DIFFERENTIABLE BLACK-BOX AND GRAY-BOX MODELING OF NONLINEAR AUDIO EFFECTS - APPENDIX

A PREPRINT

Marco Comunità
m.comunita@qmul.ac.uk

Christian J. Steinmetz **Joshua D. Reiss**

Centre for Digital Music
Queen Mary University of London, UK

ABSTRACT

Audio effects are extensively used at every stage of audio and music content creation. The majority of differentiable audio effects modeling approaches fall into the black-box or gray-box paradigms; and most models have been proposed and applied to nonlinear effects like guitar amplifiers, overdrive, distortion, fuzz and compressor. Although a plethora of architectures have been introduced for the task at hand there is still lack of understanding on the state of the art, since most publications experiment with one type of nonlinear audio effect and a very small number of devices.

In this work we aim to shed light on the audio effects modeling landscape by comparing black- and gray-box architectures on a large number of nonlinear audio effects, identifying the most suitable for a wide range of devices. In the process, we also: introduce time-varying gray-box models and propose models for compressor, distortion and fuzz, publish a large dataset for audio effects research - ToneTwist AFx[1] - that is also the first open to community contributions, evaluate models on a variety of metrics and conduct extensive subjective evaluation. Code[2], supplementary material and logs[3] are also available.

Keywords Audio Effects Modeling · Black-box Modeling · Gray-box Modeling · Neural Networks · Differentiable DSP

[1] https://github.com/mcomunita/tonetwist-afx-dataset
[2] https://github.com/mcomunita/nablafx
[3] https://github.com/mcomunita/nnlinafx-supp-material

1 Appendix

1.1 Results Compressor/Limiter

Table 1: *Scaled test loss for non parametric models of compressor/limiter effects. Bold indicates best performing models.*

Model	Params.	Ampeg Optocomp			Flamma AnalogComp			Yuer DynaCompressor			UA 1176LN		
		Tot.	L1	MR-STFT	Tot.	L1	MR-STFT	Tot.	L1	MR-STFT	Tot.	L1	MR-STFT
LSTM-32	4.5k	0.2378	0.0316	0.2062	0.4004	0.0041	0.3964	0.7345	0.0208	0.7137	0.3640	0.0087	0.3553
LSTM-96	38.1k	0.2251	0.0011	0.2240	0.3740	0.0028	0.3711	0.7671	0.0218	0.7452	0.3441	0.0080	0.3361
TCN-45-S-16	7.5k	0.3810	0.0023	0.3788	0.5605	0.0070	0.5534	0.9239	0.0245	0.8994	0.4823	0.0146	0.4677
TCN-45-L-16	7.3k	0.4403	0.0027	0.4376	0.5651	0.0065	0.5586	0.8838	0.0268	0.8571	0.4901	0.0233	0.4668
TCN-250-S-16	14.5k	0.4973	0.0319	0.4654	0.5661	0.0071	0.5590	0.8479	0.0233	0.8246	0.4361	0.0185	0.4175
TCN-250-L-16	18.4k	0.4592	0.0027	0.4565	0.5162	0.0047	0.5115	0.8245	0.0227	0.8019	0.4241	0.0121	0.4120
TCN-2500-S-16	13.7k	0.4589	0.0029	0.4561	0.5705	0.0088	0.5618	0.8229	0.0231	0.7998	0.4687	0.0157	0.4530
TCN-2500-L-16	11.9k	0.4725	0.0318	0.4407	0.5744	0.0090	0.5654	0.7805	0.0221	0.7583	0.4407	0.0208	0.4199
TCN-TF-45-S-16	39.5k	0.2110	0.0006	0.2104	0.3748	0.0043	0.3705	0.7090	0.0212	0.6879	0.3090	0.0042	0.3048
TCN-TF-45-L-16	71.3k	0.2195	0.0007	0.2188	0.3615	0.0032	0.3582	0.7319	0.0228	0.7091	0.2968	0.0046	0.2922
TCN-TF-250-S-16	52.9k	0.2372	0.0313	0.2059	0.3794	0.0037	0.3756	0.7387	0.0218	0.7170	0.2786	0.0041	0.2745
TCN-TF-250-L-16	88.8k	0.2354	0.0006	0.2347	0.3883	0.0068	0.3815	0.6915	0.0204	0.6711	0.2739	0.0032	0.2707
TCN-TF-2500-S-16	45.7k	0.2607	0.0314	0.2293	0.4098	0.0040	0.4059	0.7290	0.0214	0.7076	0.3105	0.0051	0.3054
TCN-TF-2500-L-16	75.9k	0.2589	0.0314	0.2275	0.3796	0.0031	0.3765	0.7222	0.0214	0.7008	0.2950	0.0093	0.2857
GCN-45-S-16	16.2k	0.3940	0.0315	0.3625	0.4554	0.0037	0.4516	0.8218	0.0221	0.7997	0.4187	0.0128	0.4059
GCN-45-L-16	17.1k	0.3978	0.0315	0.3663	0.4552	0.0033	0.4519	0.8048	0.0226	0.7823	0.4203	0.0133	0.4070
GCN-250-S-16	30.4k	0.3268	0.0315	0.2953	0.4341	0.0028	0.4312	0.7549	0.0227	0.7322	0.3695	0.0096	0.3599
GCN-250-L-16	39.6k	0.3443	0.0021	0.3422	0.3996	0.0033	0.3963	0.7569	0.0211	0.7359	0.3981	0.0140	0.3841
GCN-2500-S-16	28.6k	0.2924	0.0311	0.2613	0.3999	0.0035	0.3964	0.7484	0.0214	0.7269	0.3397	0.0089	0.3308
GCN-2500-L-16	26.4k	0.2572	0.0013	0.2559	0.3735	0.0027	0.3708	0.7206	0.0207	0.6999	0.3583	0.0090	0.3492
GCN-TF-45-S-16	141.6k	0.2031	0.0005	0.2026	0.3542	0.0024	0.3519	0.7131	0.0212	0.6919	0.2444	0.0030	0.2414
GCN-TF-45-L-16	268.0k	0.2037	0.0007	0.2030	0.3618	0.0033	0.3585	0.6920	0.0210	0.6710	0.2559	0.0078	0.2481
GCN-TF-250-S-16	181.0k	0.2045	0.0011	0.2034	0.3583	0.0027	0.3556	0.7143	0.0213	0.6930	0.2755	0.0042	0.2713
GCN-TF-250-L-16	315.6k	0.2009	0.0007	0.2003	0.3616	0.0035	0.3581	0.7163	0.0212	0.6952	0.2642	0.0043	0.2599
GCN-TF-2500-S-16	154.1k	0.2383	0.0314	0.2068	0.3674	0.0029	0.3645	0.7336	0.0218	0.7118	0.2630	0.0031	0.2599
GCN-TF-2500-L-16	277.3k	0.2373	0.0314	0.2058	0.3452	0.0023	0.3429	0.7363	0.0211	0.7152	0.2548	0.0075	0.2473
S4-S-16	2.4k	0.2527	0.0013	0.2514	0.4547	0.0063	0.4485	0.7121	0.0213	0.6908	0.4296	0.0142	0.4153
S4-L-16	19.0k	0.2265	0.0010	0.2255	0.3466	0.0034	0.3433	0.6801	0.0205	0.6596	0.2821	0.0061	0.2761
S4-TF-S-16	28.0k	0.2213	0.0314	0.1899	0.3420	0.0025	0.3394	0.7488	0.1044	0.6444	0.2614	0.0030	0.2583
S4-TF-L-16	70.2k	**0.1943**	0.0005	0.1937	**0.3066**	0.0025	0.3041	**0.6534**	0.0204	0.6331	**0.2210**	0.0026	0.2183
GB-COMP	47	0.2969	0.0017	0.2952	0.6495	0.0236	0.6259	0.9725	0.0279	0.9446	0.4105	0.0100	0.4005

Table 2: *Scaled validation and test loss for non parametric models of* ***Ampeg OptoComp*** *compressor. Bold indicates best performing models.*

Model	Params.	LR	Weights		Val. Loss			Test Loss		
			L1	MR-STFT	Tot.	L1	MR-STFT	Tot.	L1	MR-STFT
LSTM-32	4.5k	0.001	1	0.1	0.3037	0.0279	0.2758	0.2378	0.0316	0.2062
LSTM-96	38.1k	0.005	10	1	0.2916	0.0013	0.2903	0.2251	0.0011	0.2240
TCN-45-S-16	7.5k	0.005	1	0.1	0.4439	0.0027	0.4411	0.3810	0.0023	0.3788
TCN-45-L-16	7.3k	0.005	10	1	0.4593	0.0034	0.4559	0.4403	0.0027	0.4376
TCN-250-S-16	14.5k	0.005	5	5	0.5471	0.0323	0.5148	0.4973	0.0319	0.4654
TCN-250-L-16	18.4k	0.005	1	0.1	0.4991	0.0033	0.4958	0.4592	0.0027	0.4565
TCN-2500-S-16	13.7k	0.005	1	0.1	0.4928	0.0031	0.4897	0.4589	0.0029	0.4561
TCN-2500-L-16	11.9k	0.005	0.5	0.5	0.5597	0.0286	0.5311	0.4725	0.0318	0.4407
TCN-TF-45-S-16	39.5k	0.005	10	1	**0.2392**	0.0008	0.2385	0.2110	0.0006	0.2104
TCN-TF-45-L-16	71.3k	0.005	10	1	0.4942	0.2385	0.2557	0.2195	0.0007	0.2188
TCN-TF-250-S-16	52.9k	0.005	10	1	0.2848	0.0333	0.2515	0.2372	0.0313	0.2059
TCN-TF-250-L-16	88.8k	0.005	10	1	0.2553	0.0007	0.2546	0.2354	0.0006	0.2347
TCN-TF-2500-S-16	45.7k	0.005	5	5	0.3156	0.0321	0.2835	0.2607	0.0314	0.2293
TCN-TF-2500-L-16	75.9k	0.005	5	5	0.3127	0.0360	0.2767	0.2589	0.0314	0.2275
GCN-45-S-16	16.2k	0.005	5	5	0.4552	0.0272	0.4280	0.3940	0.0315	0.3625
GCN-45-L-16	17.1k	0.005	0.5	0.5	0.4670	0.0275	0.4395	0.3978	0.0315	0.3663
GCN-250-S-16	30.4k	0.005	5	5	0.3646	0.0300	0.3346	0.3268	0.0315	0.2953
GCN-250-L-16	39.6k	0.005	10	1	0.3051	0.0016	0.3035	0.3443	0.0021	0.3422
GCN-2500-S-16	28.6k	0.005	1	0.1	0.3551	0.0320	0.3231	0.2924	0.0311	0.2613
GCN-2500-L-16	26.4k	0.005	10	1	0.3197	0.0017	0.3180	0.2572	0.0013	0.2559
GCN-TF-45-S-16	141.6k	0.005	1	0.1	0.2469	0.0005	0.2463	0.2031	0.0005	0.2026
GCN-TF-45-L-16	268.0k	0.005	1	0.1	0.2489	0.0011	0.2478	0.2037	0.0007	0.2030
GCN-TF-250-S-16	181.0k	0.005	0.5	0.5	0.2644	0.0013	0.2631	0.2045	0.0011	0.2034
GCN-TF-250-L-16	315.6k	0.005	10	1	0.2604	0.0008	0.2596	0.2009	0.0007	0.2003
GCN-TF-2500-S-16	154.1k	0.005	0.5	0.5	0.2717	0.0332	0.2386	0.2383	0.0314	0.2068
GCN-TF-2500-L-16	277.3k	0.005	0.5	0.5	0.2791	0.0317	0.2474	0.2373	0.0314	0.2058
S4-S-16	2.4k	0.01	1	0.1	0.3048	0.0014	0.3035	0.2527	0.0013	0.2514
S4-L-16	19.0k	0.01	1	0.1	0.2520	0.0010	0.2510	0.2265	0.0010	0.2255
S4-TF-S-16	28.0k	0.01	1	0.1	0.2718	0.0293	0.2425	0.2213	0.0314	0.1899
S4-TF-L-16	70.2k	0.01	10	1	0.2458	0.0006	0.2453	**0.1943**	0.0005	0.1937
GB-COMP	47	0.1	0.5	0.5	0.4018	0.0019	0.3999	0.2969	0.0017	0.2952

Table 3: *Scaled validation and test loss for non parametric models of* ***Flamma Analog Comp*** *compressor. Bold indicates best performing models.*

Model	Params.	LR	Weights		Val. Loss			Test Loss		
			L1	MR-STFT	Tot.	L1	MR-STFT	Tot.	L1	MR-STFT
LSTM-32	4.5k	0.005	10	1	0.5751	0.0033	0.5718	0.4004	0.0041	0.3964
LSTM-96	38.1k	0.005	10	1	0.5508	0.0034	0.5474	0.3740	0.0028	0.3711
TCN-45-S-16	7.5k	0.005	10	1	0.7673	0.0069	0.7605	0.5605	0.0070	0.5534
TCN-45-L-16	7.3k	0.005	1	0.1	0.7214	0.0073	0.7141	0.5651	0.0065	0.5586
TCN-250-S-16	14.5k	0.005	1	0.1	0.7757	0.0069	0.7689	0.5661	0.0071	0.5590
TCN-250-L-16	18.4k	0.005	10	1	0.6324	0.0046	0.6278	0.5162	0.0047	0.5115
TCN-2500-S-16	13.7k	0.005	0.5	0.5	0.6885	0.0100	0.6785	0.5705	0.0088	0.5618
TCN-2500-L-16	11.9k	0.005	0.5	0.5	0.6724	0.0093	0.6631	0.5744	0.0090	0.5654
TCN-TF-45-S-16	39.5k	0.005	5	5	0.4756	0.0052	0.4704	0.3748	0.0043	0.3705
TCN-TF-45-L-16	71.3k	0.005	0.5	0.5	0.4732	0.0033	0.4700	0.3615	0.0032	0.3582
TCN-TF-250-S-16	52.9k	0.005	0.5	0.5	0.4627	0.0036	0.4590	0.3794	0.0037	0.3756
TCN-TF-250-L-16	88.8k	0.005	0.5	0.5	0.4967	0.0092	0.4875	0.3883	0.0068	0.3815
TCN-TF-2500-S-16	45.7k	0.005	10	1	0.5324	0.0038	0.5286	0.4098	0.0040	0.4059
TCN-TF-2500-L-16	75.9k	0.005	1	0.1	0.5134	0.0037	0.5097	0.3796	0.0031	0.3765
GCN-45-S-16	16.2k	0.005	1	0.1	0.6641	0.0034	0.6607	0.4554	0.0037	0.4516
GCN-45-L-16	17.1k	0.005	10	1	0.6426	0.0029	0.6397	0.4552	0.0033	0.4519
GCN-250-S-16	30.4k	0.005	10	1	0.6109	0.0026	0.6084	0.4341	0.0028	0.4312
GCN-250-L-16	39.6k	0.005	10	1	0.5292	0.0038	0.5254	0.3996	0.0033	0.3963
GCN-2500-S-16	28.6k	0.005	1	0.1	0.5091	0.0040	0.5051	0.3999	0.0035	0.3964
GCN-2500-L-16	26.4k	0.005	10	1	0.5311	0.0027	0.5284	0.3735	0.0027	0.3708
GCN-TF-45-S-16	141.6k	0.005	1	0.1	0.4696	0.0021	0.4675	0.3542	0.0024	0.3519
GCN-TF-45-L-16	268.0k	0.005	10	1	0.4356	0.0030	0.4326	0.3618	0.0033	0.3585
GCN-TF-250-S-16	181.0k	0.005	10	1	0.4721	0.0021	0.4700	0.3583	0.0027	0.3556
GCN-TF-250-L-16	315.6k	0.005	0.5	0.5	0.4868	0.0033	0.4835	0.3616	0.0035	0.3581
GCN-TF-2500-S-16	154.1k	0.005	10	1	0.4452	0.0027	0.4425	0.3674	0.0029	0.3645
GCN-TF-2500-L-16	277.3k	0.005	1	0.1	0.4434	0.0018	0.4416	0.3452	0.0023	0.3429
S4-S-16	2.4k	0.01	0.5	0.5	0.6513	0.0065	0.6448	0.4547	0.0063	0.4485
S4-L-16	19.0k	0.01	1	0.1	0.4447	0.0037	0.4410	0.3466	0.0034	0.3433
S4-TF-S-16	28.0k	0.01	10	1	0.4433	0.0019	0.4414	0.3420	0.0025	0.3394
S4-TF-L-16	70.2k	0.01	10	1	**0.4241**	0.0019	0.4222	**0.3066**	0.0025	0.3041
GB-COMP	47	0.1	5	5	0.8843	0.0205	0.8638	0.6495	0.0236	0.6259

Table 4: *Scaled validation and test loss for non parametric models of* ***Yuer DynaComp*** *compressor. Bold indicates best performing models.*

Model	Params.	LR	Weights		Val. Loss			Test Loss		
			L1	MR-STFT	Tot.	L1	MR-STFT	Tot.	L1	MR-STFT
LSTM-32	4.5k	0.005	10	1	0.7387	0.0087	0.7300	0.7345	0.0208	0.7137
LSTM-96	38.1k	0.001	1	0.1	0.6892	0.0083	0.6809	0.7671	0.0218	0.7452
TCN-45-S-16	7.5k	0.005	1	0.1	0.9432	0.0123	0.9310	0.9239	0.0245	0.8994
TCN-45-L-16	7.3k	0.005	5	5	0.8286	0.0205	0.8081	0.8838	0.0268	0.8571
TCN-250-S-16	14.5k	0.005	10	1	0.8550	0.0118	0.8432	0.8479	0.0233	0.8246
TCN-250-L-16	18.4k	0.005	1	0.1	0.7813	0.0120	0.7693	0.8245	0.0227	0.8019
TCN-2500-S-16	13.7k	0.005	1	0.1	0.7878	0.0128	0.7750	0.8229	0.0231	0.7998
TCN-2500-L-16	11.9k	0.005	10	1	0.7159	0.0114	0.7045	0.7805	0.0221	0.7583
TCN-TF-45-S-16	39.5k	0.005	10	1	0.5839	0.0071	0.5768	0.7090	0.0212	0.6879
TCN-TF-45-L-16	71.3k	0.005	0.5	0.5	0.6144	0.0123	0.6021	0.7319	0.0228	0.7091
TCN-TF-250-S-16	52.9k	0.005	1	0.1	0.6436	0.0090	0.6346	0.7387	0.0218	0.7170
TCN-TF-250-L-16	88.8k	0.005	5	5	0.5793	0.0110	0.5683	0.6915	0.0204	0.6711
TCN-TF-2500-S-16	45.7k	0.005	1	0.1	0.6631	0.0100	0.6531	0.7290	0.0214	0.7076
TCN-TF-2500-L-16	75.9k	0.005	10	1	0.6417	0.0093	0.6324	0.7222	0.0214	0.7008
GCN-45-S-16	16.2k	0.005	1	0.1	0.8140	0.0111	0.8029	0.8218	0.0221	0.7997
GCN-45-L-16	17.1k	0.005	10	1	0.7890	0.0109	0.7781	0.8048	0.0226	0.7823
GCN-250-S-16	30.4k	0.005	10	1	0.6788	0.0091	0.6698	0.7549	0.0227	0.7322
GCN-250-L-16	39.6k	0.005	10	1	0.6796	0.0104	0.6693	0.7569	0.0211	0.7359
GCN-2500-S-16	28.6k	0.005	1	0.1	0.6715	0.0108	0.6607	0.7484	0.0214	0.7269
GCN-2500-L-16	26.4k	0.005	10	1	0.6545	0.0092	0.6452	0.7206	0.0207	0.6999
GCN-TF-45-S-16	141.6k	0.005	1	0.1	0.6048	0.0082	0.5966	0.7131	0.0212	0.6919
GCN-TF-45-L-16	268.0k	0.005	10	1	0.5731	0.0076	0.5655	0.6920	0.0210	0.6710
GCN-TF-250-S-16	181.0k	0.005	10	1	0.6182	0.0075	0.6107	0.7143	0.0213	0.6930
GCN-TF-250-L-16	315.6k	0.005	0.5	0.5	0.6408	0.0111	0.6297	0.7163	0.0212	0.6952
GCN-TF-2500-S-16	154.1k	0.005	10	1	0.6442	0.0099	0.6343	0.7336	0.0218	0.7118
GCN-TF-2500-L-16	277.3k	0.005	1	0.1	0.6526	0.0103	0.6423	0.7363	0.0211	0.7152
S4-S-16	2.4k	0.01	5	5	0.6309	0.0096	0.6212	0.7121	0.0213	0.6908
S4-L-16	19.0k	0.01	5	5	0.5713	0.0096	0.5616	0.6801	0.0205	0.6596
S4-TF-S-16	28.0k	0.01	5	5	0.6334	0.1043	0.5292	0.7488	0.1044	0.6444
S4-TF-L-16	70.2k	0.01	10	1	**0.5372**	0.0071	0.5301	**0.6534**	0.0204	0.6331
GB-COMP	47	0.1	5	5	0.9923	0.0137	0.9786	0.9725	0.0279	0.9446

Table 5: *Scaled validation and test loss for non parametric models of* ***Universal Audio 1176LN*** *limiter. Bold indicates best performing models.*

Model	Params.	LR	Weights		Val. Loss			Test Loss		
			L1	MR-STFT	Tot.	L1	MR-STFT	Tot.	L1	MR-STFT
LSTM-32	4.5k	0.001	10	1	0.3702	0.0103	0.3600	0.3640	0.0087	0.3553
LSTM-96	38.1k	0.001	1	0.1	0.3303	0.0074	0.3229	0.3441	0.0080	0.3361
TCN-45-S-16	7.5k	0.005	10	1	0.4461	0.0134	0.4327	0.4823	0.0146	0.4677
TCN-45-L-16	7.3k	0.005	5	5	0.4581	0.0204	0.4378	0.4901	0.0233	0.4668
TCN-250-S-16	14.5k	0.005	5	5	0.4019	0.0163	0.3856	0.4361	0.0185	0.4175
TCN-250-L-16	18.4k	0.005	10	1	0.3961	0.0115	0.3846	0.4241	0.0121	0.4120
TCN-2500-S-16	13.7k	0.005	10	1	0.4302	0.0141	0.4162	0.4687	0.0157	0.4530
TCN-2500-L-16	11.9k	0.005	5	5	0.3975	0.0179	0.3796	0.4407	0.0208	0.4199
TCN-TF-45-S-16	39.5k	0.005	10	1	0.2846	0.0038	0.2809	0.3090	0.0042	0.3048
TCN-TF-45-L-16	71.3k	0.005	1	0.1	0.2469	0.0035	0.2434	0.2968	0.0046	0.2922
TCN-TF-250-S-16	52.9k	0.005	10	1	0.2532	0.0037	0.2494	0.2786	0.0041	0.2745
TCN-TF-250-L-16	88.8k	0.005	1	0.1	0.2463	0.0030	0.2433	0.2739	0.0032	0.2707
TCN-TF-2500-S-16	45.7k	0.005	1	0.1	0.2788	0.0048	0.2740	0.3105	0.0051	0.3054
TCN-TF-2500-L-16	75.9k	0.005	5	5	0.2647	0.0084	0.2563	0.2950	0.0093	0.2857
GCN-45-S-16	16.2k	0.005	10	1	0.4011	0.0129	0.3882	0.4187	0.0128	0.4059
GCN-45-L-16	17.1k	0.005	10	1	0.4198	0.0108	0.4091	0.4203	0.0133	0.4070
GCN-250-S-16	30.4k	0.005	1	0.1	0.3333	0.0092	0.3241	0.3695	0.0096	0.3599
GCN-250-L-16	39.6k	0.005	1	0.1	0.4088	0.0112	0.3976	0.3981	0.0140	0.3841
GCN-2500-S-16	28.6k	0.005	10	1	0.2961	0.0082	0.2879	0.3397	0.0089	0.3308
GCN-2500-L-16	26.4k	0.005	10	1	0.3505	0.0094	0.3412	0.3583	0.0090	0.3492
GCN-TF-45-S-16	141.6k	0.005	10	1	0.2131	0.0030	0.2101	0.2444	0.0030	0.2414
GCN-TF-45-L-16	268.0k	0.005	5	5	0.2292	0.0062	0.2230	0.2559	0.0078	0.2481
GCN-TF-250-S-16	181.0k	0.005	1	0.1	0.2374	0.0040	0.2334	0.2755	0.0042	0.2713
GCN-TF-250-L-16	315.6k	0.005	1	0.1	0.2271	0.0035	0.2236	0.2642	0.0043	0.2599
GCN-TF-2500-S-16	154.1k	0.005	1	0.1	0.2227	0.0030	0.2198	0.2630	0.0031	0.2599
GCN-TF-2500-L-16	277.3k	0.005	5	5	0.2285	0.0058	0.2227	0.2548	0.0075	0.2473
S4-S-16	2.4k	0.01	5	5	0.3985	0.0130	0.3855	0.4296	0.0142	0.4153
S4-L-16	19.0k	0.01	10	1	0.2551	0.0062	0.2489	0.2821	0.0061	0.2761
S4-TF-S-16	28.0k	0.01	1	0.1	0.2261	0.0027	0.2234	0.2614	0.0030	0.2583
S4-TF-L-16	70.2k	0.01	10	1	**0.1937**	0.0025	0.1911	**0.2210**	0.0026	0.2183
GB-COMP	47	0.1	0.5	0.5	0.3839	0.0107	0.3733	0.4105	0.0100	0.4005

Table 6: *Objective metrics for non parametric models of* ***Ampeg OptoComp*** *compressor. Bold indicates best performing models.*

