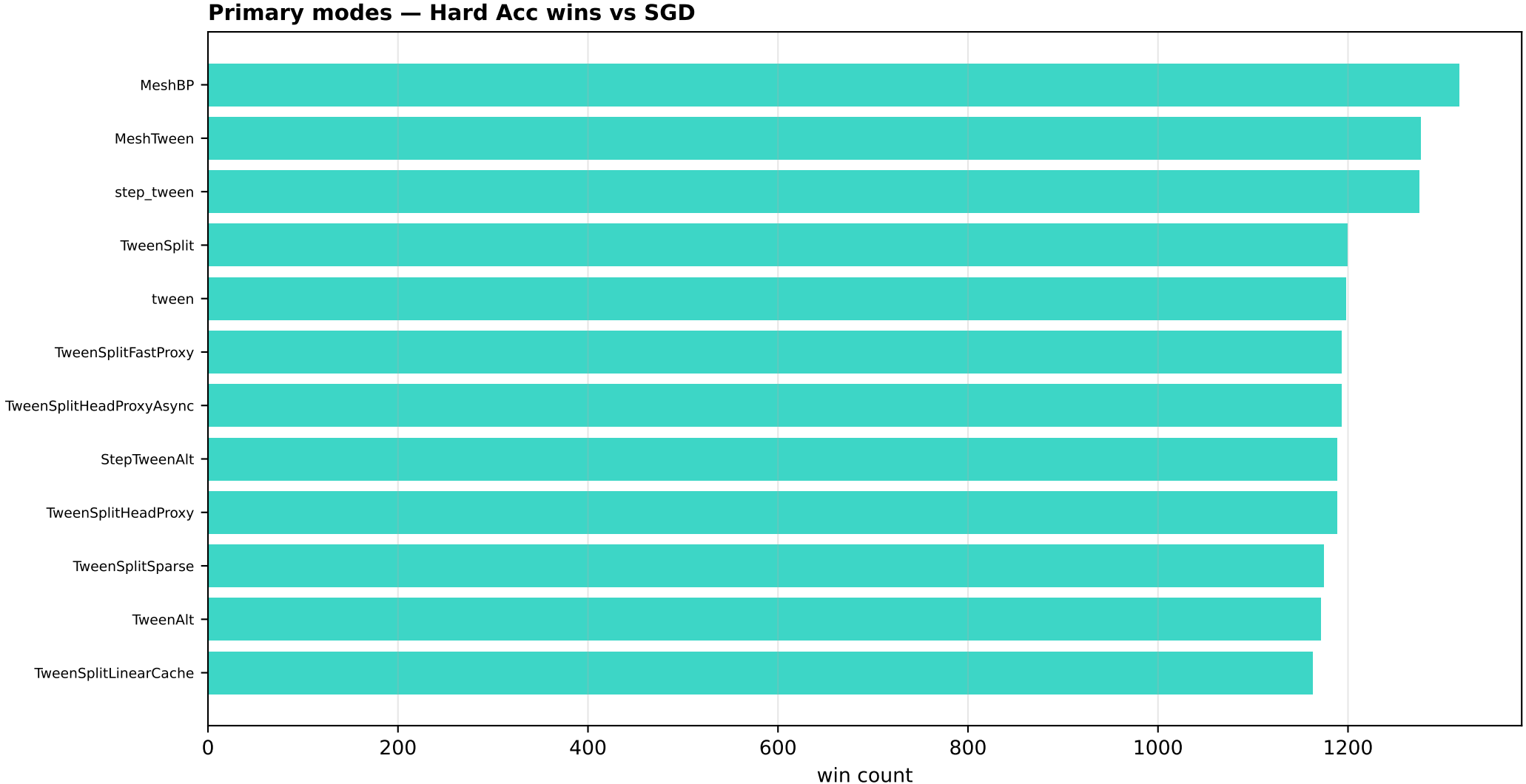
mode	matched	Hard Acc	SoftAcc %	Lucy Sco	Through	Availabil	Zero dov	Acc/s (le	Score/Mi	Acc/MiB	Thru/MiB	Avail/MiB	Adapt %	Consiste	Stability	Acc × Th	Thru × A	Weight b	Weight N	Heap by	Time to 9	Time to 2	Wall dura	Train ms	Infer ms	Blocked train ms
step_sgd	2145	892	495	231	196	297	237	571	277	888	196	342	397	580	771	382	216	0	0	330	464	597	353	840	1907	851

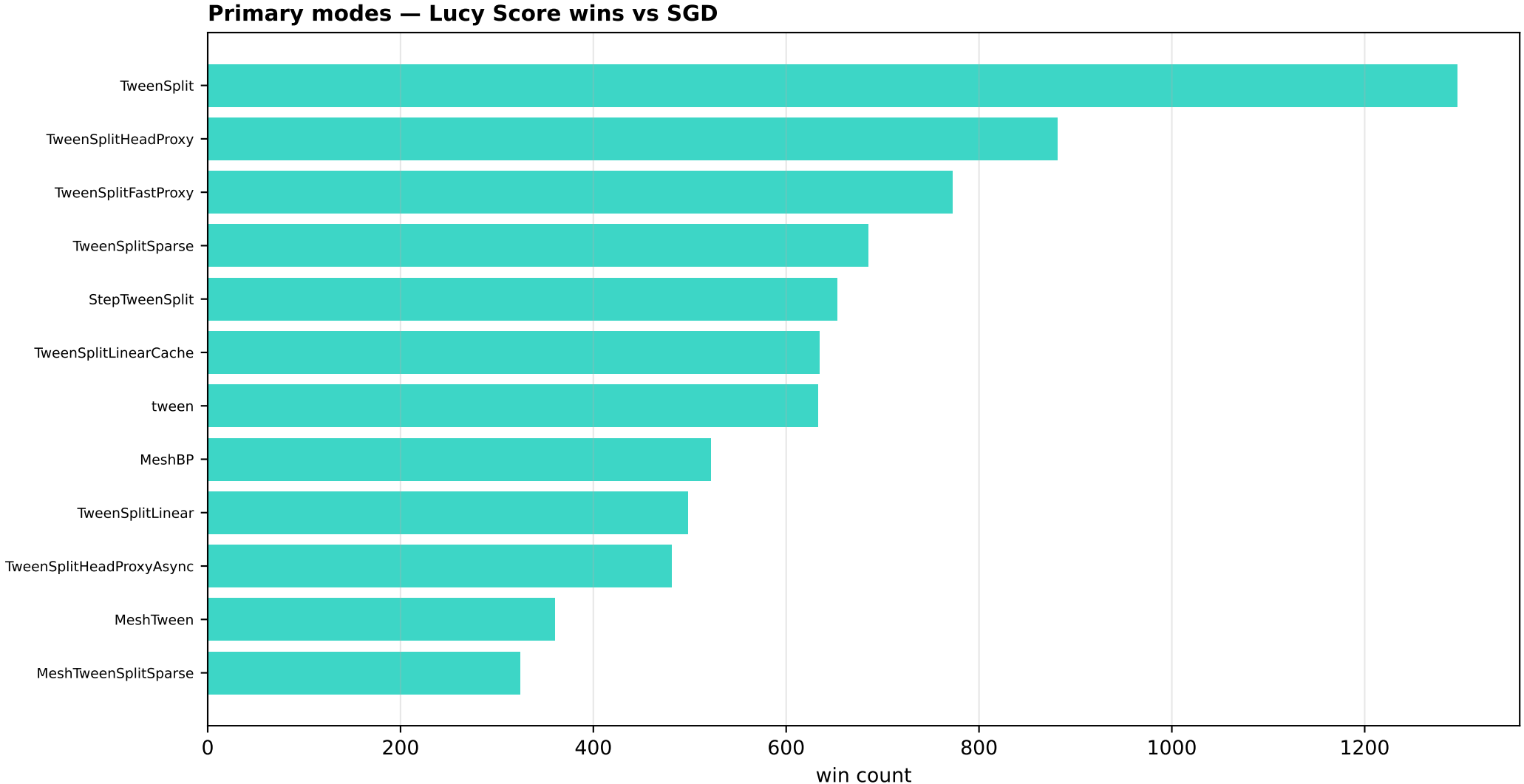
LPD / consciousness — WIN counts vs matched SGD (+ gold/near band beats)

mode	matched	gold>SGD	near>SGD	LPD	Consciousnes	Mix (Q if Acc	M-Speed (Thr	M-Avail (Avai	Acc keep vs p	Thru keep vs	Avail keep vs	× smaller tha	Dens Acc	Dens Thru	Dens Avail	Gold pillars (	RAM vs Acc champ
MeshTweenA	2043	0	1	168	48	168	168	168	1152	2	157	0	176	162	168	64	0
MeshTweenS	1941	0	10	166	520	166	166	173	1081	15	1776	0	169	163	173	1144	0
TweenSplitLir	2145	0	10	162	763	162	162	170	1200	135	1874	0	165	160	170	881	0
TweenSplitHe	2145	0	16	159	710	161	161	168	1235	61	1866	0	164	157	168	841	0
TweenSplitHe	2145	0	9	156	944	157	155	166	1234	315	1853	0	158	154	165	900	0
TweenSplitFa	2145	0	13	156	880	156	157	159	1239	325	1869	0	155	153	159	892	0
TweenAlt	2145	0	1	152	238	152	152	152	1221	28	178	0	159	152	152	71	0
TweenSplitLir	2145	0	6	151	681	151	149	156	1201	219	1379	0	152	147	156	355	0
StepTweenAlt	2145	0	0	149	121	150	150	150	1234	11	109	0	159	149	150	65	0
MeshTweenS	1996	0	7	145	390	145	145	152	1088	3	1730	0	148	140	151	731	0
MeshTweenS	2129	0	11	139	541	141	141	146	1184	6	1866	0	145	136	146	803	0
TweenSplitSp	2145	0	15	138	756	138	138	146	1217	142	1913	0	143	134	146	1280	0
StepTweenSp	2145	0	1	124	831	125	122	125	1195	179	1073	0	123	122	124	218	0
TweenSplit	2145	0	1	94	1291	95	92	102	1262	735	1852	0	94	92	102	899	0
MeshTween	2145	0	0	79	641	79	79	80	1335	115	577	0	80	79	80	143	0
MeshBP	2145	0	0	74	840	74	73	85	1387	171	830	0	84	73	85	179	0
step_tween	2145	0	0	38	477	38	38	38	1342	118	306	0	39	38	38	75	0
step_sgd	2145	0	0	35	400	35	35	42	993	161	340	0	50	35	42	70	0

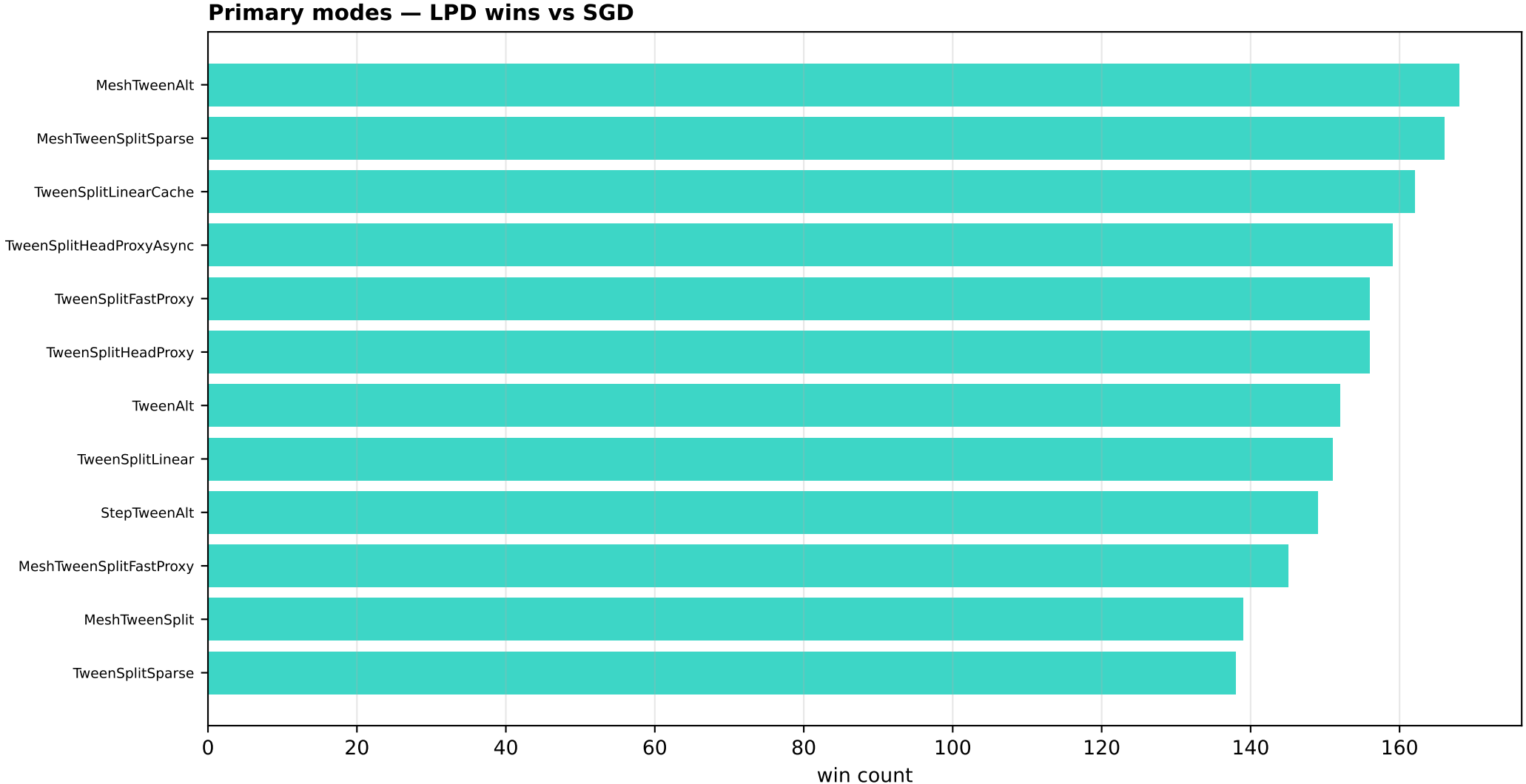
LPD / consciousness — WIN counts vs matched SGD (+ gold/near band beats) (part 2/2)

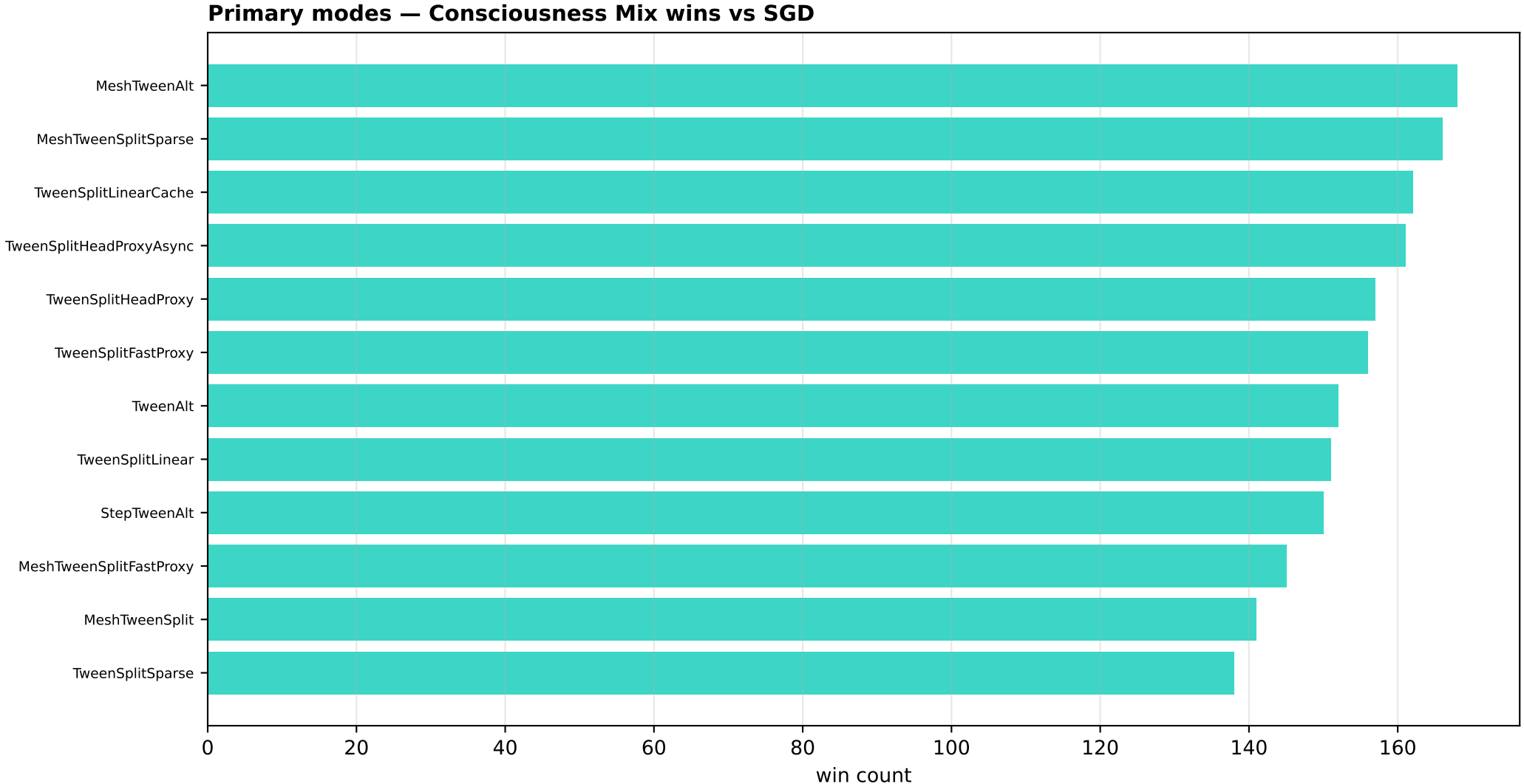
mode	matched	gold>SGD	near>SGD	LPD	Consciousnes	Mix (Q if Acc	M-Speed (Thr	M-Avail (Avai	Acc keep vs p	Thru keep vs	Avail keep vs	× smaller tha	Dens Acc	Dens Thru	Dens Avail	Gold pillars (	RAM vs Acc champ
tween	2145	0	0	28	860	28	28	30	1277	318	684	0	30	28	29	163	0

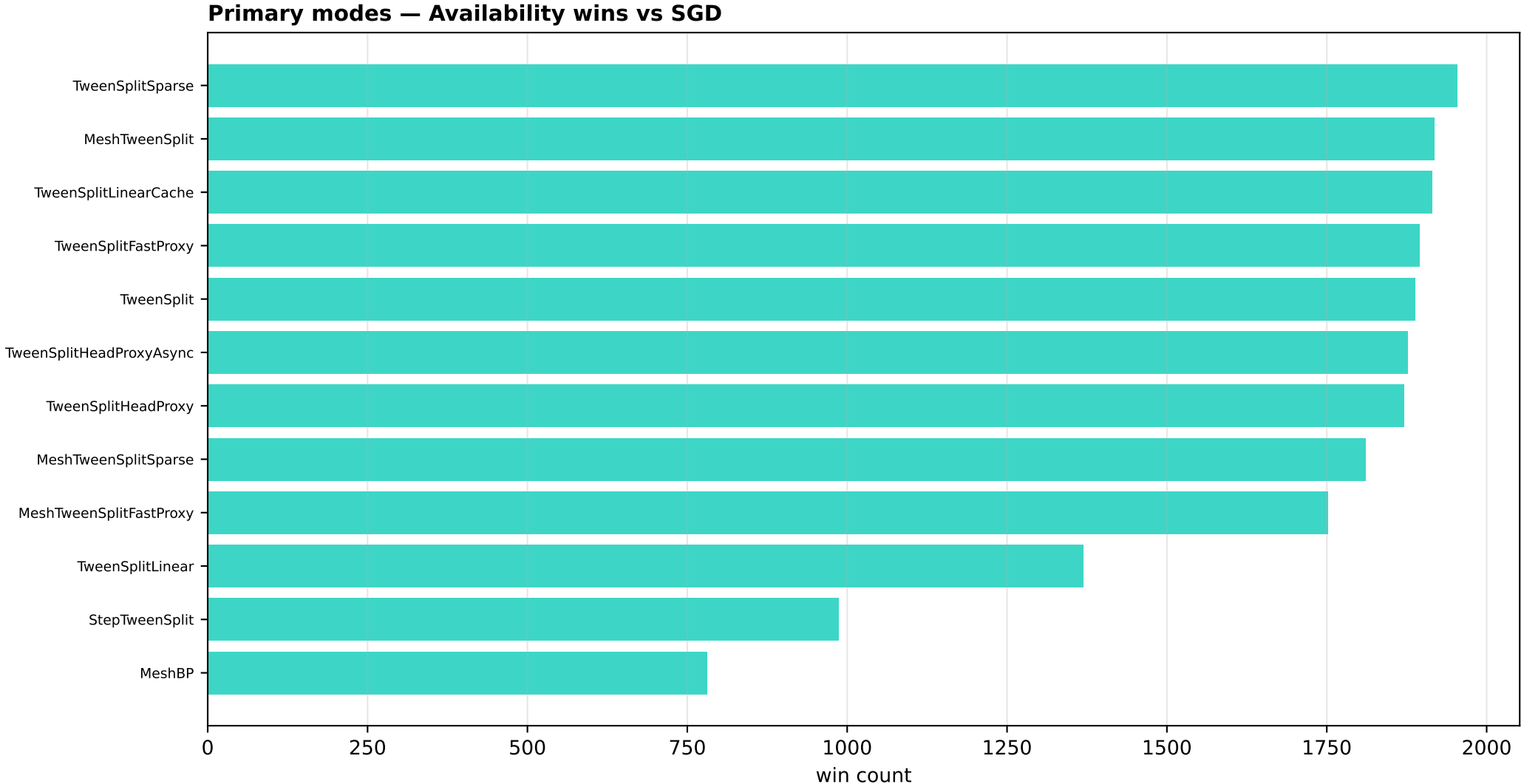

Primary modes — Hard Acc wins vs SGD
MeshBP
MeshTween
step_tween
TweenSplit
tween
TweenSplitFastProxy
TweenSplitHeadProxyAsync
StepTweenAlt
TweenSplitHeadProxy
TweenSplitSparse
TweenAlt
TweenSplitLinearCache
0
200
400
600
800
1000
1200
win count
SGD omitted — baseline; 0 wins by definition vs itself.



SGD omitted — baseline; 0 wins by definition vs itself.


Primary modes — LPD wins vs SGD
MeshTweenAlt
MeshTweenSplitSparse
TweenSplitLinearCache
TweenSplitHeadProxyAsync
TweenSplitFastProxy
TweenSplitHeadProxy
TweenAlt
TweenSplitLinear
StepTweenAlt
MeshTweenSplitFastProxy
MeshTweenSplit
TweenSplitSparse
0
20
40
60
80
100
120
140
160
win count
SGD omitted — baseline; 0 wins by definition vs itself.


Primary modes — Consciousness Mix wins vs SGD
MeshTweenAlt
MeshTweenSplitSparse
TweenSplitLinearCache
TweenSplitHeadProxyAsync
TweenSplitHeadProxy
TweenSplitFastProxy
TweenAlt
TweenSplitLinear
StepTweenAlt
MeshTweenSplitFastProxy
MeshTweenSplit
TweenSplitSparse
0
20
40
60
80
100
120
140
160
win count
SGD omitted — baseline; 0 wins by definition vs itself.



SGD omitted — baseline; 0 wins by definition vs itself.

