

A Case for the Use of Chroma Cartesian Colour Representations for Image Classification on Plant-Based Domains: Supplementary Materials

1. Additional Results

Table 1. Accuracies by Dataset and Colour Representation for ConvNeXt Tiny Trained From Scratch on the Broader Array

Dataset	Accuracy	YD _B D _B	H2SV	YP _B P _B	YUV	L*u*v*	YIQ	YC _B C _R	L*a*b*	BEX	HDX	HSV	RGB	RGBCIE	GDX	BPX	HAX	BRO	HED	XYZ	AHX	FGX	HPX	RBD
Swedish	Top-1	0.9351	0.9439	0.9359	0.9285	0.9378	0.9402	0.9270	0.9260	0.9353	0.9147	0.9217	0.9124	0.9242	0.9088	0.8935	0.8927	0.9485	0.9196	0.8978	0.8972	0.9136	0.9053	0.8903
	Top-5	0.9991	0.9974	0.9983	1.0000	0.9982	0.9994	0.9985	0.9984	0.9991	0.9956	0.9983	0.9983	0.9962	0.9966	0.9962	0.9955	0.9982	0.9980	0.9982	0.9967	0.9983	0.9972	0.9971
Flavia	Top-1	0.9155	0.9352	0.9238	0.9108	0.9135	0.9146	0.9124	0.9047	0.8857	0.9099	0.8794	0.8904	0.9226	0.8949	0.8973	0.8871	0.8978	0.8861	0.8828	0.8792	0.8873	0.8874	0.8811
	Top-5	0.9955	0.9971	0.9938	0.9942	0.9938	0.9952	0.9949	0.9925	0.9902	0.9939	0.9951	0.9932	0.9962	0.9932	0.9908	0.9961	0.9913	0.9931	0.9911	0.9906	0.9915	0.9951	0.9922
Leafsnap	Top-1	0.8791	0.8801	0.8724	0.8753	0.8679	0.8705	0.8749	0.8769	0.8608	0.8536	0.8724	0.8606	0.8503	0.8486	0.8652	0.8605	0.8602	0.8399	0.8207	0.8575	0.8508	0.8368	0.8344
	Top-5	0.9766	0.9759	0.9753	0.9753	0.9749	0.9757	0.9759	0.9755	0.9710	0.9712	0.9731	0.9729	0.9700	0.9695	0.9734	0.9714	0.9717	0.9643	0.9569	0.9708	0.9674	0.9616	0.9629
Folio	Top-1	0.8252	0.8505	0.8146	0.8115	0.8179	0.8134	0.8336	0.7872	0.7834	0.7358	0.8093	0.7566	0.8026	0.7822	0.7386	0.7318	0.7476	0.6915	0.6684	0.7579	0.7478	0.6763	0.7531
	Top-5	0.9600	0.9788	0.9528	0.9538	0.9604	0.9696	0.9631	0.9633	0.9670	0.9508	0.9674	0.9472	0.9619	0.9630	0.9588	0.9456	0.9453	0.9145	0.9164	0.9534	0.9485	0.9272	0.9345
D-Leaf	Top-1	0.6781	0.6311	0.6936	0.6841	0.6863	0.6824	0.6851	0.6745	0.6111	0.5790	0.6154	0.5501	0.5859	0.5933	0.5878	0.6197	0.6038	0.6185	0.5406	0.6118	0.5777	0.5821	0.5930
	Top-5	0.8189	0.8296	0.8341	0.8277	0.8274	0.8393	0.8360	0.8351	0.8266	0.7988	0.8076	0.7810	0.7928	0.8157	0.8107	0.7938	0.8269	0.8134	0.7807	0.8006	0.8001	0.8083	0.7993
PlantaeK	Top-1	0.6282	0.6199	0.6266	0.6180	0.6273	0.6097	0.6080	0.6193	0.5957	0.6190	0.5931	0.6154	0.5846	0.6227	0.6153	0.6050	0.6048	0.5924	0.6003	0.6135	0.5689	0.5932	0.5805
	Top-5	0.9595	0.9552	0.9687	0.9704	0.9694	0.9775	0.9688	0.9634	0.9575	0.9672	0.9589	0.9680	0.9359	0.9593	0.9638	0.9483	0.9589	0.9763	0.9388	0.9581	0.9498	0.9514	0.9718
PlantVillage	Top-1	0.9641	0.9612	0.9650	0.9681	0.9709	0.9627	0.9699	0.9632	0.9676	0.9679	0.9661	0.9722	0.9636	0.9631	0.9632	0.9655	0.9580	0.9440	0.9626	0.9565	0.9499	0.9487	0.9495
	Top-5	0.9985	0.9976	0.9983	0.9986	0.9986	0.9990	0.9987	0.9984	0.9990	0.9986	0.9986	0.9991	0.9987	0.9984	0.9988	0.9982	0.9981	0.9968	0.9980	0.9981	0.9976	0.9975	0.9977
Citrus Leaves	Top-1	0.8847	0.8914	0.8821	0.9038	0.8952	0.8860	0.8763	0.8902	0.8574	0.8776	0.8680	0.8851	0.8582	0.8372	0.8175	0.8352	0.8500	0.8405	0.8451	0.7744	0.7225	0.7827	0.8181
	Top-5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Citrus Fruits	Top-1	0.6121	0.5260	0.6264	0.5931	0.5175	0.5840	0.5714	0.5629	0.5209	0.5564	0.5294	0.4878	0.4314	0.4972	0.5250	0.5294	0.4586	0.5835	0.5457	0.4705	0.5302	0.5899	0.4672
	Top-5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cassava	Top-1	0.3530	0.3692	0.3627	0.3526	0.3554	0.3625	0.3469	0.3667	0.3597	0.3507	0.3553	0.3602	0.3497	0.3323	0.3470	0.3574	0.3556	0.3364	0.3688	0.3336	0.3306	0.3352	0.3214
	Top-5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Plant Pathology	Top-1	0.8853	0.8988	0.8910	0.8781	0.8856	0.8808	0.8764	0.8875	0.8912	0.8904	0.8505	0.8752	0.8583	0.8798	0.8893	0.8855	0.8831	0.8712	0.8518	0.8800	0.8599	0.8710	0.8754
	Top-5	0.9905	0.9941	0.9914	0.9895	0.9906	0.9907	0.9858	0.9905	0.9911	0.9874	0.9876	0.9870	0.9889	0.9891	0.9909	0.9924	0.9884	0.9872	0.9885	0.9898	0.9855	0.9896	0.9895