Model	Params.	LR	Weights					FAD			
			L1	MR-STFT	MSE	ESR	MAPE	VGGish	PANN	CLAP	AFx-Rep
LSTM-32	4.5k	0.001	1	0.1	2.72e-03	4.0779	2.5266	0.0046	4.21e-09	0.0068	0.0082
LSTM-96	38.1k	0.005	10	1	2.67e-06	0.0052	1.5669	0.0052	2.19e-07	0.0070	0.0082
TCN-45-S-16	7.5k	0.005	1	0.1	1.31e-05	0.0288	1.5961	0.0536	8.43e-06	0.0103	0.0746
TCN-45-L-16	7.3k	0.005	10	1	1.73e-05	0.0373	3.1260	0.1518	4.87e-05	0.0198	0.1553
TCN-250-S-16	14.5k	0.005	5	5	2.72e-03	3.9334	4.1025	0.1730	3.28e-05	0.0227	0.1805
TCN-250-L-16	18.4k	0.005	1	0.1	1.83e-05	0.0388	1.4565	0.1727	4.84e-05	0.0201	0.1694
TCN-2500-S-16	13.7k	0.005	1	0.1	2.06e-05	0.0442	1.2756	0.1919	6.49e-05	0.0239	0.1964
TCN-2500-L-16	11.9k	0.005	0.5	0.5	2.72e-03	3.9934	3.4717	0.1500	3.31e-05	0.0219	0.1366
TCN-TF-45-S-16	39.5k	0.005	10	1	1.81e-06	0.0037	0.4155	0.0049	1.20e-08	0.0067	0.0061
TCN-TF-45-L-16	71.3k	0.005	10	1	2.13e-06	0.0040	0.6163	0.0053	3.32e-09	0.0057	0.0051
TCN-TF-250-S-16	52.9k	0.005	10	1	2.68e-03	4.0072	2.4095	0.0042	1.05e-07	0.0064	0.0049
TCN-TF-250-L-16	88.8k	0.005	10	1	1.87e-06	0.0037	0.4079	0.0054	1.73e-07	0.0064	0.0056
TCN-TF-2500-S-16	45.7k	0.005	5	5	2.69e-03	4.0316	2.6948	0.0118	2.45e-06	0.0059	0.0066
TCN-TF-2500-L-16	75.9k	0.005	5	5	2.69e-03	4.0319	2.5622	0.0070	5.72e-08	0.0050	0.0048
GCN-45-S-16	16.2k	0.005	5	5	2.69e-03	3.9597	2.8336	0.0486	1.71e-09	0.0120	0.0822
GCN-45-L-16	17.1k	0.005	0.5	0.5	2.69e-03	3.9538	3.1831	0.0635	1.27e-06	0.0116	0.0851
GCN-250-S-16	30.4k	0.005	5	5	2.70e-03	4.0120	2.9786	0.0170	3.53e-07	0.0080	0.0239
GCN-250-L-16	39.6k	0.005	10	1	1.14e-05	0.0220	2.3755	0.0496	4.30e-07	0.0097	0.0421
GCN-2500-S-16	28.6k	0.005	1	0.1	2.65e-03	3.9405	2.9564	0.0166	4.46e-06	0.0076	0.0208
GCN-2500-L-16	26.4k	0.005	10	1	5.71e-06	0.0117	0.7966	0.0175	2.02e-06	0.0063	0.0144
GCN-TF-45-S-16	141.6k	0.005	1	0.1	1.56e-06	0.0030	**0.3327**	0.0037	2.37e-08	0.0068	0.0052
GCN-TF-45-L-16	268.0k	0.005	1	0.1	2.24e-06	0.0042	0.3917	0.0045	5.42e-09	0.0060	**0.0048**
GCN-TF-250-S-16	181.0k	0.005	0.5	0.5	4.97e-06	0.0086	0.6895	0.0038	3.86e-07	0.0073	0.0056
GCN-TF-250-L-16	315.6k	0.005	10	1	2.22e-06	0.0041	0.3898	**0.0035**	4.70e-09	0.0061	0.0048
GCN-TF-2500-S-16	154.1k	0.005	0.5	0.5	2.70e-03	4.0415	2.5044	0.0047	5.02e-07	0.0049	0.0070
GCN-TF-2500-L-16	277.3k	0.005	0.5	0.5	2.70e-03	4.0372	2.3945	0.0043	**6.33e-10**	0.0048	0.0056
S4-S-16	2.4k	0.01	1	0.1	4.45e-06	0.0109	1.0636	0.0158	4.12e-09	0.0065	0.0092
S4-L-16	19.0k	0.01	1	0.1	2.70e-06	0.0062	1.3359	0.0067	7.24e-08	0.0053	0.0058
S4-TF-S-16	28.0k	0.01	1	0.1	2.69e-03	4.0326	2.1828	0.0039	5.34e-08	0.0057	0.0050
S4-TF-L-16	70.2k	0.01	10	1	**1.18e-06**	**0.0022**	0.4089	0.0047	3.12e-09	**0.0046**	0.0054
GB-COMP	47	0.1	0.5	0.5	1.17e-05	0.0256	1.0919	0.0077	5.73e-06	0.0068	0.0185

Table 7: *Objective metrics for non parametric models of* ***Flamma AnalogComp*** *compressor. Bold indicates best performing models.*

Model	Params.	LR	Weights					FAD			
			L1	MR-STFT	MSE	ESR	MAPE	VGGish	PANN	CLAP	AFx-Rep
LSTM-32	4.5k	0.005	10	1	6.11e-05	0.0041	0.6271	0.0620	3.15e-06	0.0085	0.0151
LSTM-96	38.1k	0.005	10	1	2.76e-05	0.0021	1.2703	0.0303	4.37e-07	0.0078	0.0132
TCN-45-S-16	7.5k	0.005	10	1	2.00e-04	0.0145	1.1282	0.5163	1.03e-04	0.0351	0.2174
TCN-45-L-16	7.3k	0.005	1	0.1	1.77e-04	0.0125	1.3288	0.3382	5.45e-05	0.0267	0.1848
TCN-250-S-16	14.5k	0.005	1	0.1	1.97e-04	0.0142	0.5991	0.4504	7.37e-05	0.0332	0.2065
TCN-250-L-16	18.4k	0.005	10	1	1.11e-04	0.0077	1.9784	0.1169	3.43e-06	0.0135	0.0685
TCN-2500-S-16	13.7k	0.005	0.5	0.5	2.73e-04	0.0206	1.2972	0.5588	1.04e-04	0.0354	0.2222
TCN-2500-L-16	11.9k	0.005	0.5	0.5	2.75e-04	0.0216	3.4443	0.3600	5.73e-05	0.0250	0.1563
TCN-TF-45-S-16	39.5k	0.005	5	5	7.66e-05	0.0055	1.0900	0.1093	4.43e-07	0.0074	0.0426
TCN-TF-45-L-16	71.3k	0.005	0.5	0.5	4.54e-05	0.0036	0.7004	0.0303	6.09e-07	0.0060	0.0205
TCN-TF-250-S-16	52.9k	0.005	0.5	0.5	5.37e-05	0.0041	0.7663	0.0901	7.17e-07	0.0072	0.0302
TCN-TF-250-L-16	88.8k	0.005	0.5	0.5	1.53e-04	0.0134	1.4655	0.0303	4.72e-07	0.0058	0.0223
TCN-TF-2500-S-16	45.7k	0.005	10	1	7.57e-05	0.0050	1.6560	0.2033	2.35e-06	0.0096	0.0441
TCN-TF-2500-L-16	75.9k	0.005	1	0.1	4.36e-05	0.0031	1.5167	0.0896	6.05e-06	0.0089	0.0320
GCN-45-S-16	16.2k	0.005	1	0.1	7.37e-05	0.0052	0.6256	0.0797	6.26e-06	0.0113	0.0415
GCN-45-L-16	17.1k	0.005	10	1	6.32e-05	0.0044	0.4764	0.0510	3.43e-08	0.0116	0.0347
GCN-250-S-16	30.4k	0.005	10	1	4.94e-05	0.0035	1.1553	0.0430	3.34e-07	0.0092	0.0251
GCN-250-L-16	39.6k	0.005	10	1	5.46e-05	0.0039	1.4670	0.0358	2.81e-06	0.0088	0.0150
GCN-2500-S-16	28.6k	0.005	1	0.1	6.81e-05	0.0050	0.4872	0.0394	5.87e-06	0.0047	0.0161
GCN-2500-L-16	26.4k	0.005	10	1	3.95e-05	0.0029	0.4672	0.0346	7.07e-06	0.0046	0.0127
GCN-TF-45-S-16	141.6k	0.005	1	0.1	2.47e-05	0.0017	1.0051	0.1070	1.87e-06	0.0082	0.0311
GCN-TF-45-L-16	268.0k	0.005	10	1	3.81e-05	0.0027	0.9231	0.0336	3.92e-07	0.0055	0.0214
GCN-TF-250-S-16	181.0k	0.005	10	1	3.12e-05	0.0022	0.5085	0.0618	**1.04e-08**	0.0065	0.0323
GCN-TF-250-L-16	315.6k	0.005	0.5	0.5	4.78e-05	0.0039	0.6216	0.0731	1.89e-06	0.0052	0.0244
GCN-TF-2500-S-16	154.1k	0.005	10	1	3.70e-05	0.0025	0.4120	0.0380	9.65e-07	0.0046	0.0235
GCN-TF-2500-L-16	277.3k	0.005	1	0.1	2.45e-05	0.0017	0.3605	0.0193	1.93e-06	0.0040	0.0099
S4-S-16	2.4k	0.01	0.5	0.5	1.35e-04	0.0101	1.0429	0.0734	6.76e-06	0.0095	0.0409
S4-L-16	19.0k	0.01	1	0.1	4.33e-05	0.0030	2.0815	**0.0177**	4.41e-06	**0.0020**	**0.0073**
S4-TF-S-16	28.0k	0.01	10	1	3.25e-05	0.0023	**0.2862**	0.0302	2.02e-07	0.0045	0.0194
S4-TF-L-16	70.2k	0.01	10	1	**2.35e-05**	**0.0017**	0.3077	0.0188	5.28e-07	0.0041	0.0135
GB-COMP	47	0.1	5	5	1.37e-03	0.0954	2.7457	0.2296	6.64e-07	0.0169	0.1098

Table 8: *Objective metrics for non parametric models of* ***Yuer DynaComp*** *compressor. Bold indicates best performing models.*

Model	Params.	LR	Weights					FAD			
			L1	MR-STFT	MSE	ESR	MAPE	VGGish	PANN	CLAP	AFx-Rep
LSTM-32	4.5k	0.005	10	1	2.77e-03	0.5049	3.5045	0.1909	5.72e-06	0.0234	0.0238
LSTM-96	38.1k	0.001	1	0.1	2.80e-03	0.5107	3.9581	0.2057	3.61e-06	0.0235	0.0308
TCN-45-S-16	7.5k	0.005	1	0.1	2.92e-03	0.5142	3.6166	1.1084	2.35e-04	0.0755	0.2505
TCN-45-L-16	7.3k	0.005	5	5	3.02e-03	0.5290	6.2789	0.2674	6.71e-05	0.0306	0.1082
TCN-250-S-16	14.5k	0.005	10	1	2.83e-03	0.5022	3.1373	0.7767	2.16e-04	0.0545	0.1500
TCN-250-L-16	18.4k	0.005	1	0.1	2.81e-03	0.5022	3.7181	0.3657	7.80e-05	0.0362	0.0870
TCN-2500-S-16	13.7k	0.005	1	0.1	2.90e-03	0.5150	3.4373	0.3080	8.77e-05	0.0232	0.0593
TCN-2500-L-16	11.9k	0.005	10	1	2.85e-03	0.5113	3.2285	0.1675	3.50e-05	0.0131	0.0318
TCN-TF-45-S-16	39.5k	0.005	10	1	2.76e-03	0.5013	3.1074	0.1491	1.31e-05	0.0160	0.0192
TCN-TF-45-L-16	71.3k	0.005	0.5	0.5	2.91e-03	0.5240	3.7697	0.1822	4.41e-06	0.0181	0.0238
TCN-TF-250-S-16	52.9k	0.005	1	0.1	2.81e-03	0.5102	3.1086	0.1574	2.00e-05	0.0219	0.0277
TCN-TF-250-L-16	88.8k	0.005	5	5	2.75e-03	0.4998	2.8870	0.1731	1.34e-05	0.0194	0.0189
TCN-TF-2500-S-16	45.7k	0.005	1	0.1	**2.72e-03**	**0.4928**	3.5306	0.2158	8.90e-06	0.0149	0.0208
TCN-TF-2500-L-16	75.9k	0.005	10	1	2.75e-03	0.4975	3.1162	0.1772	5.67e-06	0.0143	0.0229
GCN-45-S-16	16.2k	0.005	1	0.1	2.84e-03	0.5087	3.1357	0.2140	**3.85e-07**	0.0266	0.0495
GCN-45-L-16	17.1k	0.005	1	0.1	2.88e-03	0.5157	3.3112	0.2161	4.80e-07	0.0248	0.0409
GCN-250-S-16	30.4k	0.005	10	1	2.78e-03	0.5051	9.9088	0.1298	6.88e-06	0.0188	0.0237
GCN-250-L-16	39.6k	0.005	10	1	2.76e-03	0.4991	3.5485	0.1663	2.13e-05	0.0178	0.0263
GCN-2500-S-16	28.6k	0.005	10	1	2.81e-03	0.5078	2.9546	0.1478	6.36e-06	**0.0097**	0.0230
GCN-2500-L-16	26.4k	0.005	10	1	2.77e-03	0.5035	3.0217	**0.0931**	2.79e-06	0.0107	0.0178
GCN-TF-45-S-16	141.6k	0.005	1	0.1	2.78e-03	0.5044	3.1127	0.1987	2.43e-05	0.0151	0.0259
GCN-TF-45-L-16	268.0k	0.005	10	1	2.75e-03	0.5003	3.0603	0.2021	7.21e-06	0.0186	0.0187
GCN-TF-250-S-16	181.0k	0.005	1	0.1	2.77e-03	0.5038	3.1035	0.2323	1.63e-05	0.0193	0.0299
GCN-TF-250-L-16	315.6k	0.005	5	5	2.77e-03	0.5023	3.0060	0.2340	7.38e-06	0.0198	0.0261
GCN-TF-2500-S-16	154.1k	0.005	1	0.1	2.76e-03	0.4992	3.1722	0.1872	4.05e-06	0.0143	0.0277
GCN-TF-2500-L-16	277.3k	0.005	10	1	2.76e-03	0.5002	3.1549	0.1598	1.12e-05	0.0136	0.0240
S4-S-16	2.4k	0.01	5	5	2.80e-03	0.5066	3.0662	0.1657	8.36e-06	0.0182	0.0263
S4-L-16	19.0k	0.01	5	5	2.75e-03	0.5004	2.8643	0.2143	6.60e-06	0.0188	0.0124
S4-TF-S-16	28.0k	0.01	5	5	2.62e-02	3.4814	4.0847	0.1099	8.28e-06	0.0193	**0.0118**
S4-TF-L-16	70.2k	0.01	10	1	2.72e-03	0.4961	**2.8315**	0.1056	1.60e-05	0.0175	0.0137
GB-COMP	47	0.1	5	5	3.44e-03	0.5953	3.7422	0.4163	6.29e-05	0.0382	0.1934

Table 9: *Objective metrics for non parametric models of* ***Universal Audio 1176LN*** *limiter. Bold indicates best performing models.*

Model	Params.	LR	Weights					FAD			
			L1	MR-STFT	MSE	ESR	MAPE	VGGish	PANN	CLAP	AFx-Rep
LSTM-32	4.5k	0.001	10	1	2.11e-04	0.0034	33.4556	0.1199	1.43e-05	0.0927	0.0531
LSTM-96	38.1k	0.001	1	0.1	1.84e-04	0.0030	31.7705	0.0537	2.79e-05	0.0953	0.0491
TCN-45-S-16	7.5k	0.005	10	1	7.52e-04	0.0123	22.6519	0.5622	5.67e-05	0.1789	0.1421
TCN-45-L-16	7.3k	0.005	5	5	2.08e-03	0.0351	7.1800	0.5551	3.39e-05	0.1781	0.1338
TCN-250-S-16	14.5k	0.005	5	5	1.42e-03	0.0238	3.6584	0.7090	3.49e-05	0.1215	0.1091
TCN-250-L-16	18.4k	0.005	10	1	6.01e-04	0.0098	1.7731	0.5886	3.76e-05	0.1323	0.1095
TCN-2500-S-16	13.7k	0.005	10	1	9.33e-04	0.0153	2.9281	1.0565	7.22e-05	0.1313	0.1349
TCN-2500-L-16	11.9k	0.005	5	5	1.85e-03	0.0312	6.2843	0.7231	2.78e-05	0.1098	0.1037
TCN-TF-45-S-16	39.5k	0.005	10	1	9.46e-05	0.0016	2.3228	0.1738	1.52e-05	0.0417	0.0224
TCN-TF-45-L-16	71.3k	0.005	1	0.1	9.54e-05	0.0015	2.3920	0.1097	2.24e-05	0.0293	0.0166
TCN-TF-250-S-16	52.9k	0.005	10	1	8.49e-05	0.0014	1.6220	0.0718	2.01e-06	0.0201	0.0164
TCN-TF-250-L-16	88.8k	0.005	1	0.1	6.11e-05	0.0010	2.0004	0.0643	2.91e-06	0.0184	0.0114
TCN-TF-2500-S-16	45.7k	0.005	1	0.1	1.30e-04	0.0021	1.9660	0.2419	1.63e-05	0.0315	0.0271
TCN-TF-2500-L-16	75.9k	0.005	5	5	4.71e-04	0.0080	5.8395	0.1076	2.98e-06	0.0229	0.0220
GCN-45-S-16	16.2k	0.005	10	1	6.51e-04	0.0109	6.3400	0.4614	4.86e-07	0.1465	0.0761
GCN-45-L-16	17.1k	0.005	10	1	5.68e-04	0.0095	42.1807	0.3609	1.19e-05	0.1478	0.0763
GCN-250-S-16	30.4k	0.005	1	0.1	4.00e-04	0.0066	3.4189	0.4703	7.88e-06	0.0974	0.0521
GCN-250-L-16	39.6k	0.005	1	0.1	5.99e-04	0.0101	53.2828	0.5867	1.30e-05	0.1051	0.0649
GCN-2500-S-16	28.6k	0.005	10	1	3.50e-04	0.0058	1.8697	0.3144	5.04e-06	0.0857	0.0296
GCN-2500-L-16	26.4k	0.005	10	1	3.62e-04	0.0060	3.1052	0.4022	1.58e-06	0.0840	0.0444
GCN-TF-45-S-16	141.6k	0.005	10	1	5.64e-05	0.0009	0.8019	0.0317	**1.67e-07**	0.0206	0.0054
GCN-TF-45-L-16	268.0k	0.005	5	5	3.02e-04	0.0052	1.0718	0.0243	2.11e-06	0.0299	0.0052
GCN-TF-250-S-16	181.0k	0.005	1	0.1	9.48e-05	0.0016	1.5248	0.0628	4.35e-06	0.0203	0.0078
GCN-TF-250-L-16	315.6k	0.005	1	0.1	9.54e-05	0.0016	1.7229	0.0371	4.02e-06	0.0191	0.0098
GCN-TF-2500-S-16	154.1k	0.005	1	0.1	5.83e-05	0.0010	1.4051	0.1082	8.25e-06	0.0187	0.0124
GCN-TF-2500-L-16	277.3k	0.005	5	5	2.71e-04	0.0046	1.6863	0.0476	4.82e-07	0.0170	0.0069
S4-S-16	2.4k	0.01	5	5	7.53e-04	0.0123	5.3618	0.4503	5.75e-06	0.0812	0.0886
S4-L-16	19.0k	0.01	10	1	1.50e-04	0.0025	9.5521	0.0517	8.10e-07	0.0253	0.0186
S4-TF-S-16	28.0k	0.01	1	0.1	6.56e-05	0.0011	0.7010	0.0810	2.41e-06	0.0223	0.0100
S4-TF-L-16	70.2k	0.01	10	1	**5.03e-05**	**0.0008**	0.9904	**0.0215**	1.17e-05	**0.0152**	**0.0046**
GB-COMP	47	0.1	0.5	0.5	4.92e-04	0.0081	**0.6918**	0.3773	8.98e-07	0.1448	0.0977

1.2 Results Overdrive

Table 10: *Scaled test loss for non parametric models of overdrive effects. Bold indicates best performing models.*

Model	Params.	Fulltone Fulldrive 2			Harley Benton Green Tint			Ibanez TS9			DIY Klon Centaur		
		Tot.	L1	MR-STFT	Tot.	L1	MR-STFT	Tot.	L1	MR-STFT	Tot.	L1	MR-STFT
LSTM-32	4.5k	1.1757	0.0275	1.1482	1.1488	0.0404	1.1084	0.2504	0.0029	0.2475	2.6646	0.1623	2.5023
LSTM-96	38.1k	0.5053	0.0071	0.4982	1.1921	0.0459	1.1463	**0.2094**	0.0025	0.2068	1.6661	0.1663	1.4998
TCN-45-S-16	7.5k	0.4409	0.0059	0.4350	0.5190	0.0051	0.5138	0.4214	0.0125	0.4089	0.9993	0.0539	0.9454
TCN-45-L-16	7.3k	0.4388	0.0059	0.4328	0.4985	0.0061	0.4924	0.3622	0.0088	0.3534	0.8964	0.0492	0.8472
TCN-250-S-16	14.5k	0.4161	0.0038	0.4122	0.5041	0.0045	0.4996	0.4050	0.0063	0.3987	1.0135	0.0478	0.9657
TCN-250-L-16	18.4k	0.4165	0.0027	0.4138	0.4799	0.0058	0.4740	0.3066	0.0057	0.3010	0.8163	0.0244	0.7919
TCN-2500-S-16	13.7k	0.4468	0.0039	0.4429	0.5025	0.0054	0.4971	0.4976	0.0167	0.4809	1.1596	0.0670	1.0926
TCN-2500-L-16	11.9k	0.4078	0.0030	0.4048	0.4675	0.0052	0.4623	0.3639	0.0109	0.3531	0.8681	0.0358	0.8323
TCN-TF-45-S-16	39.5k	0.4023	0.0029	0.3994	0.5279	0.0054	0.5225	0.4209	0.0072	0.4137	0.8154	0.0466	0.7688
TCN-TF-45-L-16	71.3k	0.3946	0.0029	0.3917	0.4923	0.0049	0.4874	0.3743	0.0062	0.3681	0.6794	0.0354	0.6440
TCN-TF-250-S-16	52.9k	0.4056	0.0028	0.4027	0.5242	0.0055	0.5187	0.3088	0.0057	0.3032	0.7251	0.0412	0.6839
TCN-TF-250-L-16	88.8k	0.3729	0.0024	0.3705	0.4908	0.0116	0.4792	0.2992	0.0037	0.2955	0.6896	0.0286	0.6610
TCN-TF-2500-S-16	45.7k	0.4092	0.0035	0.4057	0.4745	0.0047	0.4698	0.4799	0.0076	0.4724	0.9178	0.0608	0.8571
TCN-TF-2500-L-16	75.9k	0.3883	0.0029	0.3853	0.4364	0.0061	0.4303	0.3389	0.0054	0.3334	0.8672	0.0352	0.8320
GCN-45-S-16	16.2k	0.4385	0.0043	0.4342	0.5215	0.0048	0.5168	0.4147	0.0127	0.4020	1.0857	0.0540	1.0317
GCN-45-L-16	17.1k	0.4129	0.0070	0.4059	0.5085	0.0060	0.5025	0.3482	0.0104	0.3378	0.8823	0.0311	0.8512
GCN-250-S-16	30.4k	0.4290	0.0032	0.4258	0.4827	0.0042	0.4785	0.4121	0.0168	0.3953	1.0585	0.0481	1.0104
GCN-250-L-16	39.6k	0.3919	0.0027	0.3892	0.4635	0.0040	0.4594	0.3317	0.0046	0.3271	0.7715	0.0263	0.7452
GCN-2500-S-16	28.6k	0.4312	0.0049	0.4263	0.4948	0.0055	0.4894	0.4725	0.0181	0.4544	1.0732	0.0626	1.0106
GCN-2500-L-16	26.4k	0.3958	0.0028	0.3931	0.4625	0.0038	0.4587	0.3559	0.0128	0.3431	0.7494	0.0393	0.7101
GCN-TF-45-S-16	141.6k	0.3872	0.0025	0.3847	0.5896	0.0071	0.5824	0.3799	0.0067	0.3732	0.7586	0.0463	0.7123
GCN-TF-45-L-16	268.0k	0.3704	0.0026	0.3678	0.5029	0.0056	0.4973	0.3128	0.0061	0.3067	0.6668	0.0372	0.6296
GCN-TF-250-S-16	181.0k	0.4312	0.0034	0.4278	0.4495	0.0043	0.4452	0.3613	0.0042	0.3571	0.6735	0.0367	0.6369
GCN-TF-250-L-16	315.6k	0.3701	0.0027	0.3674	0.5065	0.0052	0.5013	0.2702	0.0038	0.2664	0.6275	0.0301	0.5974
GCN-TF-2500-S-16	154.1k	0.3897	0.0029	0.3868	0.4654	0.0048	0.4606	0.4014	0.0079	0.3936	0.8594	0.0485	0.8109
GCN-TF-2500-L-16	277.3k	0.3790	0.0046	0.3743	0.4307	0.0039	0.4267	0.3073	0.0063	0.3009	0.6816	0.0406	0.6410
S4-S-16	2.4k	0.3615	0.0019	0.3596	0.4431	0.0035	0.4395	0.3631	0.0106	0.3525	1.0089	0.0312	0.9777
S4-L-16	19.0k	0.3427	0.0017	0.3409	**0.4272**	0.0035	0.4237	0.2553	0.0026	0.2527	**0.5605**	0.0201	0.5404
S4-TF-S-16	28.0k	0.3403	0.0019	0.3384	0.4313	0.0049	0.4264	0.3070	0.0044	0.3026	0.8116	0.0240	0.7876
S4-TF-L-16	70.2k	**0.3191**	0.0018	0.3173	0.4316	0.0037	0.4278	0.2637	0.0028	0.2608	0.5859	0.0280	0.5579
GB-DIST-MLP	2.2k	0.6919	0.0165	0.6754	0.8617	0.0239	0.8379	0.5755	0.0802	0.4953	1.2269	0.1200	1.1069
GB-DIST-RNL	47	0.7860	0.0170	0.7690	0.9526	0.0252	0.9274	0.6380	0.0774	0.5606	0.9397	0.1090	0.8306
GB-FUZZ-MLP	2.3k	0.6928	0.0158	0.6770	0.8992	0.0229	0.8763	0.6618	0.0846	0.5772	1.1462	0.0876	1.0586
GB-FUZZ-RNL	62	0.7970	0.0172	0.7798	0.8817	0.0250	0.8567	0.5814	0.0797	0.5017	1.1943	0.1095	1.0849