Mean Δ vs matched SGD (positive = mode better on average)

mode	Δ Acc	Δ Score	Δ LPD	Δ Mix	Δ Avail	Δ Thru
MeshBP	+3.61	+6.2	+0.086	+0.001	-0.40	-969
MeshTween	+2.69	-40.5	+0.050	-0.015	-2.04	-1284
TweenSplit	+2.42	-37.3	+0.118	-0.005	+6.40	-1486
TweenSplitFastProxy	+2.40	-88.0	+0.243	+0.003	+6.85	-2421
TweenSplitHeadProxy	+2.37	-137.3	+0.216	+0.010	+6.65	-2693
step_tween	+2.34	-71.2	+0.010	-0.022	-5.15	-1212
StepTweenAlt	+2.29	-365.3	+0.129	-0.008	-9.55	-3984
TweenAlt	+2.20	-259.3	+0.193	-0.002	-7.37	-3039
TweenSplitHeadProxyAsyn	+2.19	-214.5	+0.222	+0.003	+6.65	-3483
StepTweenSplit	+2.16	-15.2	+0.201	-0.001	+0.31	-1135
TweenSplitSparse	+1.97	-232.9	+0.155	-0.003	+10.03	-3741
TweenSplitLinear	+1.92	-85.2	+0.251	+0.002	+2.37	-2185
MeshTweenSplitSparse	+1.66	-382.1	+0.221	-0.000	+10.30	-4958
MeshTweenSplit	+1.64	-295.7	+0.110	-0.006	+6.82	-4199
TweenSplitLinearCache	+1.56	-144.7	+0.208	+0.003	+6.97	-2924
MeshTweenSplitFastProxy	+1.41	-393.5	+0.143	-0.006	+6.44	-5090
MeshTweenAlt	+1.32	-480.6	+0.208	-0.009	-7.59	-5485
tween	+1.26	+59.0	+0.032	-0.021	-1.48	-231

Mean Δ vs matched SGD (positive = mode better on average) (part 2/2)

mode	Δ Acc	Δ Score	Δ LPD	Δ Mix	Δ Avail	Δ Thru
step_sgd	-0.53	-53.8	+0.006	-0.004	-4.08	-598

Layer dense (pi-240) — wins vs SGD · Acc peak 41.5% · Acc-champ RAM 4.5 KiB

mode	Acc	Score	LPD	Mix	Avail	gold>SGD
TweenSplitHeadProxyAsyn	51	38	18	18	102	0
TweenSplitHeadProxy	50	26	11	11	102	0
TweenSplitSparse	50	35	20	20	102	0
step_sgd	49	38	6	6	49	0
MeshTweenAlt	49	2	18	18	38	0
tween	48	87	6	6	91	0
MeshBP	48	61	2	2	97	0
StepTweenAlt	48	16	6	6	34	0
TweenSplitFastProxy	48	97	19	19	102	0
TweenSplitLinearCache	46	87	15	15	102	0
MeshTweenSplitSparse	46	2	21	21	102	0
TweenSplitLinear	45	93	15	15	101	0
MeshTween	44	47	6	6	87	0
step_tween	42	42	3	3	50	0
TweenSplit	42	34	8	8	95	0
StepTweenSplit	42	64	7	7	100	0
TweenAlt	42	23	12	12	40	0
MeshTweenSplitFastProxy	39	2	13	13	102	0

Layer cnn1 (pi-240) — wins vs SGD · Acc peak 94.7% · Acc-champ RAM 0.5 KiB

mode	Acc	Score	LPD	Mix	Avail	gold>SGD
MeshBP	59	26	2	2	23	0
MeshTween	50	14	0	0	15	0
TweenSplit	50	75	2	2	82	0
TweenSplitSparse	49	70	7	7	99	0
MeshTweenAlt	49	0	2	2	1	0
tween	48	30	0	0	25	0
StepTweenAlt	48	0	0	1	0	0
TweenSplitFastProxy	48	93	7	7	102	0
TweenAlt	47	0	0	0	2	0
TweenSplitLinearCache	47	72	2	2	98	0
MeshTweenSplitFastProxy	47	34	3	3	92	0
TweenSplitHeadProxyAsyn	46	63	2	4	95	0
step_tween	45	8	0	0	10	0
MeshTweenSplitSparse	45	63	0	0	100	0
TweenSplitLinear	43	49	2	2	54	0
StepTweenSplit	42	24	0	0	30	0
TweenSplitHeadProxy	42	74	4	4	82	0
step_sgd	41	6	2	2	13	0

Layer cnn2 (pi-240) — wins vs SGD · Acc peak 87.6% · Acc-champ RAM 0.6 KiB

mode	Acc	Score	LPD	Mix	Avail	gold>SGD
StepTweenAlt	49	0	1	1	0	0
MeshBP	48	26	1	1	22	0
TweenSplitHeadProxyAsyn	47	59	1	1	82	0
MeshTween	46	15	0	0	17	0
MeshTweenSplitFastProxy	46	24	5	5	82	0
StepTweenSplit	44	41	1	1	43	0
TweenSplitLinear	44	52	2	2	53	0
step_tween	43	4	0	0	3	0
TweenSplitHeadProxy	43	61	2	2	84	0
MeshTweenSplitSparse	43	56	4	4	85	0
MeshTweenAlt	42	0	1	1	0	0
TweenAlt	41	0	0	0	1	0
TweenSplitLinearCache	41	58	1	1	85	0
TweenSplit	40	70	0	0	88	0
TweenSplitSparse	39	68	1	1	82	0
MeshTweenSplit	39	39	2	3	88	0
tween	38	13	0	0	12	0
TweenSplitFastProxy	35	70	3	3	86	0

Layer cnn3 (pi-240) — wins vs SGD · Acc peak 74.9% · Acc-champ RAM 0.2 KiB

mode	Acc	Score	LPD	Mix	Avail	gold>SGD
MeshBP	64	15	3	3	24	0
step_sgd	48	5	2	2	10	0
StepTweenAlt	48	0	0	0	1	0
TweenSplitHeadProxyAsyn	46	23	7	7	91	0
MeshTweenAlt	46	0	2	2	1	0
step_tween	45	1	0	0	4	0
TweenAlt	45	0	1	1	1	0
TweenSplitHeadProxy	44	76	2	2	95	0
MeshTweenSplitSparse	44	8	1	1	99	0
TweenSplitLinearCache	42	50	1	1	97	0
MeshTweenSplit	42	13	2	2	96	0
TweenSplitFastProxy	41	67	2	2	98	0
tween	40	18	0	0	14	0
MeshTween	40	4	0	0	10	0
TweenSplitLinear	40	28	2	2	52	0
MeshTweenSplitFastProxy	40	2	1	1	92	0
TweenSplit	39	65	0	1	80	0
StepTweenSplit	39	6	0	0	25	0

Layer convt1 (pi-240) — wins vs SGD · Acc peak 48.0% · Acc-champ RAM 10.0 KiB

mode	Acc	Score	LPD	Mix	Avail	gold>SGD
StepTweenSplit	56	13	3	3	67	0
step_tween	51	8	0	0	27	0
tween	49	33	0	0	47	0
MeshBP	49	29	0	0	45	0
TweenSplit	49	69	0	0	102	0
MeshTweenAlt	49	0	8	8	15	0
TweenSplitFastProxy	48	71	2	2	100	0
TweenSplitHeadProxyAsyn	48	42	7	7	99	0
TweenAlt	46	0	3	3	16	0
MeshTweenSplit	46	14	3	3	101	0
MeshTweenSplitFastProxy	46	1	7	7	102	0
StepTweenAlt	45	0	0	0	2	0
step_sgd	44	10	0	0	17	0
TweenSplitHeadProxy	44	44	0	0	100	0
TweenSplitSparse	43	55	4	4	101	0
TweenSplitLinearCache	42	58	5	5	102	0
MeshTween	41	10	0	0	34	0
MeshTweenSplitSparse	40	10	7	7	102	0

Layer convt2 (pi-240) — wins vs SGD · Acc peak 56.2% · Acc-champ RAM 123.8 KiB

mode	Acc	Score	LPD	Mix	Avail	gold>SGD
MeshTweenSplitSparse	66	66	5	5	102	0
MeshTween	64	13	0	0	3	0
tween	62	7	0	0	4	0
step_tween	62	0	0	0	0	0
MeshBP	60	16	0	0	28	0
MeshTweenSplitFastProxy	60	32	7	7	102	0
MeshTweenSplit	58	58	8	8	102	0
StepTweenSplit	57	35	2	2	61	0
TweenSplitSparse	57	68	2	2	102	0
StepTweenAlt	56	0	4	4	0	0
TweenSplitHeadProxy	55	66	5	5	101	0
TweenSplitFastProxy	55	67	4	4	102	0
TweenSplit	54	70	1	1	102	0
TweenSplitLinear	54	56	7	7	86	0
TweenSplitLinearCache	54	66	1	1	102	0
MeshTweenAlt	52	0	4	4	0	0
TweenAlt	51	0	1	1	0	0
TweenSplitHeadProxyAsyn	47	67	5	5	102	0

Layer convt3 (pi-240) — wins vs SGD · Acc peak 59.4% · Acc-champ RAM 92.8 KiB

mode	Acc	Score	LPD	Mix	Avail	gold>SGD
MeshTween	67	2	0	0	6	0
MeshTweenSplitSparse	65	23	3	3	83	0
StepTweenAlt	63	0	2	2	0	0
step_tween	61	1	0	0	4	0
MeshTweenAlt	61	0	6	6	0	0
TweenSplitFastProxy	59	55	1	1	82	0
MeshBP	58	5	0	0	15	0
tween	55	16	0	0	15	0
TweenSplitHeadProxyAsyn	55	31	0	0	74	0
StepTweenSplit	54	8	0	0	22	0
TweenSplit	53	62	0	0	82	0
TweenSplitHeadProxy	53	71	2	2	81	0
TweenAlt	52	0	0	0	0	0
TweenSplitLinearCache	51	45	6	6	86	0
TweenSplitSparse	51	62	4	4	85	0
MeshTweenSplit	50	17	3	3	86	0
MeshTweenSplitFastProxy	49	6	0	0	73	0
TweenSplitLinear	47	32	2	2	48	0

Layer rnn (pi-241) — wins vs SGD · Acc peak 87.5% · Acc-champ RAM 10.3 KiB

mode	Acc	Score	LPD	Mix	Avail	gold>SGD
MeshBP	81	31	1	1	32	0
MeshTween	78	19	0	0	22	0
step_tween	76	18	0	0	12	0
TweenSplitHeadProxy	73	48	3	3	65	0
StepTweenSplit	71	36	1	1	31	0
TweenSplitSparse	71	36	2	2	76	0
tween	70	28	0	0	25	0
TweenSplitFastProxy	70	34	2	2	71	0
MeshTweenSplit	68	11	0	0	72	0
TweenSplit	66	77	4	4	71	0
MeshTweenAlt	66	0	2	2	11	0
MeshTweenSplitSparse	66	21	0	0	81	0
TweenAlt	64	5	2	2	11	0
MeshTweenSplitFastProxy	64	8	1	1	71	0
TweenSplitLinear	63	16	1	1	40	0
TweenSplitLinearCache	63	20	1	1	70	0
TweenSplitHeadProxyAsyn	63	19	1	1	70	0
StepTweenAlt	62	0	4	4	6	0

Layer lstm (pi-241) — wins vs SGD · Acc peak 100.0% · Acc-champ RAM 6.5 KiB

mode	Acc	Score	LPD	Mix	Avail	gold>SGD
tween	83	38	0	0	9	0
step_tween	82	4	0	0	0	0
MeshBP	80	36	0	0	22	0
TweenSplit	79	58	0	0	97	0
MeshTween	78	35	0	0	8	0
StepTweenSplit	69	61	0	0	32	0
MeshTweenSplit	68	5	0	0	94	0
TweenSplitFastProxy	67	57	1	1	96	0
TweenSplitHeadProxyAsyn	67	31	1	1	101	0
TweenSplitSparse	67	67	0	0	99	0
TweenSplitLinear	66	18	1	1	42	0
StepTweenAlt	63	0	0	0	0	0
MeshTweenSplitSparse	63	30	0	0	95	0
MeshTweenAlt	61	0	0	0	0	0
TweenAlt	60	0	1	1	0	0
TweenSplitHeadProxy	56	64	0	0	95	0
TweenSplitLinearCache	56	40	1	1	92	0
MeshTweenSplitFastProxy	53	1	0	0	98	0

Layer mha (pi-241) — wins vs SGD · Acc peak 100.0% · Acc-champ RAM 6.2 KiB

mode	Acc	Score	LPD	Mix	Avail	gold>SGD
step_tween	95	15	0	0	4	0
MeshBP	94	34	0	0	26	0
MeshTween	94	13	0	0	9	0
tween	89	26	0	0	18	0
TweenSplitSparse	84	48	0	0	83	0
TweenSplitLinearCache	82	18	0	0	80	0
TweenSplit	81	77	0	0	83	0
MeshTweenSplitSparse	81	16	2	2	86	0
TweenSplitFastProxy	79	36	1	1	77	0
MeshTweenSplit	78	4	0	0	78	0
TweenAlt	77	0	0	0	1	0
StepTweenAlt	77	0	0	0	1	0
TweenSplitHeadProxy	77	61	0	0	81	0
TweenSplitLinear	76	6	0	0	39	0
StepTweenSplit	73	36	0	0	30	0
TweenSplitHeadProxyAsyn	71	16	1	1	76	0
MeshTweenAlt	71	0	1	1	2	0
MeshTweenSplitFastProxy	71	3	0	0	83	0

Layer mamba (pi-241) — wins vs SGD · Acc peak 75.0% · Acc-champ RAM 66.5 KiB

mode	Acc	Score	LPD	Mix	Avail	gold>SGD
MeshTween	98	25	0	0	33	0
MeshBP	95	35	0	0	43	0
step_tween	94	18	0	0	21	0
TweenSplitFastProxy	89	24	1	1	64	0
tween	88	31	0	0	31	0
TweenSplitHeadProxy	86	44	2	2	66	0
TweenSplitHeadProxyAsyn	84	33	3	3	72	0
TweenSplit	82	76	1	1	71	0
StepTweenSplit	82	35	0	0	45	0
TweenSplitSparse	80	35	0	0	84	0
TweenAlt	78	4	1	1	14	0
TweenSplitLinear	78	7	3	3	40	0
StepTweenAlt	76	2	1	1	12	0
TweenSplitLinearCache	76	30	0	0	70	0
MeshTweenSplit	72	8	1	1	61	0
step_sgd	50	9	0	0	23	0

Layer gdn (pi-241) — wins vs SGD · Acc peak 43.8% · Acc-champ RAM 49.0 KiB

mode	Acc	Score	LPD	Mix	Avail	gold>SGD
MeshTween	3	1	0	0	0	0
TweenSplit	3	3	0	0	2	0
StepTweenAlt	3	0	1	1	0	0
TweenSplitHeadProxy	3	1	1	1	1	0
TweenSplitFastProxy	3	1	1	1	2	0
TweenSplitHeadProxyAsyn	3	1	1	1	2	0
TweenSplitSparse	3	1	0	0	3	0
MeshTweenAlt	3	0	1	1	0	0
MeshTweenSplitFastProxy	3	0	2	2	3	0
MeshTweenSplitSparse	3	1	2	2	2	0
tween	2	0	0	0	0	0
step_tween	2	1	0	0	0	0
MeshBP	2	1	0	0	0	0
StepTweenSplit	2	1	0	0	0	0
TweenSplitLinear	2	1	0	0	2	0
MeshTweenSplit	2	1	0	0	1	0
step_sgd	1	0	0	0	0	0
TweenAlt	1	0	1	1	0	0

Layer embedding (pi-241) — wins vs SGD · Acc peak 68.8% · Acc-champ RAM 16.4 KiB

mode	Acc	Score	LPD	Mix	Avail	gold>SGD
MeshBP	75	12	0	0	13	0
step_tween	72	5	0	0	3	0
tween	68	27	0	0	15	0
MeshTween	68	6	0	0	8	0
TweenSplitLinearCache	68	28	1	1	99	0
TweenSplitHeadProxy	67	57	6	6	86	0
TweenSplitFastProxy	67	37	2	2	80	0
MeshTweenSplitSparse	66	11	1	1	88	0
StepTweenSplit	65	43	3	3	35	0
TweenAlt	65	0	3	3	1	0
MeshTweenAlt	65	0	6	6	1	0
TweenSplit	63	62	1	1	93	0
StepTweenAlt	62	0	3	3	0	0
TweenSplitHeadProxyAsyn	62	16	4	4	79	0
TweenSplitSparse	62	48	1	1	84	0
MeshTweenSplitFastProxy	62	1	1	1	85	0
MeshTweenSplit	61	11	3	3	97	0
TweenSplitLinear	57	14	5	5	62	0

Layer swiglu (pi-241) — wins vs SGD · Acc peak 43.8% · Acc-champ RAM 0.5 KiB

mode	Acc	Score	LPD	Mix	Avail	gold>SGD
TweenAlt	52	0	22	22	0	0
step_sgd	50	0	4	4	1	0
MeshBP	50	0	11	11	22	0
StepTweenAlt	49	0	20	20	0	0
TweenSplitHeadProxyAsyn	48	0	17	17	98	0
MeshTweenSplitFastProxy	48	0	16	16	100	0
tween	47	1	4	4	6	0
MeshTweenAlt	47	0	19	19	0	0
MeshTweenSplitSparse	46	0	21	21	98	0
MeshTween	45	0	13	13	2	0
MeshTweenSplit	45	0	18	18	100	0
TweenSplit	43	13	4	4	100	0
TweenSplitLinearCache	43	0	11	11	99	0
TweenSplitSparse	43	0	12	12	100	0
TweenSplitHeadProxy	42	0	16	16	99	0
TweenSplitFastProxy	39	0	12	12	100	0
StepTweenSplit	38	0	10	10	6	0
TweenSplitLinear	38	0	8	8	0	0

Layer layernorm (pi-243) — wins vs SGD · Acc peak 46.3% · Acc-champ RAM 0.2 KiB

mode	Acc	Score	LPD	Mix	Avail	gold>SGD
TweenSplitLinear	40	0	6	6	93	0
MeshTweenSplitSparse	39	0	7	7	102	0
MeshTweenSplit	37	0	6	6	102	0
StepTweenSplit	35	7	8	8	47	0
MeshTweenAlt	35	0	7	7	1	0
step_tween	34	1	0	0	5	0
TweenSplit	34	31	4	4	102	0
TweenAlt	34	0	5	5	0	0
TweenSplitHeadProxyAsyn	34	0	5	5	102	0
TweenSplitFastProxy	33	0	3	3	102	0
TweenSplitHeadProxy	32	3	6	6	102	0
step_sgd	31	4	6	6	8	0
tween	31	15	0	0	34	0
MeshBP	31	8	1	1	47	0
StepTweenAlt	31	0	5	5	0	0
MeshTween	30	3	3	3	25	0
TweenSplitLinearCache	29	0	3	3	102	0
MeshTweenSplitFastProxy	29	0	5	5	102	0

Layer rmsnorm (pi-243) — wins vs SGD · Acc peak 45.8% · Acc-champ RAM 0.2 KiB

mode	Acc	Score	LPD	Mix	Avail	gold>SGD
step_tween	79	32	1	1	18	0
MeshBP	76	51	6	6	45	0
TweenSplit	76	74	9	9	79	0
MeshTweenSplitSparse	74	13	14	14	92	0
MeshTween	73	39	2	2	36	0
TweenSplitHeadProxy	72	40	4	4	80	0
MeshTweenSplitFastProxy	71	17	5	5	80	0
MeshTweenSplit	69	21	7	7	84	0
StepTweenAlt	67	11	4	4	13	0
TweenSplitLinearCache	67	28	13	13	83	0
tween	66	45	0	0	34	0
TweenSplitLinear	66	26	7	7	62	0
TweenSplitHeadProxyAsyn	66	23	4	4	81	0
TweenAlt	65	22	4	4	18	0
StepTweenSplit	64	43	6	6	50	0
TweenSplitFastProxy	64	27	5	5	76	0
TweenSplitSparse	64	28	9	9	94	0
MeshTweenAlt	62	0	6	6	12	0

Layer softmax (pi-243) — wins vs SGD · Acc peak 45.8% · Acc-champ RAM 1.8 KiB

mode	Acc	Score	LPD	Mix	Avail	gold>SGD
step_tween	91	25	2	2	23	0
TweenSplitLinear	88	12	5	5	49	0
TweenSplitLinearCache	87	12	12	12	58	0
MeshBP	85	34	5	5	29	0
MeshTween	85	25	3	3	30	0
TweenSplit	85	74	8	8	73	0
MeshTweenAlt	83	3	6	6	17	0
TweenAlt	82	3	7	7	14	0
TweenSplitHeadProxyAsyn	81	5	8	8	69	0
tween	80	38	1	1	29	0
TweenSplitHeadProxy	80	16	7	7	58	0
TweenSplitSparse	80	6	3	3	70	0
StepTweenAlt	78	2	12	12	7	0
MeshTweenSplit	77	10	7	7	84	0
TweenSplitFastProxy	75	9	7	7	69	0
StepTweenSplit	74	18	4	4	35	0
step_sgd	71	31	0	0	18	0
MeshTweenSplitFastProxy	48	0	2	2	26	0

Layer kmeans (pi-243) — wins vs SGD · Acc peak 39.8% · Acc-champ RAM 1.1 KiB

mode	Acc	Score	LPD	Mix	Avail	gold>SGD
MeshTween	80	34	15	15	37	0
TweenSplit	76	77	26	26	82	0
step_tween	75	30	14	14	25	0
TweenSplitHeadProxy	75	34	29	29	89	0
MeshTweenSplit	75	5	27	27	82	0
TweenSplitLinearCache	74	17	24	24	81	0
MeshBP	72	43	22	22	43	0
TweenSplitLinear	72	14	24	24	61	0
StepTweenSplit	70	44	29	29	52	0
StepTweenAlt	70	7	26	26	15	0
TweenSplitHeadProxyAsyn	70	11	24	24	77	0
tween	68	38	8	8	32	0
MeshTweenSplitSparse	67	4	31	31	88	0
TweenAlt	66	15	32	32	19	0
MeshTweenSplitFastProxy	66	2	22	22	74	0
TweenSplitFastProxy	65	21	24	24	83	0
MeshTweenAlt	65	0	22	22	20	0
TweenSplitSparse	64	11	19	19	82	0

Layer sequential (pi-243) — wins vs SGD · Acc peak 42.7% · Acc-champ RAM 1.6 KiB

mode	Acc	Score	LPD	Mix	Avail	gold>SGD
TweenSplitFastProxy	61	0	20	20	97	0
TweenSplitSparse	61	0	14	14	102	0
TweenAlt	60	0	18	18	1	0
TweenSplitLinear	59	2	24	24	91	0
MeshTweenSplitFastProxy	59	0	20	20	96	0
MeshBP	58	8	8	8	25	0
TweenSplitHeadProxy	56	7	19	19	99	0
TweenSplitLinearCache	55	0	22	22	101	0
MeshTweenAlt	55	0	15	15	1	0
TweenSplitHeadProxyAsyn	54	0	14	14	99	0
step_tween	53	1	6	6	2	0
StepTweenSplit	53	12	20	20	38	0
TweenSplit	50	65	9	9	100	0
StepTweenAlt	48	0	14	14	0	0
MeshTween	47	2	7	7	20	0
MeshTweenSplit	45	0	10	10	100	0
tween	44	17	0	0	19	0
MeshTweenSplitSparse	43	0	12	12	102	0

Layer residual (pi-243) — wins vs SGD · Acc peak 44.9% · Acc-champ RAM 2.8 KiB

mode	Acc	Score	LPD	Mix	Avail	gold>SGD
TweenSplitFastProxy	52	2	14	14	102	0
MeshTweenSplitSparse	52	0	14	14	102	0
TweenSplitLinear	49	3	13	13	102	0
MeshTweenAlt	48	0	15	15	12	0
StepTweenAlt	47	0	15	15	7	0
MeshTween	46	31	6	6	63	0
TweenAlt	46	0	12	12	13	0
MeshTweenSplit	46	0	7	7	102	0
MeshTweenSplitFastProxy	46	0	8	8	102	0
TweenSplitHeadProxyAsyn	45	1	14	14	101	0
step_sgd	44	22	1	1	32	0
TweenSplit	44	64	2	2	100	0
step_tween	42	18	0	0	32	0
TweenSplitLinearCache	42	1	12	12	102	0
TweenSplitSparse	42	1	13	13	102	0
MeshBP	41	28	2	2	68	0
TweenSplitHeadProxy	41	35	10	10	101	0
StepTweenSplit	40	57	9	9	88	0

Layer parallel (pi-243) — wins vs SGD · Acc peak 41.1% · Acc-champ RAM 0.2 KiB

mode	Acc	Score	LPD	Mix	Avail	gold>SGD
TweenSplitLinearCache	55	3	28	28	102	0
MeshTween	53	6	24	24	11	0
TweenAlt	52	1	23	23	1	0
MeshTweenSplitFastProxy	52	0	25	25	85	0
TweenSplitHeadProxyAsyn	51	2	21	21	102	0
MeshTweenSplitSparse	50	0	19	19	100	0
StepTweenAlt	48	0	25	25	0	0
TweenSplitHeadProxy	46	52	24	25	102	0
TweenSplitSparse	46	1	22	22	102	0
step_tween	44	2	11	11	8	0
MeshBP	44	9	10	10	43	0
MeshTweenAlt	43	0	25	25	0	0
TweenSplitFastProxy	41	4	22	22	102	0
TweenSplitLinear	40	3	17	17	100	0
TweenSplit	39	71	12	12	102	0
StepTweenSplit	39	45	15	16	72	0
MeshTweenSplit	38	0	16	16	91	0
tween	37	28	7	7	34	0

Layer metacognition (pi-243) — wins vs SGD · Acc peak 47.9% · Acc-champ RAM 0.3 KiB

mode	Acc	Score	LPD	Mix	Avail	gold>SGD
TweenSplitFastProxy	54	0	3	3	102	0
TweenSplitHeadProxyAsyn	54	0	1	1	102	0
TweenSplitSparse	52	0	4	4	102	0
TweenSplit	51	29	3	3	102	0
TweenSplitHeadProxy	51	1	3	3	102	0
step_tween	50	5	0	0	24	0
StepTweenAlt	50	0	6	6	3	0
MeshTweenAlt	50	0	2	2	10	0
step_sgd	49	9	0	0	29	0
tween	48	40	0	0	55	0
TweenSplitLinear	48	0	3	3	101	0
MeshBP	47	14	0	0	69	0
MeshTween	46	16	0	0	48	0
StepTweenSplit	45	24	6	6	77	0
TweenAlt	45	0	4	4	10	0
MeshTweenSplitFastProxy	44	0	2	2	102	0
TweenSplitLinearCache	42	0	3	3	102	0
MeshTweenSplitSparse	41	0	2	2	102	0

Largest wins vs matched SGD (primary modes)

layer	mode	metric	SGD	mode	Δ
dense	tween	Thru/MiB	28252552611.4629	34129919072.9934	+5877366461.5305
dense	tween	Thru/MiB	13227313317.7016	17163807793.3812	+3936494475.6796
dense	step_sgd	Thru/MiB	28252552611.4629	32021730509.8433	+3769177898.3803
dense	tween	Thru/MiB	13309877349.2255	17029566875.7699	+3719689526.5443
dense	StepTweenSplit	Thru/MiB	28252552611.4629	31713313028.6848	+3460760417.2219
dense	step_sgd	Thru/MiB	13227313317.7016	16545301293.3768	+3317987975.6753
dense	MeshBP	Thru/MiB	13227313317.7016	16507271840.0844	+3279958522.3828
dense	step_sgd	Thru/MiB	13309877349.2255	16575072593.3522	+3265195244.1267
dense	MeshTween	Thru/MiB	28252552611.4629	31330769728.8102	+3078217117.3472
dense	step_tween	Thru/MiB	13227313317.7016	16165333423.0612	+2938020105.3597
dense	tween	Thru/MiB	1432839811.5739	4364264576.3752	+2931424764.8013
dense	MeshTween	Thru/MiB	13309877349.2255	16125114649.0170	+2815237299.7915
dense	MeshTween	Thru/MiB	1432839811.5739	4220393345.3055	+2787553533.7315
dense	StepTweenSplit	Thru/MiB	13227313317.7016	16006023015.5868	+2778709697.8852
dense	MeshTween	Thru/MiB	13227313317.7016	15871560567.5478	+2644247249.8462
dense	step_tween	Thru/MiB	1432839811.5739	4068123904.6967	+2635284093.1228
dense	TweenSplitLinear	Thru/MiB	13309877349.2255	15850363816.2474	+2540486467.0219
dense	TweenSplitLinear	Thru/MiB	28252552611.4629	30746638124.8088	+2494085513.3459

Largest wins vs matched SGD (primary modes) (part 2/4)

layer	mode	metric	SGD	mode	Δ
dense	TweenSplitLinear	Thru/MiB	1432839811.5739	3893892977.1035	+2461053165.5296
dense	tween	Thru/MiB	6593367357.3476	9036720724.6392	+2443353367.2916
dense	step_tween	Thru/MiB	13309877349.2255	15748595841.5577	+2438718492.3321
dense	MeshBP	Thru/MiB	1432839811.5739	3741410322.3253	+2308570510.7514
dense	step_sgd	Thru/MiB	1432839811.5739	3730134551.9599	+2297294740.3860
dense	TweenSplitFastProxy	Thru/MiB	1432839811.5739	3630645342.5208	+2197805530.9469
dense	tween	Thru/MiB	6677206714.3392	8873799061.9429	+2196592347.6037
dense	TweenSplitLinear	Thru/MiB	13227313317.7016	15406447591.5103	+2179134273.8087
dense	step_sgd	Thru/MiB	6593367357.3476	8712446449.0472	+2119079091.6996
dense	StepTweenSplit	Thru/MiB	13309877349.2255	15406343043.2023	+2096465693.9767
dense	step_tween	Thru/MiB	6593367357.3476	8630311209.7046	+2036943852.3570
mamba	MeshBP	Blocked train ms	2,801,434,491	852,772,942	+1,948,661,549
dense	StepTweenSplit	Thru/MiB	6593367357.3476	8538973907.1324	+1945606549.7848
dense	TweenSplitLinear	Thru/MiB	6593367357.3476	8467834991.1901	+1874467633.8425
dense	TweenAlt	Thru/MiB	1432839811.5739	3235529700.2451	+1802689888.6712
dense	MeshTween	Thru/MiB	6593367357.3476	8376060444.3362	+1782693086.9886
dense	tween	Score/MiB	2227891586.0402	3967461009.1738	+1739569423.1336
dense	step_sgd	Thru/MiB	6677206714.3392	8406196072.8263	+1728989358.4871

Largest wins vs matched SGD (primary modes) (part 3/4)

layer	mode	metric	SGD	mode	Δ
dense	TweenSplitLinearCache	Thru/MiB	1432839811.5739	3131444346.4383	+1698604534.8644
dense	StepTweenSplit	Thru/MiB	6677206714.3392	8350312518.4897	+1673105804.1505
dense	TweenSplitLinear	Thru/MiB	6677206714.3392	8336384837.8614	+1659178123.5221
dense	StepTweenSplit	Score/MiB	2227891586.0402	3829338999.2761	+1601447413.2358
dense	MeshTween	Score/MiB	2227891586.0402	3785587395.8873	+1557695809.8470
dense	MeshTween	Thru/MiB	6677206714.3392	8118183515.6045	+1440976801.2653
mamba	TweenSplitHeadProxyAsync	Blocked train ms	2,315,691,420	895,925,158	+1,419,766,262
dense	step_tween	Thru/MiB	6677206714.3392	8084398239.0094	+1407191524.6702
mamba	StepTweenAlt	Blocked train ms	2,315,691,420	939,633,806	+1,376,057,614
dense	TweenSplitHeadProxyAsync	Thru/MiB	1432839811.5739	2804873297.3389	+1372033485.7650
dense	MeshBP	Thru/MiB	13309877349.2255	14680246497.6381	+1370369148.4125
mamba	TweenSplitLinear	Blocked train ms	1,693,093,603	353,213,671	+1,339,879,932
dense	tween	Thru/MiB	4224598287.9863	5492680186.8402	+1268081898.8539
mamba	TweenAlt	Blocked train ms	2,267,427,659	1,003,312,802	+1,264,114,857
dense	TweenSplitSparse	Blocked train ms	2,254,572,011	1,004,415,512	+1,250,156,499
dense	MeshTweenSplitFastProxy	Blocked train ms	2,254,572,011	1,007,063,681	+1,247,508,330
mamba	MeshTweenSplit	Blocked train ms	2,097,548,168	853,722,345	+1,243,825,823
dense	TweenSplitHeadProxyAsync	Blocked train ms	2,254,572,011	1,021,416,416	+1,233,155,595

Largest wins vs matched SGD (primary modes) (part 4/4)

layer	mode	metric	SGD	mode	Δ
mamba	TweenSplitFastProxy	Blocked train ms	1,837,340,517	604,214,806	+1,233,125,711
dense	TweenAlt	Blocked train ms	2,254,572,011	1,022,140,487	+1,232,431,524
mamba	TweenSplitFastProxy	Blocked train ms	1,693,093,603	470,320,652	+1,222,772,951
dense	TweenSplitLinear	Score/MiB	2227891586.0402	3449259279.6935	+1221367693.6533
dense	MeshTween	Blocked train ms	2,254,572,011	1,033,901,018	+1,220,670,993
dense	TweenSplitHeadProxy	Blocked train ms	2,254,572,011	1,035,141,274	+1,219,430,737

Appendix — chain tween modes vs SGD (BP-equivalent family)

mode	Acc wins	LPD wins	Score wins	Mix wins
tween_chain	1332	74	859	76
MeshTweenChain	1271	78	328	78
step_tween_chain	1296	46	227	46

Visual summary — how to read the charts

SGD baseline: fleet mean Acc 22.9%, Score 653.6 on matched cells.
Gray bars / black X / dashed lines = SGD. Every other mode is compared to SGD on the same cell.