2. Statistical Analysis

Table 2. Unadjusted P-values for Rejecting the Null-Hypothesis for ConvNeXt Tiny Trained From Scratch Under Friedman Ranking and Holm Post Hoc Analysis in the Broader Array

Hypothesised “Better” Colour Representation	YD _B D _R	H2SV	YP _B P _R	YUV	L*u*v*	YIQ	YC _B C _R	L*a*b*	BEX	HDX	HSV	RGB	RGBCIE	GDX	BPX	HAX	BRO	HED	XYZ	AHX	FGX	HPX	RBD
YD _B D _R	-	0.8258	0.6150	0.5715	0.3960	0.2996	0.2996	0.1666	0.0200	0.0130	0.0051	0.0025	0.0021	0.0012	0.0006	0.0003	0.0003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
H2SV	-	-	0.7772	0.7295	0.5295	0.4138	0.4138	0.2448	0.0352	0.0236	0.0099	0.0051	0.0042	0.0025	0.0013	0.0007	0.0006	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000
YP _B P _R	-	-	-	0.9499	0.7295	0.5931	0.5931	0.3788	0.0683	0.0477	0.0217	0.0119	0.0099	0.0062	0.0035	0.0019	0.0017	0.0002	0.0001	0.0001	0.0000	0.0000	0.0000
L*u*v*	-	-	-	-	0.7772	0.6373	0.6373	0.4138	0.0783	0.0552	0.0256	0.0142	0.0119	0.0075	0.0042	0.0023	0.0021	0.0002	0.0001	0.0001	0.0000	0.0000	0.0000
YUV	-	-	-	-	-	0.8504	0.8504	0.5931	0.1396	0.1021	0.0513	0.0301	0.0256	0.0169	0.0099	0.0057	0.0051	0.0006	0.0004	0.0003	0.0001	0.0000	0.0000
YIQ	-	-	-	-	-	-	1.0000	0.7295	0.1975	0.1482	0.0783	0.0477	0.0410	0.0278	0.0169	0.0099	0.0091	0.0012	0.0008	0.0006	0.0002	0.0001	0.0000
L*a*b*	-	-	-	-	-	-	-	0.7295	0.1975	0.1482	0.0783	0.0477	0.0410	0.0278	0.0169	0.0099	0.0091	0.0012	0.0008	0.0006	0.0002	0.0001	0.0000
YC _B C _R	-	-	-	-	-	-	-	-	0.3457	0.2712	0.1572	0.1021	0.0896	0.0636	0.0410	0.0256	0.0236	0.0038	0.0025	0.0021	0.0008	0.0004	0.0001
BEX	-	-	-	-	-	-	-	-	-	0.8751	0.6373	0.4892	0.4506	0.3620	0.2712	0.1975	0.1867	0.0513	0.0380	0.0326	0.0155	0.0091	0.0021
HDx	-	-	-	-	-	-	-	-	-	-	0.7533	0.5931	0.5503	0.4506	0.3457	0.2578	0.2448	0.0732	0.0552	0.0477	0.0236	0.0142	0.0035
RGB	-	-	-	-	-	-	-	-	-	-	-	0.8258	0.7772	0.6599	0.5295	0.4138	0.3960	0.1396	0.1089	0.0957	0.0513	0.0326	0.0091
HSV	-	-	-	-	-	-	-	-	-	-	-	-	0.9499	0.8258	0.6828	0.5503	0.5295	0.2086	0.1666	0.1482	0.0838	0.0552	0.0169
BRO	-	-	-	-	-	-	-	-	-	-	-	-	-	0.8751	0.7295	0.5931	0.5715	0.2323	0.1867	0.1666	0.0957	0.0636	0.0200
HAX	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.8504	0.7060	0.6828	0.2996	0.2448	0.2202	0.1313	0.0896	0.0301
BPX	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.8504	0.8258	0.3960	0.3298	0.2996	0.1867	0.1313	0.0477
RGBCIE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.9749	0.5092	0.4319	0.3960	0.2578	0.1867	0.0732
GDX	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.5295	0.4506	0.4138	0.2712	0.1975	0.0783
HED	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.8999	0.8504	0.6373	0.5092	0.2578
AHX	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.9499	0.7295	0.5931	0.3145
XYZ	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.7772	0.6373	0.3457
HPX	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.8504	0.5092
FGX	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.6373
RBD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

These results are gathered by analysis on the top-1 accuracies seen in 1, and the colour representations are listed in order of rankings obtained by the Friedman procedure. We take $\alpha = 0.05$ and the bolded cells satisfy this, allowing us to reject the null-hypothesis that the hypothesised “better” is the same as the colour representation it is being compared to, listed across the top. Meaningless comparisons, i.e. between a representation and itself, or between a representation and one that was higher ranked by the Friedman test, are omitted with ‘-’.