Table 11: *Scaled validation and test loss for non parametric models of* ***Fulltone Fulldrive 2*** *overdrive. Bold indicates best performing models. Learning rate multiplier for nonlinearity in gray-box models shown in brackets.*

Model	Params.	LR	Weights		Val. Loss			Test Loss		
			L1	MR-STFT	Tot.	L1	MR-STFT	Tot.	L1	MR-STFT
LSTM-32	4.5k	0.005	10	1	0.9025	0.0156	0.8869	1.1757	0.0275	1.1482
LSTM-96	38.1k	0.005	1	0.1	0.5337	0.0053	0.5284	0.5053	0.0071	0.4982
TCN-45-S-16	7.5k	0.005	5	5	0.4692	0.0069	0.4623	0.4409	0.0059	0.4350
TCN-45-L-16	7.3k	0.005	5	5	0.4605	0.0082	0.4523	0.4388	0.0059	0.4328
TCN-250-S-16	14.5k	0.005	0.5	0.5	0.4669	0.0048	0.4621	0.4161	0.0038	0.4122
TCN-250-L-16	18.4k	0.005	1	0.1	0.4385	0.0027	0.4358	0.4165	0.0027	0.4138
TCN-2500-S-16	13.7k	0.005	10	1	0.4695	0.0037	0.4658	0.4468	0.0039	0.4429
TCN-2500-L-16	11.9k	0.005	1	0.1	0.4430	0.0028	0.4402	0.4078	0.0030	0.4048
TCN-TF-45-S-16	39.5k	0.005	1	0.1	0.4463	0.0028	0.4435	0.4023	0.0029	0.3994
TCN-TF-45-L-16	71.3k	0.005	10	1	0.4273	0.0023	0.4250	0.3946	0.0029	0.3917
TCN-TF-250-S-16	52.9k	0.005	1	0.1	0.4215	0.0027	0.4188	0.4056	0.0028	0.4027
TCN-TF-250-L-16	88.8k	0.005	10	1	0.3983	0.0020	0.3962	0.3729	0.0024	0.3705
TCN-TF-2500-S-16	45.7k	0.005	5	5	0.4496	0.0044	0.4452	0.4092	0.0035	0.4057
TCN-TF-2500-L-16	75.9k	0.005	10	1	0.4152	0.0026	0.4126	0.3883	0.0029	0.3853
GCN-45-S-16	16.2k	0.005	5	5	0.4894	0.0047	0.4847	0.4385	0.0043	0.4342
GCN-45-L-16	17.1k	0.005	5	5	0.4805	0.0081	0.4724	0.4129	0.0070	0.4059
GCN-250-S-16	30.4k	0.005	1	0.1	0.4569	0.0029	0.4540	0.4290	0.0032	0.4258
GCN-250-L-16	39.6k	0.005	10	1	0.4226	0.0026	0.4200	0.3919	0.0027	0.3892
GCN-2500-S-16	28.6k	0.005	5	5	0.4800	0.0051	0.4748	0.4312	0.0049	0.4263
GCN-2500-L-16	26.4k	0.005	10	1	0.4239	0.0028	0.4211	0.3958	0.0028	0.3931
GCN-TF-45-S-16	141.6k	0.005	10	1	0.4180	0.0021	0.4159	0.3872	0.0025	0.3847
GCN-TF-45-L-16	268.0k	0.005	1	0.1	0.4046	0.0020	0.4025	0.3704	0.0026	0.3678
GCN-TF-250-S-16	181.0k	0.005	10	1	0.5026	0.0036	0.4990	0.4312	0.0034	0.4278
GCN-TF-250-L-16	315.6k	0.005	1	0.1	0.4084	0.0023	0.4061	0.3701	0.0027	0.3674
GCN-TF-2500-S-16	154.1k	0.005	1	0.1	0.3946	0.0026	0.3919	0.3897	0.0029	0.3868
GCN-TF-2500-L-16	277.3k	0.005	5	5	0.3932	0.0058	0.3874	0.3790	0.0046	0.3743
S4-S-16	2.4k	0.01	10	1	0.3945	0.0015	0.3930	0.3615	0.0019	0.3596
S4-L-16	19.0k	0.01	1	0.1	0.3585	0.0015	0.3569	0.3427	0.0017	0.3409
S4-TF-S-16	28.0k	0.01	10	1	0.3726	0.0012	0.3714	0.3403	0.0019	0.3384
S4-TF-L-16	70.2k	0.01	1	0.1	**0.3488**	0.0011	0.3477	**0.3191**	0.0018	0.3173
GB-DIST-MLP	2.2k	0.1 (0.01)	5	5	0.7507	0.0148	0.7360	0.6919	0.0165	0.6754
GB-DIST-RNL	47	0.1 (1)	0.5	0.5	0.8472	0.0151	0.8321	0.7860	0.0170	0.7690
GB-FUZZ-MLP	2.3k	0.1 (0.01)	1	0.1	0.7521	0.0159	0.7362	0.6928	0.0158	0.6770
GB-FUZZ-RNL	62	0.1 (1)	0.5	0.5	0.8666	0.0166	0.8500	0.7970	0.0172	0.7798

Table 12: *Scaled validation and test loss for non parametric models of* ***Harley Benton Green Tint*** *overdrive. Bold indicates best performing models. Learning rate multiplier for nonlinearity in gray-box models shown in brackets.*

Model	Params.	LR	Weights		Val. Loss			Test Loss		
			L1	MR-STFT	Tot.	L1	MR-STFT	Tot.	L1	MR-STFT
LSTM-32	4.5k	0.001	0.5	0.5	1.2897	0.0377	1.2520	1.1488	0.0404	1.1084
LSTM-96	38.1k	0.001	0.5	0.5	1.2992	0.0509	1.2483	1.1921	0.0459	1.1463
TCN-45-S-16	7.5k	0.005	5	5	0.5695	0.0036	0.5659	0.5190	0.0051	0.5138
TCN-45-L-16	7.3k	0.005	5	5	0.5220	0.0092	0.5128	0.4985	0.0061	0.4924
TCN-250-S-16	14.5k	0.005	5	5	0.5550	0.0051	0.5498	0.5041	0.0045	0.4996
TCN-250-L-16	18.4k	0.005	0.5	0.5	0.5156	0.0084	0.5073	0.4799	0.0058	0.4740
TCN-2500-S-16	13.7k	0.005	1	0.1	0.5324	0.0044	0.5280	0.5025	0.0054	0.4971
TCN-2500-L-16	11.9k	0.005	5	5	0.5097	0.0060	0.5037	0.4675	0.0052	0.4623
TCN-TF-45-S-16	39.5k	0.005	10	1	0.5519	0.0049	0.5470	0.5279	0.0054	0.5225
TCN-TF-45-L-16	71.3k	0.005	10	1	0.5248	0.0038	0.5210	0.4923	0.0049	0.4874
TCN-TF-250-S-16	52.9k	0.005	1	0.1	0.5417	0.0045	0.5372	0.5242	0.0055	0.5187
TCN-TF-250-L-16	88.8k	0.005	0.5	0.5	0.5474	0.0183	0.5291	0.4908	0.0116	0.4792
TCN-TF-2500-S-16	45.7k	0.005	10	1	0.5060	0.0039	0.5022	0.4745	0.0047	0.4698
TCN-TF-2500-L-16	75.9k	0.005	5	5	0.4631	0.0090	0.4541	0.4364	0.0061	0.4303
GCN-45-S-16	16.2k	0.005	5	5	0.5930	0.0049	0.5881	0.5215	0.0048	0.5168
GCN-45-L-16	17.1k	0.005	5	5	0.6377	0.0079	0.6298	0.5085	0.0060	0.5025
GCN-250-S-16	30.4k	0.005	5	5	0.5374	0.0042	0.5332	0.4827	0.0042	0.4785
GCN-250-L-16	39.6k	0.005	5	5	0.4933	0.0044	0.4890	0.4635	0.0040	0.4594
GCN-2500-S-16	28.6k	0.005	5	5	0.5459	0.0056	0.5404	0.4948	0.0055	0.4894
GCN-2500-L-16	26.4k	0.005	10	1	0.5013	0.0027	0.4986	0.4625	0.0038	0.4587
GCN-TF-45-S-16	141.6k	0.005	10	1	0.5053	0.0035	0.5019	0.5896	0.0071	0.5824
GCN-TF-45-L-16	268.0k	0.005	5	5	0.6342	0.0077	0.6265	0.5029	0.0056	0.4973
GCN-TF-250-S-16	181.0k	0.005	0.5	0.5	0.4921	0.0037	0.4884	0.4495	0.0043	0.4452
GCN-TF-250-L-16	315.6k	0.005	10	1	0.5329	0.0042	0.5287	0.5065	0.0052	0.5013
GCN-TF-2500-S-16	154.1k	0.005	0.5	0.5	0.4694	0.0046	0.4648	0.4654	0.0048	0.4606
GCN-TF-2500-L-16	277.3k	0.005	5	5	0.4556	0.0042	0.4514	0.4307	0.0039	0.4267
S4-S-16	2.4k	0.01	1	0.1	0.4743	0.0022	0.4722	0.4431	0.0035	0.4395
S4-L-16	19.0k	0.01	10	1	**0.4421**	0.0025	0.4396	**0.4272**	0.0035	0.4237
S4-TF-S-16	28.0k	0.01	0.5	0.5	0.4598	0.0033	0.4565	0.4313	0.0049	0.4264
S4-TF-L-16	70.2k	0.01	10	1	0.4581	0.0022	0.4559	0.4316	0.0037	0.4278
GB-DIST-MLP	2.2k	0.1 (0.01)	5	5	0.9715	0.0204	0.9511	0.8617	0.0239	0.8379
GB-DIST-RNL	47	0.1 (1)	0.5	0.5	1.0295	0.0220	1.0075	0.9526	0.0252	0.9274
GB-FUZZ-MLP	2.3k	0.1 (0.01)	10	1	0.9771	0.0236	0.9535	0.8992	0.0229	0.8763
GB-FUZZ-RNL	62	0.1 (1)	5	5	0.9321	0.0226	0.9096	0.8817	0.0250	0.8567

Table 13: *Scaled validation and test loss for non parametric models of **Ibanez TS9** overdrive. Bold indicates best performing models. Learning rate multiplier for nonlinearity in gray-box models shown in brackets.*

Model	Params.	LR	Weights		Val. Loss			Test Loss		
			L1	MR-STFT	Tot.	L1	MR-STFT	Tot.	L1	MR-STFT
LSTM-32	4.5k	0.005	10	1	0.3481	0.0029	0.3452	0.2504	0.0029	0.2475
LSTM-96	38.1k	0.005	10	1	0.2932	0.0056	0.2876	**0.2094**	0.0025	0.2068
TCN-45-S-16	7.5k	0.005	0.5	0.5	0.4900	0.0145	0.4755	0.4214	0.0125	0.4089
TCN-45-L-16	7.3k	0.005	5	5	0.8015	0.0201	0.7814	0.3622	0.0088	0.3534
TCN-250-S-16	14.5k	0.005	1	0.1	0.5158	0.0115	0.5043	0.4050	0.0063	0.3987
TCN-250-L-16	18.4k	0.005	5	5	0.6339	0.0154	0.6185	0.3066	0.0057	0.3010
TCN-2500-S-16	13.7k	0.005	5	5	0.6698	0.0180	0.6518	0.4976	0.0167	0.4809
TCN-2500-L-16	11.9k	0.005	0.5	0.5	0.3801	0.0107	0.3694	0.3639	0.0109	0.3531
TCN-TF-45-S-16	39.5k	0.005	1	0.1	0.4427	0.0080	0.4346	0.4209	0.0072	0.4137
TCN-TF-45-L-16	71.3k	0.005	10	1	0.3814	0.0071	0.3743	0.3743	0.0062	0.3681
TCN-TF-250-S-16	52.9k	0.005	0.5	0.5	0.2752	0.0063	0.2689	0.3088	0.0057	0.3032
TCN-TF-250-L-16	88.8k	0.005	10	1	0.3149	0.0040	0.3109	0.2992	0.0037	0.2955
TCN-TF-2500-S-16	45.7k	0.005	10	1	0.4834	0.0084	0.4750	0.4799	0.0076	0.4724
TCN-TF-2500-L-16	75.9k	0.005	1	0.1	0.3483	0.0052	0.3431	0.3389	0.0054	0.3334
GCN-45-S-16	16.2k	0.005	5	5	0.5817	0.0172	0.5645	0.4147	0.0127	0.4020
GCN-45-L-16	17.1k	0.005	5	5	0.4984	0.0101	0.4884	0.3482	0.0104	0.3378
GCN-250-S-16	30.4k	0.005	0.5	0.5	0.7055	0.0226	0.6830	0.4121	0.0168	0.3953
GCN-250-L-16	39.6k	0.005	1	0.1	0.3505	0.0047	0.3459	0.3317	0.0046	0.3271
GCN-2500-S-16	28.6k	0.005	5	5	0.4817	0.0167	0.4650	0.4725	0.0181	0.4544
GCN-2500-L-16	26.4k	0.005	0.5	0.5	0.5076	0.0225	0.4851	0.3559	0.0128	0.3431
GCN-TF-45-S-16	141.6k	0.005	10	1	0.3824	0.0052	0.3772	0.3799	0.0067	0.3732
GCN-TF-45-L-16	268.0k	0.005	0.5	0.5	0.3177	0.0074	0.3103	0.3128	0.0061	0.3067
GCN-TF-250-S-16	181.0k	0.005	10	1	0.3541	0.0048	0.3493	0.3613	0.0042	0.3571
GCN-TF-250-L-16	315.6k	0.005	5	5	0.3109	0.0078	0.3031	0.2702	0.0038	0.2664
GCN-TF-2500-S-16	154.1k	0.005	1	0.1	0.4221	0.0080	0.4141	0.4014	0.0079	0.3936
GCN-TF-2500-L-16	277.3k	0.005	0.5	0.5	0.3277	0.0059	0.3218	0.3073	0.0063	0.3009
S4-S-16	2.4k	0.01	0.5	0.5	0.3611	0.0114	0.3498	0.3631	0.0106	0.3525
S4-L-16	19.0k	0.01	10	1	**0.2647**	0.0030	0.2617	0.2553	0.0026	0.2527
S4-TF-S-16	28.0k	0.01	5	5	0.2984	0.0043	0.2941	0.3070	0.0044	0.3026
S4-TF-L-16	70.2k	0.01	10	1	0.3591	0.0030	0.3561	0.2637	0.0028	0.2608
GB-DIST-MLP	2.2k	0.1 (0.01)	5	5	0.5558	0.0705	0.4854	0.5755	0.0802	0.4953
GB-DIST-RNL	47	0.1 (1)	0.5	0.5	0.8022	0.0787	0.7235	0.6380	0.0774	0.5606
GB-FUZZ-MLP	2.3k	0.1 (0.01)	5	5	0.6642	0.0922	0.5720	0.6618	0.0846	0.5772
GB-FUZZ-RNL	62	0.1 (1)	5	5	0.6213	0.0942	0.5271	0.5814	0.0797	0.5017

Table 14: *Scaled validation and test loss for non parametric models of **DIY Klon Centaur** overdrive. Bold indicates best performing models. Learning rate multiplier for nonlinearity in gray-box models shown in brackets.*

Model	Params.	LR	Weights		Val. Loss			Test Loss		
			L1	MR-STFT	Tot.	L1	MR-STFT	Tot.	L1	MR-STFT
LSTM-32	4.5k	0.001	10	1	1.8829	0.1647	1.7182	2.6646	0.1623	2.5023
LSTM-96	38.1k	0.001	0.5	0.5	1.8798	0.1696	1.7102	1.6661	0.1663	1.4998
TCN-45-S-16	7.5k	0.005	5	5	1.0613	0.0562	1.0051	0.9993	0.0539	0.9454
TCN-45-L-16	7.3k	0.005	0.5	0.5	1.2864	0.0737	1.2127	0.8964	0.0492	0.8472
TCN-250-S-16	14.5k	0.005	5	5	1.0239	0.0477	0.9762	1.0135	0.0478	0.9657
TCN-250-L-16	18.4k	0.005	10	1	1.1026	0.0372	1.0654	0.8163	0.0244	0.7919
TCN-2500-S-16	13.7k	0.005	5	5	1.3573	0.0687	1.2886	1.1596	0.0670	1.0926
TCN-2500-L-16	11.9k	0.005	10	1	0.8868	0.0349	0.8519	0.8681	0.0358	0.8323
TCN-TF-45-S-16	39.5k	0.005	0.5	0.5	0.8634	0.0487	0.8147	0.8154	0.0466	0.7688
TCN-TF-45-L-16	71.3k	0.005	0.5	0.5	0.6667	0.0381	0.6286	0.6794	0.0354	0.6440
TCN-TF-250-S-16	52.9k	0.005	5	5	0.7290	0.0434	0.6855	0.7251	0.0412	0.6839
TCN-TF-250-L-16	88.8k	0.005	5	5	0.7160	0.0279	0.6881	0.6896	0.0286	0.6610
TCN-TF-2500-S-16	45.7k	0.005	0.5	0.5	0.9325	0.0648	0.8677	0.9178	0.0608	0.8571
TCN-TF-2500-L-16	75.9k	0.005	1	0.1	0.8690	0.0360	0.8330	0.8672	0.0352	0.8320
GCN-45-S-16	16.2k	0.005	5	5	1.1328	0.0562	1.0766	1.0857	0.0540	1.0317
GCN-45-L-16	17.1k	0.005	10	1	1.0064	0.0290	0.9773	0.8823	0.0311	0.8512
GCN-250-S-16	30.4k	0.005	0.5	0.5	1.1857	0.0620	1.1237	1.0585	0.0481	1.0104
GCN-250-L-16	39.6k	0.005	5	5	0.8407	0.0309	0.8097	0.7715	0.0263	0.7452
GCN-2500-S-16	28.6k	0.005	0.5	0.5	1.1248	0.0601	1.0647	1.0732	0.0626	1.0106
GCN-2500-L-16	26.4k	0.005	5	5	0.8338	0.0508	0.7830	0.7494	0.0393	0.7101
GCN-TF-45-S-16	141.6k	0.005	5	5	0.7624	0.0439	0.7185	0.7586	0.0463	0.7123
GCN-TF-45-L-16	268.0k	0.005	5	5	0.7206	0.0415	0.6791	0.6668	0.0372	0.6296
GCN-TF-250-S-16	181.0k	0.005	5	5	0.6830	0.0400	0.6430	0.6735	0.0367	0.6369
GCN-TF-250-L-16	315.6k	0.005	0.5	0.5	0.6484	0.0375	0.6109	0.6275	0.0301	0.5974
GCN-TF-2500-S-16	154.1k	0.005	0.5	0.5	0.9044	0.0496	0.8548	0.8594	0.0485	0.8109
GCN-TF-2500-L-16	277.3k	0.005	0.5	0.5	0.6993	0.0384	0.6610	0.6816	0.0406	0.6410
S4-S-16	2.4k	0.01	10	1	1.0142	0.0317	0.9824	1.0089	0.0312	0.9777
S4-L-16	19.0k	0.01	1	0.1	**0.5904**	0.0211	0.5693	**0.5605**	0.0201	0.5404
S4-TF-S-16	28.0k	0.01	10	1	0.8279	0.0241	0.8039	0.8116	0.0240	0.7876
S4-TF-L-16	70.2k	0.01	0.5	0.5	0.6307	0.0261	0.6046	0.5859	0.0280	0.5579
GB-DIST-MLP	2.2k	0.1 (0.01)	0.5	0.5	1.2171	0.1173	1.0998	1.2269	0.1200	1.1069
GB-DIST-RNL	47	0.1 (1)	0.5	0.5	0.9195	0.1014	0.8180	0.9397	0.1090	0.8306
GB-FUZZ-MLP	2.3k	0.1 (0.01)	1	0.1	1.1539	0.0871	1.0667	1.1462	0.0876	1.0586
GB-FUZZ-RNL	62	0.1 (1)	5	5	1.2280	0.1116	1.1164	1.1943	0.1095	1.0849

Table 15: *Objective metrics for non parametric models of* ***Fulltone Fulldrive 2*** *overdrive. Bold indicates best performing models. Learning rate multiplier for nonlinearity in gray-box models shown in brackets.*

Model	Params.	LR	Weights					FAD			
			L1	MR-STFT	MSE	ESR	MAPE	VGGish	PANN	CLAP	AFx-Rep
LSTM-32	4.5k	0.005	10	1	1.68e-03	0.1362	3.9998	1.4119	3.43e-05	0.1293	0.4988
LSTM-96	38.1k	0.005	1	0.1	8.11e-05	0.0082	6.9465	0.0667	2.05e-07	0.0133	0.0217
TCN-45-S-16	7.5k	0.005	5	5	8.97e-05	0.0082	1.2545	0.0751	3.13e-07	0.0107	0.0159
TCN-45-L-16	7.3k	0.005	5	5	9.98e-05	0.0086	1.1470	0.0565	1.47e-07	0.0113	0.0209
TCN-250-S-16	14.5k	0.005	0.5	0.5	3.65e-05	0.0034	0.7144	0.0529	2.62e-07	0.0106	0.0099
TCN-250-L-16	18.4k	0.005	1	0.1	2.10e-05	0.0019	0.7343	0.0632	3.90e-06	0.0105	0.0485
TCN-2500-S-16	13.7k	0.005	10	1	3.06e-05	0.0029	1.1176	0.0792	4.23e-07	0.0106	0.0220
TCN-2500-L-16	11.9k	0.005	1	0.1	2.15e-05	0.0020	0.5055	0.0584	1.18e-06	0.0094	0.0223
TCN-TF-45-S-16	39.5k	0.005	1	0.1	2.30e-05	0.0020	0.8225	0.0686	6.78e-07	0.0105	0.0177
TCN-TF-45-L-16	71.3k	0.005	10	1	2.26e-05	0.0020	1.1366	0.0555	2.68e-07	0.0098	0.0208
TCN-TF-250-S-16	52.9k	0.005	1	0.1	2.22e-05	0.0020	0.5282	0.0558	1.42e-07	0.0110	0.0441
TCN-TF-250-L-16	88.8k	0.005	10	1	1.67e-05	0.0014	0.6382	0.0477	2.64e-06	0.0124	0.0279
TCN-TF-2500-S-16	45.7k	0.005	5	5	3.48e-05	0.0032	0.6971	0.0419	4.81e-07	0.0088	0.0353
TCN-TF-2500-L-16	75.9k	0.005	10	1	2.33e-05	0.0021	0.8519	0.0555	1.11e-06	**0.0074**	0.0230
GCN-45-S-16	16.2k	0.005	5	5	4.29e-05	0.0039	0.7902	0.0706	1.43e-07	0.0111	0.0161
GCN-45-L-16	17.1k	0.005	5	5	1.38e-04	0.0121	1.2566	0.0526	8.82e-08	0.0107	0.0152
GCN-250-S-16	30.4k	0.005	1	0.1	2.58e-05	0.0024	1.5628	0.0659	2.79e-07	0.0113	0.0162
GCN-250-L-16	39.6k	0.005	10	1	2.01e-05	0.0018	0.5185	0.0504	6.07e-07	0.0116	0.0121
GCN-2500-S-16	28.6k	0.005	5	5	4.73e-05	0.0045	1.8441	0.0617	2.60e-07	0.0092	0.0122
GCN-2500-L-16	26.4k	0.005	10	1	2.15e-05	0.0020	0.4165	0.0632	8.68e-08	0.0086	0.0282
GCN-TF-45-S-16	141.6k	0.005	10	1	1.75e-05	0.0015	0.4074	0.0515	1.68e-08	0.0087	0.0210
GCN-TF-45-L-16	268.0k	0.005	1	0.1	1.88e-05	0.0017	0.4704	0.0487	9.30e-07	0.0096	0.0148
GCN-TF-250-S-16	181.0k	0.005	10	1	2.83e-05	0.0025	0.5976	0.0897	1.19e-06	0.0098	0.0248
GCN-TF-250-L-16	315.6k	0.005	1	0.1	2.02e-05	0.0018	0.7378	0.0538	9.96e-07	0.0097	0.0142
GCN-TF-2500-S-16	154.1k	0.005	1	0.1	2.32e-05	0.0021	0.4487	0.0563	7.83e-07	0.0085	0.0164
GCN-TF-2500-L-16	277.3k	0.005	5	5	6.88e-05	0.0060	0.7360	0.0452	8.33e-08	0.0078	0.0207
S4-S-16	2.4k	0.01	10	1	1.22e-05	0.0011	0.6766	0.0403	8.82e-08	0.0108	0.0183
S4-L-16	19.0k	0.01	1	0.1	**1.14e-05**	**0.0010**	**0.3585**	0.0151	3.47e-07	0.0082	0.0090
S4-TF-S-16	28.0k	0.01	10	1	1.25e-05	0.0011	0.3888	0.0212	**1.16e-08**	0.0087	0.0108
S4-TF-L-16	70.2k	0.01	1	0.1	1.19e-05	0.0010	0.3658	**0.0140**	3.05e-08	0.0080	**0.0089**
GB-DIST-MLP	2.2k	0.1 (0.01)	5	5	7.68e-04	0.0548	1.7275	0.1413	2.75e-07	0.0134	0.2571
GB-DIST-RNL	47	0.1 (1)	0.5	0.5	7.28e-04	0.0542	1.6332	0.1725	4.32e-07	0.0259	0.3159
GB-FUZZ-MLP	2.3k	0.1 (0.01)	1	0.1	6.76e-04	0.0489	1.5442	0.1614	4.63e-07	0.0158	0.2621
GB-FUZZ-RNL	62	0.1 (1)	0.5	0.5	7.21e-04	0.0557	1.9976	0.2280	2.20e-06	0.0276	0.3003