Trap (orange): Score wins with Acc keep <70%. Real (teal): credible learning.
Per-dtype traps: fp4 ≠ int2 ≠ float32 — see trap heatmap and per-dtype tables.
Tide charts section follows: heatmaps, scatters, SGD-vs-leaders per dtype.

Trap audit — modes with trap cells and score traps vs real score wins

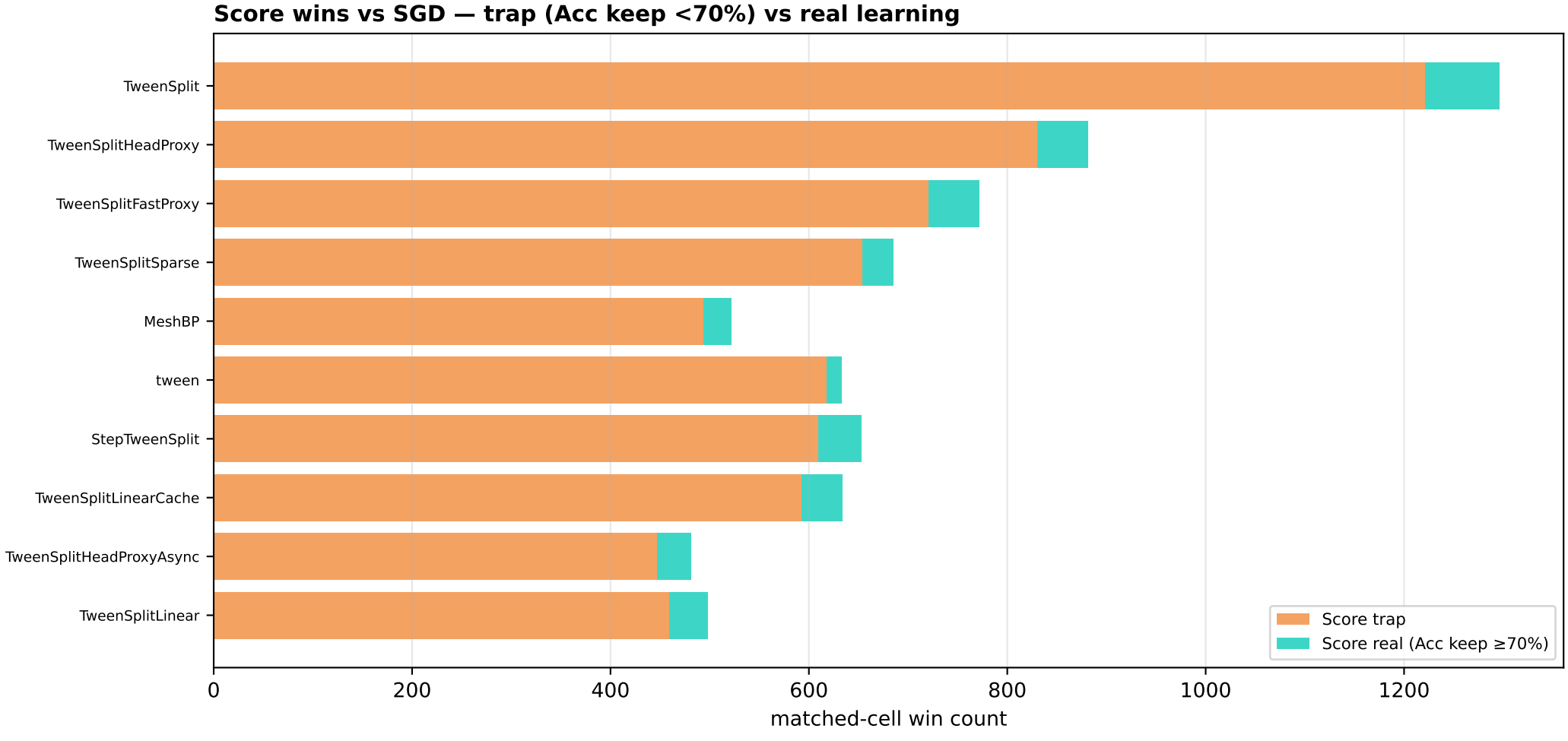
mode	trap cells	near cells	score trap	score real	trap %	peer trap Acc
TweenSplit	733	1	1221	75	94%	1118
TweenSplitHeadProxy	714	9	830	51	94%	1024
TweenSplitFastProxy	710	13	721	51	93%	1014
tween	756	0	618	15	98%	1183
TweenSplitSparse	718	15	654	31	95%	1022
StepTweenSplit	720	1	610	43	93%	1005
TweenSplitLinearCache	707	10	593	41	94%	997
MeshBP	748	1	494	28	95%	1250
TweenSplitLinear	699	6	459	39	92%	988
TweenSplitHeadProxyAsync	709	16	447	34	93%	1005
MeshTween	743	0	350	10	97%	1212
step_tween	760	0	233	6	97%	1242
step_sgd	762	0	217	14	94%	865
MeshTweenSplit	709	11	261	19	93%	983

Trap audit — modes with trap cells and score traps vs real score wins (part 2/2)

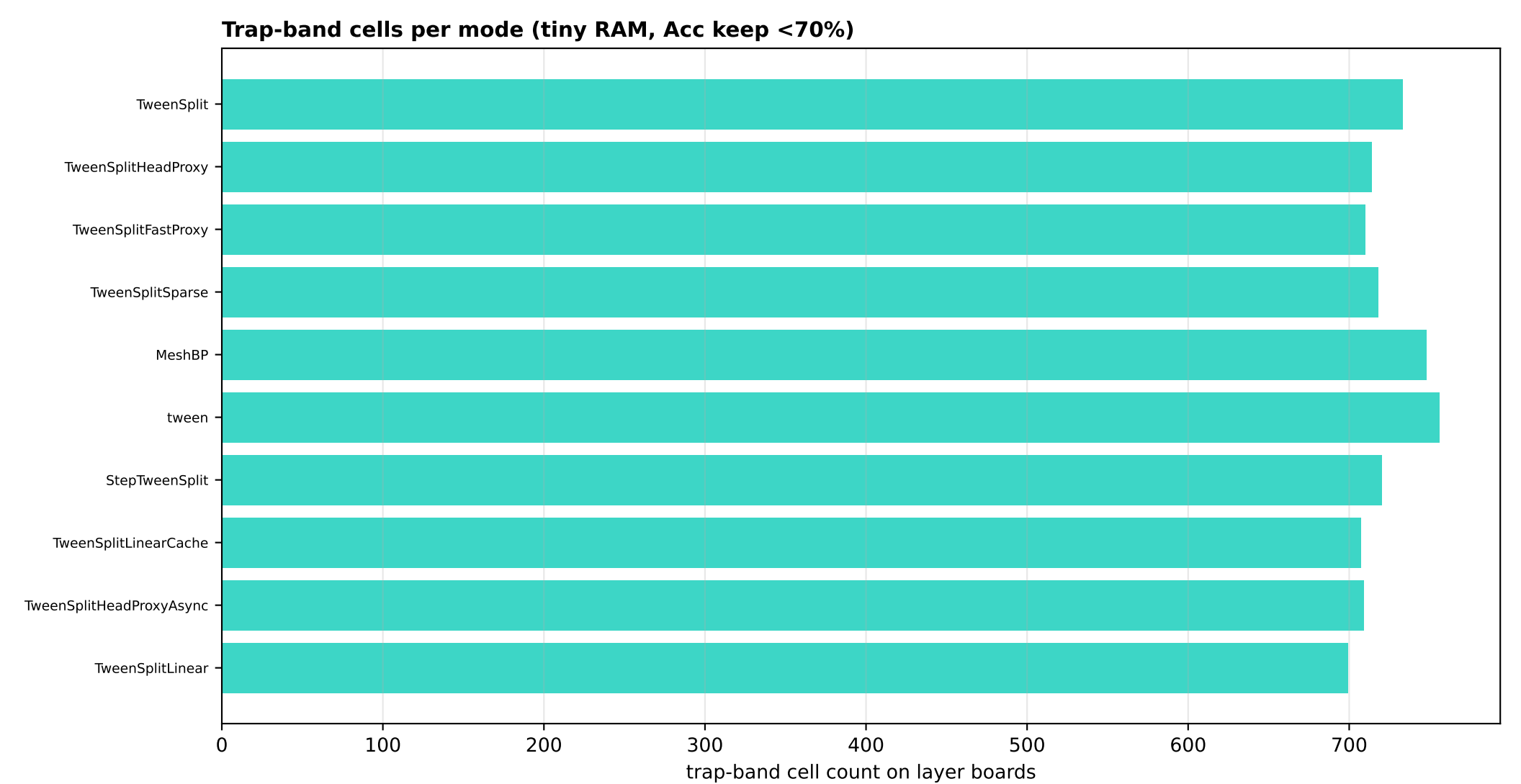
mode	trap cells	near cells	score trap	score real	trap %	peer trap Acc
MeshTweenSplitSparse	570	10	310	14	96%	863
TweenAlt	715	1	64	9	88%	1029
sgd	767	2	0	0	0%	0
StepTweenAlt	718	0	35	3	92%	1021
MeshTweenSplitFastProxy	622	7	121	12	91%	890
MeshTweenAlt	625	1	5	0	100%	931

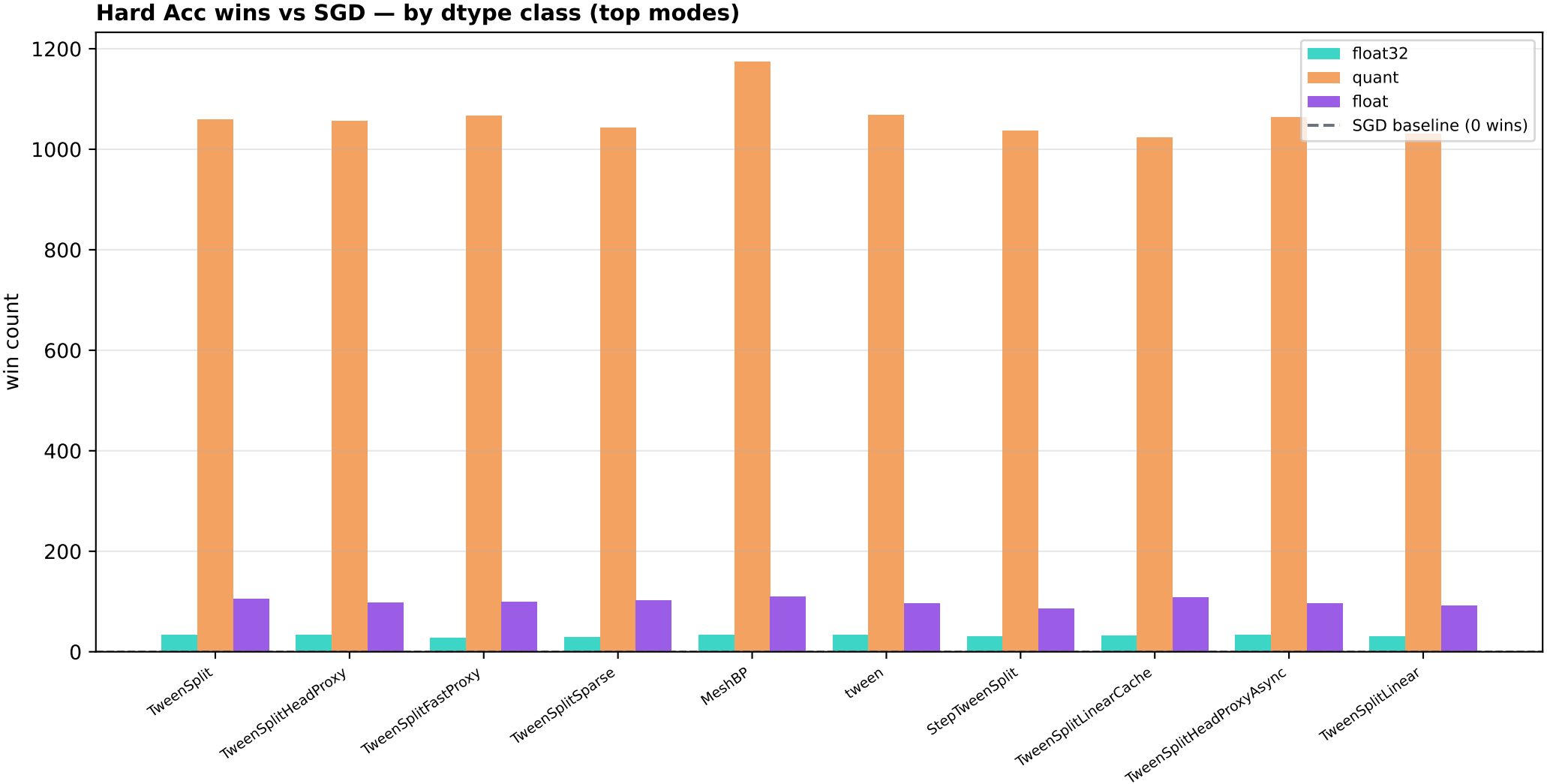
Dtype class rollup (float32 / quant / float)

class	configs	non-SGD Acc%	non-SGD Score%	trap cells
float32	66	98%	74%	252
quant	1890	97%	81%	15402
float	189	97%	77%	803

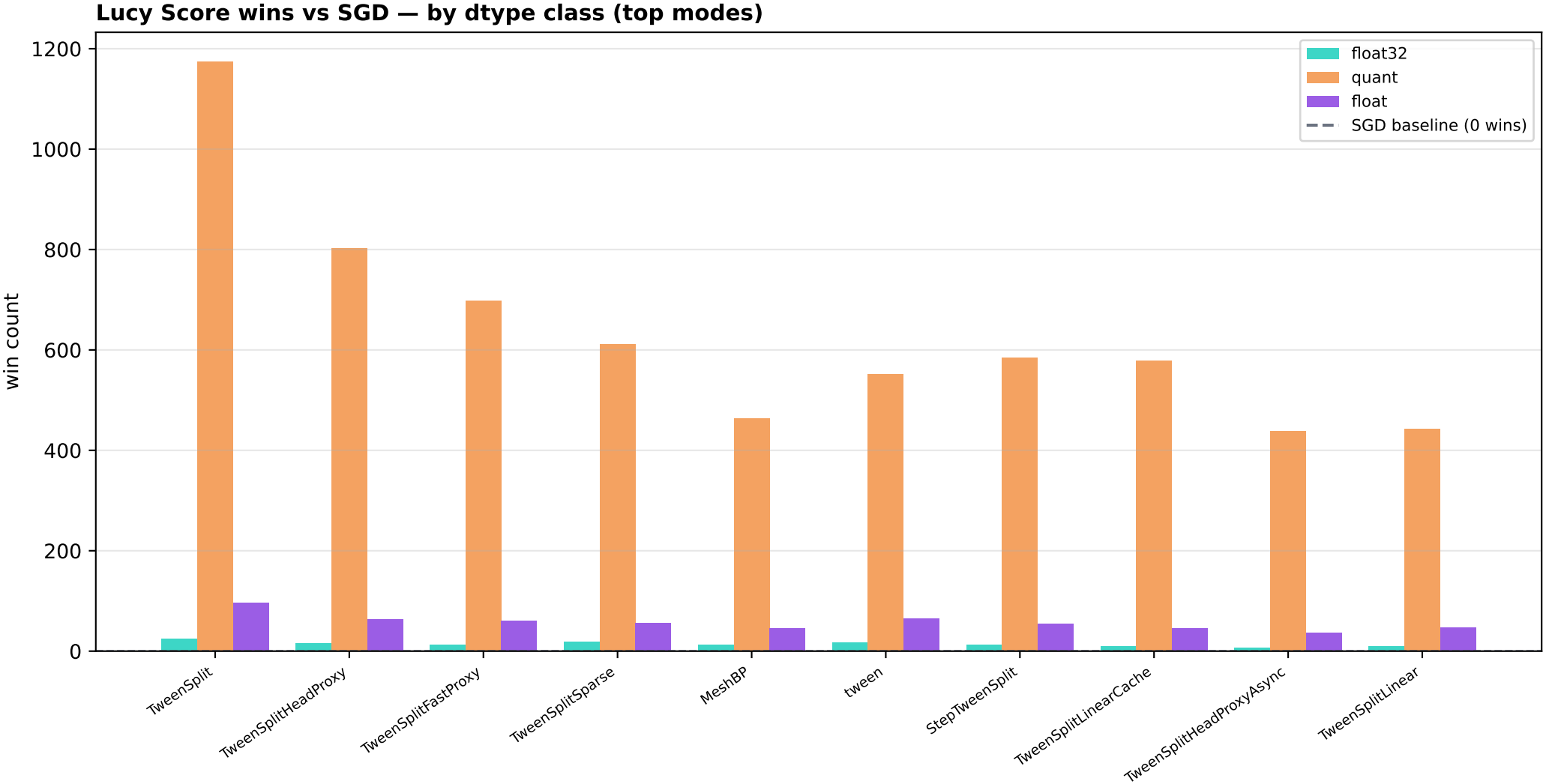


Most TweenSplit Score wins are traps — high Avail/Thru, Acc did not keep.

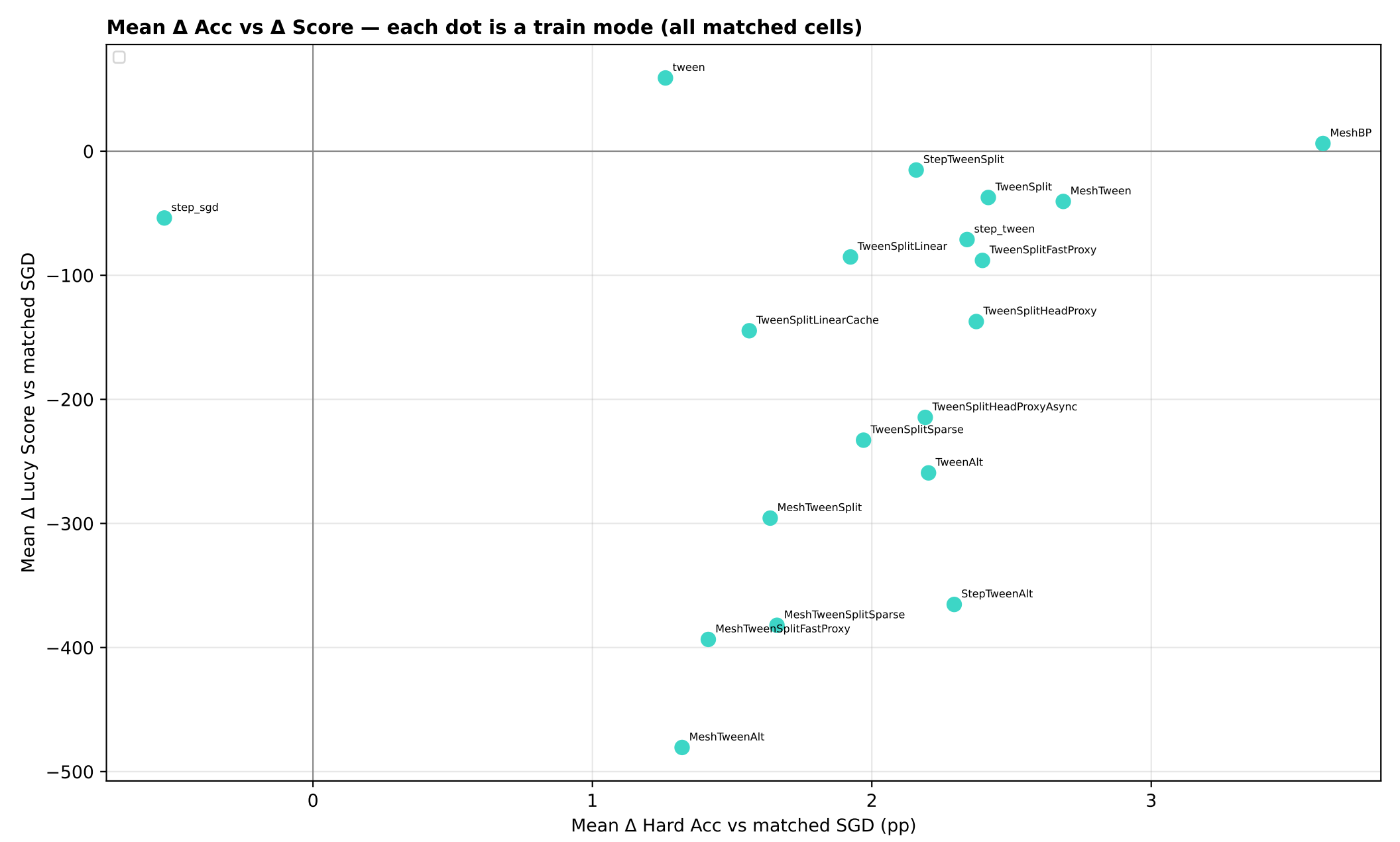

Trap-band cells per mode (tiny RAM, Acc keep <70%)
TweenSplit
TweenSplitHeadProxy
TweenSplitFastProxy
TweenSplitSparse
MeshBP
tween
StepTweenSplit
TweenSplitLinearCache
TweenSplitHeadProxyAsync
TweenSplitLinear
0
100
200
300
400
500
600
700
trap-band cell count on layer boards



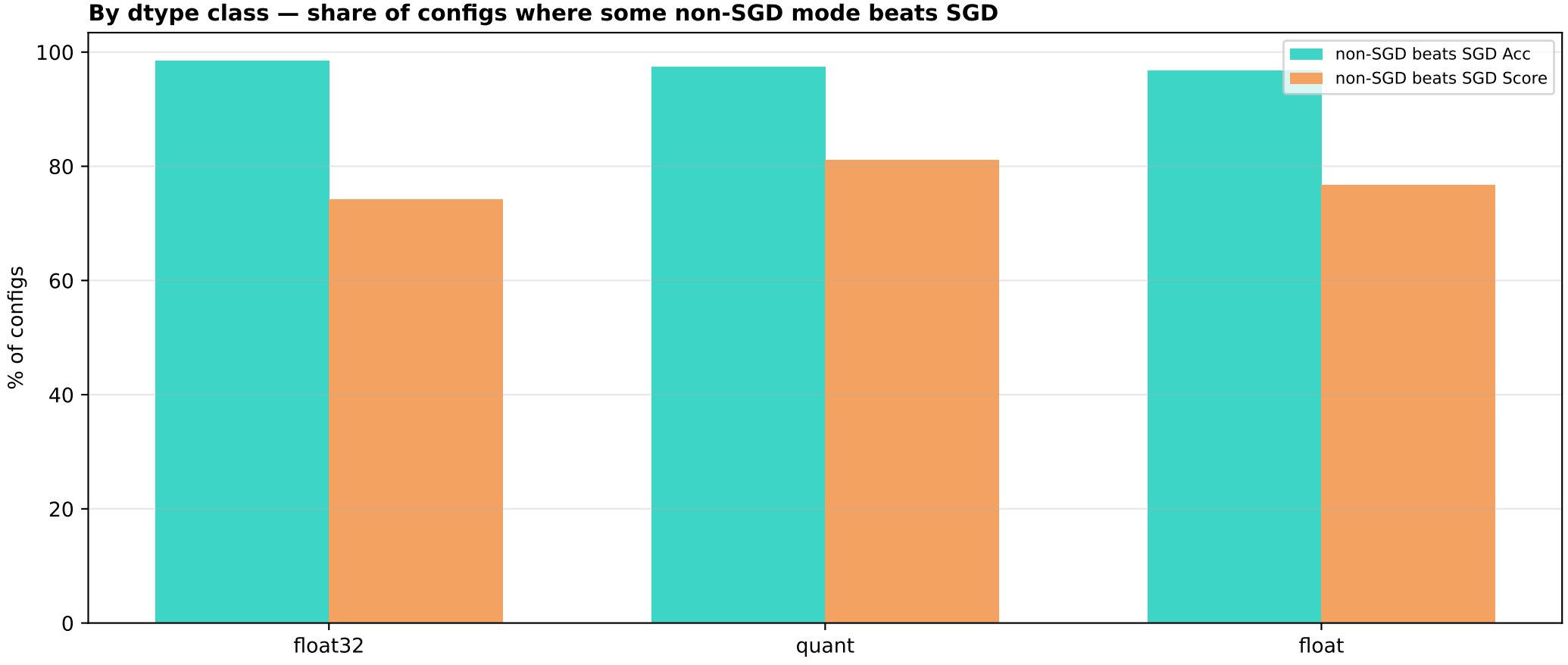
MeshBP leads quant Acc. Dashed line = SGD (0 wins — baseline).