Table 16: *Objective metrics for non parametric models of* ***Harley Benton Green Tint*** *overdrive. Bold indicates best performing models. Learning rate multiplier for nonlinearity in gray-box models shown in brackets.*

Model	Params.	LR	Weights					FAD			
			L1	MR-STFT	MSE	ESR	MAPE	VGGish	PANN	CLAP	AFx-Rep
LSTM-32	4.5k	0.005	10	1	2.81e-03	0.2160	5.4028	1.8410	8.41e-06	0.2023	0.2814
LSTM-96	38.1k	0.005	1	0.1	3.86e-03	0.2963	4.1289	2.2347	8.33e-05	0.1941	0.3846
TCN-45-S-16	7.5k	0.005	5	5	7.40e-05	0.0062	1.3801	0.1096	7.32e-06	0.0284	0.0693
TCN-45-L-16	7.3k	0.005	5	5	1.95e-04	0.0123	1.1080	0.1268	3.56e-06	0.0179	0.0442
TCN-250-S-16	14.5k	0.005	0.5	0.5	8.19e-05	0.0055	0.7237	0.1133	7.10e-06	0.0225	0.0793
TCN-250-L-16	18.4k	0.005	1	0.1	1.95e-04	0.0123	0.9553	0.1236	5.66e-06	0.0160	0.0457
TCN-2500-S-16	13.7k	0.005	10	1	7.98e-05	0.0068	0.8872	0.1394	9.40e-06	0.0169	0.0756
TCN-2500-L-16	11.9k	0.005	1	0.1	1.09e-04	0.0071	1.0042	0.1034	1.04e-05	0.0165	0.0609
TCN-TF-45-S-16	39.5k	0.005	1	0.1	8.06e-05	0.0065	1.3401	0.1486	5.07e-06	0.0326	0.1232
TCN-TF-45-L-16	71.3k	0.005	10	1	6.94e-05	0.0058	0.9144	0.1783	5.06e-06	0.0348	0.1291
TCN-TF-250-S-16	52.9k	0.005	1	0.1	8.43e-05	0.0062	0.8361	0.1649	3.04e-06	0.0302	0.1349
TCN-TF-250-L-16	88.8k	0.005	10	1	7.42e-04	0.0465	1.3120	0.1064	1.01e-06	0.0231	0.0534
TCN-TF-2500-S-16	45.7k	0.005	5	5	6.78e-05	0.0056	0.6322	0.1245	1.23e-06	0.0199	0.0789
TCN-TF-2500-L-16	75.9k	0.005	10	1	2.19e-04	0.0137	0.8151	0.1283	2.76e-06	0.0136	0.0394
GCN-45-S-16	16.2k	0.005	5	5	6.96e-05	0.0050	0.9516	0.1197	1.09e-05	0.0334	0.0925
GCN-45-L-16	17.1k	0.005	5	5	1.46e-04	0.0094	1.6361	0.0994	5.76e-06	0.0277	0.0670
GCN-250-S-16	30.4k	0.005	1	0.1	6.89e-05	0.0047	0.7354	0.0902	1.10e-05	0.0209	0.0411
GCN-250-L-16	39.6k	0.005	10	1	5.74e-05	0.0040	0.6825	0.1075	6.10e-06	0.0201	0.0396
GCN-2500-S-16	28.6k	0.005	5	5	7.92e-05	0.0062	0.6932	0.0977	1.14e-05	0.0165	0.0350
GCN-2500-L-16	26.4k	0.005	10	1	5.07e-05	0.0043	0.5802	0.1010	4.54e-06	0.0155	0.0899
GCN-TF-45-S-16	141.6k	0.005	10	1	1.19e-04	0.0096	1.0578	0.1855	3.56e-06	0.0490	0.1563
GCN-TF-45-L-16	268.0k	0.005	1	0.1	1.58e-04	0.0099	0.8804	0.1111	4.11e-06	0.0199	0.0685
GCN-TF-250-S-16	181.0k	0.005	10	1	5.84e-05	0.0046	0.8507	0.1358	7.14e-07	0.0249	0.0667
GCN-TF-250-L-16	315.6k	0.005	1	0.1	7.09e-05	0.0056	0.6383	0.1275	2.41e-07	0.0378	0.1462
GCN-TF-2500-S-16	154.1k	0.005	1	0.1	6.38e-05	0.0050	0.9412	0.1304	5.86e-06	0.0165	0.0353
GCN-TF-2500-L-16	277.3k	0.005	5	5	5.79e-05	**0.0040**	0.6065	0.1080	4.26e-06	0.0140	**0.0254**
S4-S-16	2.4k	0.01	10	1	5.09e-05	0.0044	0.5667	0.0929	9.65e-06	0.0139	0.0320
S4-L-16	19.0k	0.01	1	0.1	**4.93e-05**	0.0042	**0.5328**	**0.0833**	9.98e-06	**0.0120**	0.0309
S4-TF-S-16	28.0k	0.01	10	1	8.69e-05	0.0074	0.6419	0.0953	3.92e-06	0.0198	0.0365
S4-TF-L-16	70.2k	0.01	1	0.1	5.59e-05	0.0049	0.5545	0.0884	1.51e-06	0.0202	0.0265
GB-DIST-MLP	2.2k	0.1 (0.01)	5	5	1.64e-03	0.1019	1.6994	0.1594	5.57e-07	0.0156	0.3358
GB-DIST-RNL	47	0.1 (1)	0.5	0.5	1.63e-03	0.1058	2.3980	0.2697	**2.36e-07**	0.0384	0.2337
GB-FUZZ-MLP	2.3k	0.1 (0.01)	1	0.1	1.52e-03	0.0937	2.0278	0.2103	2.00e-06	0.0169	0.2225
GB-FUZZ-RNL	62	0.1 (1)	0.5	0.5	1.67e-03	0.1049	3.0199	0.5670	2.28e-06	0.0623	0.5714

Table 17: *Objective metrics for non parametric models of **Ibanez TS9** overdrive. Bold indicates best performing models. Learning rate multiplier for nonlinearity in gray-box models shown in brackets.*

Model	Params.	LR	Weights					FAD			
			L1	MR-STFT	MSE	ESR	MAPE	VGGish	PANN	CLAP	AFx-Rep
LSTM-32	4.5k	0.005	10	1	2.08e-05	0.0004	0.1472	0.0453	4.34e-08	0.0043	0.0093
LSTM-96	38.1k	0.005	1	0.1	**1.70e-05**	**0.0003**	0.1314	**0.0142**	7.18e-08	0.0034	**0.0053**
TCN-45-S-16	7.5k	0.005	5	5	2.78e-04	0.0057	0.4798	0.1983	2.09e-06	0.0100	0.1609
TCN-45-L-16	7.3k	0.005	5	5	1.45e-04	0.0030	0.3891	0.1701	6.40e-06	0.0073	0.1142
TCN-250-S-16	14.5k	0.005	0.5	0.5	8.28e-05	0.0017	0.2950	0.2580	2.80e-05	0.0229	0.1640
TCN-250-L-16	18.4k	0.005	1	0.1	6.62e-05	0.0013	0.2789	0.1291	4.94e-07	0.0060	0.0642
TCN-2500-S-16	13.7k	0.005	10	1	5.18e-04	0.0106	0.6641	0.3674	3.95e-06	0.0073	0.1678
TCN-2500-L-16	11.9k	0.005	1	0.1	2.52e-04	0.0051	0.5024	0.1956	5.17e-06	0.0069	0.1580
TCN-TF-45-S-16	39.5k	0.005	1	0.1	1.22e-04	0.0025	0.2897	0.2762	1.50e-05	0.0069	0.1585
TCN-TF-45-L-16	71.3k	0.005	10	1	8.81e-05	0.0018	0.2615	0.2927	3.54e-05	0.0046	0.1104
TCN-TF-250-S-16	52.9k	0.005	1	0.1	7.04e-05	0.0014	0.2937	0.1097	2.66e-06	0.0030	0.0398
TCN-TF-250-L-16	88.8k	0.005	10	1	3.70e-05	0.0007	0.1618	0.0881	1.02e-05	0.0039	0.0634
TCN-TF-2500-S-16	45.7k	0.005	5	5	1.32e-04	0.0027	0.2822	0.6526	6.00e-05	0.0149	0.1723
TCN-TF-2500-L-16	75.9k	0.005	10	1	6.95e-05	0.0014	0.2202	0.1951	1.28e-05	0.0032	0.0972
GCN-45-S-16	16.2k	0.005	5	5	2.99e-04	0.0061	0.5453	0.3169	1.84e-07	0.0115	0.1526
GCN-45-L-16	17.1k	0.005	5	5	2.07e-04	0.0042	0.4218	0.2012	6.56e-07	0.0061	0.1304
GCN-250-S-16	30.4k	0.005	1	0.1	5.61e-04	0.0114	0.8541	0.2388	1.40e-05	0.0114	0.1425
GCN-250-L-16	39.6k	0.005	10	1	4.68e-05	0.0009	0.2054	0.2092	1.66e-06	0.0099	0.0562
GCN-2500-S-16	28.6k	0.005	5	5	6.24e-04	0.0127	0.7235	0.3332	3.85e-07	0.0064	0.1276
GCN-2500-L-16	26.4k	0.005	10	1	3.71e-04	0.0075	0.5852	0.1818	6.87e-08	0.0048	0.1353
GCN-TF-45-S-16	141.6k	0.005	10	1	9.72e-05	0.0020	0.2776	0.1940	5.53e-06	0.0046	0.1080
GCN-TF-45-L-16	268.0k	0.005	1	0.1	7.99e-05	0.0016	0.2797	0.1215	6.36e-08	0.0048	0.0399
GCN-TF-250-S-16	181.0k	0.005	10	1	4.96e-05	0.0010	0.1768	0.1024	4.53e-06	0.0080	0.0747
GCN-TF-250-L-16	315.6k	0.005	1	0.1	3.70e-05	0.0008	0.1779	0.0765	**2.64e-08**	0.0032	0.0084
GCN-TF-2500-S-16	154.1k	0.005	1	0.1	1.29e-04	0.0026	0.3129	0.1873	3.86e-06	0.0062	0.1041
GCN-TF-2500-L-16	277.3k	0.005	5	5	8.39e-05	0.0017	0.2697	0.1372	4.13e-06	0.0045	0.0398
S4-S-16	2.4k	0.01	10	1	2.95e-04	0.0059	0.4295	0.0998	1.44e-07	0.0061	0.1221
S4-L-16	19.0k	0.01	1	0.1	2.08e-05	0.0004	**0.1037**	0.0590	6.87e-07	0.0072	0.0090
S4-TF-S-16	28.0k	0.01	10	1	4.54e-05	0.0009	0.2013	0.0730	1.86e-06	0.0042	0.0149
S4-TF-L-16	70.2k	0.01	1	0.1	2.41e-05	0.0005	0.1114	0.0711	3.40e-07	**0.0028**	0.0084
GB-DIST-MLP	2.2k	0.1 (0.01)	5	5	1.30e-02	0.2593	3.2119	0.1769	2.53e-06	0.0070	0.0709
GB-DIST-RNL	47	0.1 (1)	0.5	0.5	1.18e-02	0.2356	2.9920	0.4412	1.79e-06	0.0169	0.0382
GB-FUZZ-MLP	2.3k	0.1 (0.01)	1	0.1	1.40e-02	0.2800	3.3089	0.3732	4.45e-06	0.0077	0.0792
GB-FUZZ-RNL	62	0.1 (1)	0.5	0.5	1.27e-02	0.2545	3.1520	0.2248	1.95e-06	0.0116	0.0484

Table 18: *Objective metrics for non parametric models of* ***DIY Klon Centaur*** *overdrive. Bold indicates best performing models. Learning rate multiplier for nonlinearity in gray-box models shown in brackets.*

Model	Params.	LR	Weights					FAD			
			L1	MR-STFT	MSE	ESR	MAPE	VGGish	PANN	CLAP	AFx-Rep
LSTM-32	4.5k	0.005	10	1	4.66e-02	0.2111	2.9196	9.6966	9.05e-04	0.2174	0.8175
LSTM-96	38.1k	0.005	1	0.1	4.80e-02	0.2181	2.7740	3.9958	2.09e-04	0.1629	0.7006
TCN-45-S-16	7.5k	0.005	5	5	5.16e-03	0.0235	1.0840	0.8840	5.03e-05	0.0238	0.4548
TCN-45-L-16	7.3k	0.005	5	5	4.36e-03	0.0198	1.0185	0.7198	6.48e-05	0.0260	0.4765
TCN-250-S-16	14.5k	0.005	0.5	0.5	4.09e-03	0.0186	1.0556	0.8927	8.37e-05	0.0219	0.5331
TCN-250-L-16	18.4k	0.005	1	0.1	1.18e-03	0.0053	0.4629	0.7519	2.62e-06	0.0216	0.5483
TCN-2500-S-16	13.7k	0.005	10	1	8.01e-03	0.0365	1.3660	1.4930	2.50e-05	0.0434	0.6563
TCN-2500-L-16	11.9k	0.005	1	0.1	2.39e-03	0.0109	0.6854	1.0190	3.10e-05	0.0254	0.5104
TCN-TF-45-S-16	39.5k	0.005	1	0.1	4.05e-03	0.0185	0.8284	1.0321	5.56e-05	0.0226	0.2177
TCN-TF-45-L-16	71.3k	0.005	10	1	2.42e-03	0.0110	0.6456	0.7566	8.71e-06	0.0158	0.1387
TCN-TF-250-S-16	52.9k	0.005	1	0.1	3.13e-03	0.0143	0.7445	0.8421	8.14e-06	0.0250	0.2000
TCN-TF-250-L-16	88.8k	0.005	10	1	1.56e-03	0.0071	0.5315	0.8354	3.79e-06	0.0215	0.3536
TCN-TF-2500-S-16	45.7k	0.005	5	5	6.84e-03	0.0312	1.1772	1.2828	6.68e-05	0.0306	0.4468
TCN-TF-2500-L-16	75.9k	0.005	10	1	2.43e-03	0.0110	0.6983	0.7679	2.21e-05	0.0203	0.5172
GCN-45-S-16	16.2k	0.005	5	5	5.13e-03	0.0234	1.1088	0.9727	9.33e-06	0.0295	0.5996
GCN-45-L-16	17.1k	0.005	5	5	1.82e-03	0.0083	0.6039	0.7229	3.32e-06	0.0248	0.5758
GCN-250-S-16	30.4k	0.005	1	0.1	4.35e-03	0.0197	0.9686	1.1377	5.29e-07	0.0439	0.5762
GCN-250-L-16	39.6k	0.005	10	1	1.34e-03	0.0061	0.5192	0.5905	3.30e-06	0.0187	0.5209
GCN-2500-S-16	28.6k	0.005	5	5	7.09e-03	0.0323	1.2700	1.4552	7.52e-05	0.0379	0.7264
GCN-2500-L-16	26.4k	0.005	10	1	2.85e-03	0.0129	0.7419	0.8812	1.82e-05	**0.0150**	0.3475
GCN-TF-45-S-16	141.6k	0.005	10	1	3.95e-03	0.0180	0.8750	1.0308	1.90e-05	0.0226	0.2466
GCN-TF-45-L-16	268.0k	0.005	1	0.1	2.65e-03	0.0120	0.7103	0.6903	2.28e-05	0.0247	0.1464
GCN-TF-250-S-16	181.0k	0.005	10	1	2.52e-03	0.0115	0.7152	0.8511	**4.07e-07**	0.0210	0.2873
GCN-TF-250-L-16	315.6k	0.005	1	0.1	1.82e-03	0.0082	0.6382	0.8487	9.19e-06	0.0224	0.2755
GCN-TF-2500-S-16	154.1k	0.005	1	0.1	4.46e-03	0.0203	0.8914	1.0105	1.04e-06	0.0248	0.2522
GCN-TF-2500-L-16	277.3k	0.005	5	5	3.20e-03	0.0145	0.7610	0.8648	1.20e-05	0.0197	0.1330
S4-S-16	2.4k	0.01	10	1	2.05e-03	0.0093	0.6192	0.7942	6.93e-05	0.0221	0.4940
S4-L-16	19.0k	0.01	1	0.1	**8.45e-04**	**0.0038**	**0.3859**	**0.5087**	3.12e-05	0.0268	**0.0540**
S4-TF-S-16	28.0k	0.01	10	1	1.16e-03	0.0053	0.4169	0.8394	2.19e-05	0.0290	0.1286
S4-TF-L-16	70.2k	0.01	1	0.1	1.49e-03	0.0068	0.4804	0.6001	3.30e-05	0.0228	0.1001
GB-DIST-MLP	2.2k	0.1 (0.01)	5	5	3.18e-02	0.1442	2.7599	1.8080	1.35e-05	0.0500	0.3970
GB-DIST-RNL	47	0.1 (1)	0.5	0.5	2.64e-02	0.1201	2.5006	1.7624	5.50e-05	0.0464	0.1012
GB-FUZZ-MLP	2.3k	0.1 (0.01)	1	0.1	1.56e-02	0.0703	1.8575	2.3194	1.37e-05	0.0515	0.4289
GB-FUZZ-RNL	62	0.1 (1)	0.5	0.5	2.66e-02	0.1206	2.4504	1.9103	3.91e-05	0.0567	0.4804

1.3 Results Distortion

Table 19: *Scaled test loss for non parametric models of distortion effects. Bold indicates best performing models.*

Model	Params.	Electro Harmonix Big Muff			Harley Benton DropKick			Harley Benton Plexicon			Harley Benton Rodent		
		Tot.	L1	MR-STFT	Tot.	L1	MR-STFT	Tot.	L1	MR-STFT	Tot.	L1	MR-STFT
LSTM-32	4.5k	0.7679	0.0294	0.7385	1.7506	0.2284	1.5222	0.3323	0.0163	0.3161	1.5315	0.0605	1.4710
LSTM-96	38.1k	0.5265	0.0033	0.5232	1.9392	0.2181	1.7211	**0.1973**	0.0118	0.1855	1.6861	0.0569	1.6292
TCN-45-S-16	7.5k	0.7548	0.0069	0.7479	1.2535	0.1964	1.0571	0.6290	0.0361	0.5928	1.0722	0.0254	1.0468
TCN-45-L-16	7.3k	0.7348	0.0086	0.7262	1.2598	0.1986	1.0612	0.8903	0.0633	0.8270	0.9984	0.0238	0.9746
TCN-250-S-16	14.5k	0.7035	0.0054	0.6981	1.2548	0.1818	1.0731	0.5389	0.0286	0.5103	0.9287	0.0179	0.9108
TCN-250-L-16	18.4k	0.7371	0.0114	0.7257	1.2506	0.1749	1.0757	0.6132	0.0306	0.5826	0.8366	0.0154	0.8212
TCN-2500-S-16	13.7k	0.7942	0.0293	0.7649	1.3208	0.1875	1.1333	0.6608	0.0366	0.6242	0.9234	0.0210	0.9024
TCN-2500-L-16	11.9k	0.6920	0.0081	0.6839	1.2115	0.1862	1.0253	0.5284	0.0259	0.5025	0.8330	0.0158	0.8172
TCN-TF-45-S-16	39.5k	0.7316	0.0063	0.7253	1.0231	0.1272	0.8959	0.5479	0.0273	0.5206	0.7775	0.0128	0.7647
TCN-TF-45-L-16	71.3k	0.6598	0.0051	0.6547	0.9189	0.1068	0.8120	0.4759	0.0212	0.4548	0.7786	0.0130	0.7656
TCN-TF-250-S-16	52.9k	0.6592	0.0049	0.6543	0.9865	0.1165	0.8699	0.4664	0.0218	0.4447	0.7400	0.0131	0.7269
TCN-TF-250-L-16	88.8k	0.6370	0.0055	0.6315	**0.8746**	0.1003	0.7743	0.3724	0.0172	0.3552	0.7820	0.0132	0.7688
TCN-TF-2500-S-16	45.7k	0.7411	0.0064	0.7346	0.9293	0.1063	0.8230	0.5622	0.0295	0.5327	0.7771	0.0128	0.7643
TCN-TF-2500-L-16	75.9k	0.5985	0.0045	0.5940	0.8906	0.0470	0.8437	0.4559	0.0191	0.4368	0.6239	0.0101	0.6138
GCN-45-S-16	16.2k	0.8324	0.0071	0.8253	1.2207	0.1935	1.0272	0.4597	0.0224	0.4373	0.9744	0.0213	0.9531
GCN-45-L-16	17.1k	0.7556	0.0063	0.7493	1.2218	0.2033	1.0186	0.4755	0.0299	0.4456	0.9480	0.0212	0.9267
GCN-250-S-16	30.4k	0.6634	0.0050	0.6585	1.2195	0.1886	1.0309	0.4842	0.0256	0.4585	0.8881	0.0181	0.8699
GCN-250-L-16	39.6k	0.6737	0.0051	0.6687	1.2022	0.1843	1.0179	0.4123	0.0220	0.3903	0.8468	0.0141	0.8327
GCN-2500-S-16	28.6k	0.7132	0.0056	0.7076	1.2034	0.1873	1.0161	0.5805	0.0340	0.5465	0.8929	0.0175	0.8755
GCN-2500-L-16	26.4k	0.6765	0.0093	0.6673	1.1590	0.1874	0.9717	0.4753	0.0221	0.4532	0.7830	0.0132	0.7698
GCN-TF-45-S-16	141.6k	0.6238	0.0052	0.6186	0.9847	0.1168	0.8679	0.4612	0.0226	0.4386	0.7742	0.0124	0.7618
GCN-TF-45-L-16	268.0k	0.5918	0.0063	0.5855	0.9676	0.1141	0.8536	0.3965	0.0168	0.3797	0.6863	0.0097	0.6766
GCN-TF-250-S-16	181.0k	0.6044	0.0054	0.5990	1.0128	0.1141	0.8987	0.4179	0.0199	0.3980	0.7671	0.0122	0.7549
GCN-TF-250-L-16	315.6k	0.5846	0.0059	0.5787	0.9204	0.1052	0.8151	0.3275	0.0150	0.3125	0.7992	0.0142	0.7850
GCN-TF-2500-S-16	154.1k	0.5978	0.0043	0.5935	0.9940	0.1169	0.8770	0.5037	0.0252	0.4785	0.7182	0.0113	0.7069
GCN-TF-2500-L-16	277.3k	0.6238	0.0295	0.5944	0.9613	0.1092	0.8521	0.3872	0.0182	0.3690	0.6247	0.0081	0.6166
S4-S-16	2.4k	0.6475	0.0048	0.6427	1.1464	0.2090	0.9374	0.4505	0.0212	0.4292	0.7245	0.0125	0.7120
S4-L-16	19.0k	0.6004	0.0042	0.5961	1.0607	0.2635	0.7972	0.2982	0.0131	0.2851	0.6367	0.0091	0.6276
S4-TF-S-16	28.0k	0.5514	0.0037	0.5477	1.0327	0.1461	0.8865	0.4146	0.0161	0.3985	0.6367	0.0089	0.6279
S4-TF-L-16	70.2k	**0.5078**	0.0031	0.5046	0.9052	0.1323	0.7729	0.2449	0.0121	0.2329	**0.5816**	0.0077	0.5738
GB-DIST-MLP	2.2k	0.9649	0.0122	0.9527	1.5608	0.3081	1.2527	0.9509	0.0826	0.8683	1.2826	0.0368	1.2458
GB-DIST-RNL	47	0.9608	0.0125	0.9483	1.5215	0.3105	1.2110	0.9273	0.0760	0.8512	1.3654	0.0392	1.3262
GB-FUZZ-MLP	2.3k	0.9671	0.0117	0.9554	1.5600	0.3116	1.2484	0.9657	0.0777	0.8880	1.2751	0.0357	1.2394
GB-FUZZ-RNL	62	0.9626	0.0121	0.9505	1.5124	0.3115	1.2008	0.9827	0.0883	0.8944	1.3963	0.0450	1.3513

Table 20: *Scaled validation and test loss for non parametric models of* ***Electro Harmonix Big Muff*** *distortion. Bold indicates best performing models. Learning rate multiplier for nonlinearity in gray-box models shown in brackets.*

Model	Params.	LR	Weights		Val. Loss			Test Loss		
			L1	MR-STFT	Tot.	L1	MR-STFT	Tot.	L1	MR-STFT
LSTM-32	4.5k	0.001	5	5	0.6528	0.0300	0.6229	0.7679	0.0294	0.7385
LSTM-96	38.1k	0.001	5	5	0.4140	0.0018	0.4122	0.5265	0.0033	0.5232
TCN-45-S-16	7.5k	0.005	5	5	0.5976	0.0051	0.5924	0.7548	0.0069	0.7479
TCN-45-L-16	7.3k	0.005	0.5	0.5	0.6823	0.0056	0.6767	0.7348	0.0086	0.7262
TCN-250-S-16	14.5k	0.005	1	0.1	0.5135	0.0029	0.5106	0.7035	0.0054	0.6981
TCN-250-L-16	18.4k	0.005	0.5	0.5	0.5437	0.0087	0.5350	0.7371	0.0114	0.7257
TCN-2500-S-16	13.7k	0.005	0.5	0.5	0.6246	0.0165	0.6081	0.7942	0.0293	0.7649
TCN-2500-L-16	11.9k	0.005	0.5	0.5	0.4922	0.0058	0.4864	0.6920	0.0081	0.6839
TCN-TF-45-S-16	39.5k	0.005	1	0.1	0.6927	0.0053	0.6875	0.7316	0.0063	0.7253
TCN-TF-45-L-16	71.3k	0.005	0.5	0.5	0.4993	0.0034	0.4959	0.6598	0.0051	0.6547
TCN-TF-250-S-16	52.9k	0.005	10	1	0.5144	0.0036	0.5108	0.6592	0.0049	0.6543
TCN-TF-250-L-16	88.8k	0.005	1	0.1	0.4474	0.0035	0.4439	0.6370	0.0055	0.6315
TCN-TF-2500-S-16	45.7k	0.005	10	1	0.6608	0.0052	0.6555	0.7411	0.0064	0.7346
TCN-TF-2500-L-16	75.9k	0.005	1	0.1	0.4910	0.0025	0.4885	0.5985	0.0045	0.5940
GCN-45-S-16	16.2k	0.005	10	1	0.7628	0.0048	0.7580	0.8324	0.0071	0.8253
GCN-45-L-16	17.1k	0.005	1	0.1	0.6188	0.0071	0.6117	0.7556	0.0063	0.7493
GCN-250-S-16	30.4k	0.005	1	0.1	0.5001	0.0030	0.4971	0.6634	0.0050	0.6585
GCN-250-L-16	39.6k	0.005	10	1	0.5116	0.0032	0.5085	0.6737	0.0051	0.6687
GCN-2500-S-16	28.6k	0.005	10	1	0.5177	0.0036	0.5141	0.7132	0.0056	0.7076
GCN-2500-L-16	26.4k	0.005	5	5	0.5120	0.0064	0.5056	0.6765	0.0093	0.6673
GCN-TF-45-S-16	141.6k	0.005	5	5	0.4657	0.0030	0.4627	0.6238	0.0052	0.6186
GCN-TF-45-L-16	268.0k	0.005	0.5	0.5	0.5398	0.0036	0.5363	0.5918	0.0063	0.5855
GCN-TF-250-S-16	181.0k	0.005	5	5	0.4068	0.0033	0.4035	0.6044	0.0054	0.5990
GCN-TF-250-L-16	315.6k	0.005	0.5	0.5	0.4586	0.0035	0.4551	0.5846	0.0059	0.5787
GCN-TF-2500-S-16	154.1k	0.005	1	0.1	0.4077	0.0021	0.4056	0.5978	0.0043	0.5935
GCN-TF-2500-L-16	277.3k	0.005	5	5	0.4007	0.0272	0.3735	0.6238	0.0295	0.5944
S4-S-16	2.4k	0.01	10	1	0.4113	0.0025	0.4088	0.6475	0.0048	0.6427
S4-L-16	19.0k	0.01	10	1	0.4401	0.0019	0.4382	0.6004	0.0042	0.5961
S4-TF-S-16	28.0k	0.01	0.5	0.5	0.3195	0.0016	0.3180	0.5514	0.0037	0.5477
S4-TF-L-16	70.2k	0.01	1	0.1	**0.3032**	0.0014	0.3018	**0.5078**	0.0031	0.5046
GB-DIST-MLP	2.2k	0.1 (0.01)	5	5	0.9669	0.0109	0.9560	0.9649	0.0122	0.9527
GB-DIST-RNL	47	0.1 (1)	5	5	1.0055	0.0107	0.9948	0.9608	0.0125	0.9483
GB-FUZZ-MLP	2.3k	0.1 (0.01)	1	0.1	0.9813	0.0088	0.9725	0.9671	0.0117	0.9554
GB-FUZZ-RNL	62	0.1 (1)	5	5	1.0276	0.0113	1.0163	0.9626	0.0121	0.9505

Table 21: *Scaled validation and test loss for non parametric models of* ***Harley Benton Drop Kick*** *distortion. Bold indicates best performing models. Learning rate multiplier for nonlinearity in gray-box models shown in brackets.*

Model	Params.	LR	Weights		Val. Loss			Test Loss		
			L1	MR-STFT	Tot.	L1	MR-STFT	Tot.	L1	MR-STFT
LSTM-32	4.5k	0.001	5	5	1.7919	0.2177	1.5742	1.7506	0.2284	1.5222
LSTM-96	38.1k	0.001	1	0.1	1.8443	0.2305	1.6138	1.9392	0.2181	1.7211
TCN-45-S-16	7.5k	0.005	5	5	1.2951	0.1939	1.1013	1.2535	0.1964	1.0571
TCN-45-L-16	7.3k	0.005	0.5	0.5	1.2708	0.2096	1.0612	1.2598	0.1986	1.0612
TCN-250-S-16	14.5k	0.005	5	5	1.3040	0.1877	1.1164	1.2548	0.1818	1.0731
TCN-250-L-16	18.4k	0.005	0.5	0.5	1.2671	0.1784	1.0887	1.2506	0.1749	1.0757
TCN-2500-S-16	13.7k	0.005	0.5	0.5	1.2884	0.1775	1.1109	1.3208	0.1875	1.1333
TCN-2500-L-16	11.9k	0.005	5	5	1.1899	0.1913	0.9986	1.2115	0.1862	1.0253
TCN-TF-45-S-16	39.5k	0.005	0.5	0.5	1.0367	0.1425	0.8941	1.0231	0.1272	0.8959
TCN-TF-45-L-16	71.3k	0.005	5	5	0.9281	0.1222	0.8060	0.9189	0.1068	0.8120
TCN-TF-250-S-16	52.9k	0.005	5	5	0.9899	0.1304	0.8596	0.9865	0.1165	0.8699
TCN-TF-250-L-16	88.8k	0.005	5	5	**0.8754**	0.1077	0.7677	**0.8746**	0.1003	0.7743
TCN-TF-2500-S-16	45.7k	0.005	0.5	0.5	0.9781	0.1270	0.8511	0.9293	0.1063	0.8230
TCN-TF-2500-L-16	75.9k	0.005	10	1	0.9631	0.0565	0.9066	0.8906	0.0470	0.8437
GCN-45-S-16	16.2k	0.005	0.5	0.5	1.2409	0.1936	1.0473	1.2207	0.1935	1.0272
GCN-45-L-16	17.1k	0.005	5	5	1.3288	0.1939	1.1349	1.2218	0.2033	1.0186
GCN-250-S-16	30.4k	0.005	5	5	1.2469	0.1921	1.0549	1.2195	0.1886	1.0309
GCN-250-L-16	39.6k	0.005	5	5	1.1658	0.1680	0.9978	1.2022	0.1843	1.0179
GCN-2500-S-16	28.6k	0.005	5	5	1.2159	0.1885	1.0274	1.2034	0.1873	1.0161
GCN-2500-L-16	26.4k	0.005	5	5	1.1162	0.1775	0.9387	1.1590	0.1874	0.9717
GCN-TF-45-S-16	141.6k	0.005	0.5	0.5	1.0018	0.1303	0.8715	0.9847	0.1168	0.8679
GCN-TF-45-L-16	268.0k	0.005	0.5	0.5	0.9561	0.1295	0.8267	0.9676	0.1141	0.8536
GCN-TF-250-S-16	181.0k	0.005	5	5	1.0252	0.1241	0.9011	1.0128	0.1141	0.8987
GCN-TF-250-L-16	315.6k	0.005	5	5	0.9382	0.1192	0.8189	0.9204	0.1052	0.8151
GCN-TF-2500-S-16	154.1k	0.005	5	5	0.9933	0.1264	0.8669	0.9940	0.1169	0.8770
GCN-TF-2500-L-16	277.3k	0.005	0.5	0.5	0.9816	0.1329	0.8488	0.9613	0.1092	0.8521
S4-S-16	2.4k	0.01	0.5	0.5	1.1228	0.2166	0.9062	1.1464	0.2090	0.9374
S4-L-16	19.0k	0.01	5	5	1.0613	0.2605	0.8008	1.0607	0.2635	0.7972
S4-TF-S-16	28.0k	0.01	5	5	1.0076	0.1520	0.8556	1.0327	0.1461	0.8865
S4-TF-L-16	70.2k	0.01	5	5	0.8902	0.1374	0.7528	0.9052	0.1323	0.7729
GB-DIST-MLP	2.2k	0.1 (0.01)	5	5	1.6483	0.2669	1.3814	1.5608	0.3081	1.2527
GB-DIST-RNL	47	0.1 (1)	5	5	1.5509	0.2749	1.2760	1.5215	0.3105	1.2110
GB-FUZZ-MLP	2.3k	0.1 (0.01)	5	5	1.5592	0.2855	1.2738	1.5600	0.3116	1.2484
GB-FUZZ-RNL	62	0.1 (1)	0.5	0.5	1.5981	0.2808	1.3173	1.5124	0.3115	1.2008

Table 22: *Scaled validation and test loss for non parametric models of* ***Harley Benton Plexicon*** *distortion. Bold indicates best performing models. Learning rate multiplier for nonlinearity in gray-box models shown in brackets.*

Model	Params.	LR	Weights		Val. Loss			Test Loss		
			L1	MR-STFT	Tot.	L1	MR-STFT	Tot.	L1	MR-STFT
LSTM-32	4.5k	0.005	1	0.1	0.3677	0.0276	0.3401	0.3323	0.0163	0.3161
LSTM-96	38.1k	0.005	5	5	**0.2312**	0.0253	0.2059	**0.1973**	0.0118	0.1855
TCN-45-S-16	7.5k	0.005	5	5	0.6778	0.0456	0.6321	0.6290	0.0361	0.5928
TCN-45-L-16	7.3k	0.005	0.5	0.5	0.6473	0.0496	0.5978	0.8903	0.0633	0.8270
TCN-250-S-16	14.5k	0.005	5	5	0.6074	0.0463	0.5612	0.5389	0.0286	0.5103
TCN-250-L-16	18.4k	0.005	10	1	0.6156	0.0458	0.5698	0.6132	0.0306	0.5826
TCN-2500-S-16	13.7k	0.005	1	0.1	0.7247	0.0543	0.6705	0.6608	0.0366	0.6242
TCN-2500-L-16	11.9k	0.005	10	1	0.5411	0.0338	0.5072	0.5284	0.0259	0.5025
TCN-TF-45-S-16	39.5k	0.005	5	5	0.5581	0.0318	0.5264	0.5479	0.0273	0.5206
TCN-TF-45-L-16	71.3k	0.005	0.5	0.5	0.4844	0.0332	0.4512	0.4759	0.0212	0.4548
TCN-TF-250-S-16	52.9k	0.005	5	5	0.4920	0.0410	0.4510	0.4664	0.0218	0.4447
TCN-TF-250-L-16	88.8k	0.005	0.5	0.5	0.4147	0.0355	0.3792	0.3724	0.0172	0.3552
TCN-TF-2500-S-16	45.7k	0.005	5	5	0.5884	0.0411	0.5473	0.5622	0.0295	0.5327
TCN-TF-2500-L-16	75.9k	0.005	0.5	0.5	0.5065	0.0383	0.4683	0.4559	0.0191	0.4368
GCN-45-S-16	16.2k	0.005	0.5	0.5	0.5852	0.0434	0.5418	0.4597	0.0224	0.4373
GCN-45-L-16	17.1k	0.005	5	5	0.5668	0.0535	0.5133	0.4755	0.0299	0.4456
GCN-250-S-16	30.4k	0.005	0.5	0.5	0.5219	0.0396	0.4823	0.4842	0.0256	0.4585
GCN-250-L-16	39.6k	0.005	0.5	0.5	0.4682	0.0398	0.4283	0.4123	0.0220	0.3903
GCN-2500-S-16	28.6k	0.005	0.5	0.5	0.6274	0.0454	0.5820	0.5805	0.0340	0.5465
GCN-2500-L-16	26.4k	0.005	1	0.1	0.5159	0.0382	0.4777	0.4753	0.0221	0.4532
GCN-TF-45-S-16	141.6k	0.005	0.5	0.5	0.5127	0.0468	0.4659	0.4612	0.0226	0.4386
GCN-TF-45-L-16	268.0k	0.005	5	5	0.4151	0.0360	0.3790	0.3965	0.0168	0.3797
GCN-TF-250-S-16	181.0k	0.005	5	5	0.4606	0.0304	0.4302	0.4179	0.0199	0.3980
GCN-TF-250-L-16	315.6k	0.005	5	5	0.3788	0.0312	0.3476	0.3275	0.0150	0.3125
GCN-TF-2500-S-16	154.1k	0.005	0.5	0.5	0.5202	0.0364	0.4837	0.5037	0.0252	0.4785
GCN-TF-2500-L-16	277.3k	0.005	0.5	0.5	0.4020	0.0333	0.3687	0.3872	0.0182	0.3690
S4-S-16	2.4k	0.01	0.5	0.5	0.4833	0.0336	0.4496	0.4505	0.0212	0.4292
S4-L-16	19.0k	0.01	1	0.1	0.3543	0.0389	0.3154	0.2982	0.0131	0.2851
S4-TF-S-16	28.0k	0.01	1	0.1	0.4362	0.0265	0.4098	0.4146	0.0161	0.3985
S4-TF-L-16	70.2k	0.01	0.5	0.5	0.2766	0.0246	0.2519	0.2449	0.0121	0.2329
GB-DIST-MLP	2.2k	0.1 (0.01)	0.5	0.5	1.0038	0.0886	0.9152	0.9509	0.0826	0.8683
GB-DIST-RNL	47	0.1 (1)	5	5	0.9344	0.0711	0.8632	0.9273	0.0760	0.8512
GB-FUZZ-MLP	2.3k	0.1 (0.01)	0.5	0.5	1.0088	0.0833	0.9255	0.9657	0.0777	0.8880
GB-FUZZ-RNL	62	0.1 (1)	5	5	1.0354	0.0872	0.9481	0.9827	0.0883	0.8944

Table 23: *Scaled validation and test loss for non parametric models of* ***Harley Benton Rodent*** *distortion. Bold indicates best performing models. Learning rate multiplier for nonlinearity in gray-box models shown in brackets.*

Model	Params.	LR	Weights		Val. Loss			Test Loss		
			L1	MR-STFT	Tot.	L1	MR-STFT	Tot.	L1	MR-STFT
LSTM-32	4.5k	0.005	0.5	0.5	1.4877	0.0528	1.4349	1.5315	0.0605	1.4710
LSTM-96	38.1k	0.001	5	5	1.6675	0.1810	1.4865	1.6861	0.0569	1.6292
TCN-45-S-16	7.5k	0.005	10	1	1.0152	0.0171	0.9981	1.0722	0.0254	1.0468
TCN-45-L-16	7.3k	0.005	5	5	0.9341	0.0221	0.9120	0.9984	0.0238	0.9746
TCN-250-S-16	14.5k	0.005	1	0.1	0.9058	0.0153	0.8905	0.9287	0.0179	0.9108
TCN-250-L-16	18.4k	0.005	0.5	0.5	0.8064	0.0149	0.7914	0.8366	0.0154	0.8212
TCN-2500-S-16	13.7k	0.005	5	5	0.9117	0.0204	0.8912	0.9234	0.0210	0.9024
TCN-2500-L-16	11.9k	0.005	10	1	0.7681	0.0133	0.7548	0.8330	0.0158	0.8172
TCN-TF-45-S-16	39.5k	0.005	1	0.1	0.7422	0.0114	0.7307	0.7775	0.0128	0.7647
TCN-TF-45-L-16	71.3k	0.005	10	1	0.7249	0.0117	0.7132	0.7786	0.0130	0.7656
TCN-TF-250-S-16	52.9k	0.005	5	5	0.6696	0.0114	0.6582	0.7400	0.0131	0.7269
TCN-TF-250-L-16	88.8k	0.005	1	0.1	0.7318	0.0116	0.7203	0.7820	0.0132	0.7688
TCN-TF-2500-S-16	45.7k	0.005	10	1	0.7343	0.0119	0.7224	0.7771	0.0128	0.7643
TCN-TF-2500-L-16	75.9k	0.005	0.5	0.5	0.6068	0.0105	0.5963	0.6239	0.0101	0.6138
GCN-45-S-16	16.2k	0.005	5	5	0.9508	0.0172	0.9337	0.9744	0.0213	0.9531
GCN-45-L-16	17.1k	0.005	5	5	1.0460	0.0176	1.0284	0.9480	0.0212	0.9267
GCN-250-S-16	30.4k	0.005	5	5	0.8692	0.0153	0.8539	0.8881	0.0181	0.8699
GCN-250-L-16	39.6k	0.005	1	0.1	0.7973	0.0129	0.7844	0.8468	0.0141	0.8327
GCN-2500-S-16	28.6k	0.005	1	0.1	0.8633	0.0155	0.8478	0.8929	0.0175	0.8755
GCN-2500-L-16	26.4k	0.005	1	0.1	0.7319	0.0115	0.7205	0.7830	0.0132	0.7698
GCN-TF-45-S-16	141.6k	0.005	1	0.1	0.7805	0.0117	0.7688	0.7742	0.0124	0.7618
GCN-TF-45-L-16	268.0k	0.005	1	0.1	0.6801	0.0095	0.6706	0.6863	0.0097	0.6766
GCN-TF-250-S-16	181.0k	0.005	10	1	0.7481	0.0117	0.7364	0.7671	0.0122	0.7549
GCN-TF-250-L-16	315.6k	0.005	1	0.1	0.6019	0.0073	0.5947	0.7992	0.0142	0.7850
GCN-TF-2500-S-16	154.1k	0.005	10	1	0.6899	0.0107	0.6792	0.7182	0.0113	0.7069
GCN-TF-2500-L-16	277.3k	0.005	10	1	0.6081	0.0083	0.5998	0.6247	0.0081	0.6166
S4-S-16	2.4k	0.01	0.5	0.5	0.6965	0.0113	0.6851	0.7245	0.0125	0.7120
S4-L-16	19.0k	0.01	10	1	0.5865	0.0073	0.5791	0.6367	0.0091	0.6276
S4-TF-S-16	28.0k	0.01	1	0.1	0.6270	0.0080	0.6190	0.6367	0.0089	0.6279
S4-TF-L-16	70.2k	0.01	5	5	**0.5707**	0.0080	0.5627	**0.5816**	0.0077	0.5738
GB-DIST-MLP	2.2k	0.1 (0.01)	1	0.1	1.4323	0.0329	1.3993	1.2826	0.0368	1.2458
GB-DIST-RNL	47	0.1 (1)	1	0.1	1.4156	0.0353	1.3803	1.3654	0.0392	1.3262
GB-FUZZ-MLP	2.3k	0.1 (0.01)	10	1	1.2579	0.0333	1.2246	1.2751	0.0357	1.2394
GB-FUZZ-RNL	62	0.1 (1)	5	5	1.4987	0.0396	1.4591	1.3963	0.0450	1.3513

Table 24: *Objective metrics for non parametric models of* ***Electro Harmonix Big Muff*** *distortion. Bold indicates best performing models. Learning rate multiplier for nonlinearity in gray-box models shown in brackets.*

Model	Params.	LR	Weights					FAD			
			L1	MR-STFT	MSE	ESR	MAPE	VGGish	PANN	CLAP	AFx-Rep
LSTM-32	4.5k	0.001	5	5	9.25e-03	3.5938	7.7534	1.0347	7.30e-06	0.0932	0.0262
LSTM-96	38.1k	0.001	5	5	**1.80e-04**	0.1205	5.1320	0.7303	1.42e-07	0.0872	0.0164
TCN-45-S-16	7.5k	0.005	5	5	6.58e-04	0.3407	5.4885	0.8465	1.72e-05	0.1027	0.0642
TCN-45-L-16	7.3k	0.005	0.5	0.5	9.69e-04	0.4160	7.4735	0.7747	2.51e-05	0.0955	0.0813
TCN-250-S-16	14.5k	0.005	1	0.1	4.73e-04	0.2703	4.7165	0.7876	2.47e-05	0.1119	0.0553
TCN-250-L-16	18.4k	0.005	0.5	0.5	1.79e-03	0.6723	7.1658	0.7803	9.28e-06	0.0968	0.0282
TCN-2500-S-16	13.7k	0.005	0.5	0.5	8.48e-03	3.3871	8.5297	0.8464	1.82e-05	0.1312	0.0572
TCN-2500-L-16	11.9k	0.005	0.5	0.5	9.43e-04	0.3879	6.1196	0.7373	3.43e-06	0.1032	0.0298
TCN-TF-45-S-16	39.5k	0.005	1	0.1	5.70e-04	0.3003	4.0923	0.7754	5.34e-05	0.1030	0.0535
TCN-TF-45-L-16	71.3k	0.005	0.5	0.5	3.80e-04	0.2007	4.1743	0.6458	2.21e-05	0.0992	0.0640
TCN-TF-250-S-16	52.9k	0.005	10	1	3.43e-04	0.1803	4.1170	0.7057	3.79e-05	0.0823	0.0465
TCN-TF-250-L-16	88.8k	0.005	1	0.1	4.46e-04	0.2104	3.9814	0.6236	2.15e-05	0.0944	0.0539
TCN-TF-2500-S-16	45.7k	0.005	10	1	5.61e-04	0.2789	4.7279	0.7041	6.96e-05	0.0807	0.1272
TCN-TF-2500-L-16	75.9k	0.005	1	0.1	3.17e-04	0.1615	3.4850	0.4300	1.50e-05	0.0779	0.0298
GCN-45-S-16	16.2k	0.005	10	1	6.26e-04	0.3408	5.8670	1.1365	6.20e-05	0.1200	0.2347
GCN-45-L-16	17.1k	0.005	1	0.1	5.47e-04	0.2943	4.9605	0.8029	3.90e-05	0.1012	0.0851
GCN-250-S-16	30.4k	0.005	1	0.1	3.46e-04	0.1889	5.4230	0.6357	1.52e-05	0.0971	0.0723
GCN-250-L-16	39.6k	0.005	10	1	3.86e-04	0.2126	4.8257	0.7745	2.54e-05	0.1011	0.0543
GCN-2500-S-16	28.6k	0.005	10	1	4.32e-04	0.2348	5.3948	0.7070	2.06e-05	0.1177	0.1008
GCN-2500-L-16	26.4k	0.005	5	5	1.25e-03	0.4943	7.1149	0.7932	7.55e-06	0.1067	0.0473
GCN-TF-45-S-16	141.6k	0.005	5	5	3.58e-04	0.1897	4.1376	0.6413	3.32e-06	0.0890	0.0610
GCN-TF-45-L-16	268.0k	0.005	0.5	0.5	6.35e-04	0.2430	4.2569	0.4949	2.49e-05	**0.0738**	0.0327
GCN-TF-250-S-16	181.0k	0.005	5	5	4.26e-04	0.2096	4.2674	0.5707	5.42e-06	0.0836	0.0445
GCN-TF-250-L-16	315.6k	0.005	0.5	0.5	5.45e-04	0.2386	5.2190	0.5263	2.26e-05	0.0905	0.0364
GCN-TF-2500-S-16	154.1k	0.005	1	0.1	2.72e-04	0.1370	4.7303	0.5106	1.02e-05	0.0819	0.0572
GCN-TF-2500-L-16	277.3k	0.005	5	5	9.06e-03	3.6098	5.1530	0.4959	2.07e-05	0.0841	0.0297
S4-S-16	2.4k	0.01	10	1	3.94e-04	0.2374	4.6882	0.8045	3.61e-06	0.1061	0.0257
S4-L-16	19.0k	0.01	10	1	3.27e-04	0.1922	4.5979	0.8086	**1.75e-08**	0.0992	**0.0116**
S4-TF-S-16	28.0k	0.01	0.5	0.5	2.63e-04	0.1478	3.0808	0.6401	2.73e-06	0.0885	0.0127
S4-TF-L-16	70.2k	0.01	1	0.1	1.89e-04	**0.1076**	**2.8853**	**0.2661**	1.07e-06	0.0809	0.0139
GB-DIST-MLP	2.2k	0.1 (0.01)	5	5	1.48e-03	0.6912	24.8279	0.9631	1.85e-05	0.1068	0.2113
GB-DIST-RNL	47	0.1 (1)	5	5	1.37e-03	0.6107	42.0342	1.0088	1.05e-05	0.0968	0.2744
GB-FUZZ-MLP	2.3k	0.1 (0.01)	1	0.1	1.45e-03	0.7042	20.8625	1.0107	2.30e-05	0.1051	0.1828
GB-FUZZ-RNL	62	0.1 (1)	5	5	1.30e-03	0.5869	44.9507	0.8679	5.02e-06	0.0946	0.2279

Table 25: *Objective metrics for non parametric models of* ***Harley Benton Drop Kick*** *distortion. Bold indicates best performing models. Learning rate multiplier for nonlinearity in gray-box models shown in brackets.*