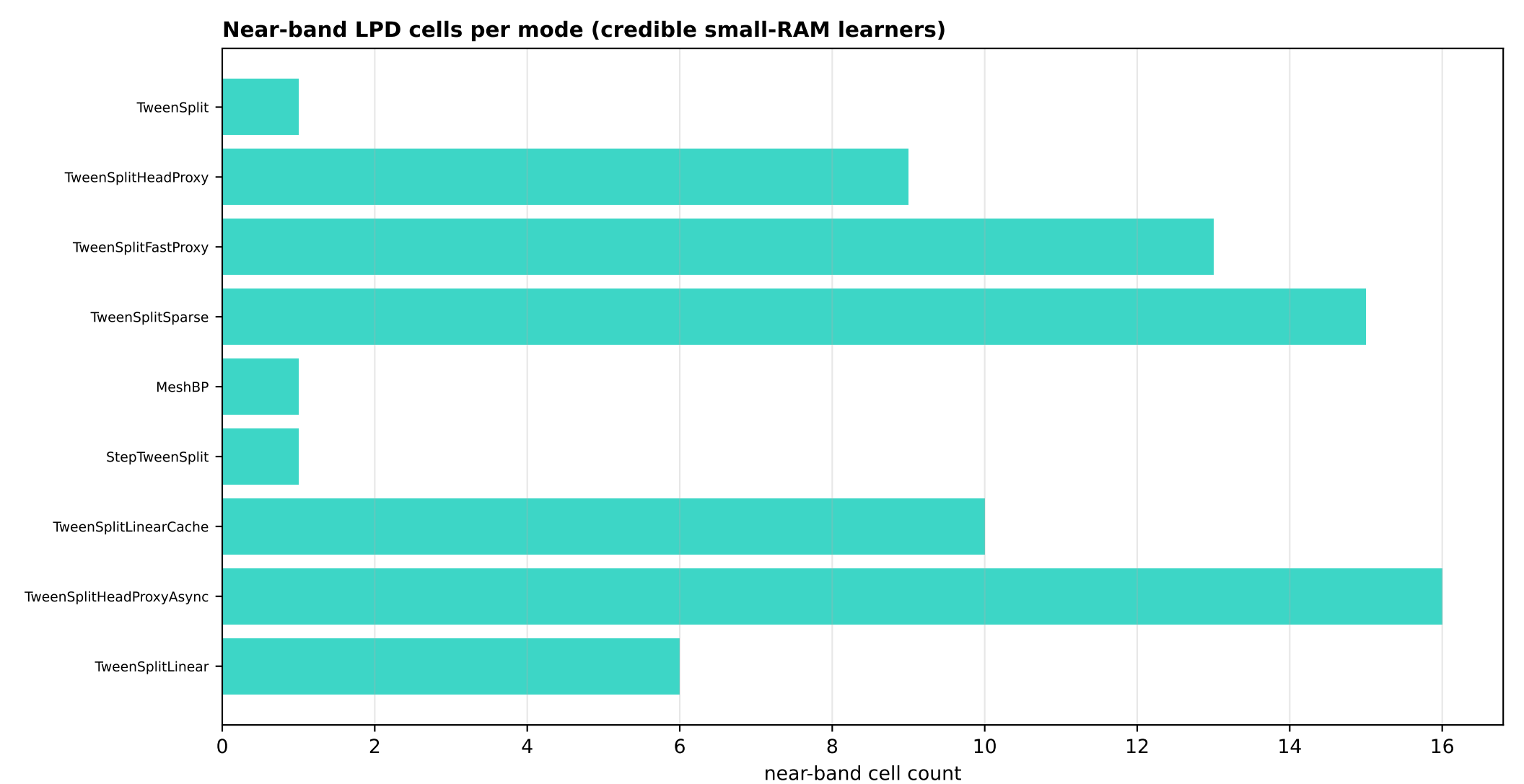


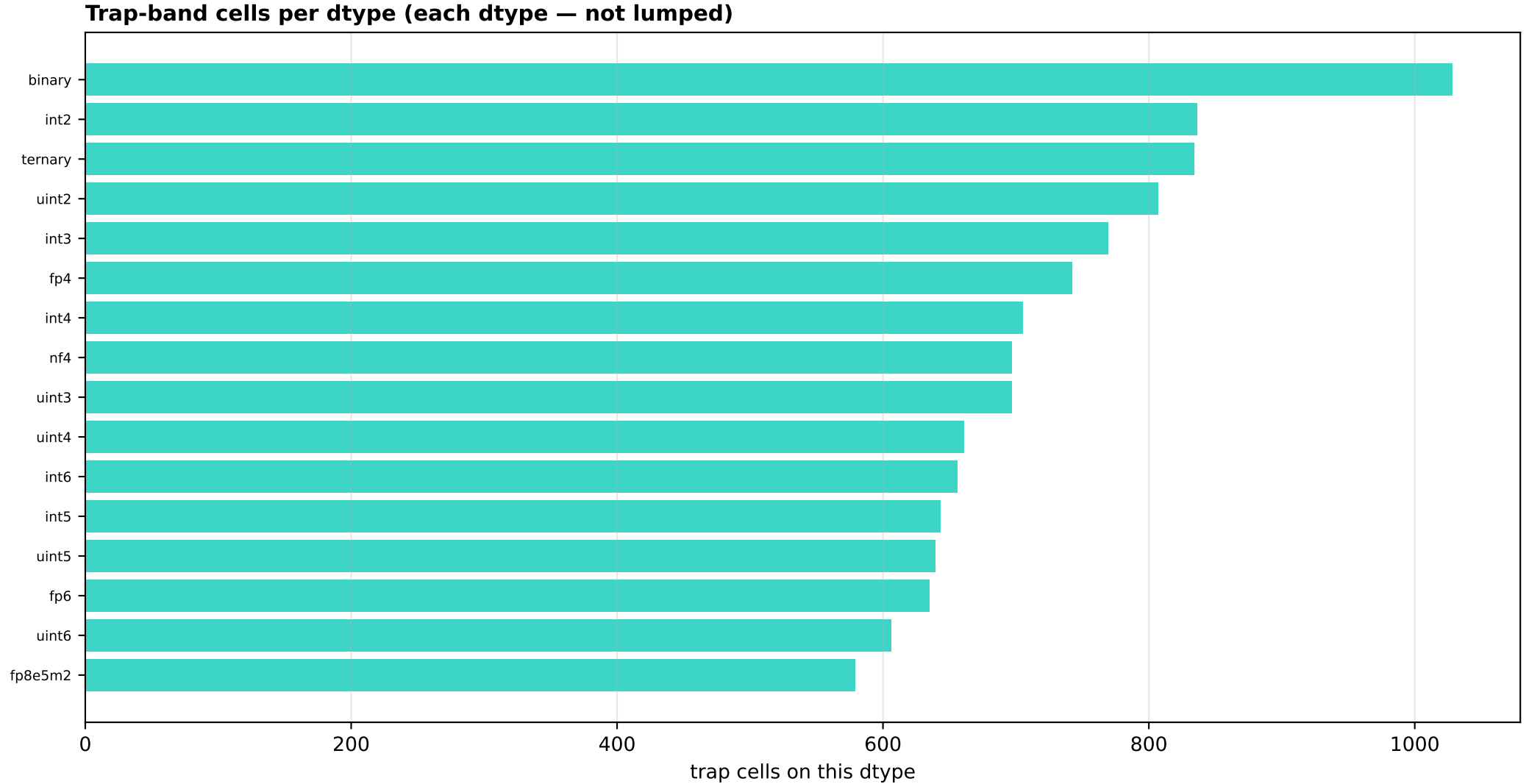
TweenSplit* leads but check trap stack — SGD dashed at 0.



Top-right = better Acc AND Score on average. Bottom-right = Score trap zone if Acc Δ is tiny.

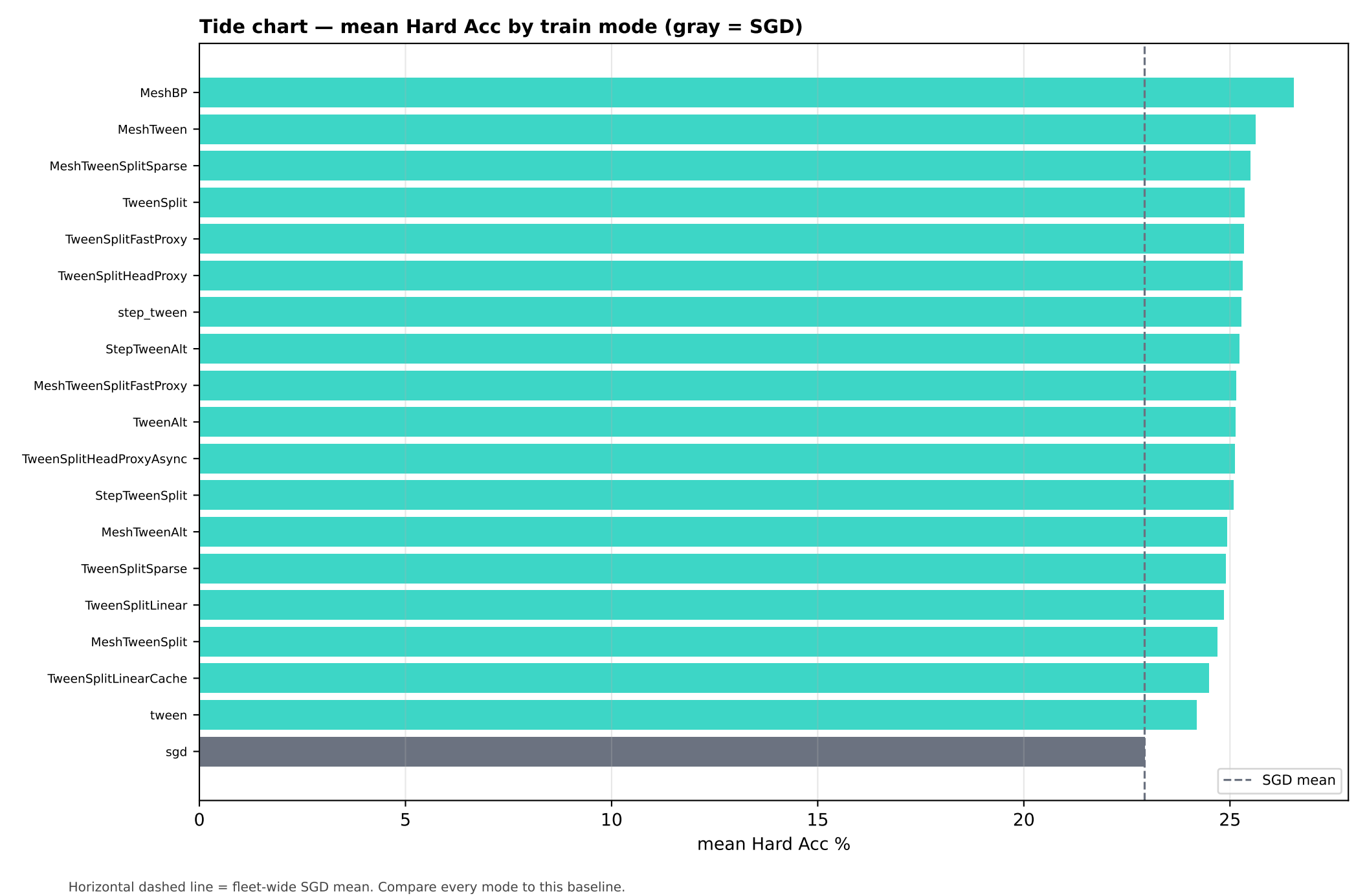

By dtype class — share of configs where some non-SGD mode beats SGD
non-SGD beats SGD Acc
non-SGD beats SGD Score
% of configs
100
80
60
40
20
0
float32
quant
float
float32 vs quant vs float — same arch/backend slice; only dtype class differs.

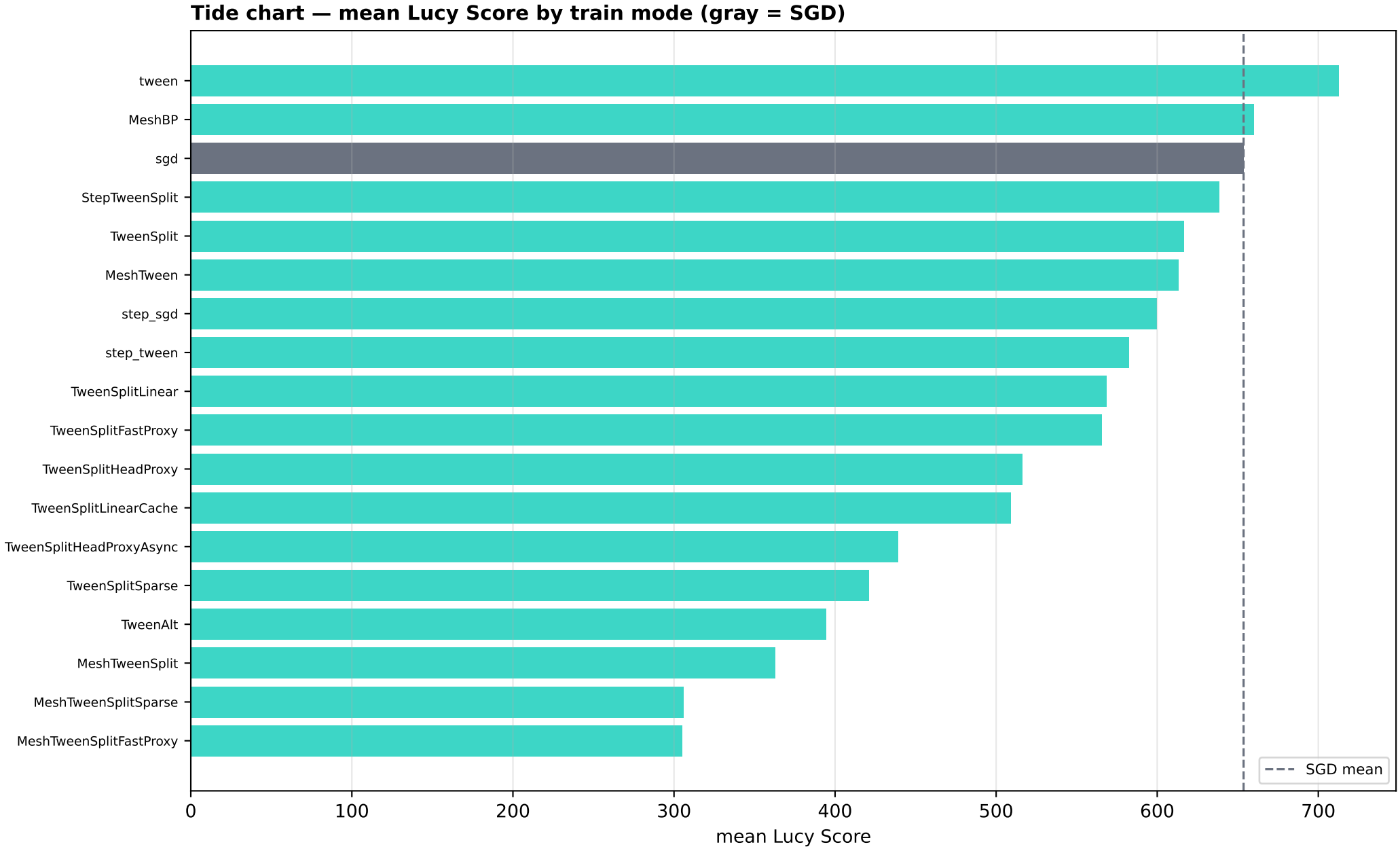

Near-band LPD cells per mode (credible small-RAM learners)
TweenSplit
TweenSplitHeadProxy
TweenSplitFastProxy
TweenSplitSparse
MeshBP
StepTweenSplit
TweenSplitLinearCache
TweenSplitHeadProxyAsync
TweenSplitLinear
0
2
4
6
8
10
12
14
16
near-band cell count


Trap-band cells per dtype (each dtype — not lumped)
binary
int2
ternary
uint2
int3
fp4
int4
nf4
uint3
uint4
int6
int5
uint5
fp6
uint6
fp8e5m2
0
200
400
600
800
1000
trap cells on this dtype
binary/int2/fp4 trap differently — compare columns not just “quant”.

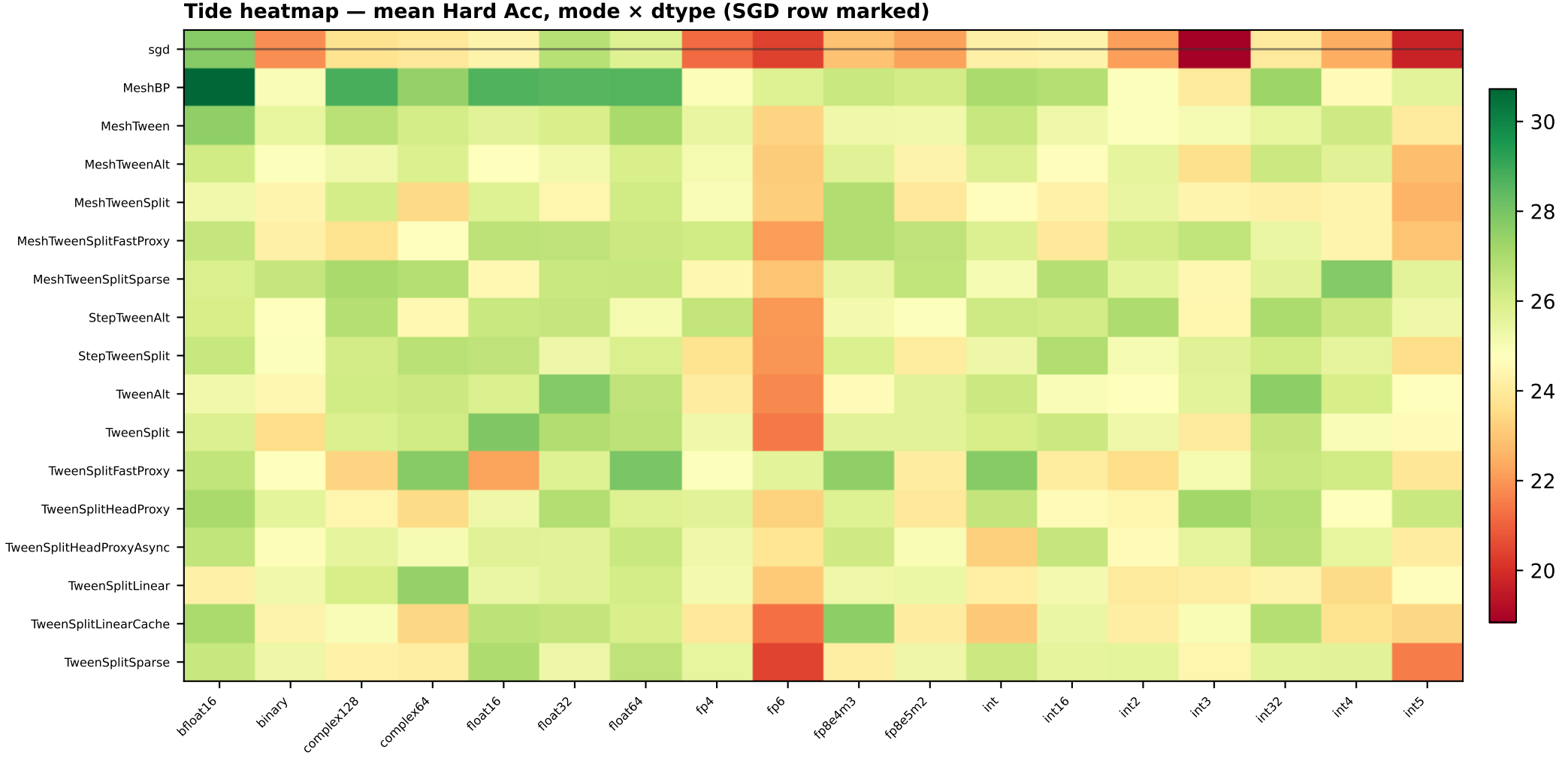
What the results mean

1. Pick train mode per dtype: Acc pick + real Score pick in per-dtype tables.
2. SGD is reference (gray/X) — beating SGD ≠ best among all modes (peer trap).
3. Score traps dominate TweenSplit* — deploy only real-Score winners with Acc keep.
4. Tide heatmaps: compare each mode row to SGD row on same dtype column.
5. MeshBP/MeshTween for quant Acc; float32 is tighter — smaller margins vs SGD.
6. Chain tweens ≈ BP — appendix only; not independent tween magic.

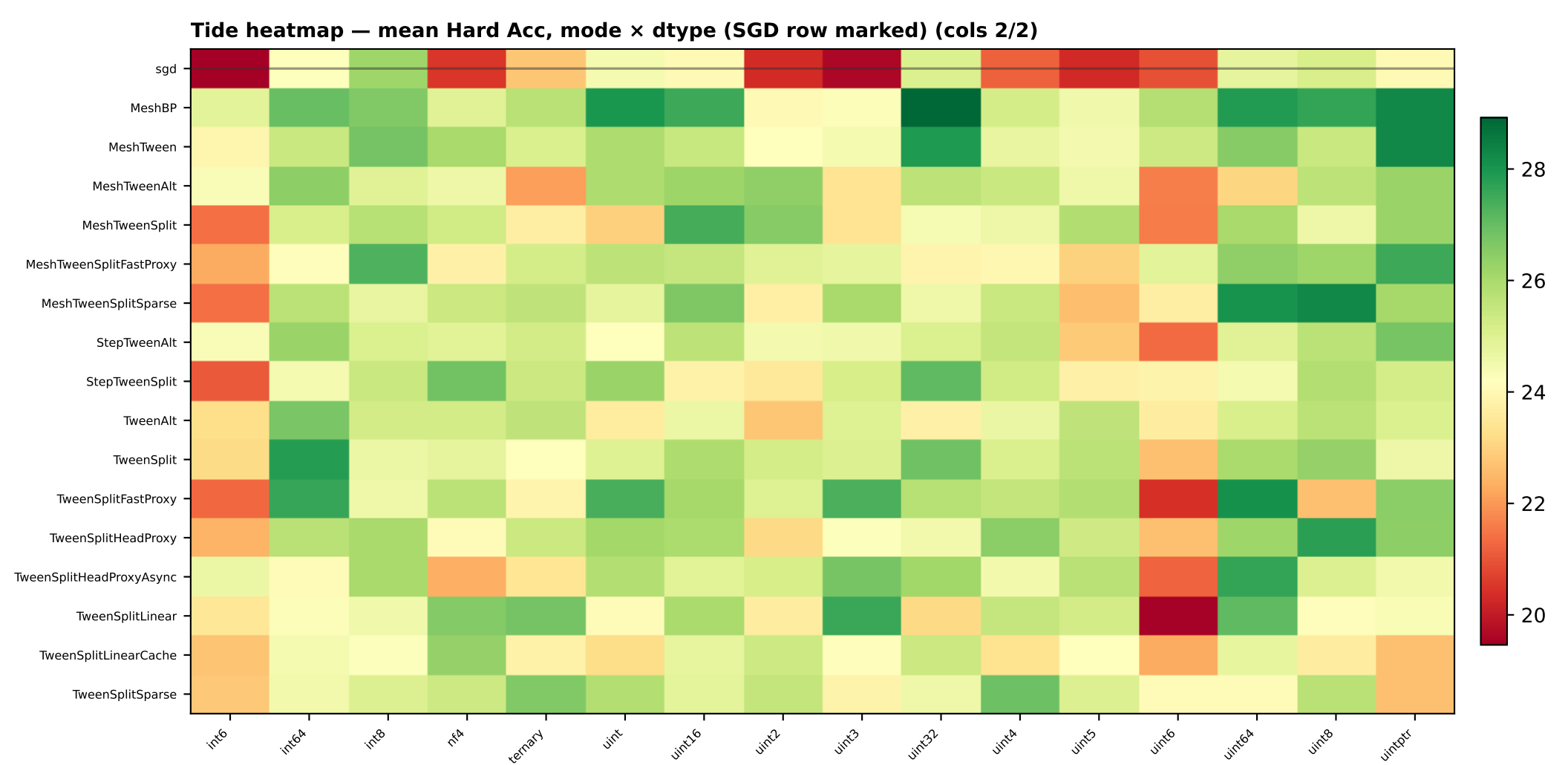

Tide chart — mean Hard Acc by train mode (gray = SGD)
MeshBP
MeshTween
MeshTweenSplitSparse
TweenSplit
TweenSplitFastProxy
TweenSplitHeadProxy
step_tween
StepTweenAlt
MeshTweenSplitFastProxy
TweenAlt
TweenSplitHeadProxyAsync
StepTweenSplit
MeshTweenAlt
TweenSplitSparse
TweenSplitLinear
MeshTweenSplit
TweenSplitLinearCache
tween
sgd
SGD mean
0
5
10
15
20
25
mean Hard Acc %
Horizontal dashed line = fleet-wide SGD mean. Compare every mode to this baseline.