Model	Params.	LR	Weights					FAD			
			L1	MR-STFT	MSE	ESR	MAPE	VGGish	PANN	CLAP	AFx-Rep
LSTM-32	4.5k	0.001	5	5	8.74e-02	1.0047	14.4504	10.5485	7.54e-06	0.2205	0.6451
LSTM-96	38.1k	0.001	1	0.1	8.42e-02	0.9664	6.4870	12.3535	2.28e-04	0.2478	0.7762
TCN-45-S-16	7.5k	0.005	5	5	6.98e-02	0.8266	8.8056	1.0275	1.44e-05	0.0468	0.0640
TCN-45-L-16	7.3k	0.005	0.5	0.5	7.30e-02	0.8620	8.4297	0.9014	9.25e-06	0.0425	0.0375
TCN-250-S-16	14.5k	0.005	5	5	6.51e-02	0.7714	6.6630	0.8192	5.69e-05	0.0417	0.0313
TCN-250-L-16	18.4k	0.005	0.5	0.5	6.20e-02	0.7351	12.6195	0.9232	1.17e-04	0.0562	0.0278
TCN-2500-S-16	13.7k	0.005	0.5	0.5	6.64e-02	0.8001	40.7961	0.7086	8.30e-05	0.0392	0.0573
TCN-2500-L-16	11.9k	0.005	5	5	6.90e-02	0.8203	5.3636	0.6465	1.92e-05	0.0270	0.0189
TCN-TF-45-S-16	39.5k	0.005	0.5	0.5	3.35e-02	0.4090	5.0408	2.1693	3.79e-04	0.0661	0.0803
TCN-TF-45-L-16	71.3k	0.005	5	5	2.57e-02	0.3175	4.0402	1.7221	3.10e-04	0.0342	0.0445
TCN-TF-250-S-16	52.9k	0.005	5	5	2.88e-02	0.3540	3.7182	1.3592	2.63e-04	0.0397	0.0491
TCN-TF-250-L-16	88.8k	0.005	5	5	2.19e-02	0.2713	3.2864	0.9728	2.22e-04	0.0256	0.0385
TCN-TF-2500-S-16	45.7k	0.005	0.5	0.5	2.09e-02	0.2541	4.4876	1.0521	1.49e-04	0.0385	0.0775
TCN-TF-2500-L-16	75.9k	0.005	10	1	**8.15e-03**	**0.0950**	**2.6796**	3.4022	7.43e-04	0.1095	0.0926
GCN-45-S-16	16.2k	0.005	0.5	0.5	7.21e-02	0.8479	8.3446	0.9866	4.52e-05	0.0482	0.0941
GCN-45-L-16	17.1k	0.005	5	5	7.60e-02	0.8967	7.2561	1.2360	5.16e-07	0.0500	0.0897
GCN-250-S-16	30.4k	0.005	5	5	6.98e-02	0.8266	7.2827	0.7918	2.68e-05	0.0346	0.0532
GCN-250-L-16	39.6k	0.005	5	5	6.81e-02	0.8115	8.5848	1.1609	1.81e-05	0.0528	0.0352
GCN-2500-S-16	28.6k	0.005	5	5	7.04e-02	0.8298	6.6477	0.8074	3.31e-05	0.0390	0.0518
GCN-2500-L-16	26.4k	0.005	5	5	7.01e-02	0.8363	5.0842	0.8746	3.11e-06	0.0312	0.0515
GCN-TF-45-S-16	141.6k	0.005	0.5	0.5	3.08e-02	0.3788	4.4110	1.2935	1.93e-04	0.0427	0.0784
GCN-TF-45-L-16	268.0k	0.005	0.5	0.5	2.74e-02	0.3366	4.2464	1.4893	4.20e-04	0.0428	0.0501
GCN-TF-250-S-16	181.0k	0.005	5	5	3.05e-02	0.3765	3.6688	1.2289	3.02e-04	0.0435	0.0559
GCN-TF-250-L-16	315.6k	0.005	5	5	2.38e-02	0.2948	3.9232	1.4309	3.17e-04	0.0268	0.0373
GCN-TF-2500-S-16	154.1k	0.005	5	5	3.00e-02	0.3622	4.4489	1.7656	1.81e-04	0.0450	0.0750
GCN-TF-2500-L-16	277.3k	0.005	0.5	0.5	2.64e-02	0.3268	8.1004	1.5557	3.52e-04	0.0362	0.0618
S4-S-16	2.4k	0.01	0.5	0.5	7.73e-02	0.9161	8.7527	0.4475	5.20e-06	0.0191	0.0479
S4-L-16	19.0k	0.01	5	5	1.24e-01	1.3801	7.6756	**0.2166**	5.14e-06	**0.0103**	**0.0057**
S4-TF-S-16	28.0k	0.01	5	5	4.39e-02	0.5296	4.5282	1.5957	5.72e-04	0.0348	0.0327
S4-TF-L-16	70.2k	0.01	5	5	3.61e-02	0.4382	4.5640	1.3339	4.48e-04	0.0222	0.0367
GB-DIST-MLP	2.2k	0.1	5	5	1.51e-01	1.7542	9.5654	1.2074	**1.88e-07**	0.0312	0.2084
GB-DIST-RNL	47	0.1	5	5	1.54e-01	1.7786	8.4294	1.1364	3.86e-07	0.0336	0.4717
GB-FUZZ-MLP	2.3k	0.1	5	5	1.55e-01	1.7895	21.3856	1.2245	2.95e-07	0.0365	0.2212
GB-FUZZ-RNL	62	0.1	0.5	0.5	1.55e-01	1.7890	10.4823	1.0056	5.07e-06	0.0337	0.4870

Table 26: *Objective metrics for non parametric models of* ***Harley Benton Plexicon*** *distortion. Bold indicates best performing models. Learning rate multiplier for nonlinearity in gray-box models shown in brackets.*

Model	Params.	LR	Weights					FAD			
			L1	MR-STFT	MSE	ESR	MAPE	VGGish	PANN	CLAP	AFx-Rep
LSTM-32	4.5k	0.005	1	0.1	5.73e-04	0.0054	2.3736	0.0833	2.97e-07	0.0060	0.0036
LSTM-96	38.1k	0.005	5	5	**4.21e-04**	**0.0040**	1.2612	0.0483	**1.22e-08**	0.0031	**0.0020**
TCN-45-S-16	7.5k	0.005	5	5	3.13e-03	0.0304	3.5541	0.1646	1.16e-05	0.0105	0.0093
TCN-45-L-16	7.3k	0.005	0.5	0.5	7.92e-03	0.0757	8.8844	0.5941	2.43e-04	0.0468	0.0455
TCN-250-S-16	14.5k	0.005	5	5	2.13e-03	0.0199	1.9187	0.1228	3.76e-06	0.0087	0.0077
TCN-250-L-16	18.4k	0.005	10	1	2.28e-03	0.0225	4.6874	0.1808	1.07e-05	0.0164	0.0206
TCN-2500-S-16	13.7k	0.005	1	0.1	3.65e-03	0.0341	2.3259	0.1905	1.37e-05	0.0114	0.0159
TCN-2500-L-16	11.9k	0.005	10	1	1.88e-03	0.0175	1.4000	0.1218	7.60e-06	0.0106	0.0068
TCN-TF-45-S-16	39.5k	0.005	5	5	2.04e-03	0.0188	1.3898	0.1445	6.04e-06	0.0106	0.0103
TCN-TF-45-L-16	71.3k	0.005	0.5	0.5	1.24e-03	0.0116	1.1071	0.0958	8.65e-06	0.0070	0.0079
TCN-TF-250-S-16	52.9k	0.005	5	5	1.24e-03	0.0116	1.5858	0.1158	1.09e-05	0.0071	0.0067
TCN-TF-250-L-16	88.8k	0.005	0.5	0.5	7.99e-04	0.0075	**0.9314**	0.0856	8.97e-06	0.0050	0.0100
TCN-TF-2500-S-16	45.7k	0.005	5	5	2.19e-03	0.0205	1.8846	0.1664	2.29e-05	0.0076	0.0120
TCN-TF-2500-L-16	75.9k	0.005	0.5	0.5	1.00e-03	0.0095	2.1539	0.1023	1.25e-05	0.0074	0.0060
GCN-45-S-16	16.2k	0.005	0.5	0.5	1.31e-03	0.0123	1.4356	0.1037	6.33e-06	0.0071	0.0059
GCN-45-L-16	17.1k	0.005	5	5	2.06e-03	0.0211	2.3339	0.1176	5.79e-06	0.0069	0.0077
GCN-250-S-16	30.4k	0.005	0.5	0.5	1.54e-03	0.0148	2.3808	0.1215	5.08e-06	0.0079	0.0088
GCN-250-L-16	39.6k	0.005	0.5	0.5	1.12e-03	0.0109	3.3324	0.1141	6.08e-06	0.0058	0.0043
GCN-2500-S-16	28.6k	0.005	0.5	0.5	2.74e-03	0.0261	2.9833	0.1606	2.82e-06	0.0067	0.0141
GCN-2500-L-16	26.4k	0.005	1	0.1	1.23e-03	0.0117	1.0922	0.1185	1.33e-05	0.0080	0.0065
GCN-TF-45-S-16	141.6k	0.005	0.5	0.5	1.32e-03	0.0123	1.6869	0.0974	9.96e-06	0.0072	0.0059
GCN-TF-45-L-16	268.0k	0.005	5	5	8.05e-04	0.0076	1.3799	0.0870	5.71e-06	0.0074	0.0044
GCN-TF-250-S-16	181.0k	0.005	5	5	1.04e-03	0.0098	1.4588	0.0933	3.04e-06	0.0069	0.0072
GCN-TF-250-L-16	315.6k	0.005	5	5	6.86e-04	0.0066	1.3643	0.0832	5.00e-06	0.0049	0.0037
GCN-TF-2500-S-16	154.1k	0.005	0.5	0.5	1.62e-03	0.0152	2.0690	0.1098	1.86e-05	0.0057	0.0055
GCN-TF-2500-L-16	277.3k	0.005	0.5	0.5	9.05e-04	0.0087	1.0505	0.0980	4.99e-06	0.0044	0.0039
S4-S-16	2.4k	0.01	0.5	0.5	1.31e-03	0.0122	1.7591	0.0789	2.91e-07	0.0056	0.0066
S4-L-16	19.0k	0.01	1	0.1	6.00e-04	0.0056	1.3946	0.0489	1.12e-07	0.0040	0.0025
S4-TF-S-16	28.0k	0.01	1	0.1	9.82e-04	0.0090	0.9568	0.1256	1.40e-07	0.0041	0.0044
S4-TF-L-16	70.2k	0.01	0.5	0.5	5.33e-04	0.0047	1.3392	**0.0409**	7.18e-07	**0.0026**	0.0020
GB-DIST-MLP	2.2k	0.1	0.5	0.5	2.27e-02	0.2128	4.8038	0.4266	9.17e-06	0.0165	0.2288
GB-DIST-RNL	47	0.1	5	5	1.87e-02	0.1731	5.3675	0.2802	4.65e-06	0.0157	0.2007
GB-FUZZ-MLP	2.3k	0.1	0.5	0.5	2.17e-02	0.2041	4.1903	0.4562	1.27e-05	0.0188	0.0886
GB-FUZZ-RNL	62	0.1	5	5	2.51e-02	0.2367	4.6740	0.4497	1.71e-06	0.0174	0.2193

Table 27: *Objective metrics for non parametric models of **Harley Benton Rodent** distortion. Bold indicates best performing models. Learning rate multiplier for nonlinearity in gray-box models shown in brackets.*

Model	Params.	LR	Weights					FAD			
			L1	MR-STFT	MSE	ESR	MAPE	VGGish	PANN	CLAP	AFx-Rep
LSTM-32	4.5k	0.005	0.5	0.5	6.83e-03	0.4959	3.6359	6.6231	1.35e-04	0.1759	0.5508
LSTM-96	38.1k	0.001	5	5	6.83e-03	0.4928	2.5585	8.7789	5.36e-04	0.2618	0.6084
TCN-45-S-16	7.5k	0.005	10	1	2.06e-03	0.1556	2.6272	0.7638	5.75e-06	0.0701	0.0890
TCN-45-L-16	7.3k	0.005	5	5	1.83e-03	0.1367	1.5607	0.7710	1.96e-05	0.0376	0.0364
TCN-250-S-16	14.5k	0.005	1	0.1	1.32e-03	0.0981	1.3677	0.6382	6.56e-06	0.0411	0.0624
TCN-250-L-16	18.4k	0.005	0.5	0.5	9.68e-04	0.0728	1.3386	0.4340	6.89e-06	0.0285	0.0266
TCN-2500-S-16	13.7k	0.005	5	5	1.58e-03	0.1185	1.6631	0.5459	1.52e-05	0.0434	0.0768
TCN-2500-L-16	11.9k	0.005	10	1	9.94e-04	0.0741	1.2711	0.5598	1.53e-05	0.0358	0.0316
TCN-TF-45-S-16	39.5k	0.005	1	0.1	7.85e-04	0.0584	0.9434	0.3768	3.13e-07	0.0426	0.0439
TCN-TF-45-L-16	71.3k	0.005	10	1	8.40e-04	0.0625	0.9973	0.4241	1.58e-06	0.0491	0.0773
TCN-TF-250-S-16	52.9k	0.005	5	5	7.77e-04	0.0578	1.0744	0.4545	5.66e-07	0.0348	0.0655
TCN-TF-250-L-16	88.8k	0.005	1	0.1	8.72e-04	0.0644	0.9415	0.3636	2.06e-06	0.0420	0.0658
TCN-TF-2500-S-16	45.7k	0.005	10	1	7.85e-04	0.0583	1.0832	0.4552	9.58e-08	0.0423	0.0368
TCN-TF-2500-L-16	75.9k	0.005	0.5	0.5	5.10e-04	0.0380	0.9725	0.3843	8.40e-06	0.0275	0.0555
GCN-45-S-16	16.2k	0.005	5	5	1.53e-03	0.1145	1.6186	0.6044	4.31e-06	0.0401	0.0772
GCN-45-L-16	17.1k	0.005	5	5	1.50e-03	0.1113	1.5865	0.6837	4.47e-06	0.0520	0.0502
GCN-250-S-16	30.4k	0.005	5	5	1.16e-03	0.0861	1.3995	0.5936	3.11e-07	0.0435	0.0490
GCN-250-L-16	39.6k	0.005	1	0.1	7.75e-04	0.0574	1.1568	0.5820	4.06e-06	0.0636	0.0423
GCN-2500-S-16	28.6k	0.005	1	0.1	1.13e-03	0.0838	1.3130	0.6754	6.00e-06	0.0432	0.0660
GCN-2500-L-16	26.4k	0.005	1	0.1	7.18e-04	0.0533	1.0706	0.4771	1.42e-05	0.0546	0.0309
GCN-TF-45-S-16	141.6k	0.005	1	0.1	7.44e-04	0.0560	1.1428	0.4954	3.14e-06	0.0521	0.0641
GCN-TF-45-L-16	268.0k	0.005	1	0.1	4.83e-04	0.0362	0.8751	0.2920	5.06e-06	0.0385	0.0472
GCN-TF-250-S-16	181.0k	0.005	10	1	7.53e-04	0.0559	0.9686	0.3764	5.38e-06	0.0367	0.0397
GCN-TF-250-L-16	315.6k	0.005	1	0.1	9.39e-04	0.0700	1.1924	0.3339	2.13e-06	0.0402	0.0287
GCN-TF-2500-S-16	154.1k	0.005	10	1	6.31e-04	0.0474	1.0118	0.2901	**2.67e-08**	0.0368	0.0400
GCN-TF-2500-L-16	277.3k	0.005	10	1	**3.42e-04**	**0.0260**	0.7787	0.3571	1.98e-05	0.0336	0.0221
S4-S-16	2.4k	0.01	0.5	0.5	7.85e-04	0.0595	1.0255	0.4654	1.65e-05	0.0276	0.0184
S4-L-16	19.0k	0.01	10	1	5.43e-04	0.0409	0.8254	0.2271	2.16e-05	**0.0143**	**0.0094**
S4-TF-S-16	28.0k	0.01	1	0.1	4.87e-04	0.0366	0.8074	**0.2233**	8.89e-06	0.0237	0.0289
S4-TF-L-16	70.2k	0.01	5	5	3.53e-04	0.0268	**0.7482**	0.3983	1.21e-05	0.0264	0.0232
GB-DIST-MLP	2.2k	0.1	1	0.1	4.01e-03	0.2931	2.3269	0.7087	9.12e-06	0.0711	0.3428
GB-DIST-RNL	47	0.1	1	0.1	4.09e-03	0.3008	2.9429	1.3022	1.52e-04	0.0732	0.4530
GB-FUZZ-MLP	2.3k	0.1	10	1	3.82e-03	0.2797	2.4281	0.9981	2.11e-05	0.0602	0.1769
GB-FUZZ-RNL	62	0.1	5	5	5.07e-03	0.3703	3.2628	1.4103	2.72e-05	0.0679	0.3126

1.4 Results Fuzz

Table 28: *Scaled test loss for non parametric models of fuzz effects. Bold indicates best performing models.*

Model	Params.	Custom Dynamic Fuzz			Harley Benton Fuzzy Logic			Harley Benton Silly Fuzz			Arturia Spring636 Preamp		
		Tot.	L1	MR-STFT	Tot.	L1	MR-STFT	Tot.	L1	MR-STFT	Tot.	L1	MR-STFT
LSTM-32	4.5k	0.5504	0.0205	0.5299	2.2845	0.1179	2.1666	1.9206	0.0471	1.8735	0.2687	0.0091	0.2595
LSTM-96	38.1k	0.4541	0.0146	0.4395	2.3062	0.1168	2.1894	1.6853	0.0422	1.6431	0.1760	0.0123	0.1637
TCN-45-S-16	7.5k	0.9885	0.0523	0.9362	1.3093	0.0682	1.2411	0.8025	0.0107	0.7918	0.5928	0.0292	0.5635
TCN-45-L-16	7.3k	0.9854	0.0535	0.9319	0.8215	0.0234	0.7981	0.7405	0.0095	0.7310	0.5882	0.0228	0.5654
TCN-250-S-16	14.5k	0.9032	0.0408	0.8624	0.9163	0.0245	0.8918	0.7379	0.0090	0.7289	0.3764	0.0109	0.3655
TCN-250-L-16	18.4k	0.8851	0.0406	0.8445	0.6819	0.0127	0.6692	0.6666	0.0062	0.6604	0.4225	0.0114	0.4112
TCN-2500-S-16	13.7k	0.8728	0.0404	0.8325	1.3715	0.0723	1.2992	0.8418	0.0124	0.8293	0.4032	0.0182	0.3850
TCN-2500-L-16	11.9k	0.8819	0.0420	0.8399	0.6843	0.0150	0.6694	0.6682	0.0076	0.6606	0.3497	0.0192	0.3305
TCN-TF-45-S-16	39.5k	0.5797	0.0191	0.5605	0.7721	0.0174	0.7547	0.7451	0.0080	0.7371	0.3211	0.0059	0.3152
TCN-TF-45-L-16	71.3k	0.5136	0.0158	0.4978	0.5586	0.0090	0.5496	0.6570	0.0057	0.6513	0.2669	0.0069	0.2600
TCN-TF-250-S-16	52.9k	0.5413	0.0173	0.5241	0.6030	0.0112	0.5918	0.7018	0.0076	0.6942	0.3278	0.0064	0.3215
TCN-TF-250-L-16	88.8k	0.5265	0.0160	0.5106	0.6077	0.0117	0.5960	0.6634	0.0170	0.6463	0.2505	0.0066	0.2439
TCN-TF-2500-S-16	45.7k	0.5513	0.0192	0.5321	0.6829	0.0156	0.6673	1.0854	0.0152	1.0702	0.3203	0.0145	0.3058
TCN-TF-2500-L-16	75.9k	0.5073	0.0148	0.4925	0.8263	0.0212	0.8052	0.6428	0.0139	0.6289	0.2588	0.0217	0.2371
GCN-45-S-16	16.2k	0.9622	0.0585	0.9037	0.8225	0.0174	0.8050	0.7125	0.0068	0.7057	0.5803	0.0227	0.5576
GCN-45-L-16	17.1k	0.9417	0.0556	0.8861	0.7138	0.0209	0.6930	0.6452	0.0056	0.6396	0.5943	0.0384	0.5558
GCN-250-S-16	30.4k	0.8493	0.0457	0.8036	0.7027	0.0137	0.6890	0.6327	0.0057	0.6270	0.3552	0.0098	0.3453
GCN-250-L-16	39.6k	0.8844	0.0401	0.8443	0.6534	0.0113	0.6421	0.6523	0.0054	0.6469	0.3381	0.0089	0.3292
GCN-2500-S-16	28.6k	0.7325	0.0324	0.7001	0.6822	0.0157	0.6665	0.6528	0.0087	0.6441	0.3267	0.0147	0.3120
GCN-2500-L-16	26.4k	0.7103	0.0291	0.6812	0.7378	0.0165	0.7212	0.6804	0.0069	0.6735	0.3163	0.0100	0.3063
GCN-TF-45-S-16	141.6k	0.5409	0.0228	0.5181	0.5609	0.0089	0.5519	0.7960	0.0098	0.7861	0.2566	0.0047	0.2519
GCN-TF-45-L-16	268.0k	0.4949	0.0220	0.4729	0.4624	0.0066	0.4558	0.6006	0.0051	0.5955	0.2229	0.0164	0.2066
GCN-TF-250-S-16	181.0k	0.5082	0.0240	0.4842	0.6930	0.0231	0.6699	1.1097	0.0203	1.0894	0.2183	0.0109	0.2074
GCN-TF-250-L-16	315.6k	0.4778	0.0146	0.4633	0.8390	0.0178	0.8212	0.6889	0.0067	0.6823	0.2196	0.0073	0.2123
GCN-TF-2500-S-16	154.1k	0.5216	0.0246	0.4970	0.6920	0.0211	0.6709	0.6078	0.0073	0.6004	0.2624	0.0123	0.2501
GCN-TF-2500-L-16	277.3k	0.4868	0.0214	0.4654	0.5529	0.0137	0.5393	0.5687	0.0065	0.5622	0.2103	0.0123	0.1980
S4-S-16	2.4k	0.6468	0.0295	0.6173	0.5937	0.0098	0.5839	0.6539	0.0053	0.6486	0.2290	0.0085	0.2205
S4-L-16	19.0k	0.5737	0.0241	0.5496	**0.4336**	0.0048	0.4288	0.5362	0.0038	0.5324	**0.1431**	0.0090	0.1340
S4-TF-S-16	28.0k	0.4544	0.0173	0.4371	0.5507	0.0079	0.5429	0.5531	0.0041	0.5490	0.1719	0.0069	0.1650
S4-TF-L-16	70.2k	**0.4344**	0.0153	0.4190	0.6048	0.0120	0.5928	**0.4980**	0.0033	0.4946	0.1469	0.0038	0.1431
GB-DIST-MLP	2.2k	1.3593	0.1271	1.2322	1.8472	0.1119	1.7353	1.7205	0.1094	1.6111	0.8404	0.0408	0.7996
GB-DIST-RNL	47	1.4017	0.1324	1.2692	1.9171	0.1083	1.8088	1.8562	0.0479	1.8083	0.8593	0.0461	0.8132
GB-FUZZ-MLP	2.3k	1.1861	0.0620	1.1241	1.4306	0.0531	1.3776	1.4077	0.0209	1.3868	0.7604	0.0355	0.7249
GB-FUZZ-RNL	62	1.0867	0.0999	0.9868	1.5059	0.0563	1.4496	1.4646	0.0202	1.4444	0.8582	0.0452	0.8130

Table 29: *Scaled validation and test loss for non parametric models of* ***Custom Dynamic Fuzz*** *fuzz. Bold indicates best performing models. Learning rate multiplier for nonlinearity in gray-box models shown in brackets.*

Model	Params.	LR	Weights		Val. Loss			Test Loss		
			L1	MR-STFT	Tot.	L1	MR-STFT	Tot.	L1	MR-STFT
LSTM-32	4.5k	0.005	1	0.1	0.7049	0.0278	0.6771	0.5504	0.0205	0.5299
LSTM-96	38.1k	0.005	10	1	**0.5572**	0.0213	0.5359	0.4541	0.0146	0.4395
TCN-45-S-16	7.5k	0.005	10	1	1.1265	0.0655	1.0609	0.9885	0.0523	0.9362
TCN-45-L-16	7.3k	0.005	1	0.1	1.1229	0.0657	1.0572	0.9854	0.0535	0.9319
TCN-250-S-16	14.5k	0.005	10	1	1.0447	0.0533	0.9914	0.9032	0.0408	0.8624
TCN-250-L-16	18.4k	0.005	10	1	1.0360	0.0526	0.9835	0.8851	0.0406	0.8445
TCN-2500-S-16	13.7k	0.005	10	1	1.0334	0.0534	0.9801	0.8728	0.0404	0.8325
TCN-2500-L-16	11.9k	0.005	10	1	1.0179	0.0507	0.9672	0.8819	0.0420	0.8399
TCN-TF-45-S-16	39.5k	0.005	10	1	0.7597	0.0309	0.7289	0.5797	0.0191	0.5605
TCN-TF-45-L-16	71.3k	0.005	1	0.1	0.7431	0.0320	0.7111	0.5136	0.0158	0.4978
TCN-TF-250-S-16	52.9k	0.005	10	1	0.7633	0.0313	0.7320	0.5413	0.0173	0.5241
TCN-TF-250-L-16	88.8k	0.005	10	1	0.7611	0.0315	0.7296	0.5265	0.0160	0.5106
TCN-TF-2500-S-16	45.7k	0.005	1	0.1	0.7472	0.0313	0.7159	0.5513	0.0192	0.5321
TCN-TF-2500-L-16	75.9k	0.005	1	0.1	0.6930	0.0282	0.6647	0.5073	0.0148	0.4925
GCN-45-S-16	16.2k	0.005	5	5	1.1000	0.0700	1.0300	0.9622	0.0585	0.9037
GCN-45-L-16	17.1k	0.005	5	5	1.0838	0.0683	1.0156	0.9417	0.0556	0.8861
GCN-250-S-16	30.4k	0.005	5	5	1.0057	0.0574	0.9483	0.8493	0.0457	0.8036
GCN-250-L-16	39.6k	0.005	10	1	1.0129	0.0505	0.9623	0.8844	0.0401	0.8443
GCN-2500-S-16	28.6k	0.005	10	1	0.9751	0.0481	0.9270	0.7325	0.0324	0.7001
GCN-2500-L-16	26.4k	0.005	1	0.1	0.8555	0.0393	0.8162	0.7103	0.0291	0.6812
GCN-TF-45-S-16	141.6k	0.005	5	5	0.7316	0.0335	0.6981	0.5409	0.0228	0.5181
GCN-TF-45-L-16	268.0k	0.005	5	5	0.6574	0.0340	0.6234	0.4949	0.0220	0.4729
GCN-TF-250-S-16	181.0k	0.005	0.5	0.5	0.7418	0.0365	0.7053	0.5082	0.0240	0.4842
GCN-TF-250-L-16	315.6k	0.005	10	1	0.6665	0.0271	0.6393	0.4778	0.0146	0.4633
GCN-TF-2500-S-16	154.1k	0.005	5	5	0.7319	0.0367	0.6952	0.5216	0.0246	0.4970
GCN-TF-2500-L-16	277.3k	0.005	5	5	0.6975	0.0350	0.6624	0.4868	0.0214	0.4654
S4-S-16	2.4k	0.01	10	1	0.8620	0.0426	0.8194	0.6468	0.0295	0.6173
S4-L-16	19.0k	0.01	0.5	0.5	0.8022	0.0398	0.7624	0.5737	0.0241	0.5496
S4-TF-S-16	28.0k	0.01	0.5	0.5	0.6269	0.0272	0.5997	0.4544	0.0173	0.4371
S4-TF-L-16	70.2k	0.01	0.5	0.5	0.6151	0.0267	0.5884	**0.4344**	0.0153	0.4190
GB-DIST-MLP	2.2k	0.1 (0.01)	5	5	1.4192	0.1253	1.2938	1.3593	0.1271	1.2322
GB-DIST-RNL	47	0.1 (1)	5	5	1.3941	0.1280	1.2661	1.4017	0.1324	1.2692
GB-FUZZ-MLP	2.3k	0.1 (0.01)	10	1	1.3185	0.0688	1.2498	1.1861	0.0620	1.1241
GB-FUZZ-RNL	62	0.1 (1)	10	1	1.1998	0.1003	1.0995	1.0867	0.0999	0.9868

Table 30: *Scaled validation and test loss for non parametric models of* ***Harley Benton Fuzzy Logic*** *fuzz. Bold indicates best performing models. Learning rate multiplier for nonlinearity in gray-box models shown in brackets.*

Model	Params.	LR	Weights		Val. Loss			Test Loss		
			L1	MR-STFT	Tot.	L1	MR-STFT	Tot.	L1	MR-STFT
LSTM-32	4.5k	0.001	1	0.1	2.1293	0.1288	2.0005	2.2845	0.1179	2.1666
LSTM-96	38.1k	0.001	10	1	2.3521	0.1234	2.2287	2.3062	0.1168	2.1894
TCN-45-S-16	7.5k	0.005	0.5	0.5	1.0224	0.0292	0.9931	1.3093	0.0682	1.2411
TCN-45-L-16	7.3k	0.005	5	5	0.8131	0.0259	0.7872	0.8215	0.0234	0.7981
TCN-250-S-16	14.5k	0.005	1	0.1	0.9138	0.0215	0.8923	0.9163	0.0245	0.8918
TCN-250-L-16	18.4k	0.005	1	0.1	0.7011	0.0135	0.6876	0.6819	0.0127	0.6692
TCN-2500-S-16	13.7k	0.005	1	0.1	0.8944	0.0244	0.8700	1.3715	0.0723	1.2992
TCN-2500-L-16	11.9k	0.005	1	0.1	0.6806	0.0154	0.6652	0.6843	0.0150	0.6694
TCN-TF-45-S-16	39.5k	0.005	1	0.1	0.6230	0.0110	0.6120	0.7721	0.0174	0.7547
TCN-TF-45-L-16	71.3k	0.005	1	0.1	0.5809	0.0099	0.5709	0.5586	0.0090	0.5496
TCN-TF-250-S-16	52.9k	0.005	1	0.1	0.5822	0.0113	0.5709	0.6030	0.0112	0.5918
TCN-TF-250-L-16	88.8k	0.005	10	1	0.5735	0.0122	0.5614	0.6077	0.0117	0.5960
TCN-TF-2500-S-16	45.7k	0.005	1	0.1	0.6850	0.0160	0.6690	0.6829	0.0156	0.6673
TCN-TF-2500-L-16	75.9k	0.005	1	0.1	0.8690	0.0258	0.8432	0.8263	0.0212	0.8052
GCN-45-S-16	16.2k	0.005	10	1	0.8763	0.0165	0.8598	0.8225	0.0174	0.8050
GCN-45-L-16	17.1k	0.005	5	5	0.9200	0.0240	0.8960	0.7138	0.0209	0.6930
GCN-250-S-16	30.4k	0.005	10	1	0.7352	0.0133	0.7219	0.7027	0.0137	0.6890
GCN-250-L-16	39.6k	0.005	1	0.1	0.6389	0.0114	0.6274	0.6534	0.0113	0.6421
GCN-2500-S-16	28.6k	0.005	1	0.1	0.7191	0.0174	0.7017	0.6822	0.0157	0.6665
GCN-2500-L-16	26.4k	0.005	10	1	0.7147	0.0159	0.6988	0.7378	0.0165	0.7212
GCN-TF-45-S-16	141.6k	0.005	1	0.1	0.6017	0.0099	0.5918	0.5609	0.0089	0.5519
GCN-TF-45-L-16	268.0k	0.005	1	0.1	0.5245	0.0086	0.5159	0.4624	0.0066	0.4558
GCN-TF-250-S-16	181.0k	0.005	5	5	0.6902	0.0267	0.6636	0.6930	0.0231	0.6699
GCN-TF-250-L-16	315.6k	0.005	10	1	0.7624	0.0165	0.7460	0.8390	0.0178	0.8212
GCN-TF-2500-S-16	154.1k	0.005	5	5	0.7063	0.0159	0.6904	0.6920	0.0211	0.6709
GCN-TF-2500-L-16	277.3k	0.005	5	5	0.7925	0.0205	0.7721	0.5529	0.0137	0.5393
S4-S-16	2.4k	0.01	0.5	0.5	0.5991	0.0106	0.5885	0.5937	0.0098	0.5839
S4-L-16	19.0k	0.01	10	1	**0.4702**	0.0055	0.4647	**0.4336**	0.0048	0.4288
S4-TF-S-16	28.0k	0.01	1	0.1	0.5541	0.0082	0.5459	0.5507	0.0079	0.5429
S4-TF-L-16	70.2k	0.01	1	0.1	0.4988	0.0064	0.4925	0.6048	0.0120	0.5928
GB-DIST-MLP	2.2k	0.1 (0.01)	0.5	0.5	1.9248	0.1000	1.8248	1.8472	0.1119	1.7353
GB-DIST-RNL	47	0.1 (1)	10	1	1.8934	0.0971	1.7963	1.9171	0.1083	1.8088
GB-FUZZ-MLP	2.3k	0.1 (0.01)	5	5	1.4539	0.0574	1.3965	1.4306	0.0531	1.3776
GB-FUZZ-RNL	62	0.1 (1)	0.5	0.5	1.6511	0.0557	1.5954	1.5059	0.0563	1.4496

Table 31: *Scaled validation and test loss for non parametric models of* ***Harley Benton Silly Fuzz*** *fuzz. Bold indicates best performing models. Learning rate multiplier for nonlinearity in gray-box models shown in brackets.*

Model	Params.	LR	Weights		Val. Loss			Test Loss		
			L1	MR-STFT	Tot.	L1	MR-STFT	Tot.	L1	MR-STFT
LSTM-32	4.5k	0.001	10	1	1.9546	0.0420	1.9126	1.9206	0.0471	1.8735
LSTM-96	38.1k	0.001	5	5	1.6304	0.0419	1.5885	1.6853	0.0422	1.6431
TCN-45-S-16	7.5k	0.005	0.5	0.5	0.9053	0.0124	0.8929	0.8025	0.0107	0.7918
TCN-45-L-16	7.3k	0.005	5	5	0.7829	0.0160	0.7670	0.7405	0.0095	0.7310
TCN-250-S-16	14.5k	0.005	10	1	0.7935	0.0094	0.7841	0.7379	0.0090	0.7289
TCN-250-L-16	18.4k	0.005	1	0.1	0.7099	0.0068	0.7031	0.6666	0.0062	0.6604
TCN-2500-S-16	13.7k	0.005	10	1	0.8727	0.0133	0.8594	0.8418	0.0124	0.8293
TCN-2500-L-16	11.9k	0.005	1	0.1	0.7049	0.0074	0.6976	0.6682	0.0076	0.6606
TCN-TF-45-S-16	39.5k	0.005	10	1	0.7487	0.0100	0.7387	0.7451	0.0080	0.7371
TCN-TF-45-L-16	71.3k	0.005	1	0.1	0.6664	0.0071	0.6593	0.6570	0.0057	0.6513
TCN-TF-250-S-16	52.9k	0.005	1	0.1	0.7066	0.0109	0.6956	0.7018	0.0076	0.6942
TCN-TF-250-L-16	88.8k	0.005	5	5	0.6873	0.0268	0.6605	0.6634	0.0170	0.6463
TCN-TF-2500-S-16	45.7k	0.005	10	1	0.7812	0.0113	0.7699	1.0854	0.0152	1.0702
TCN-TF-2500-L-16	75.9k	0.005	0.5	0.5	0.6473	0.0216	0.6258	0.6428	0.0139	0.6289
GCN-45-S-16	16.2k	0.005	10	1	0.8102	0.0063	0.8039	0.7125	0.0068	0.7057
GCN-45-L-16	17.1k	0.005	10	1	0.8518	0.0055	0.8463	0.6452	0.0056	0.6396
GCN-250-S-16	30.4k	0.005	10	1	0.7105	0.0051	0.7055	0.6327	0.0057	0.6270
GCN-250-L-16	39.6k	0.005	1	0.1	0.6694	0.0068	0.6626	0.6523	0.0054	0.6469
GCN-2500-S-16	28.6k	0.005	0.5	0.5	0.7229	0.0118	0.7111	0.6528	0.0087	0.6441
GCN-2500-L-16	26.4k	0.005	1	0.1	0.7042	0.0078	0.6964	0.6804	0.0069	0.6735
GCN-TF-45-S-16	141.6k	0.005	10	1	0.7290	0.0094	0.7196	0.7960	0.0098	0.7861
GCN-TF-45-L-16	268.0k	0.005	1	0.1	0.6273	0.0064	0.6209	0.6006	0.0051	0.5955
GCN-TF-250-S-16	181.0k	0.005	10	1	0.7950	0.0100	0.7850	1.1097	0.0203	1.0894
GCN-TF-250-L-16	315.6k	0.005	1	0.1	0.6954	0.0080	0.6874	0.6889	0.0067	0.6823
GCN-TF-2500-S-16	154.1k	0.005	5	5	0.6180	0.0101	0.6079	0.6078	0.0073	0.6004
GCN-TF-2500-L-16	277.3k	0.005	0.5	0.5	0.5797	0.0093	0.5704	0.5687	0.0065	0.5622
S4-S-16	2.4k	0.01	1	0.1	0.6905	0.0055	0.6849	0.6539	0.0053	0.6486
S4-L-16	19.0k	0.01	10	1	0.5679	0.0033	0.5646	0.5362	0.0038	0.5324
S4-TF-S-16	28.0k	0.01	1	0.1	0.5886	0.0041	0.5845	0.5531	0.0041	0.5490
S4-TF-L-16	70.2k	0.01	10	1	**0.5272**	0.0028	0.5244	**0.4980**	0.0033	0.4946
GB-DIST-MLP	2.2k	0.1	5	5	1.8176	0.0991	1.7185	1.7205	0.1094	1.6111
GB-DIST-RNL	47	0.1	5	5	1.8785	0.0442	1.8343	1.8562	0.0479	1.8083
GB-FUZZ-MLP	2.3k	0.1	5	5	1.4506	0.0219	1.4287	1.4077	0.0209	1.3868
GB-FUZZ-RNL	62	0.1	1	0.1	1.6310	0.0207	1.6103	1.4646	0.0202	1.4444

Table 32: *Scaled validation and test loss for non parametric models of* ***Arturia Rev Spring 636 Preamp*** *fuzz. Bold indicates best performing models. Learning rate multiplier for nonlinearity in gray-box models shown in brackets.*

Model	Params.	LR	Weights		Val. Loss			Test Loss		
			L1	MR-STFT	Tot.	L1	MR-STFT	Tot.	L1	MR-STFT
LSTM-32	4.5k	0.005	1	0.1	0.3070	0.0110	0.2960	0.2687	0.0091	0.2595
LSTM-96	38.1k	0.001	5	5	0.2131	0.0150	0.1981	0.1760	0.0123	0.1637
TCN-45-S-16	7.5k	0.005	5	5	0.5907	0.0282	0.5625	0.5928	0.0292	0.5635
TCN-45-L-16	7.3k	0.005	10	1	0.5918	0.0225	0.5693	0.5882	0.0228	0.5654
TCN-250-S-16	14.5k	0.005	10	1	0.4128	0.0115	0.4014	0.3764	0.0109	0.3655
TCN-250-L-16	18.4k	0.005	1	0.1	0.4516	0.0121	0.4395	0.4225	0.0114	0.4112
TCN-2500-S-16	13.7k	0.005	0.5	0.5	0.4729	0.0236	0.4493	0.4032	0.0182	0.3850
TCN-2500-L-16	11.9k	0.005	0.5	0.5	0.4499	0.0247	0.4252	0.3497	0.0192	0.3305
TCN-TF-45-S-16	39.5k	0.005	1	0.1	0.3642	0.0072	0.3570	0.3211	0.0059	0.3152
TCN-TF-45-L-16	71.3k	0.005	1	0.1	0.3308	0.0085	0.3223	0.2669	0.0069	0.2600
TCN-TF-250-S-16	52.9k	0.005	10	1	0.3484	0.0066	0.3419	0.3278	0.0064	0.3215
TCN-TF-250-L-16	88.8k	0.005	10	1	0.2823	0.0079	0.2744	0.2505	0.0066	0.2439
TCN-TF-2500-S-16	45.7k	0.005	0.5	0.5	0.3790	0.0178	0.3612	0.3203	0.0145	0.3058
TCN-TF-2500-L-16	75.9k	0.005	5	5	0.2875	0.0261	0.2614	0.2588	0.0217	0.2371
GCN-45-S-16	16.2k	0.005	10	1	0.6270	0.0237	0.6034	0.5803	0.0227	0.5576
GCN-45-L-16	17.1k	0.005	5	5	0.6836	0.0463	0.6373	0.5943	0.0384	0.5558
GCN-250-S-16	30.4k	0.005	10	1	0.4430	0.0136	0.4294	0.3552	0.0098	0.3453
GCN-250-L-16	39.6k	0.005	1	0.1	0.3420	0.0089	0.3330	0.3381	0.0089	0.3292
GCN-2500-S-16	28.6k	0.005	5	5	0.3454	0.0171	0.3283	0.3267	0.0147	0.3120
GCN-2500-L-16	26.4k	0.005	10	1	0.3495	0.0115	0.3380	0.3163	0.0100	0.3063
GCN-TF-45-S-16	141.6k	0.005	5	5	0.2924	0.0056	0.2867	0.2566	0.0047	0.2519
GCN-TF-45-L-16	268.0k	0.005	5	5	0.2716	0.0222	0.2495	0.2229	0.0164	0.2066
GCN-TF-250-S-16	181.0k	0.005	10	1	0.2566	0.0125	0.2441	0.2183	0.0109	0.2074
GCN-TF-250-L-16	315.6k	0.005	5	5	0.2462	0.0079	0.2383	0.2196	0.0073	0.2123
GCN-TF-2500-S-16	154.1k	0.005	0.5	0.5	0.3237	0.0161	0.3076	0.2624	0.0123	0.2501
GCN-TF-2500-L-16	277.3k	0.005	0.5	0.5	0.2297	0.0148	0.2149	0.2103	0.0123	0.1980
S4-S-16	2.4k	0.01	5	5	0.2495	0.0086	0.2409	0.2290	0.0085	0.2205
S4-L-16	19.0k	0.01	5	5	0.1861	0.0130	0.1731	**0.1431**	0.0090	0.1340
S4-TF-S-16	28.0k	0.01	5	5	0.2258	0.0082	0.2176	0.1719	0.0069	0.1650
S4-TF-L-16	70.2k	0.01	10	1	**0.1660**	0.0044	0.1616	0.1469	0.0038	0.1431
GB-DIST-MLP	2.2k	0.1	10	1	0.7976	0.0373	0.7603	0.8404	0.0408	0.7996
GB-DIST-RNL	47	0.1	0.5	0.5	0.8532	0.0458	0.8074	0.8593	0.0461	0.8132
GB-FUZZ-MLP	2.3k	0.1	0.5	0.5	0.8098	0.0360	0.7738	0.7604	0.0355	0.7249
GB-FUZZ-RNL	62	0.1	0.5	0.5	0.8857	0.0467	0.8390	0.8582	0.0452	0.8130

Table 33: *Objective metrics for non parametric models of* ***Custom Dynamic Fuzz*** *fuzz. Bold indicates best performing models. Learning rate multiplier for nonlinearity in gray-box models shown in brackets.*

Model	Params.	LR	Weights					FAD			
			L1	MR-STFT	MSE	ESR	MAPE	VGGish	PANN	CLAP	AFx-Rep
LSTM-32	4.5k	0.005	1	0.1	3.56e-03	0.0315	0.8384	0.0931	3.04e-06	0.0086	0.0080
LSTM-96	38.1k	0.005	10	1	2.05e-03	0.0191	0.7337	0.0894	1.09e-06	0.0058	0.0036
TCN-45-S-16	7.5k	0.005	10	1	1.01e-02	0.0974	5.1123	0.5420	2.94e-05	0.0556	0.0447
TCN-45-L-16	7.3k	0.005	1	0.1	1.04e-02	0.1002	4.5405	0.5082	9.95e-06	0.0541	0.0417
TCN-250-S-16	14.5k	0.005	10	1	8.39e-03	0.0784	2.3234	0.4771	7.08e-05	0.0403	0.0473
TCN-250-L-16	18.4k	0.005	10	1	8.22e-03	0.0776	2.9425	0.2847	7.42e-05	0.0338	0.0312
TCN-2500-S-16	13.7k	0.005	10	1	7.09e-03	0.0662	1.9213	1.0353	1.06e-04	0.0668	0.1189
TCN-2500-L-16	11.9k	0.005	10	1	8.46e-03	0.0793	2.5310	0.3263	1.27e-04	0.0422	0.0336
TCN-TF-45-S-16	39.5k	0.005	10	1	2.67e-03	0.0256	0.7979	0.0863	2.61e-05	0.0380	0.0172
TCN-TF-45-L-16	71.3k	0.005	1	0.1	2.01e-03	0.0189	0.6915	0.0792	1.89e-05	0.0129	0.0553
TCN-TF-250-S-16	52.9k	0.005	10	1	2.20e-03	0.0202	0.8998	0.0935	1.41e-05	0.0190	0.0138
TCN-TF-250-L-16	88.8k	0.005	10	1	2.21e-03	0.0198	0.6452	0.0828	1.12e-05	0.0112	0.0184
TCN-TF-2500-S-16	45.7k	0.005	1	0.1	2.40e-03	0.0220	0.7754	0.1007	1.71e-05	0.0149	0.0141
TCN-TF-2500-L-16	75.9k	0.005	1	0.1	**1.98e-03**	**0.0175**	**0.4391**	0.0697	2.79e-06	0.0120	0.0313
GCN-45-S-16	16.2k	0.005	5	5	1.04e-02	0.0985	5.0496	0.4863	8.73e-05	0.0342	0.0380
GCN-45-L-16	17.1k	0.005	5	5	1.03e-02	0.0976	4.6198	0.3822	5.09e-05	0.0399	0.0286
GCN-250-S-16	30.4k	0.005	5	5	8.25e-03	0.0761	3.2831	0.3989	1.56e-04	0.0351	0.0415
GCN-250-L-16	39.6k	0.005	10	1	8.57e-03	0.0818	2.8326	0.4045	1.11e-04	0.0400	0.0336
GCN-2500-S-16	28.6k	0.005	10	1	4.75e-03	0.0446	2.1462	0.6218	1.38e-04	0.0481	0.0454
GCN-2500-L-16	26.4k	0.005	1	0.1	4.49e-03	0.0437	1.9491	0.4803	8.45e-05	0.0362	0.0445
GCN-TF-45-S-16	141.6k	0.005	5	5	2.66e-03	0.0238	1.2796	0.1062	1.23e-05	0.0275	0.0113
GCN-TF-45-L-16	268.0k	0.005	5	5	3.42e-03	0.0317	1.0079	0.0703	1.56e-06	0.0079	**0.0034**
GCN-TF-250-S-16	181.0k	0.005	0.5	0.5	2.45e-03	0.0227	1.5625	0.0928	2.51e-06	0.0233	0.0077
GCN-TF-250-L-16	315.6k	0.005	10	1	2.17e-03	0.0193	0.5536	0.0714	1.27e-06	0.0065	0.0057
GCN-TF-2500-S-16	154.1k	0.005	5	5	2.68e-03	0.0242	0.9486	0.0976	1.35e-06	0.0076	0.0103
GCN-TF-2500-L-16	277.3k	0.005	5	5	2.66e-03	0.0239	0.9135	0.0641	1.39e-06	0.0066	0.0137
S4-S-16	2.4k	0.01	10	1	4.92e-03	0.0459	1.5261	0.1436	1.21e-05	0.0137	0.0258
S4-L-16	19.0k	0.01	0.5	0.5	3.94e-03	0.0369	1.2131	0.1101	8.76e-06	0.0086	0.0054
S4-TF-S-16	28.0k	0.01	0.5	0.5	2.21e-03	0.0200	0.8430	0.0876	1.08e-06	0.0057	0.0056
S4-TF-L-16	70.2k	0.01	0.5	0.5	1.99e-03	0.0178	0.6776	**0.0636**	**2.76e-07**	**0.0050**	0.0037
GB-DIST-MLP	2.2k	0.1	5	5	2.94e-02	0.2591	6.7693	1.6367	4.71e-05	0.0904	0.3448
GB-DIST-RNL	47	0.1	5	5	2.97e-02	0.2605	6.7492	2.1777	2.60e-05	0.0966	0.3214
GB-FUZZ-MLP	2.3k	0.1	10	1	1.20e-02	0.1104	2.7967	1.5592	1.69e-05	0.0843	0.3571
GB-FUZZ-RNL	62	0.1	10	1	1.64e-02	0.1772	13.0024	0.3961	1.57e-05	0.0309	0.3512

Table 34: *Objective metrics for non parametric models of* ***Harley Benton Fuzzy Logic*** *fuzz. Bold indicates best performing models. Learning rate multiplier for nonlinearity in gray-box models shown in brackets.*

Model	Params.	LR	Weights					FAD			
			L1	MR-STFT	MSE	ESR	MAPE	VGGish	PANN	CLAP	AFx-Rep
LSTM-32	4.5k	0.001	1	0.1	2.83e-02	0.9203	11.3948	6.1461	1.29e-03	0.5026	0.5827
LSTM-96	38.1k	0.001	10	1	2.60e-02	0.8763	15.8152	6.7294	1.50e-04	0.3734	0.8195
TCN-45-S-16	7.5k	0.005	0.5	0.5	1.13e-02	0.3754	15.4948	0.8415	2.84e-04	0.1034	0.1431
TCN-45-L-16	7.3k	0.005	5	5	2.10e-03	0.0753	7.2155	0.2363	2.49e-06	0.0353	0.0534
TCN-250-S-16	14.5k	0.005	1	0.1	2.33e-03	0.0866	6.8113	0.2551	4.52e-06	0.0443	0.0716
TCN-250-L-16	18.4k	0.005	1	0.1	7.82e-04	0.0289	1.7976	0.1547	1.13e-07	0.0285	0.0345
TCN-2500-S-16	13.7k	0.005	1	0.1	9.33e-03	0.3630	20.1439	0.7083	4.74e-05	0.0609	0.2203
TCN-2500-L-16	11.9k	0.005	1	0.1	9.44e-04	0.0345	2.2698	0.2444	**4.23e-08**	0.0186	0.0302
TCN-TF-45-S-16	39.5k	0.005	1	0.1	1.26e-03	0.0438	3.1692	0.7610	4.96e-05	0.0530	0.1156
TCN-TF-45-L-16	71.3k	0.005	1	0.1	5.96e-04	0.0208	1.0964	0.1435	2.72e-06	0.0217	0.0638
TCN-TF-250-S-16	52.9k	0.005	1	0.1	9.00e-04	0.0314	1.4806	0.2281	1.55e-06	0.0220	0.0913
TCN-TF-250-L-16	88.8k	0.005	10	1	1.11e-03	0.0387	1.1759	0.2281	1.29e-06	0.0257	0.0269
TCN-TF-2500-S-16	45.7k	0.005	1	0.1	9.66e-04	0.0330	2.3828	0.2138	1.61e-05	0.0195	0.0709
TCN-TF-2500-L-16	75.9k	0.005	1	0.1	3.03e-03	0.1031	2.0202	0.5470	1.30e-04	0.0331	0.1535
GCN-45-S-16	16.2k	0.005	10	1	1.30e-03	0.0473	4.6385	0.1845	9.64e-07	0.0343	0.1529
GCN-45-L-16	17.1k	0.005	5	5	2.83e-03	0.0975	3.4353	0.1250	3.13e-07	0.0315	0.0391
GCN-250-S-16	30.4k	0.005	10	1	9.27e-04	0.0341	2.3576	0.1283	9.24e-07	0.0265	0.1072
GCN-250-L-16	39.6k	0.005	1	0.1	6.41e-04	0.0236	2.2444	0.1208	3.04e-06	0.0219	0.0248
GCN-2500-S-16	28.6k	0.005	1	0.1	1.01e-03	0.0369	2.4683	0.1470	1.61e-05	0.0184	0.0249
GCN-2500-L-16	26.4k	0.005	10	1	1.42e-03	0.0510	3.5339	0.2557	3.10e-07	0.0488	0.0330
GCN-TF-45-S-16	141.6k	0.005	1	0.1	5.65e-04	0.0196	1.0334	0.1470	6.96e-07	0.0173	0.0929
GCN-TF-45-L-16	268.0k	0.005	1	0.1	3.07e-04	0.0107	**0.7361**	0.1626	1.40e-06	0.0160	0.0106
GCN-TF-250-S-16	181.0k	0.005	5	5	3.32e-03	0.1123	3.5458	0.2811	1.60e-05	0.0321	0.1033
GCN-TF-250-L-16	315.6k	0.005	10	1	2.12e-03	0.0711	1.9047	0.4196	1.76e-04	0.0475	0.1372
GCN-TF-2500-S-16	154.1k	0.005	5	5	2.83e-03	0.0957	3.0513	0.2763	1.65e-05	0.0318	0.1025
GCN-TF-2500-L-16	277.3k	0.005	5	5	1.39e-03	0.0475	1.5987	0.1967	1.13e-06	0.0189	0.0224
S4-S-16	2.4k	0.01	0.5	0.5	7.96e-04	0.0293	1.6396	0.1253	8.78e-07	0.0120	0.0227
S4-L-16	19.0k	0.01	10	1	**2.00e-04**	**0.0073**	0.8161	**0.0697**	1.89e-06	**0.0114**	**0.0055**
S4-TF-S-16	28.0k	0.01	1	0.1	4.41e-04	0.0156	1.1197	0.1996	7.60e-08	0.0183	0.0207
S4-TF-L-16	70.2k	0.01	1	0.1	7.82e-04	0.0258	1.7880	0.1861	3.40e-07	0.0187	0.0112
GB-DIST-MLP	2.2k	0.1	0.5	0.5	2.30e-02	0.7771	19.7928	2.3912	7.05e-04	0.1384	0.4256
GB-DIST-RNL	47	0.1	10	1	2.04e-02	0.6886	21.6368	1.6225	1.51e-04	0.0967	0.4251
GB-FUZZ-MLP	2.3k	0.1	5	5	9.74e-03	0.3289	7.8629	0.5924	3.52e-05	0.0546	0.1954
GB-FUZZ-RNL	62	0.1	0.5	0.5	1.01e-02	0.3537	8.8434	0.8787	1.06e-04	0.0623	0.3390