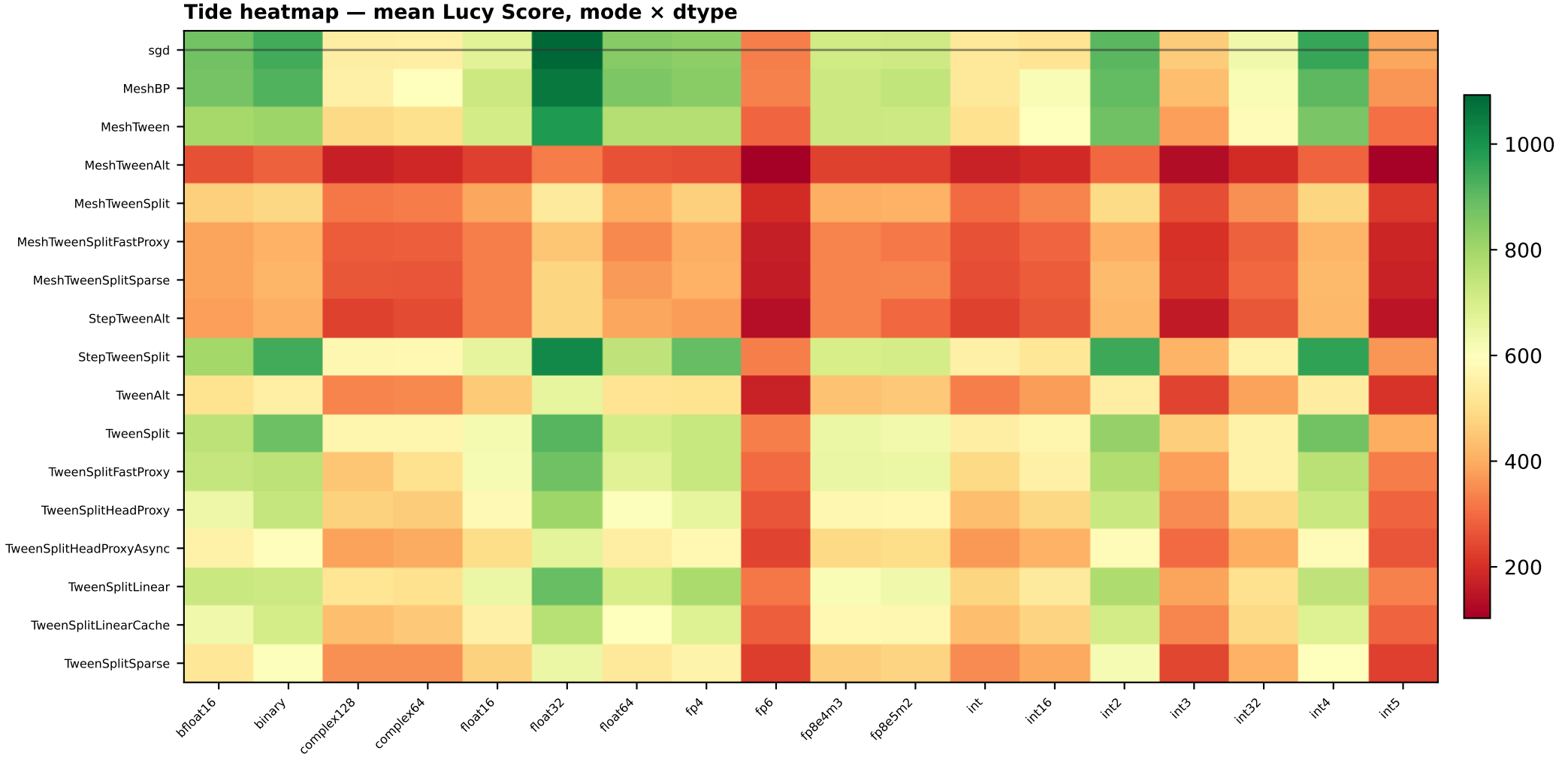
Score = Thru × Avail × Acc / 10k. High Score without Acc keep is a trap — see trap heatmap.



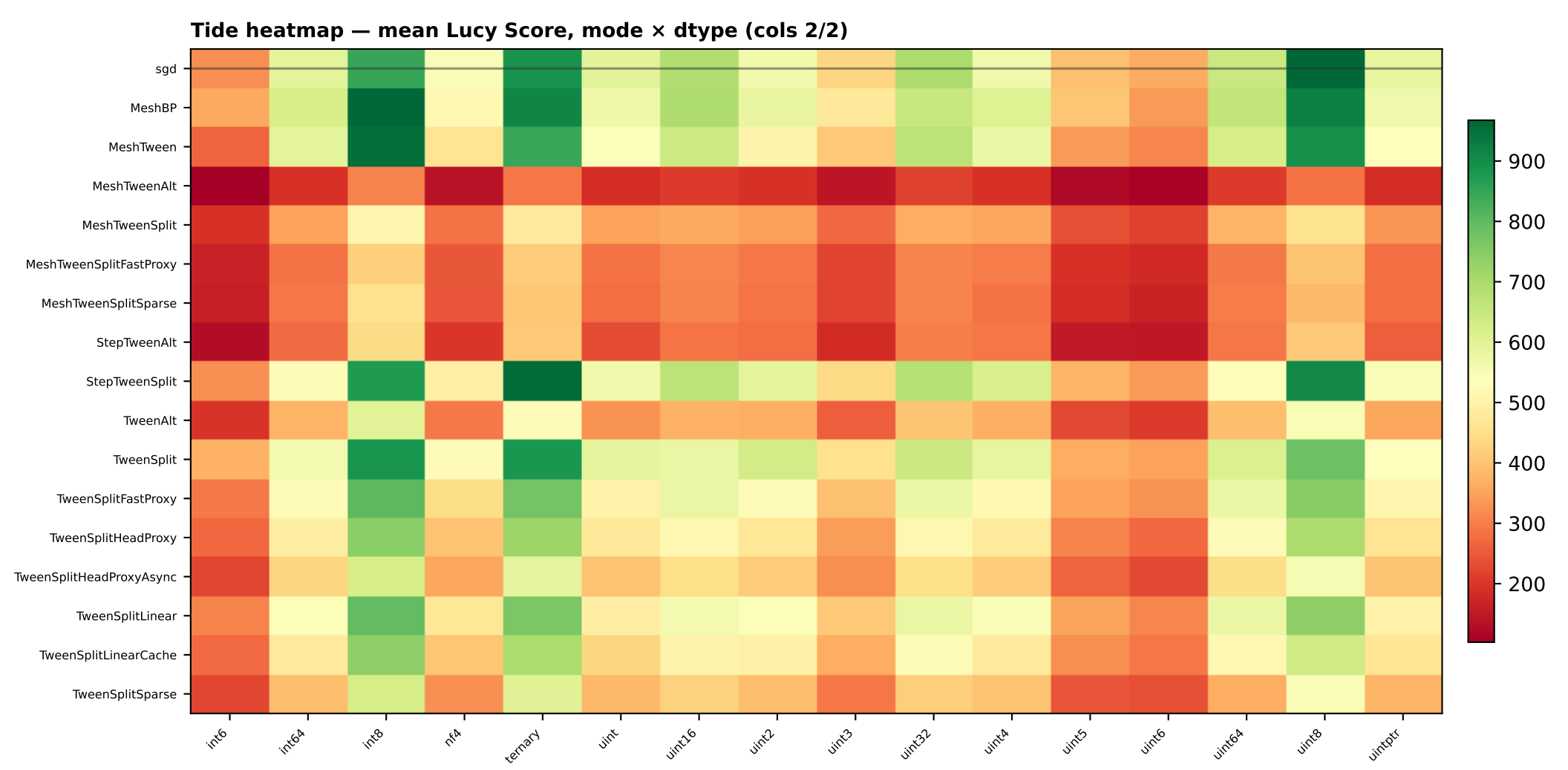
Each cell = mean Acc for that mode on that dtype across all layers/arch configs.



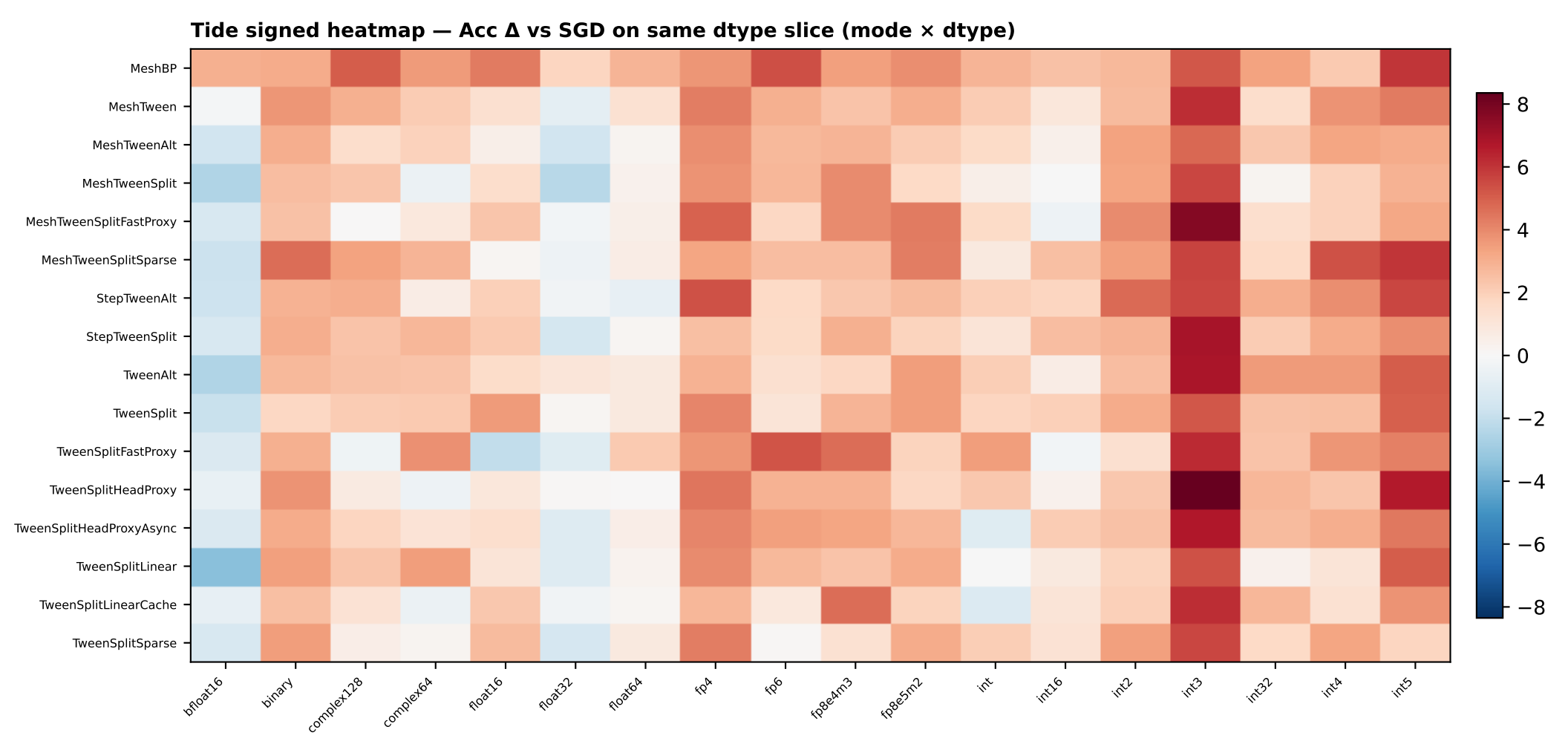
Each cell = mean Acc for that mode on that dtype across all layers/arch configs.



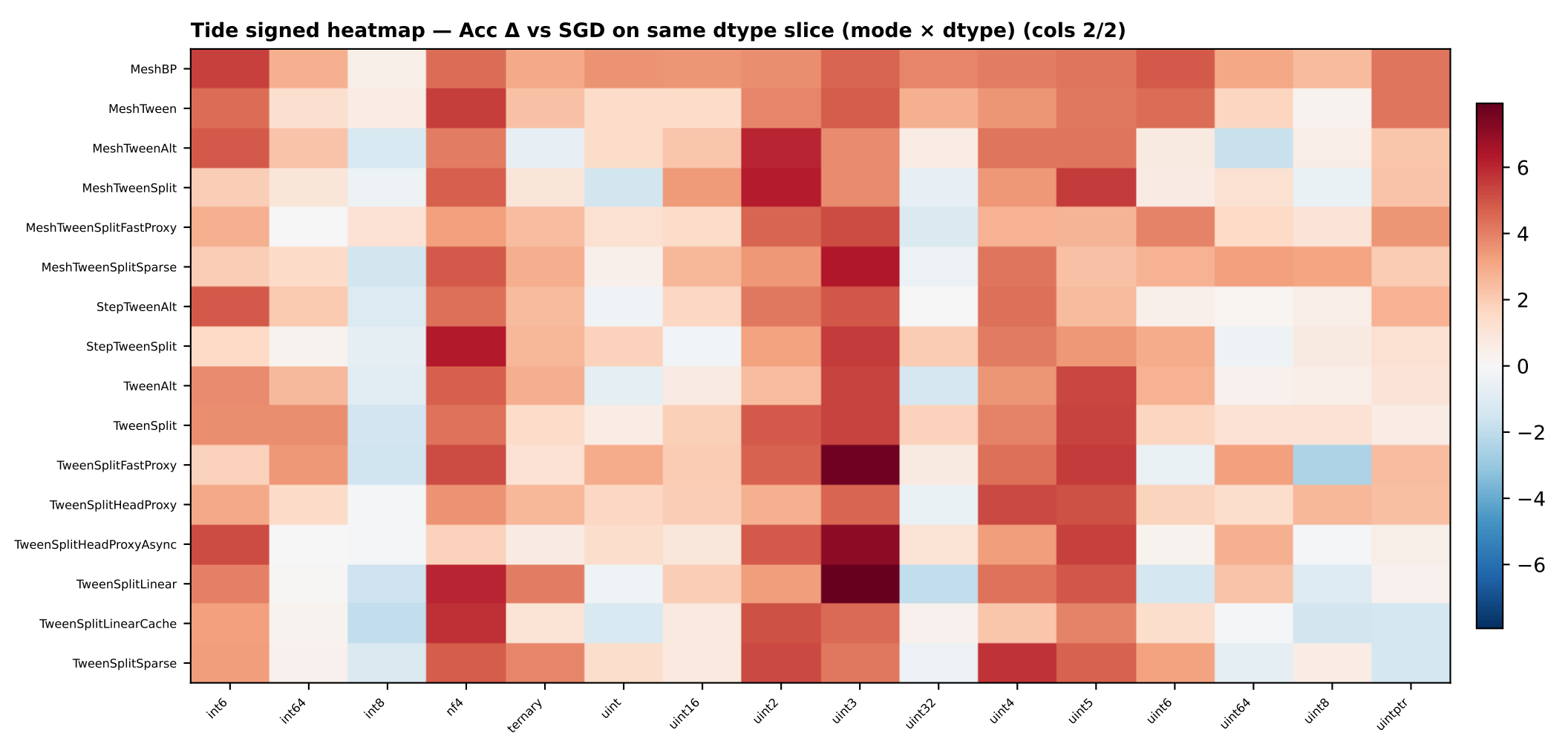
Bright Score on quant dtypes often = trap if Acc row for same mode is dim.



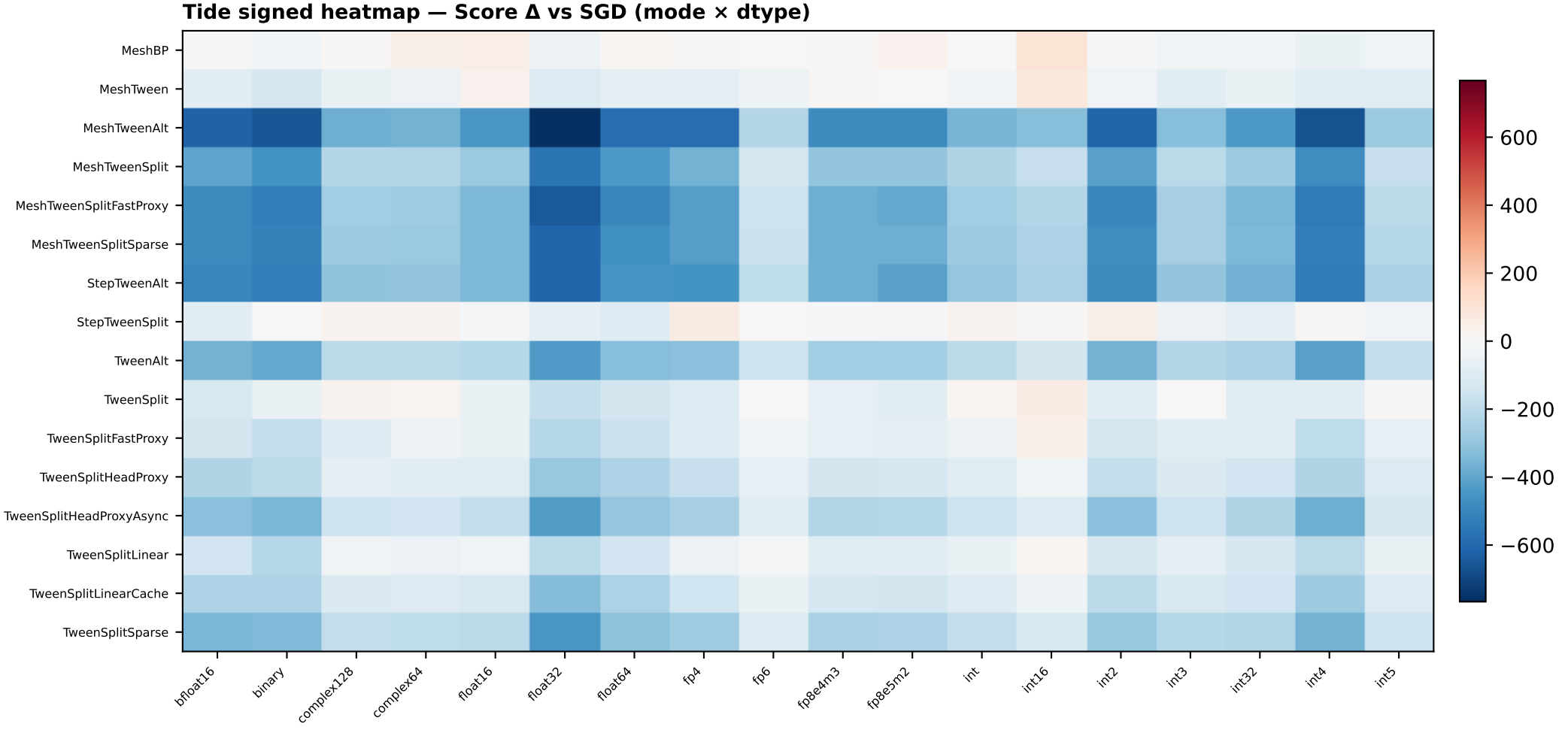
Bright Score on quant dtypes often = trap if Acc row for same mode is dim.



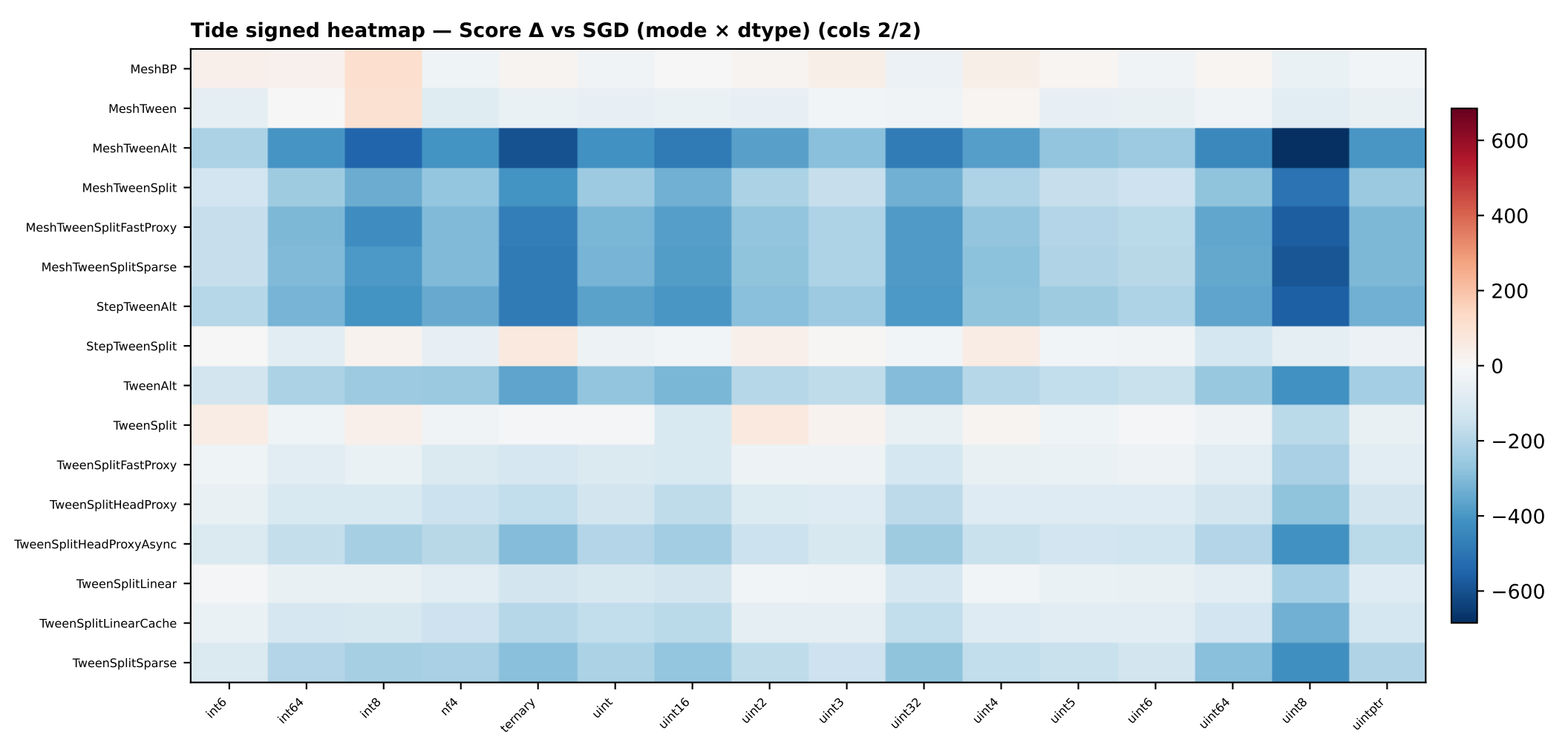
Red = worse than SGD mean on that dtype; blue = better. SGD is always Δ=0.



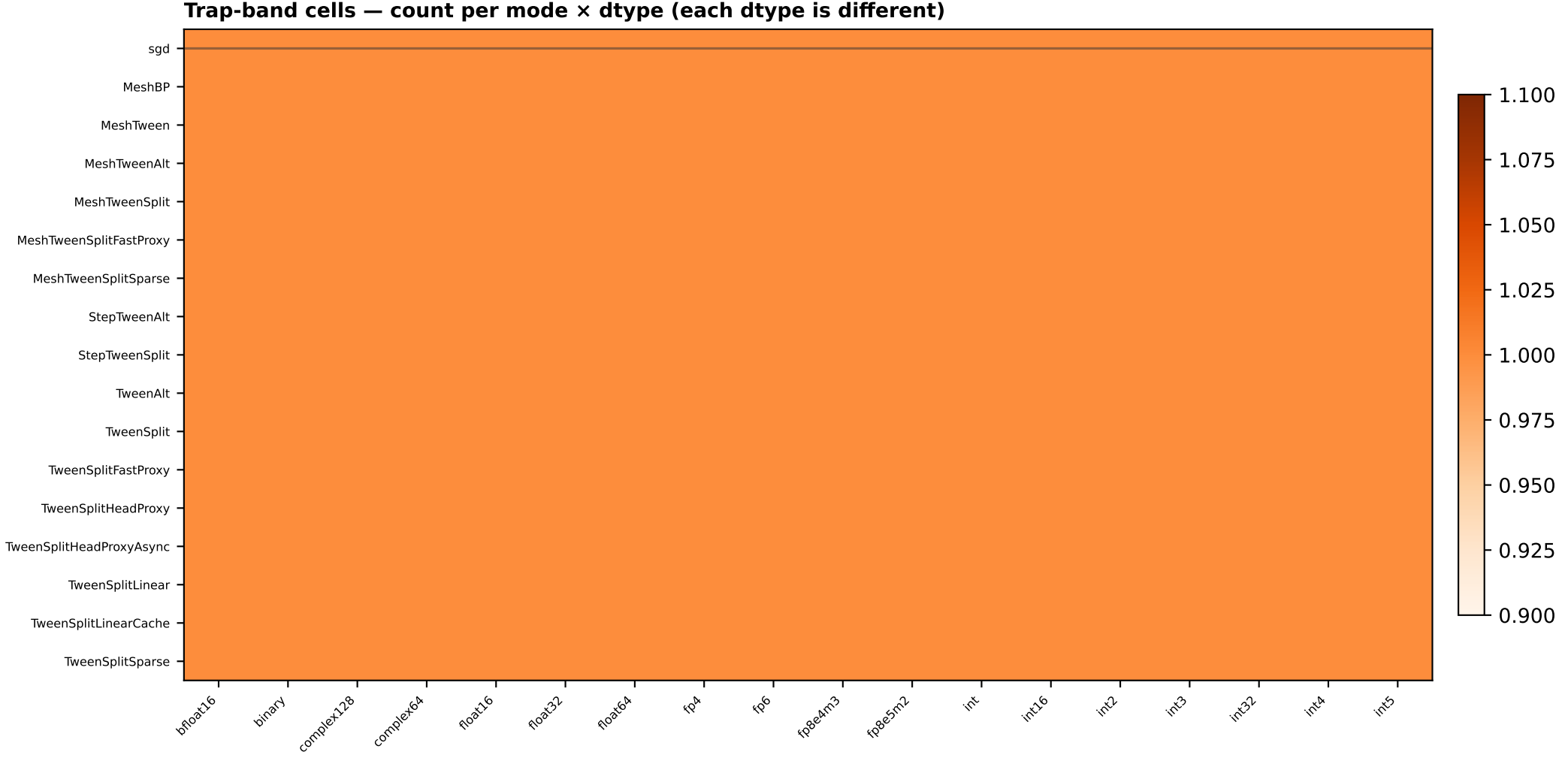
Red = worse than SGD mean on that dtype; blue = better. SGD is always Δ=0.

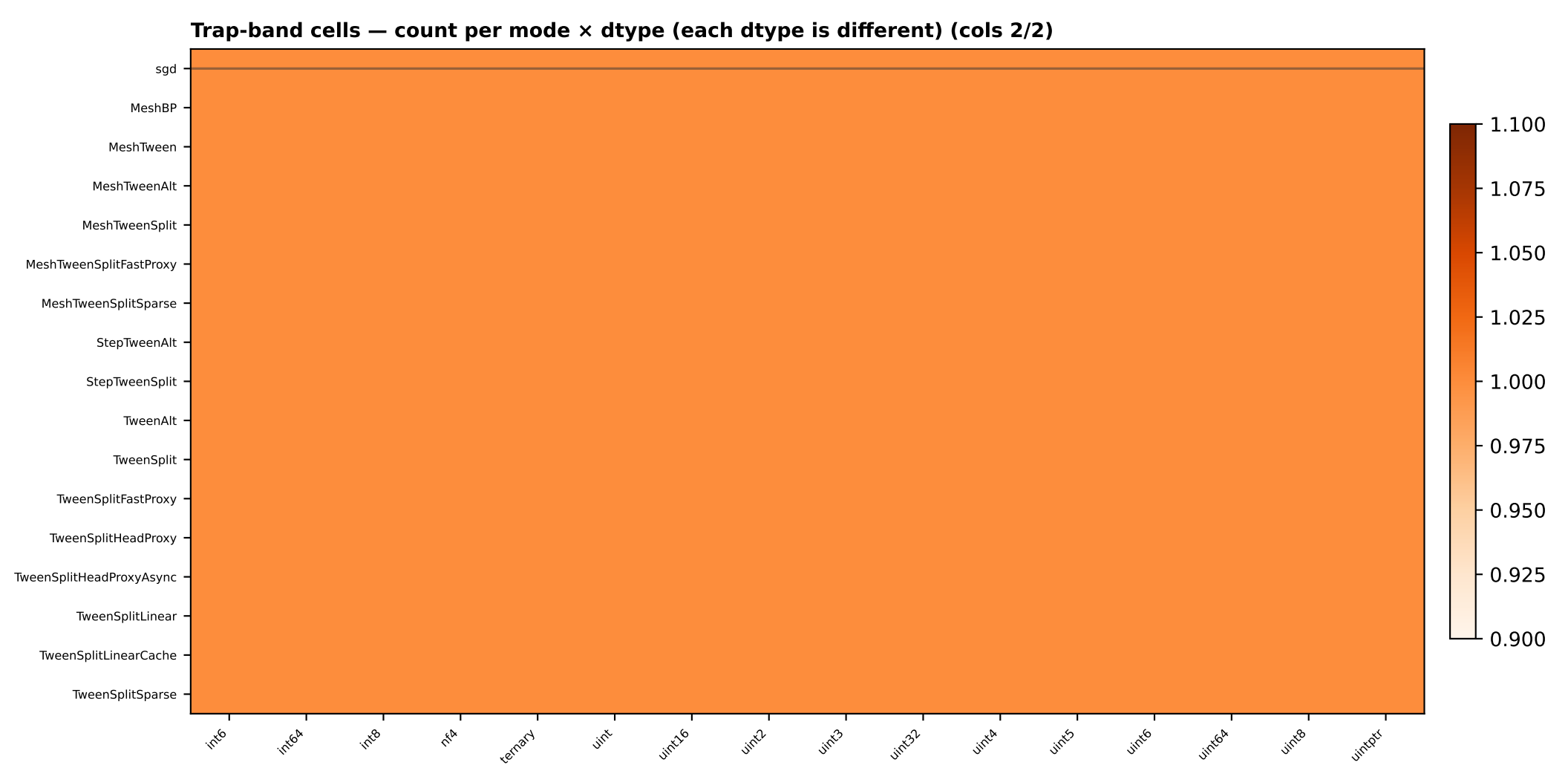


Large positive Score Δ with near-zero Acc Δ = classic trap pattern.

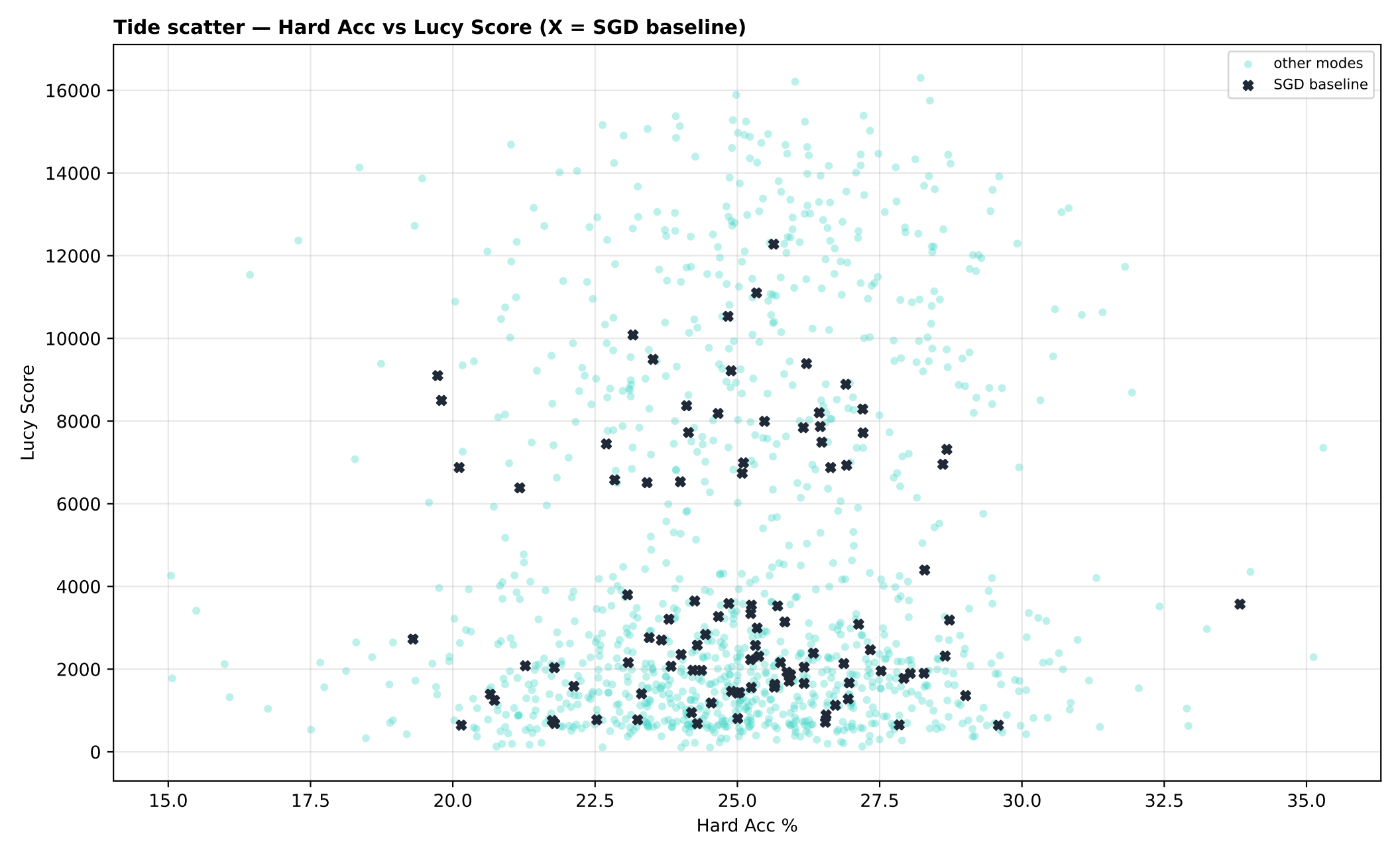


Large positive Score Δ with near-zero Acc Δ = classic trap pattern.

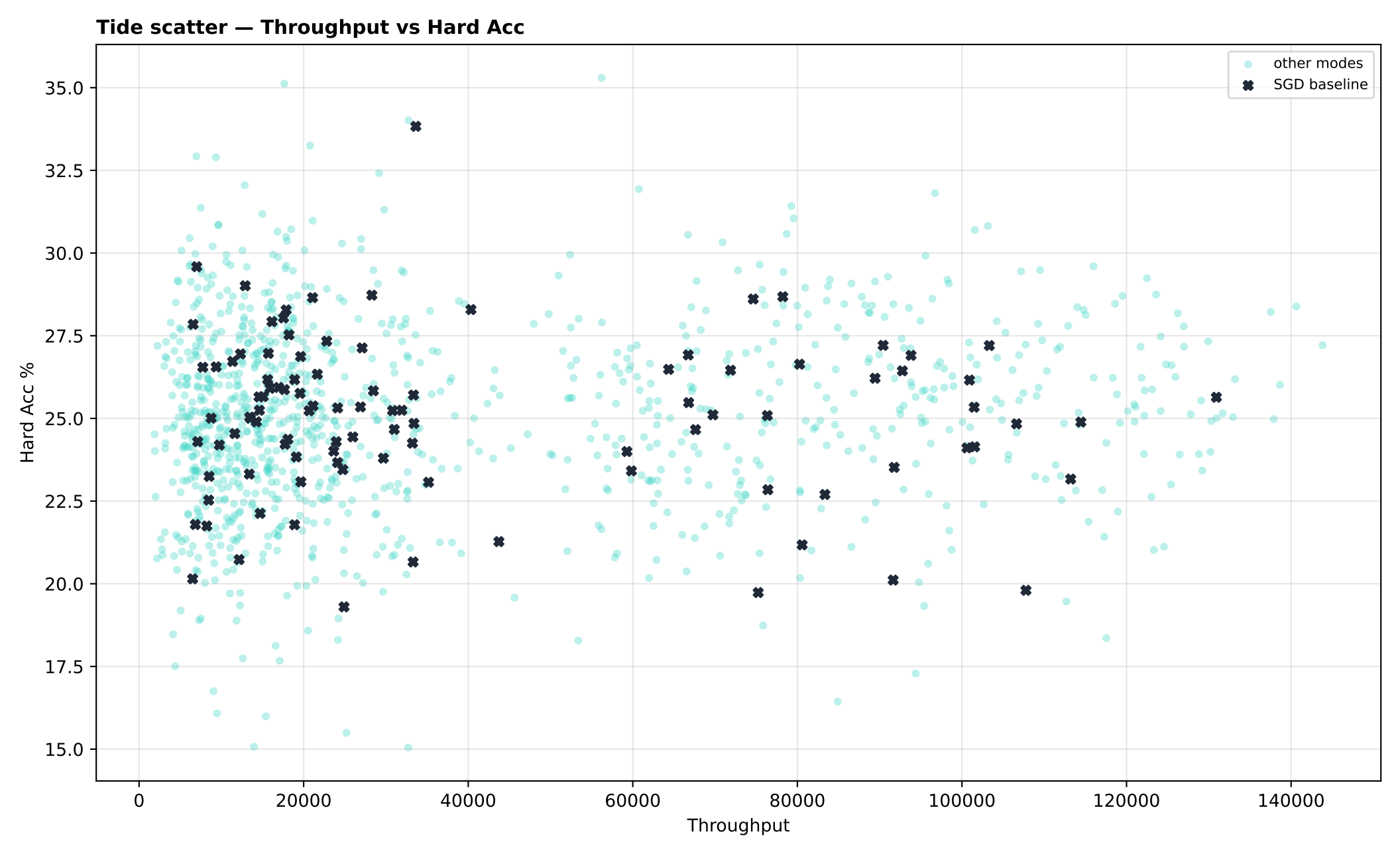

Trap-band cells — count per mode × dtype (each dtype is different)
sgd
MeshBP
MeshTween
MeshTweenAlt
MeshTweenSplit
MeshTweenSplitFastProxy
MeshTweenSplitSparse
StepTweenAlt
StepTweenSplit
TweenAlt
TweenSplit
TweenSplitFastProxy
TweenSplitHeadProxy
TweenSplitHeadProxyAsync
TweenSplitLinear
TweenSplitLinearCache
TweenSplitSparse
bfloat16
binary
complex128
complex64
float16
float32
float64
fp4
fp6
fp8e4m3
fp8e5m2
int
int16
int2
int3
int32
int4
int5
1.100
1.075
1.050
1.025
1.000
0.975
0.950
0.925
0.900
Trap = tiny RAM + Acc keep <70%. Not all quant dtypes trap equally — read per column.

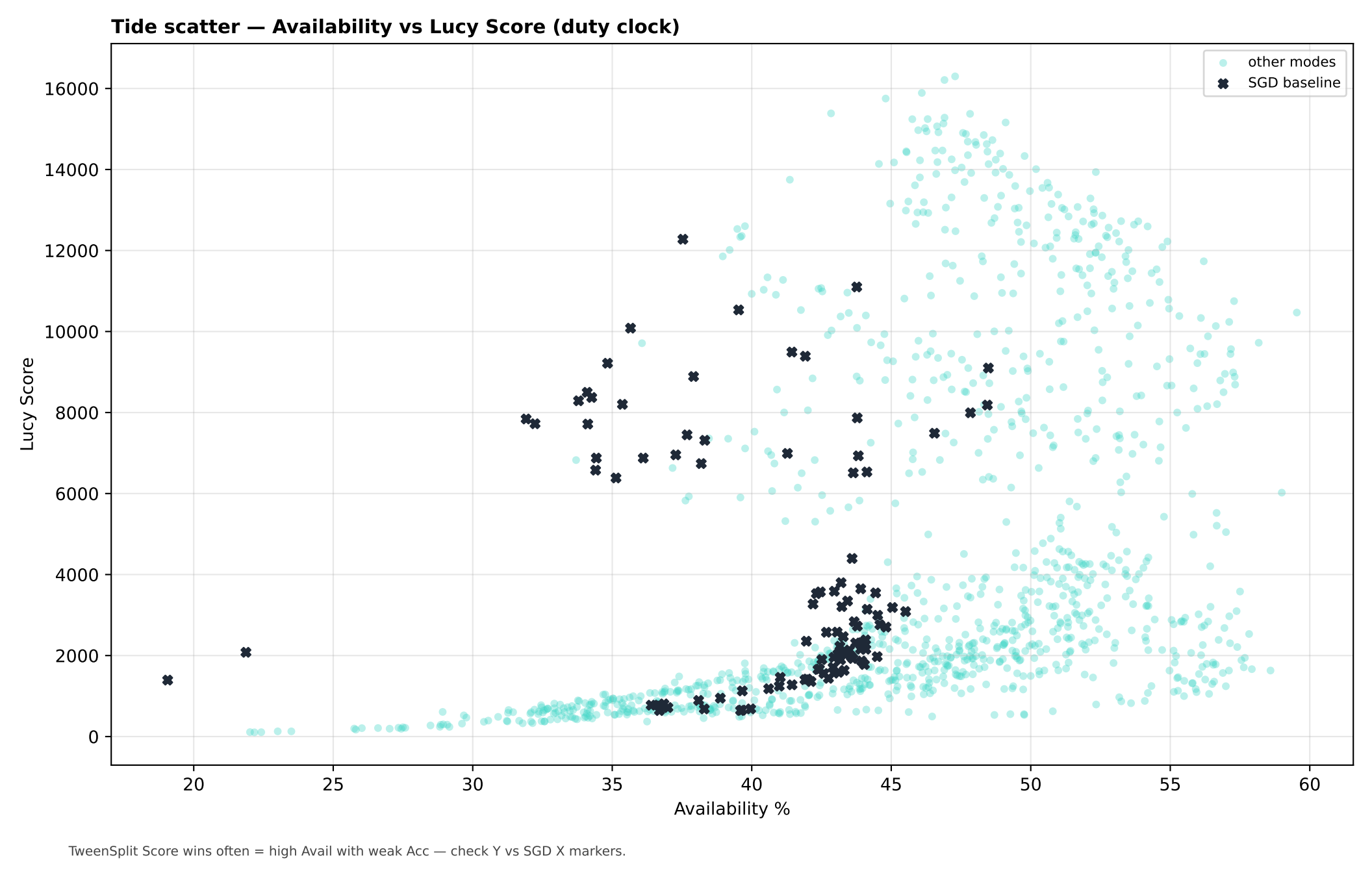


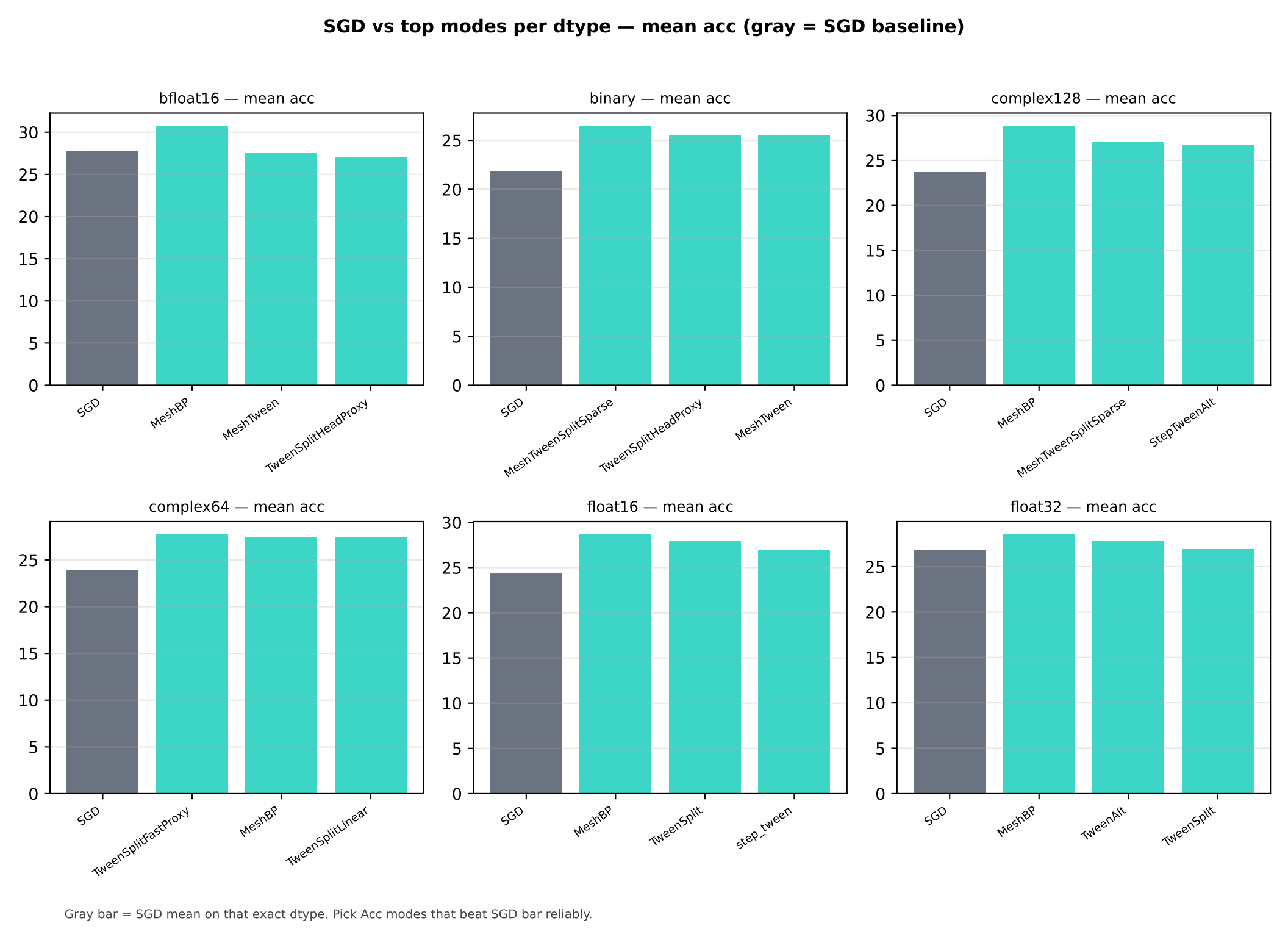
Trap = tiny RAM + Acc keep <70%. Not all quant dtypes trap equally — read per column.

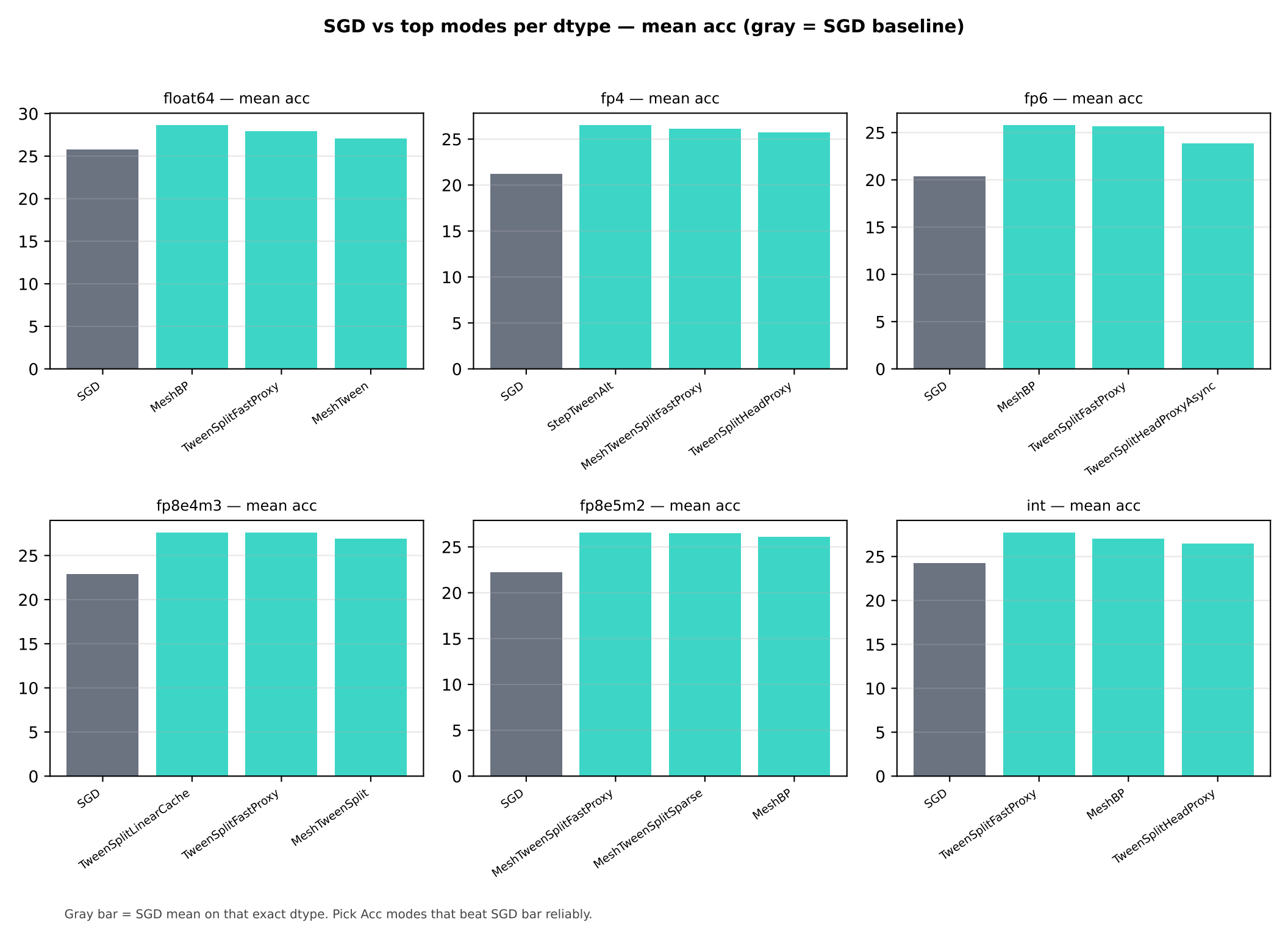


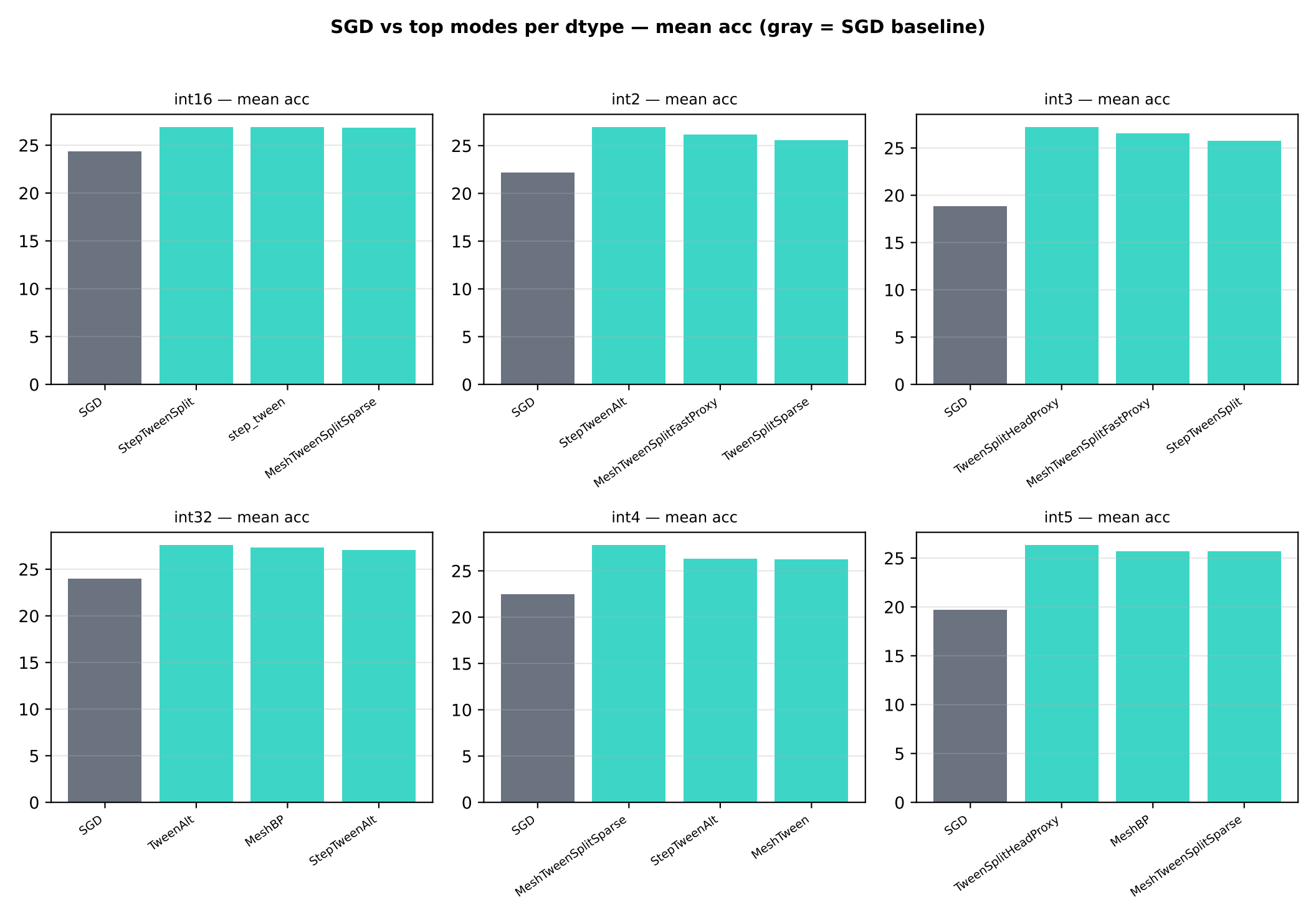
Black X = every SGD cell. Points above-right of SGD cloud with high Acc = real wins.

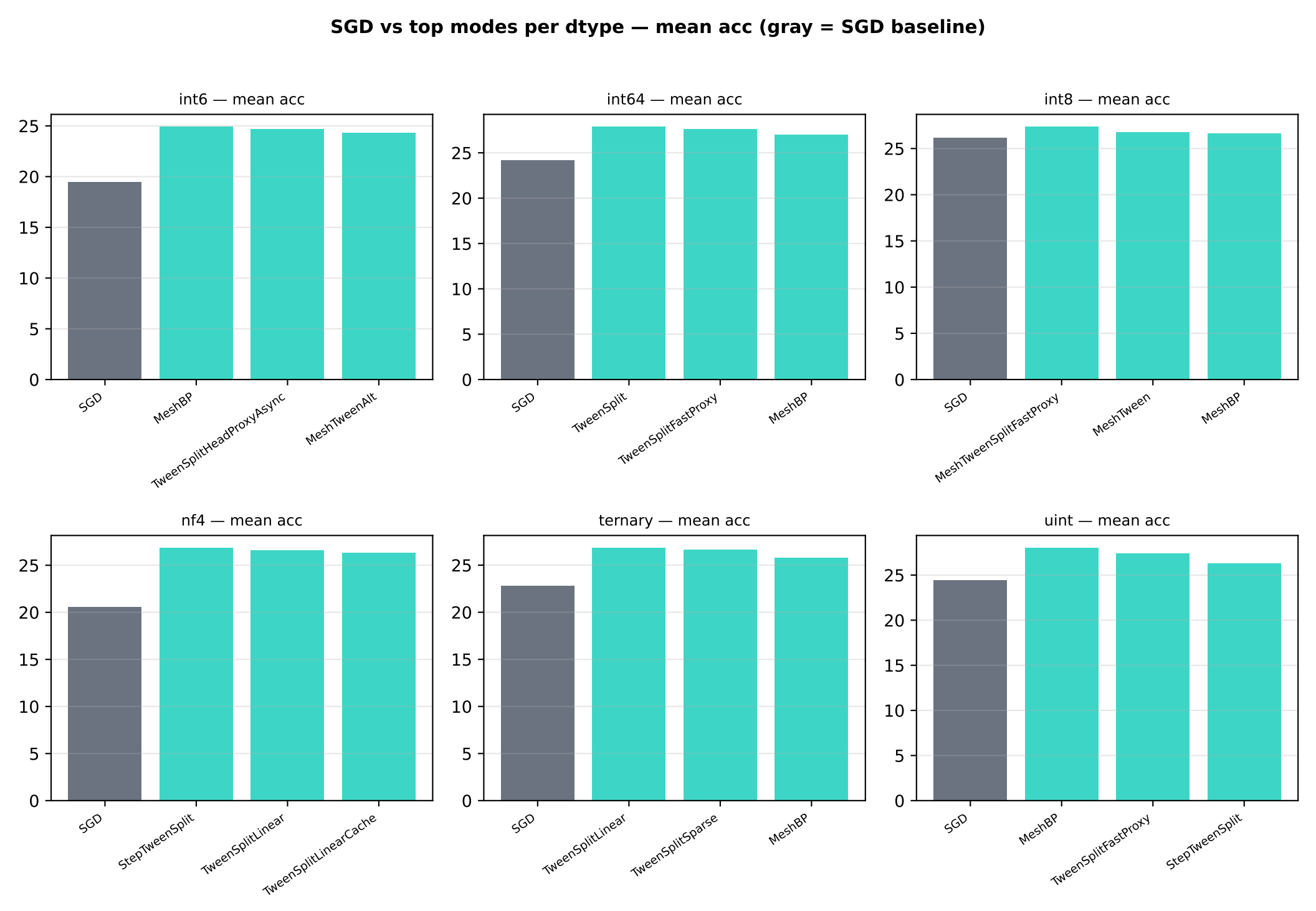

Tide scatter — Throughput vs Hard Acc
other modes
SGD baseline
Hard Acc %
Throughput
35.0
32.5
30.0
27.5
25.0
22.5
20.0
17.5
15.0
0
20000
40000
60000
80000
100000
120000
140000
SGD often mid Acc but low Thru — tweens pull right (Thru) more than up (Acc).

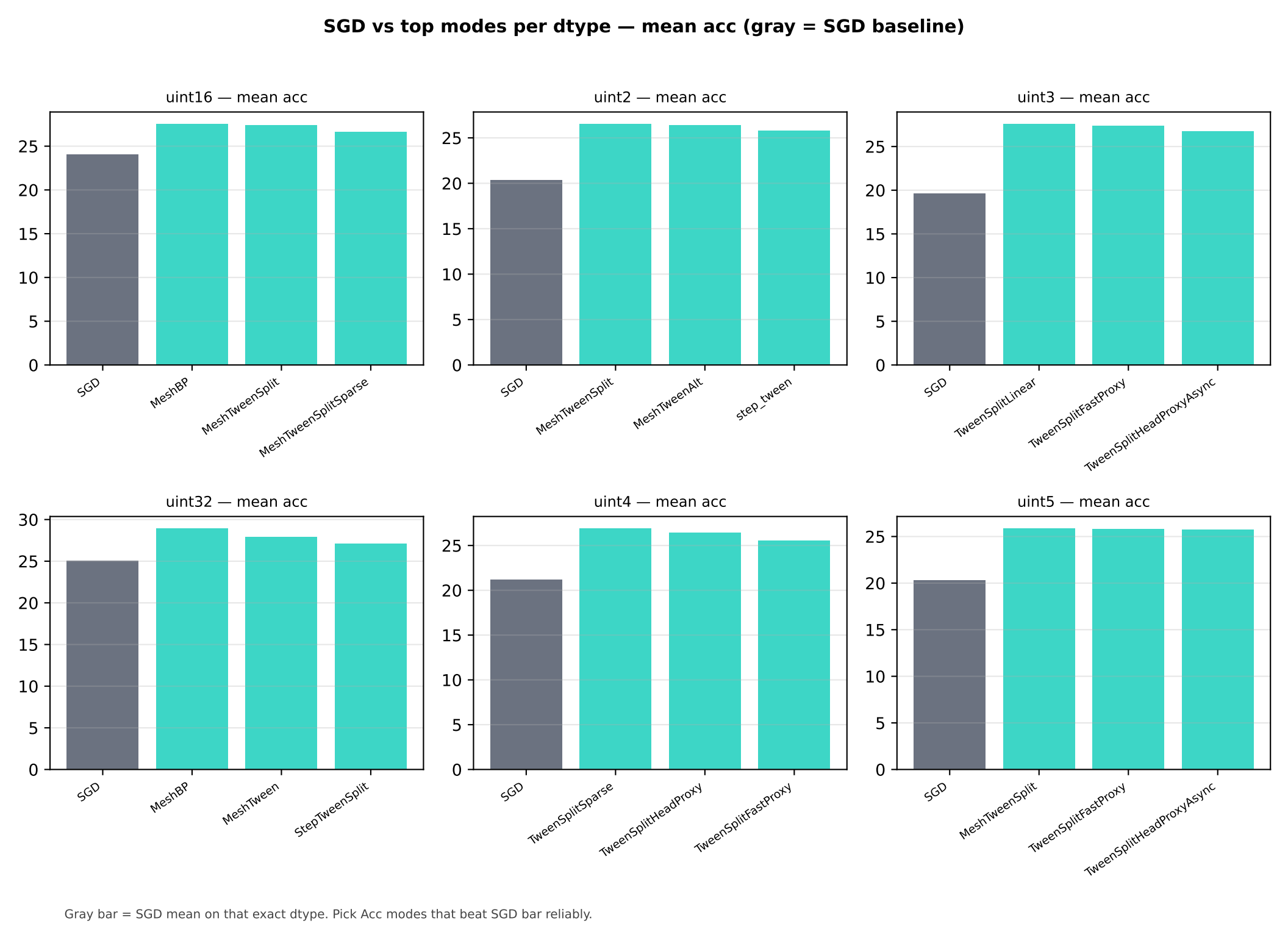

Tide scatter — Availability vs Lucy Score (duty clock)
other modes
SGD baseline
Lucy Score
Availability %
0
2000
4000
6000
8000
10000
12000
14000
16000
20
25
30
35
40
45
50
55
60
TweenSplit Score wins often = high Avail with weak Acc — check Y vs SGD X markers.


SGD vs top modes per dtype — mean acc (gray = SGD baseline)
bfloat16 — mean acc
SGD
MeshBP
MeshTween
TweenSplitHeadProxy
binary — mean acc
SGD
MeshTweenSplitSparse
TweenSplitHeadProxy
MeshTween
complex128 — mean acc
SGD
MeshBP
MeshTweenSplitSparse
StepTweenAlt
complex64 — mean acc
SGD
TweenSplitFastProxy
MeshBP
TweenSplitLinear
float16 — mean acc
SGD
MeshBP
TweenSplit
step_tween
float32 — mean acc
SGD
MeshBP
TweenAlt
TweenSplit
Gray bar = SGD mean on that exact dtype. Pick Acc modes that beat SGD bar reliably.

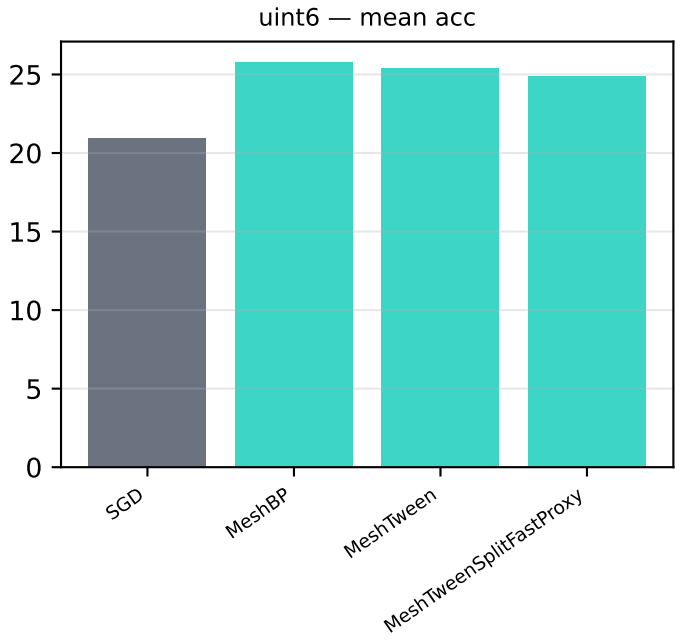

SGD vs top modes per dtype — mean acc (gray = SGD baseline)
float64 — mean acc
SGD
MeshBP
TweenSplitFastProxy
MeshTween
fp4 — mean acc
SGD
StepTweenAlt
MeshTweenSplitFastProxy
TweenSplitHeadProxy
fp6 — mean acc
SGD
MeshBP
TweenSplitFastProxy
TweenSplitHeadProxyAsync
fp8e4m3 — mean acc
SGD
TweenSplitLinearCache
TweenSplitFastProxy
MeshTweenSplit
fp8e5m2 — mean acc
SGD
MeshTweenSplitFastProxy
MeshTweenSplitSparse
MeshBP
int — mean acc
SGD
TweenSplitFastProxy
MeshBP
TweenSplitHeadProxy
Gray bar = SGD mean on that exact dtype. Pick Acc modes that beat SGD bar reliably.

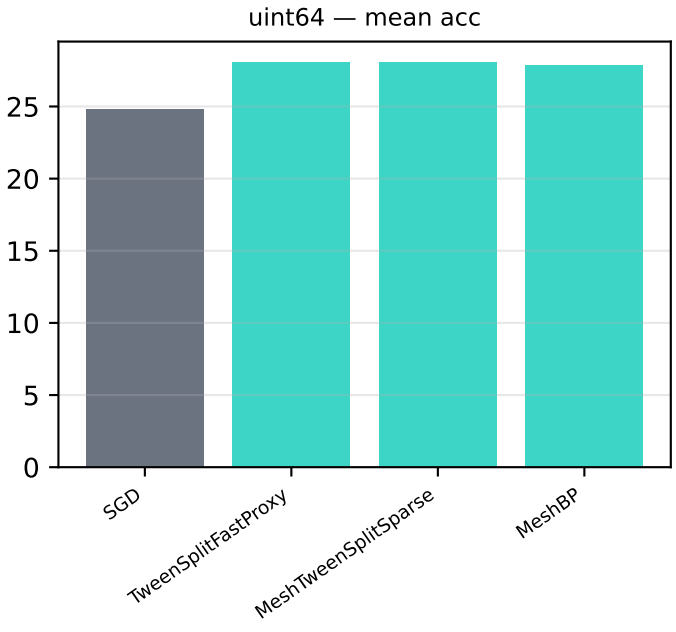

SGD vs top modes per dtype — mean acc (gray = SGD baseline)
int16 — mean acc
SGD
StepTweenSplit
step_tween
MeshTweenSplitSparse
int2 — mean acc
SGD
StepTweenAlt
MeshTweenSplitFastProxy
TweenSplitSparse
int3 — mean acc
SGD
TweenSplitHeadProxy
MeshTweenSplitFastProxy
StepTweenSplit
int32 — mean acc
SGD
TweenAlt
MeshBP
StepTweenAlt
int4 — mean acc
SGD
MeshTweenSplitSparse
StepTweenAlt
MeshTween
int5 — mean acc
SGD
TweenSplitHeadProxy
MeshBP
MeshTweenSplitSparse
Gray bar = SGD mean on that exact dtype. Pick Acc modes that beat SGD bar reliably.

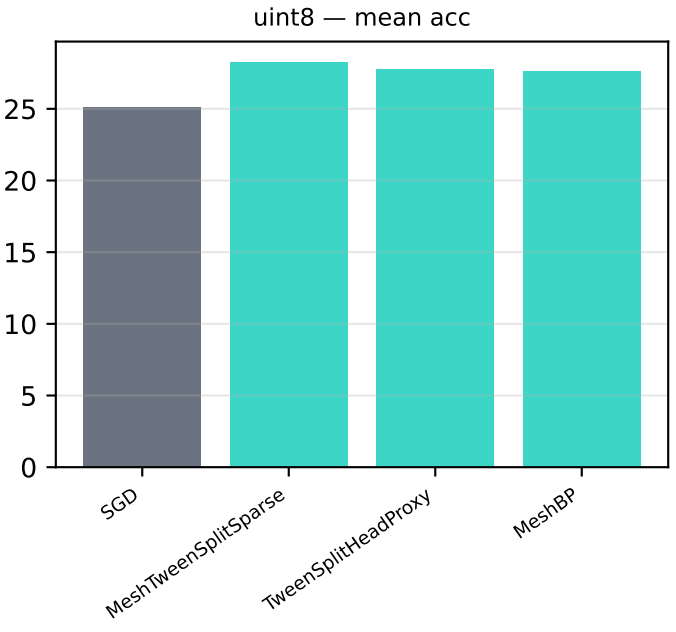

SGD vs top modes per dtype — mean acc (gray = SGD baseline)
int6 — mean acc
SGD
MeshBP
TweenSplitHeadProxyAsync
MeshTweenAlt
int64 — mean acc
SGD
TweenSplit
TweenSplitFastProxy
MeshBP
int8 — mean acc
SGD
MeshTweenSplitFastProxy
MeshTween
MeshBP
nf4 — mean acc
SGD
StepTweenSplit
TweenSplitLinear
TweenSplitLinearCache
ternary — mean acc
SGD
TweenSplitLinear
TweenSplitSparse
MeshBP
uint — mean acc
SGD
MeshBP
TweenSplitFastProxy
StepTweenSplit
Gray bar = SGD mean on that exact dtype. Pick Acc modes that beat SGD bar reliably.

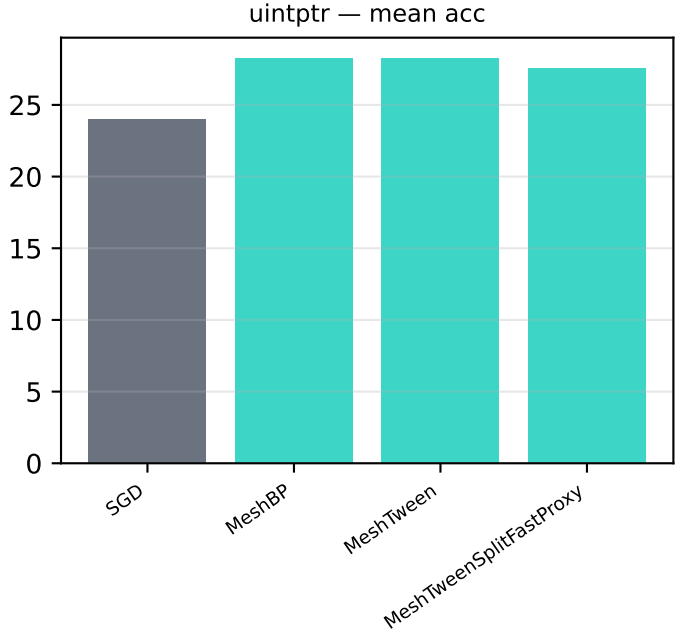

SGD vs top modes per dtype — mean acc (gray = SGD baseline)
uint16 — mean acc
SGD
MeshBP
MeshTweenSplit
MeshTweenSplitSparse
uint2 — mean acc
SGD
MeshTweenSplit
MeshTweenAlt
step_tween
uint3 — mean acc
SGD
TweenSplitLinear
TweenSplitFastProxy
TweenSplitHeadProxyAsync
uint32 — mean acc
SGD
MeshBP
MeshTween
StepTweenSplit
uint4 — mean acc
SGD
TweenSplitSparse
TweenSplitHeadProxy
TweenSplitFastProxy
uint5 — mean acc
SGD
MeshTweenSplit
TweenSplitFastProxy
TweenSplitHeadProxyAsync
Gray bar = SGD mean on that exact dtype. Pick Acc modes that beat SGD bar reliably.

SGD vs top modes per dtype — mean acc (gray = SGD baseline)

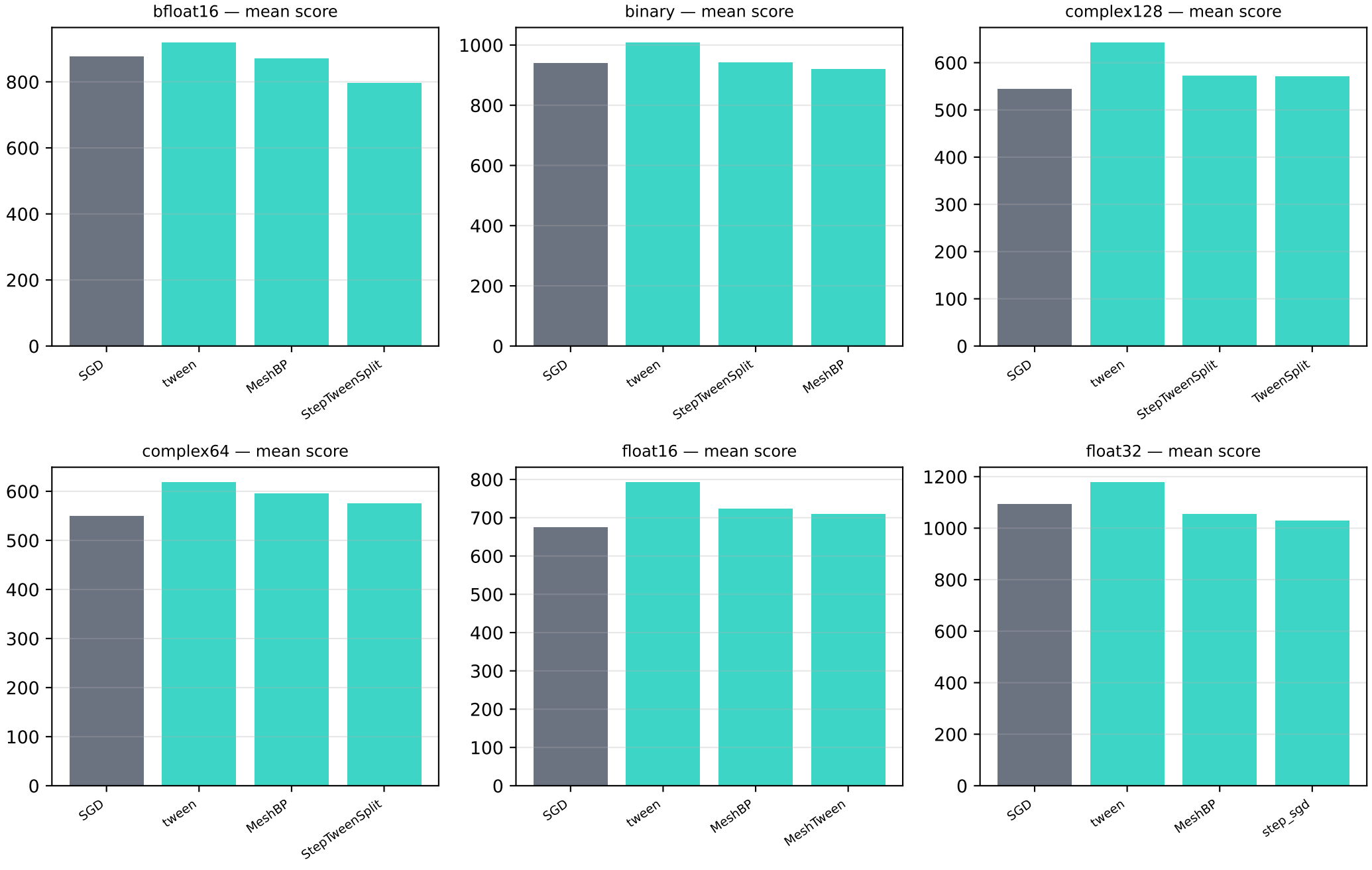




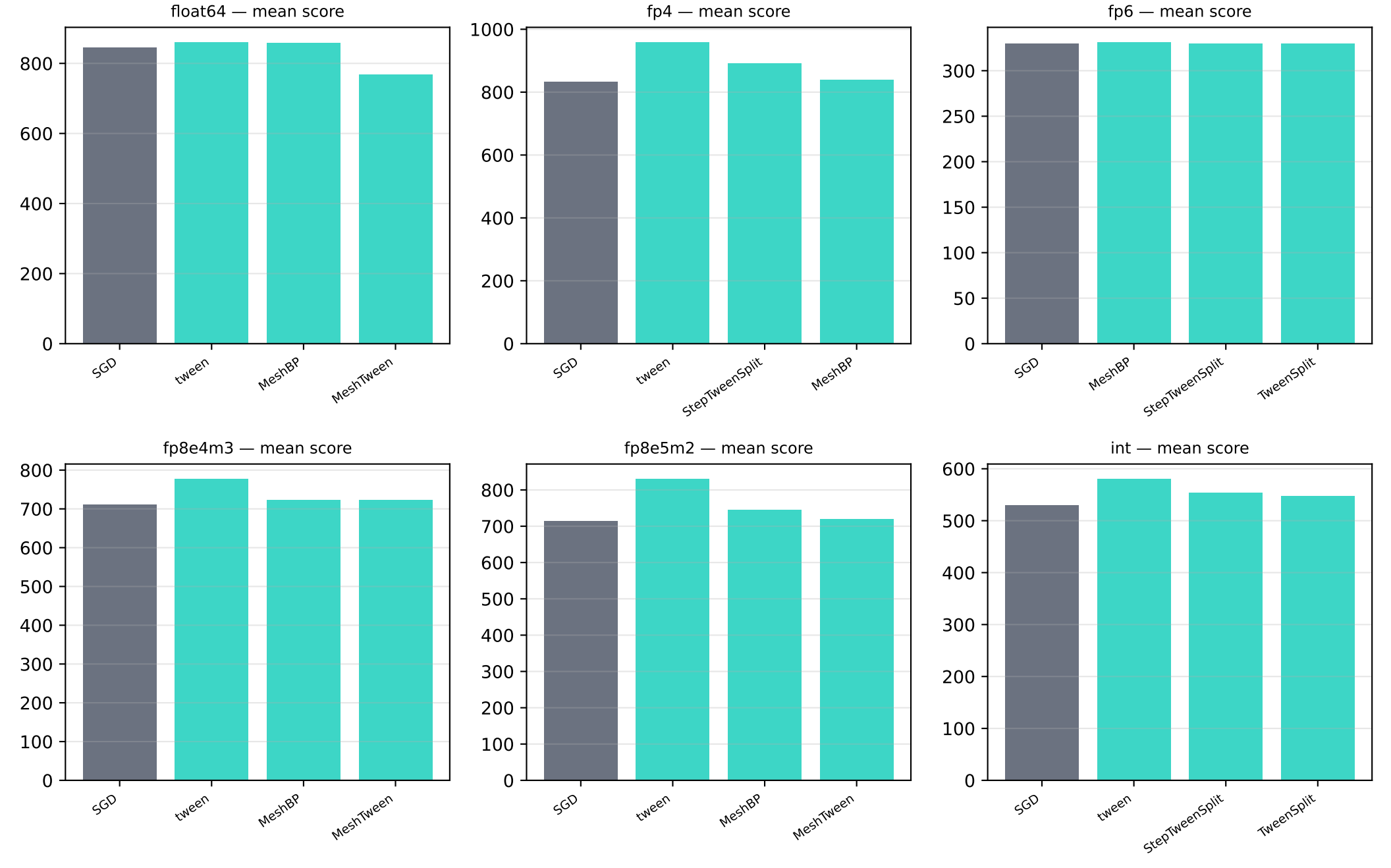




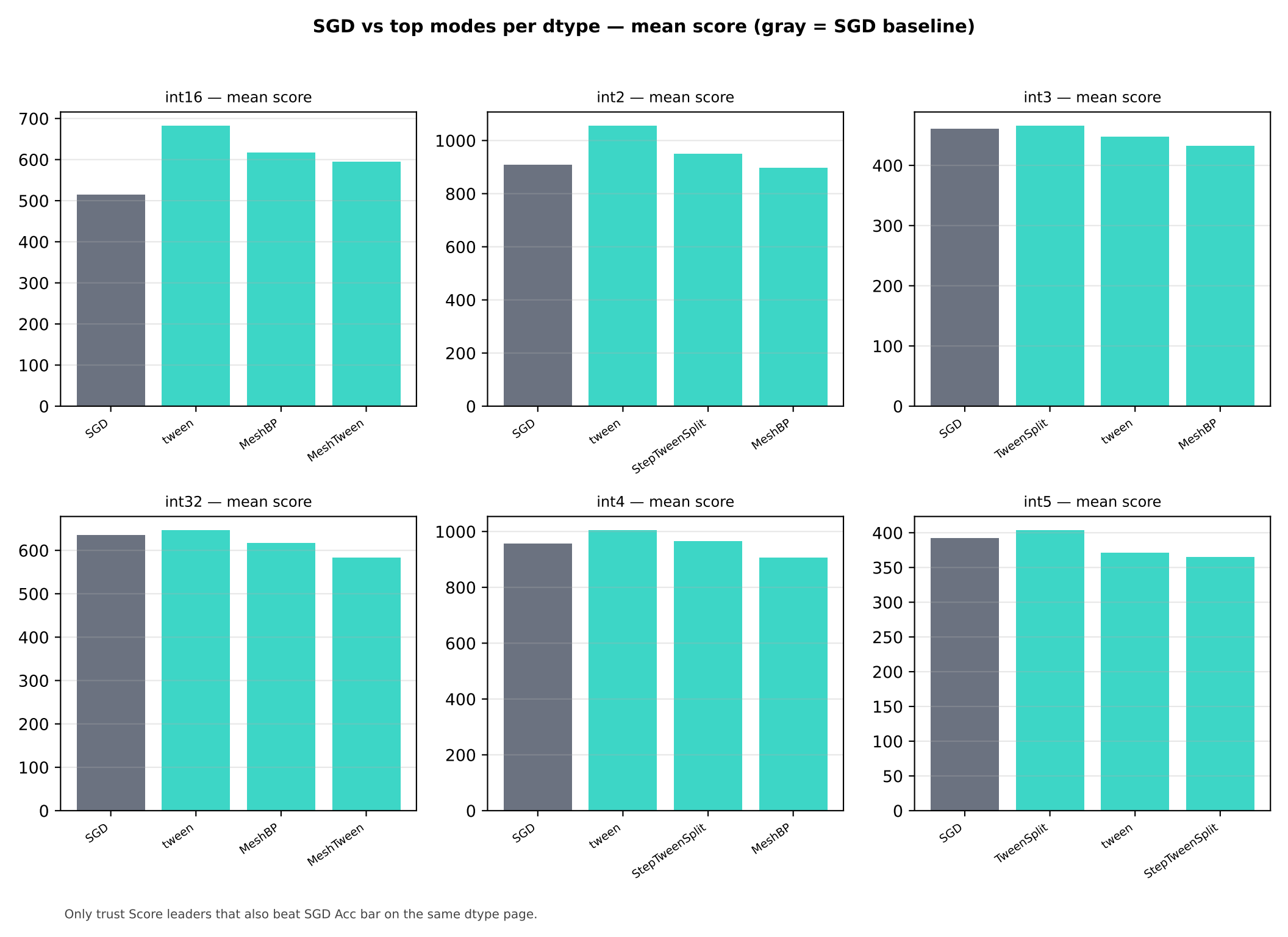
Gray bar = SGD mean on that exact dtype. Pick Acc modes that beat SGD bar reliably.


SGD vs top modes per dtype — mean score (gray = SGD baseline)
bfloat16 — mean score
SGD
tween
MeshBP
StepTweenSplit
binary — mean score
SGD
tween
StepTweenSplit
MeshBP
complex128 — mean score
SGD
tween
StepTweenSplit
TweenSplit
complex64 — mean score
SGD
tween
MeshBP
StepTweenSplit
float16 — mean score
SGD
tween
MeshBP
MeshTween
float32 — mean score
SGD
tween
MeshBP
step_sgd
Only trust Score leaders that also beat SGD Acc bar on the same dtype page.

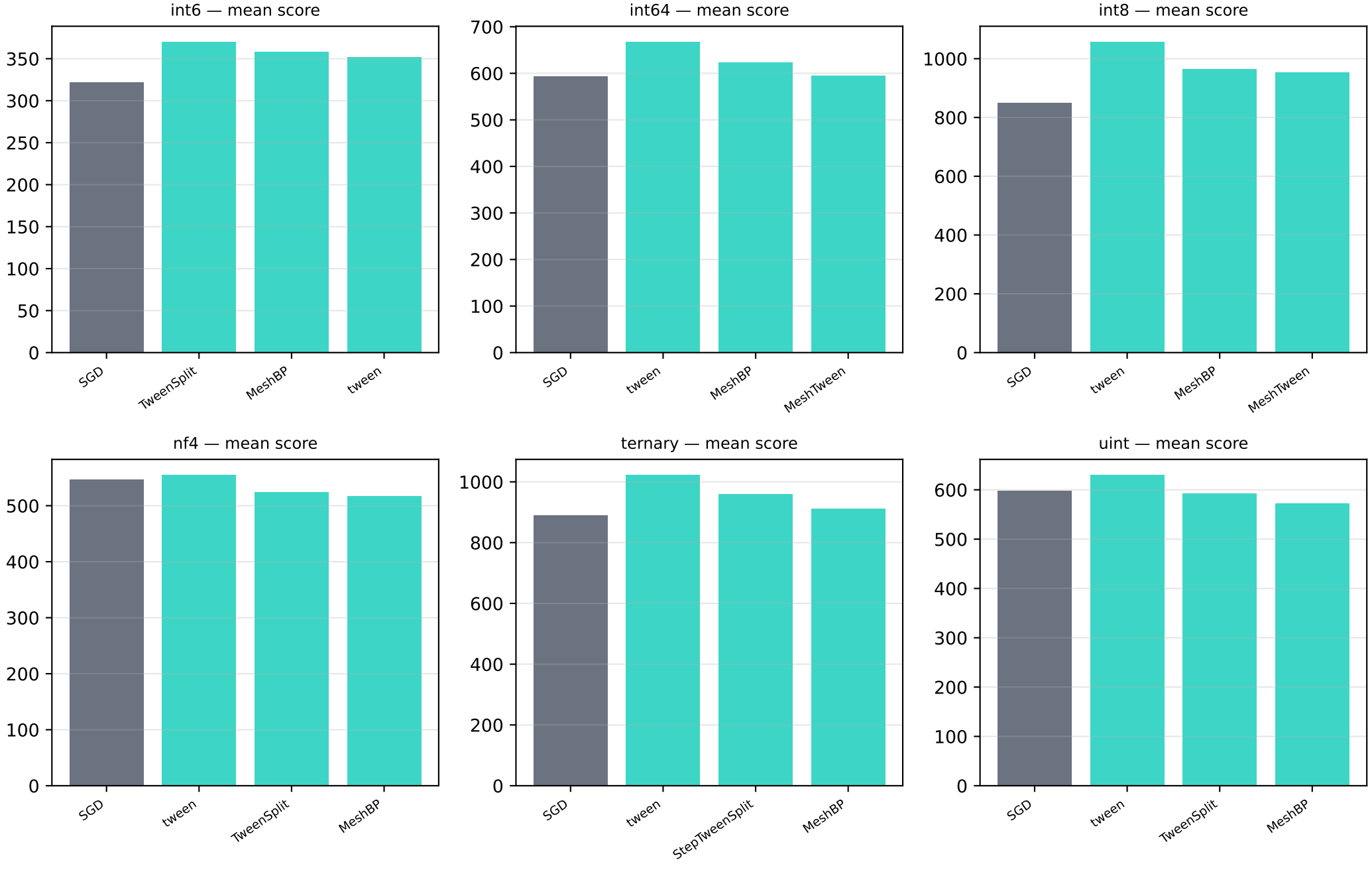
SGD vs top modes per dtype — mean score (gray = SGD baseline)



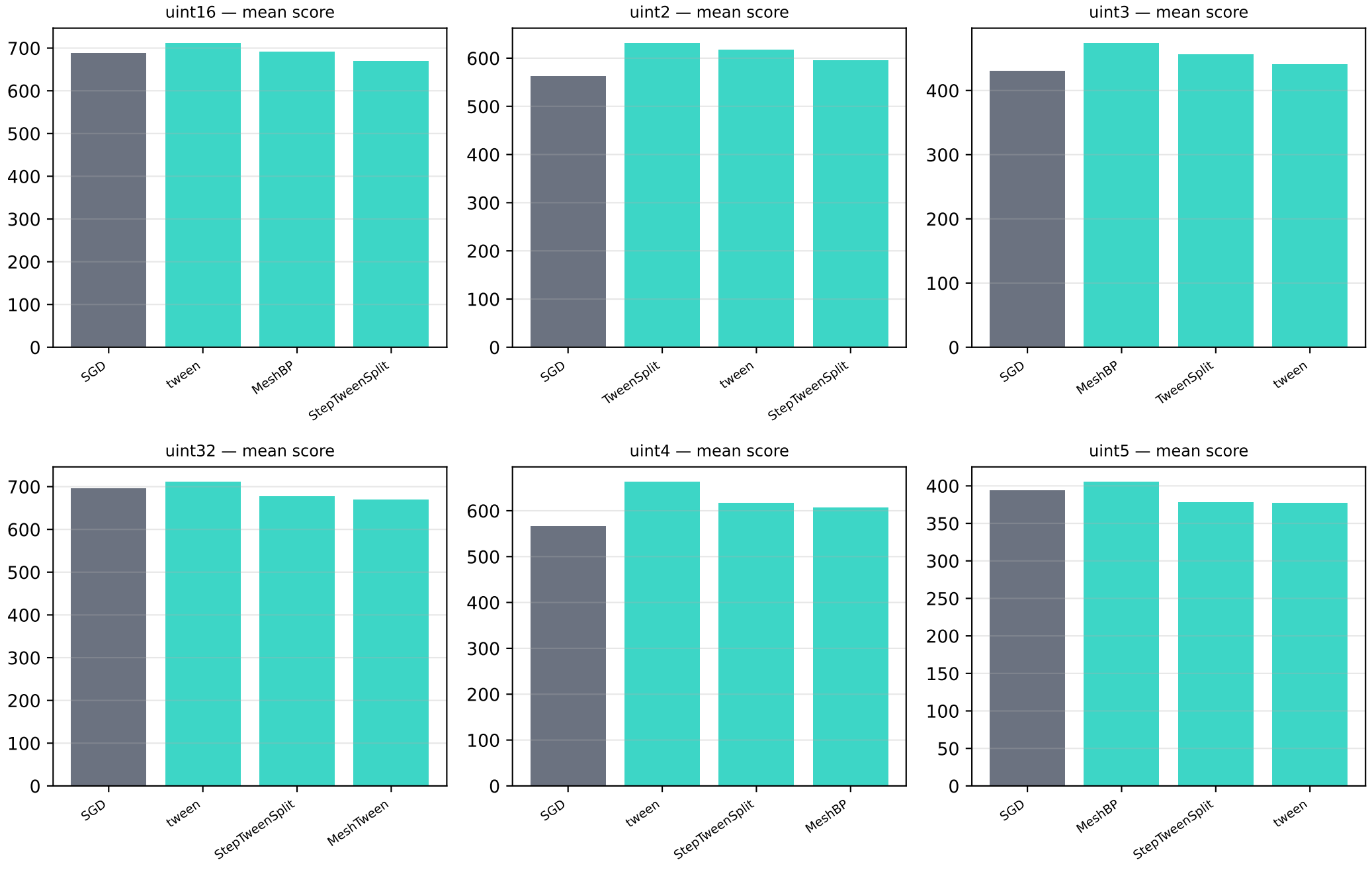
Only trust Score leaders that also beat SGD Acc bar on the same dtype page.


SGD vs top modes per dtype — mean score (gray = SGD baseline)
int16 — mean score
SGD
tween
MeshBP
MeshTween
int2 — mean score
SGD
tween
StepTweenSplit
MeshBP
int3 — mean score
SGD
TweenSplit
tween
MeshBP
int32 — mean score
SGD
tween
MeshBP
MeshTween
int4 — mean score
SGD
tween
StepTweenSplit
MeshBP
int5 — mean score
SGD
TweenSplit
tween
StepTweenSplit
Only trust Score leaders that also beat SGD Acc bar on the same dtype page.

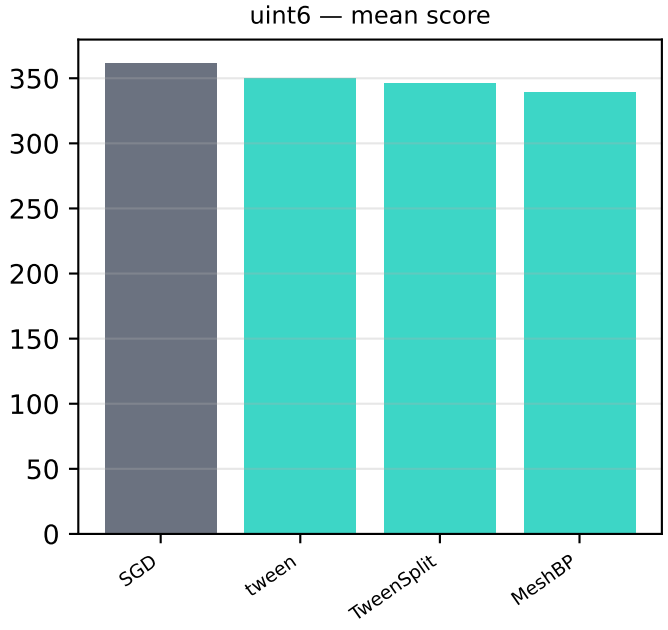
SGD vs top modes per dtype — mean score (gray = SGD baseline)

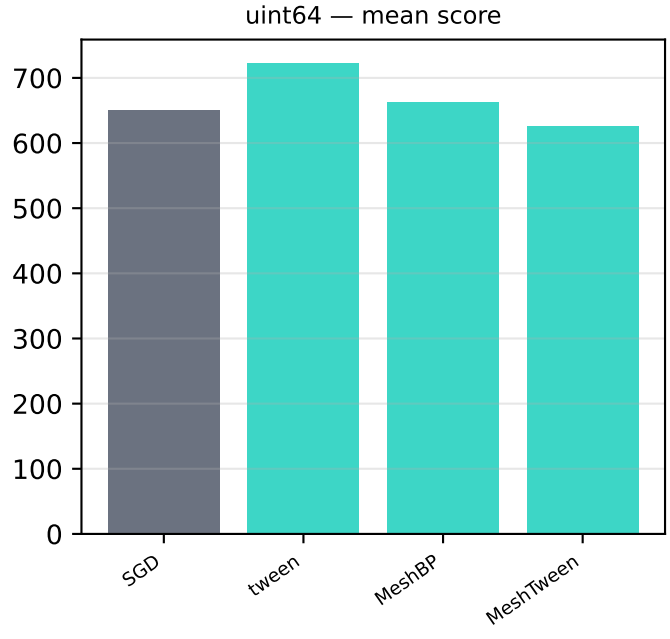


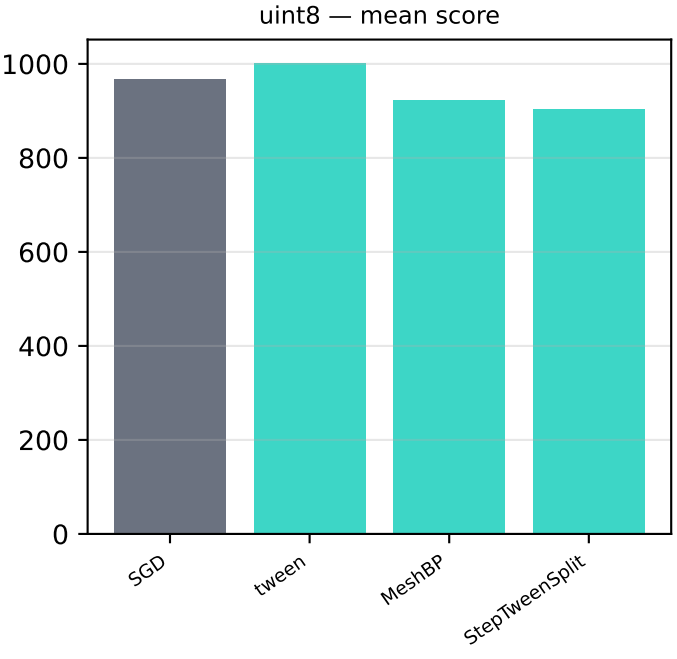
Only trust Score leaders that also beat SGD Acc bar on the same dtype page.

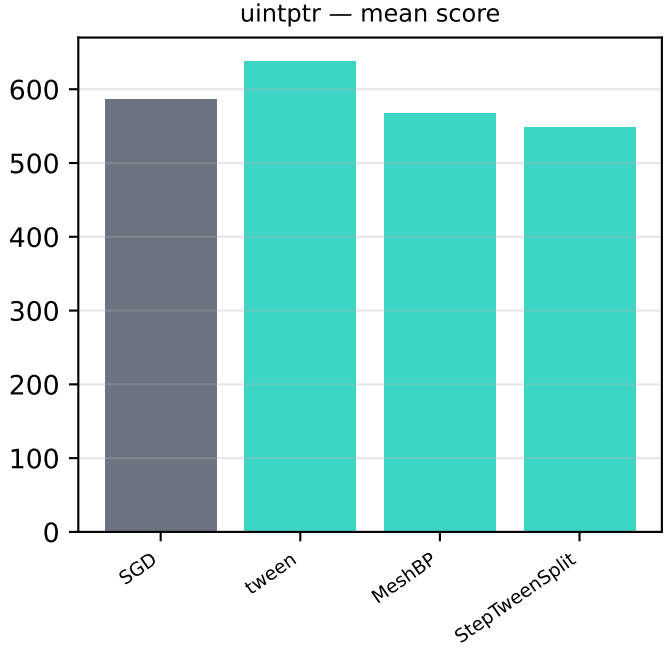

SGD vs top modes per dtype — mean score (gray = SGD baseline)
uint16 — mean score
SGD
tween
MeshBP
StepTweenSplit
uint2 — mean score
SGD
TweenSplit
tween
StepTweenSplit
uint3 — mean score
SGD
MeshBP
TweenSplit
tween
uint32 — mean score
SGD
tween
StepTweenSplit
MeshTween
uint4 — mean score
SGD
tween
StepTweenSplit
MeshBP
uint5 — mean score
SGD
MeshBP
StepTweenSplit
tween
Only trust Score leaders that also beat SGD Acc bar on the same dtype page.

SGD vs top modes per dtype — mean score (gray = SGD baseline)









Only trust Score leaders that also beat SGD Acc bar on the same dtype page.

Per-dtype trap distribution (each dtype — not lumped as “quant”)

dtype	cells	trap cells	trap %	SGD Acc	SGD Score	trap leader	Acc pick	real Score pick
bfloat16	1436	319	22%	27.7	875.9	sgd (15)	tween_chain (89.7%)	tween_chain (3)
binary	1435	1028	72%	21.8	939.6	sgd (48)	MeshTweenSpli… (74.3%)	tween (2)
complex128	1434	109	8%	23.7	543.9	sgd (5)	sgd (89.3%)	MeshBP (3)
complex64	1434	155	11%	23.9	548.9	sgd (7)	tween_chain (89.6%)	TweenSplitFas… (2)
float16	1436	331	23%	24.3	674.2	sgd (15)	TweenSplitSpa… (94.7%)	TweenSplit (4)
float32	1505	252	17%	26.8	1092.8	sgd (12)	tween_chain (94.0%)	tween_chain (7)
float64	1436	153	11%	25.8	844.3	sgd (7)	tween_chain (90.5%)	TweenSplitHea… (3)
fp4	1436	742	52%	21.2	832.0	sgd (33)	MeshTweenSpli… (62.5%)	TweenAlt (1)
fp6	1434	635	44%	20.4	329.6	sgd (31)	sgd (80.5%)	TweenSplitFas… (6)
fp8e4m3	1436	572	40%	22.9	710.9	sgd (27)	MeshBP (69.2%)	TweenSplit (3)
fp8e5m2	1436	579	40%	22.2	714.2	sgd (27)	MeshTweenSpli… (76.9%)	StepTweenSplit (2)
int	1434	154	11%	24.2	529.0	sgd (7)	MeshTweenChain (90.9%)	TweenSplitFas… (3)
int16	1436	328	23%	24.3	514.3	sgd (15)	MeshTweenChain (89.8%)	TweenSplitHea… (3)
int2	1436	836	58%	22.2	908.6	step_sgd (39)	MeshTweenSpli… (73.2%)	TweenSplitLin… (3)
int3	1434	769	54%	18.8	460.9	sgd (36)	TweenSplitHea… (81.2%)	TweenSplitHea… (5)
int32	1436	236	16%	24.0	634.5	sgd (11)	MeshTweenSpli… (87.5%)	TweenSplitHea… (2)
int4	1436	705	49%	22.4	956.2	step_sgd (33)	MeshTweenSpli… (80.2%)	TweenSplitFas… (3)
int5	1434	643	45%	19.7	391.9	sgd (31)	StepTweenAlt (75.0%)	TweenSplitHea… (5)

Per-dtype trap distribution (each dtype — not lumped as “quant”) (part 2/2)

dtype	cells	trap cells	trap %	SGD Acc	SGD Score	trap leader	Acc pick	real Score pick
int6	1434	656	46%	19.5	321.9	sgd (31)	step_tween_ch… (72.0%)	TweenSplit (4)
int64	1436	154	11%	24.2	593.2	sgd (7)	tween_chain (89.0%)	step_tween_ch… (2)
int8	1436	572	40%	26.2	849.3	sgd (27)	tween_chain (91.5%)	tween_chain (4)
nf4	1434	697	49%	20.5	546.6	sgd (33)	MeshTweenSpli… (100.0%)	StepTweenSplit (3)
ternary	1435	834	58%	22.8	889.7	sgd (39)	MeshTweenSpli… (68.8%)	TweenSplitSpa… (3)
uint	1434	154	11%	24.4	597.9	sgd (7)	sgd (88.3%)	tween_chain (3)
uint16	1436	327	23%	24.0	687.4	sgd (15)	sgd (84.8%)	TweenSplitLin… (3)
uint2	1435	807	56%	20.3	562.4	sgd (38)	TweenSplitLin… (75.0%)	TweenSplit (4)
uint3	1434	697	49%	19.6	430.8	sgd (33)	TweenSplitLin… (100.0%)	TweenSplit (4)
uint32	1436	233	16%	25.1	695.5	sgd (11)	MeshBP (87.2%)	TweenSplitHea… (4)
uint4	1436	661	46%	21.2	566.1	sgd (31)	MeshTweenAlt (75.0%)	TweenSplit (4)
uint5	1434	639	45%	20.3	393.9	step_sgd (31)	TweenSplit (87.5%)	TweenSplit (9)
uint6	1434	606	42%	20.9	361.6	sgd (29)	MeshTweenSpli… (87.5%)	TweenSplitLin… (5)
uint64	1436	155	11%	24.8	650.1	sgd (7)	StepTweenAlt (87.5%)	TweenSplitFas… (5)
uint8	1436	565	39%	25.1	967.5	step_sgd (26)	TweenSplitHea… (91.2%)	tween_chain (3)
uintptr	1434	154	11%	24.0	586.7	sgd (7)	MeshBP (89.6%)	TweenSplitLin… (3)

When to use what — dtype training picks (why, not just win counts)

dtype	task fit	use for Acc	use for live Score	avoid	why
bfloat16	quant / int	tween_chain (89.7%)	tween_chain (3 real)	TweenSplit* on Score alone	Acc leader tween_chain beats SGD 27.7% mean.
binary	extreme low-bit	MeshTweenSpli… (74.3%)	tween (2 real)	sgd traps (48)	Acc leader MeshTweenSpli… beats SGD 21.8% mean.
complex128	quant / int	sgd (89.3%)	MeshBP (3 real)	TweenSplit* on Score alone	Acc leader sgd beats SGD 23.7% mean.
complex64	quant / int	tween_chain (89.6%)	TweenSplitFas… (2 real)	TweenSplit* on Score alone	Acc leader tween_chain beats SGD 23.9% mean.
float16	quant / int	TweenSplitSpa… (94.7%)	TweenSplit (4 real)	TweenSplit* on Score alone	Tween live-fit; verify Acc pick before deploy — Score may trap.
float32	reference numerics	tween_chain (94.0%)	tween_chain (7 real)	TweenSplit* on Score alone	Acc leader tween_chain beats SGD 26.8% mean.
float64	quant / int	tween_chain (90.5%)	TweenSplitHea… (3 real)	TweenSplit* on Score alone	Acc leader tween_chain beats SGD 25.8% mean.
fp4	micro-float quant	MeshTweenSpli… (62.5%)	TweenAlt (1 real)	sgd traps (33)	Acc leader MeshTweenSpli… beats SGD 21.2% mean.
fp6	quant / int	sgd (80.5%)	TweenSplitFas… (6 real)	sgd traps (31)	Acc leader sgd beats SGD 20.4% mean.
fp8e4m3	micro-float quant	MeshBP (69.2%)	TweenSplit (3 real)	TweenSplit* on Score alone	BP/mesh-gradient path wins raw Acc on this dtype vs SGD.
fp8e5m2	micro-float quant	MeshTweenSpli… (76.9%)	StepTweenSplit (2 real)	sgd traps (27)	Acc leader MeshTweenSpli… beats SGD 22.2% mean.
int	quant / int	MeshTweenChain (90.9%)	TweenSplitFas… (3 real)	TweenSplit* on Score alone	Acc leader MeshTweenChain beats SGD 24.2% mean.
int16	quant / int	MeshTweenChain (89.8%)	TweenSplitHea… (3 real)	TweenSplit* on Score alone	Acc leader MeshTweenChain beats SGD 24.3% mean.
int2	extreme low-bit	MeshTweenSpli… (73.2%)	TweenSplitLin… (3 real)	step_sgd traps (39)	Acc leader MeshTweenSpli… beats SGD 22.2% mean.
int3	quant / int	TweenSplitHea… (81.2%)	TweenSplitHea… (5 real)	sgd traps (36)	Tween live-fit; verify Acc pick before deploy — Score may trap.
int32	quant / int	MeshTweenSpli… (87.5%)	TweenSplitHea… (2 real)	TweenSplit* on Score alone	Acc leader MeshTweenSpli… beats SGD 24.0% mean.
int4	quant / int	MeshTweenSpli… (80.2%)	TweenSplitFas… (3 real)	step_sgd traps (33)	Acc leader MeshTweenSpli… beats SGD 22.4% mean.
int5	quant / int	StepTweenAlt (75.0%)	TweenSplitHea… (5 real)	sgd traps (31)	BP/mesh-gradient path wins raw Acc on this dtype vs SGD.

When to use what — dtype training picks (why, not just win counts) (part 2/2)

dtype	task fit	use for Acc	use for live Score	avoid	why
int6	quant / int	step_tween_ch… (72.0%)	TweenSplit (4 real)	sgd traps (31)	Acc leader step_tween_ch… beats SGD 19.5% mean.
int64	quant / int	tween_chain (89.0%)	step_tween_ch… (2 real)	TweenSplit* on Score alone	Acc leader tween_chain beats SGD 24.2% mean.
int8	quant / int	tween_chain (91.5%)	tween_chain (4 real)	TweenSplit* on Score alone	Acc leader tween_chain beats SGD 26.2% mean.
nf4	micro-float quant	MeshTweenSpli… (100.0%)	StepTweenSplit (3 real)	sgd traps (33)	Acc leader MeshTweenSpli… beats SGD 20.5% mean.
ternary	extreme low-bit	MeshTweenSpli… (68.8%)	TweenSplitSpa… (3 real)	sgd traps (39)	Acc leader MeshTweenSpli… beats SGD 22.8% mean.
uint	quant / int	sgd (88.3%)	tween_chain (3 real)	TweenSplit* on Score alone	Acc leader sgd beats SGD 24.4% mean.
uint16	quant / int	sgd (84.8%)	TweenSplitLin… (3 real)	TweenSplit* on Score alone	Acc leader sgd beats SGD 24.0% mean.
uint2	extreme low-bit	TweenSplitLin… (75.0%)	TweenSplit (4 real)	sgd traps (38)	Tween live-fit; verify Acc pick before deploy — Score may trap.
uint3	quant / int	TweenSplitLin… (100.0%)	TweenSplit (4 real)	sgd traps (33)	Tween live-fit; verify Acc pick before deploy — Score may trap.
uint32	quant / int	MeshBP (87.2%)	TweenSplitHea… (4 real)	TweenSplit* on Score alone	BP/mesh-gradient path wins raw Acc on this dtype vs SGD.
uint4	quant / int	MeshTweenAlt (75.0%)	TweenSplit (4 real)	sgd traps (31)	Acc leader MeshTweenAlt beats SGD 21.2% mean.
uint5	quant / int	TweenSplit (87.5%)	TweenSplit (9 real)	step_sgd traps (31)	Tween live-fit; verify Acc pick before deploy — Score may trap.
uint6	quant / int	MeshTweenSpli… (87.5%)	TweenSplitLin… (5 real)	sgd traps (29)	Acc leader MeshTweenSpli… beats SGD 20.9% mean.
uint64	quant / int	StepTweenAlt (87.5%)	TweenSplitFas… (5 real)	TweenSplit* on Score alone	BP/mesh-gradient path wins raw Acc on this dtype vs SGD.
uint8	quant / int	TweenSplitHea… (91.2%)	tween_chain (3 real)	TweenSplit* on Score alone	Tween live-fit; verify Acc pick before deploy — Score may trap.
uintptr	quant / int	MeshBP (89.6%)	TweenSplitLin… (3 real)	TweenSplit* on Score alone	BP/mesh-gradient path wins raw Acc on this dtype vs SGD.

Notes

- Baseline: sgd on identical dtype/format/arch/backend cells.
- Hard Acc = avg_accuracy = dashboard hard_acc (argmax accuracy).
- SoftAcc is serve-confidence; Lucy Score uses hard Acc.
- LPD = Q × shrink vs Acc-champ RAM; 0 unless Acc keep ≥ 70%.
- Q = geomean(Acc/Thru/Avail keep vs learner peaks on that layer).
- Gold = all 3 pillars ≥ 80% at ≤ 20% Acc-champ RAM.
- Chain tweens (tween_chain, step_tween_chain, MeshTweenChain) often run chain-rule paths ≈ BP — listed in appendix, excluded from primary bars.
- step_sgd is NOT the baseline; it is compared as its own mode.