Table 35: *Objective metrics for non parametric models of* ***Harley Benton Silly Fuzz*** *fuzz. Bold indicates best performing models. Learning rate multiplier for nonlinearity in gray-box models shown in brackets.*

Model	Params.	LR	Weights					FAD			
			L1	MR-STFT	MSE	ESR	MAPE	VGGish	PANN	CLAP	AFx-Rep
LSTM-32	4.5k	0.001	10	1	6.74e-03	0.5091	15.6365	3.9768	9.32e-05	0.3342	0.7288
LSTM-96	38.1k	0.001	5	5	6.08e-03	0.4479	13.4749	1.8205	6.77e-05	0.1799	0.3917
TCN-45-S-16	7.5k	0.005	0.5	0.5	5.47e-04	0.0404	4.2415	0.1861	3.99e-05	0.0305	0.0444
TCN-45-L-16	7.3k	0.005	5	5	7.33e-04	0.0508	2.6337	0.1814	8.60e-05	0.0373	0.0483
TCN-250-S-16	14.5k	0.005	10	1	4.41e-04	0.0333	3.3895	0.1018	1.25e-05	0.0195	0.0286
TCN-250-L-16	18.4k	0.005	1	0.1	2.74e-04	0.0214	2.1916	0.0828	8.70e-06	0.0110	0.0134
TCN-2500-S-16	13.7k	0.005	10	1	8.01e-04	0.0582	4.1357	0.2226	1.81e-05	0.0292	0.0387
TCN-2500-L-16	11.9k	0.005	1	0.1	3.63e-04	0.0282	2.0592	0.1304	3.85e-06	0.0135	0.0149
TCN-TF-45-S-16	39.5k	0.005	10	1	6.38e-04	0.0456	2.3212	0.8912	8.29e-05	0.0894	0.1407
TCN-TF-45-L-16	71.3k	0.005	1	0.1	3.82e-04	0.0279	1.5769	0.3794	5.63e-05	0.0597	0.0556
TCN-TF-250-S-16	52.9k	0.005	1	0.1	6.63e-04	0.0466	1.6720	0.5500	1.59e-04	0.0555	0.0972
TCN-TF-250-L-16	88.8k	0.005	5	5	3.96e-03	0.2689	3.1497	0.8495	4.75e-05	0.1017	0.0931
TCN-TF-2500-S-16	45.7k	0.005	10	1	1.10e-03	0.0826	7.2219	0.4671	1.88e-04	0.0592	0.1902
TCN-TF-2500-L-16	75.9k	0.005	0.5	0.5	2.52e-03	0.1716	2.5158	0.4645	1.18e-04	0.0669	0.0267
GCN-45-S-16	16.2k	0.005	10	1	3.16e-04	0.0245	2.4492	0.1132	1.58e-05	0.0220	0.0515
GCN-45-L-16	17.1k	0.005	10	1	2.48e-04	0.0196	1.9068	0.1304	1.71e-05	0.0243	0.0230
GCN-250-S-16	30.4k	0.005	10	1	2.35e-04	0.0189	2.5600	**0.0602**	3.68e-06	**0.0092**	0.0131
GCN-250-L-16	39.6k	0.005	1	0.1	2.38e-04	0.0182	1.9500	0.0680	5.88e-06	0.0102	0.0152
GCN-2500-S-16	28.6k	0.005	0.5	0.5	6.07e-04	0.0421	2.4410	0.0927	1.35e-06	0.0169	0.0135
GCN-2500-L-16	26.4k	0.005	1	0.1	3.06e-04	0.0232	2.2419	0.0801	2.70e-06	0.0141	0.0304
GCN-TF-45-S-16	141.6k	0.005	10	1	5.85e-04	0.0418	2.8098	0.5357	4.52e-05	0.0883	0.1347
GCN-TF-45-L-16	268.0k	0.005	1	0.1	2.33e-04	**0.0176**	1.9511	0.7671	5.88e-05	0.0943	0.0604
GCN-TF-250-S-16	181.0k	0.005	10	1	2.07e-03	0.1478	7.2714	0.9028	9.65e-05	0.1337	0.2381
GCN-TF-250-L-16	315.6k	0.005	1	0.1	4.76e-04	0.0344	2.2700	0.5768	1.09e-04	0.0729	0.1104
GCN-TF-2500-S-16	154.1k	0.005	5	5	4.78e-04	0.0331	2.2827	0.3036	4.31e-05	0.0395	0.0395
GCN-TF-2500-L-16	277.3k	0.005	0.5	0.5	5.87e-04	0.0400	1.6689	0.6217	5.00e-05	0.0985	0.0661
S4-S-16	2.4k	0.01	1	0.1	4.32e-04	0.0328	1.7129	0.1179	**6.43e-07**	0.0327	0.0315
S4-L-16	19.0k	0.01	10	1	2.59e-04	0.0205	1.2290	0.2815	5.38e-06	0.0424	**0.0123**
S4-TF-S-16	28.0k	0.01	1	0.1	2.66e-04	0.0207	1.3235	0.4832	9.70e-05	0.0690	0.0430
S4-TF-L-16	70.2k	0.01	10	1	**2.29e-04**	0.0181	**1.0153**	0.5121	7.88e-05	0.0700	0.0246
GB-DIST-MLP	2.2k	0.1	5	5	4.17e-02	2.9266	9.1623	1.2965	4.67e-04	0.1155	0.3451
GB-DIST-RNL	47	0.1	5	5	6.98e-03	0.5341	16.7509	2.1911	7.50e-05	0.1835	0.3865
GB-FUZZ-MLP	2.3k	0.1	5	5	2.56e-03	0.1938	11.5878	0.8343	1.02e-05	0.1215	0.2632
GB-FUZZ-RNL	62	0.1	1	0.1	2.47e-03	0.1867	10.4652	0.6758	3.85e-05	0.1154	0.3534

Table 36: *Objective metrics for non parametric models of* ***Arturia Rev Spring 636 Preamp*** *fuzz. Bold indicates best performing models. Learning rate multiplier for nonlinearity in gray-box models shown in brackets.*

Model	Params.	LR	Weights					FAD			
			L1	MR-STFT	MSE	ESR	MAPE	VGGish	PANN	CLAP	AFx-Rep
LSTM-32	4.5k	0.005	1	0.1	2.88e-04	0.0119	0.7834	0.0221	1.45e-06	0.0018	0.0109
LSTM-96	38.1k	0.001	5	5	1.28e-03	0.0514	0.6530	0.0053	1.71e-07	0.0009	0.0073
TCN-45-S-16	7.5k	0.005	5	5	2.71e-03	0.1112	2.3335	0.0975	1.15e-06	0.0110	0.0562
TCN-45-L-16	7.3k	0.005	10	1	1.33e-03	0.0565	1.7421	0.0853	4.33e-06	0.0112	0.0405
TCN-250-S-16	14.5k	0.005	10	1	4.14e-04	0.0169	0.6300	0.0406	4.09e-06	0.0075	0.0188
TCN-250-L-16	18.4k	0.005	1	0.1	4.15e-04	0.0171	0.7136	0.0441	3.99e-07	0.0065	0.0207
TCN-2500-S-16	13.7k	0.005	0.5	0.5	1.85e-03	0.0743	0.9756	0.0597	3.29e-07	0.0080	0.0504
TCN-2500-L-16	11.9k	0.005	0.5	0.5	2.43e-03	0.0978	1.1197	0.0386	1.51e-06	0.0055	0.0509
TCN-TF-45-S-16	39.5k	0.005	1	0.1	1.30e-04	0.0054	0.3339	0.0277	2.73e-06	0.0116	0.0351
TCN-TF-45-L-16	71.3k	0.005	1	0.1	3.18e-04	0.0132	0.3950	0.0216	3.05e-06	0.0024	0.0374
TCN-TF-250-S-16	52.9k	0.005	10	1	1.58e-04	0.0065	0.3430	0.0244	2.48e-06	0.0071	0.0681
TCN-TF-250-L-16	88.8k	0.005	10	1	3.34e-04	0.0137	0.3805	0.0197	1.03e-06	0.0025	0.0255
TCN-TF-2500-S-16	45.7k	0.005	0.5	0.5	1.78e-03	0.0712	0.7379	0.0254	3.30e-07	0.0042	0.0664
TCN-TF-2500-L-16	75.9k	0.005	5	5	3.91e-03	0.1568	0.9180	0.0122	1.95e-07	0.0020	0.0565
GCN-45-S-16	16.2k	0.005	10	1	1.25e-03	0.0529	1.5329	0.0890	9.36e-07	0.0104	0.0374
GCN-45-L-16	17.1k	0.005	5	5	5.52e-03	0.2232	2.1635	0.0936	2.52e-07	0.0096	0.0577
GCN-250-S-16	30.4k	0.005	10	1	3.69e-04	0.0152	0.6251	0.0394	4.16e-06	0.0055	0.0269
GCN-250-L-16	39.6k	0.005	1	0.1	2.42e-04	0.0101	0.5882	0.0265	7.26e-06	0.0035	0.0464
GCN-2500-S-16	28.6k	0.005	5	5	1.37e-03	0.0552	0.8173	0.0537	5.92e-06	0.0061	0.0398
GCN-2500-L-16	26.4k	0.005	10	1	5.56e-04	0.0229	0.5805	0.0358	5.40e-06	0.0047	0.0467
GCN-TF-45-S-16	141.6k	0.005	10	1	1.16e-04	0.0049	0.2786	0.0091	6.32e-07	0.0096	0.0169
GCN-TF-45-L-16	268.0k	0.005	5	5	2.43e-03	0.0979	0.8554	0.0098	1.03e-07	0.0019	0.0101
GCN-TF-250-S-16	181.0k	0.005	5	5	1.15e-03	0.0461	0.5897	0.0072	5.08e-07	0.0054	0.0404
GCN-TF-250-L-16	315.6k	0.005	10	1	4.88e-04	0.0202	0.4354	0.0105	6.52e-07	0.0016	0.0064
GCN-TF-2500-S-16	154.1k	0.005	5	5	1.29e-03	0.0521	0.6616	0.0195	**1.34e-09**	0.0022	0.0354
GCN-TF-2500-L-16	277.3k	0.005	0.5	0.5	1.47e-03	0.0591	0.6384	0.0074	2.57e-07	0.0014	0.0370
S4-S-16	2.4k	0.01	5	5	4.35e-04	0.0175	0.5423	0.0082	1.15e-07	0.0011	0.0180
S4-L-16	19.0k	0.01	5	5	7.06e-04	0.0283	0.6099	**0.0043**	2.80e-08	**0.0008**	0.0015
S4-TF-S-16	28.0k	0.01	5	5	3.50e-04	0.0141	0.3821	0.0049	2.16e-07	0.0011	0.0140
S4-TF-L-16	70.2k	0.01	10	1	**1.01e-04**	**0.0042**	**0.2493**	0.0043	9.17e-08	0.0008	**0.0012**
GB-DIST-MLP	2.2k	0.1	10	1	3.52e-03	0.1451	2.1582	0.2588	6.97e-06	0.0210	0.0469
GB-DIST-RNL	47	0.1	0.5	0.5	4.00e-03	0.1651	3.5724	0.3442	4.58e-05	0.0235	0.0707
GB-FUZZ-MLP	2.3k	0.1	0.5	0.5	2.87e-03	0.1171	1.8932	0.1243	2.47e-05	0.0143	0.0376
GB-FUZZ-RNL	62	0.1	0.5	0.5	3.97e-03	0.1636	3.4919	0.3373	4.41e-05	0.0200	0.0750

1.5 Results Parametric Models

Table 37: *Scaled validation and test loss for non parametric models of* ***Marshall JVM410H - Ch. OD1*** *amplifier. Bold indicates best performing models. Learning rate multiplier for nonlinearity in gray-box models shown in brackets.*

Model	Params.	LR	Weights		Val. Loss			Test Loss		
			L1	MR-STFT	Tot.	L1	MR-STFT	Tot.	L1	MR-STFT
LSTM-C-32	5.0k	0.001	0.5	0.5	0.4634	0.0131	0.4503	1.1216	0.0376	1.0839
LSTM-TVC-32	8.0k	0.001	1	0.1	0.4521	0.0103	0.4419	1.1610	0.0351	1.1259
LSTM-C-96	39.7k	0.001	10	1	0.4686	0.0126	0.4560	1.1423	0.0347	1.1075
LSTM-TVC-96	4.6k	0.001	0.5	0.5	0.4345	0.0098	0.4247	1.1142	0.0344	1.0798
TCN-F-45-S-16	15.0k	0.005	5	5	0.6137	0.0224	0.5913	1.2636	0.0519	1.2117
TCN-TF-45-S-16	42.0k	0.005	10	1	0.4624	0.0115	0.4509	1.2087	0.0333	1.1754
TCN-TTF-45-S-16	17.3k	0.005	1	0.1	0.5220	0.0163	0.5057	1.2982	0.0449	1.2533
TCN-TVF-45-S-16	17.7k	0.005	0.5	0.5	0.4809	0.0164	0.4645	1.4137	0.0534	1.3603
TCN-F-45-L-16	20.1k	0.005	0.5	0.5	0.5962	0.0230	0.5733	1.5938	0.0638	1.5300
TCN-TF-45-L-16	76.4k	0.005	1	0.1	0.3976	0.0090	0.3886	1.1138	0.0319	1.0819
TCN-TTF-45-L-16	27.0k	0.005	1	0.1	0.4759	0.0134	0.4626	1.2022	0.0385	1.1637
TCN-TVF-45-L-16	22.8k	0.005	5	5	0.4476	0.0134	0.4343	1.1835	0.0393	1.1442
S4-F-S-16	8.9k	0.01	1	0.1	0.4571	0.0089	0.4482	1.2783	0.0465	1.2317
S4-TF-S-16	30.0k	0.01	10	1	0.3864	0.0073	0.3791	1.0965	0.0290	1.0675
S4-TTF-S-16	10.2k	0.01	1	0.1	0.4227	0.0102	0.4125	1.2164	0.0368	1.1796
S4-TVF-S-16	11.6k	0.01	5	5	0.3778	0.0095	0.3683	1.0991	0.0351	1.0640
S4-F-L-16	29.7k	0.01	5	5	0.3503	0.0084	0.3419	1.1745	0.0374	1.1370
S4-TF-L-16	74.3k	0.01	1	0.1	0.3109	0.0049	0.3060	1.1490	0.0321	1.1169
S4-TTF-L-16	34.8k	0.01	5	5	0.4066	0.0132	0.3933	1.0984	0.0349	1.0635
S4-TVF-L-16	32.4k	0.01	10	1	**0.2965**	0.0048	0.2917	**1.0133**	0.0257	0.9876
GB-C-DIST-MLP	4.5k	0.1 (0.01)	0.5	0.5	0.8563	0.0413	0.8151	1.5072	0.0741	1.4331
GB-C-DIST-RNL	2.3k	0.1 (1)	0.5	0.5	0.8395	0.0407	0.7988	1.5113	0.0667	1.4445
GB-C-FUZZ-MLP	4.2k	0.1 (0.01)	5	5	0.8208	0.0401	0.7807	1.5009	0.0686	1.4323
GB-C-FUZZ-RNL	2.0k	0.1 (1)	5	5	0.8123	0.0438	0.7685	1.5428	0.0720	1.4708

Table 38: *Scaled validation and test loss for non parametric models of* ***Multidrive F-Fuzz*** *fuzz. Bold indicates best performing models. Learning rate multiplier for nonlinearity in gray-box models shown in brackets.*

Model	Params.	LR	Weights		Val. Loss			Test Loss		
			L1	MR-STFT	Tot.	L1	MR-STFT	Tot.	L1	MR-STFT
LSTM-C-32	5.0k	0.001	5	5	0.3234	0.0050	0.3184	0.3123	0.0051	0.3072
LSTM-TVC-32	8.0k	0.001	1	0.1	0.2071	0.0027	0.2044	0.1652	0.0023	0.1628
LSTM-C-96	39.7k	0.001	1	0.1	0.2405	0.0052	0.2353	0.1689	0.0024	0.1665
LSTM-TVC-96	45.7k	0.001	5	5	**0.2026**	0.0053	0.1973	**0.1560**	0.0040	0.1521
TCN-F-45-S-16	15.0k	0.005	1	0.1	0.6664	0.0163	0.6501	0.7095	0.0217	0.6878
TCN-TF-45-S-16	42.0k	0.005	10	1	0.5147	0.0082	0.5065	0.4886	0.0077	0.4809
TCN-TTF-45-S-16	17.3k	0.005	10	1	0.5594	0.0106	0.5488	0.5324	0.0102	0.5223
TCN-TVF-45-S-16	17.7k	0.005	10	1	0.5491	0.0117	0.5374	0.5356	0.0115	0.5241
TCN-F-45-L-16	20.1k	0.005	1	0.1	0.6496	0.0176	0.6320	0.6681	0.0185	0.6495
TCN-TF-45-L-16	76.4k	0.005	10	1	0.4026	0.0062	0.3964	0.3553	0.0058	0.3495
TCN-TTF-45-L-16	27.0k	0.005	5	5	0.5052	0.0263	0.4790	0.4788	0.0225	0.4563
TCN-TVF-45-L-16	22.8k	0.005	5	5	0.5872	0.0171	0.5701	0.5835	0.0164	0.5671
S4-F-S-16	89.0k	0.01	1	0.1	0.5171	0.0107	0.5064	0.7687	0.0243	0.7444
S4-TF-S-16	30.0k	0.01	1	0.1	0.3710	0.0055	0.3655	0.4034	0.0075	0.3959
S4-TTF-S-16	10.2k	0.01	10	1	0.4264	0.0066	0.4198	0.3816	0.0066	0.3749
S4-TVF-S-16	11.6k	0.01	1	0.1	0.3673	0.0055	0.3618	0.3354	0.0058	0.3296
S4-F-L-16	29.7k	0.01	5	5	0.3811	0.0262	0.3549	0.4973	0.0225	0.4748
S4-TF-L-16	74.3k	0.01	10	1	0.2907	0.0054	0.2853	0.2619	0.0042	0.2577
S4-TTF-L-16	34.8k	0.01	5	5	0.3506	0.0071	0.3436	0.3683	0.0075	0.3608
S4-TVF-L-16	32.4k	0.01	10	1	0.2476	0.0041	0.2435	0.2673	0.0045	0.2628
GB-C-DIST-MLP	45.0k	0.1 (0.01)	5	5	1.1759	0.0631	1.1128	1.2104	0.0611	1.1492
GB-C-DIST-RNL	23.0k	0.1 (1)	0.5	0.5	1.2355	0.0683	1.1671	1.2531	0.0672	1.1858
GB-C-FUZZ-MLP	42.0k	0.1 (0.01)	0.5	0.5	0.9809	0.0363	0.9446	0.9303	0.0345	0.8958
GB-C-FUZZ-RNL	20.0k	0.1 (1)	0.5	0.5	1.0043	0.0398	0.9645	0.9395	0.0355	0.9040

Table 39: *Objective metrics for parametric models of* ***Marshall JVM410H - Ch. OD1*** *amplifier. Bold indicates best performing models. Learning rate multiplier for nonlinearity in gray-box models shown in brackets.*

Model	Params.	LR	Weights					FAD			
			L1	MR-STFT	MSE	ESR	MAPE	VGGish	PANN	CLAP	AFx-Rep
LSTM-C-32	5.0k	0.001	0.5	0.5	5.53e-03	0.2178	6.4798	0.6575	2.14e-05	0.0670	0.1319
LSTM-TVC-32	8.0k	0.001	1	0.1	5.23e-03	0.2097	6.3634	0.6531	3.09e-05	0.0750	0.1340
LSTM-C-96	39.7k	0.001	10	1	4.65e-03	0.1742	4.9881	0.6790	4.34e-05	0.0646	0.1348
LSTM-TVC-96	4.6k	0.001	0.5	0.5	5.61e-03	0.2240	5.4487	0.6408	2.00e-05	0.0672	0.1354
TCN-F-45-S-16	15.0k	0.005	5	5	6.47e-03	0.2436	17.5463	1.0410	1.43e-05	0.0744	0.1798
TCN-TF-45-S-16	42.0k	0.005	10	1	4.13e-03	0.1688	3.7782	0.7006	**2.67e-07**	0.0686	0.1616
TCN-TTF-45-S-16	17.3k	0.005	1	0.1	4.67e-03	0.1788	10.3527	0.9590	5.78e-07	0.0764	0.2189
TCN-TVF-45-S-16	17.7k	0.005	0.5	0.5	7.14e-03	0.2883	14.5766	0.7157	3.37e-05	0.0768	0.1750
TCN-F-45-L-16	20.1k	0.005	0.5	0.5	8.08e-03	0.3148	37.1117	1.3193	2.88e-05	0.1108	0.2619
TCN-TF-45-L-16	76.4k	0.005	1	0.1	3.32e-03	0.1359	3.5274	0.7486	1.02e-06	0.0674	0.1414
TCN-TTF-45-L-16	27.0k	0.005	1	0.1	4.93e-03	0.2091	4.3162	0.7804	8.67e-07	0.0707	0.1604
TCN-TVF-45-L-16	22.8k	0.005	5	5	4.68e-03	0.1893	5.7824	0.7282	2.10e-05	0.0697	0.1440
S4-F-S-16	8.9k	0.01	1	0.1	5.68e-03	0.2242	7.2561	0.7921	5.93e-05	0.0776	**0.0995**
S4-TF-S-16	30.0k	0.01	10	1	2.78e-03	0.1145	3.8495	0.7167	1.09e-05	0.0672	0.1593
S4-TTF-S-16	10.2k	0.01	1	0.1	4.16e-03	0.1710	4.8166	0.7697	4.99e-06	0.0756	0.1685
S4-TVF-S-16	11.6k	0.01	5	5	3.96e-03	0.1525	5.0032	0.6239	4.45e-05	0.0670	0.1245
S4-F-L-16	29.7k	0.01	5	5	4.23e-03	0.1786	4.5815	0.7637	2.02e-05	0.0721	0.1495
S4-TF-L-16	74.3k	0.01	1	0.1	3.92e-03	0.1778	**3.4974**	0.6139	4.56e-06	0.0644	0.1153
S4-TTF-L-16	34.8k	0.01	5	5	4.39e-03	0.1781	3.8163	0.7574	3.11e-06	0.0706	0.1292
S4-TVF-L-16	32.4k	0.01	10	1	**2.62e-03**	**0.1084**	3.7071	**0.5880**	1.02e-05	**0.0585**	0.1228
GB-C-DIST-MLP	4.5k	0.1 (0.01)	0.5	0.5	1.77e-02	0.6223	4.5876	1.8688	1.74e-05	0.0813	0.1987
GB-C-DIST-RNL	2.3k	0.1 (1)	0.5	0.5	1.75e-02	0.6220	5.4532	1.8288	8.63e-06	0.0806	0.1848
GB-C-FUZZ-MLP	4.2k	0.1 (0.01)	5	5	1.70e-02	0.6005	4.6540	1.8778	2.57e-06	0.0868	0.2099
GB-C-FUZZ-RNL	2.0k	0.1 (1)	5	5	1.74e-02	0.6193	4.9578	1.5210	1.19e-05	0.0854	0.2405

Table 40: *Objective metrics for parametric models of* ***Multidrive F-Fuzz*** *fuzz. Bold indicates best performing models. Learning rate multiplier for nonlinearity in gray-box models shown in brackets.*

Model	Params.	LR	Weights					FAD			
			L1	MR-STFT	MSE	ESR	MAPE	VGGish	PANN	CLAP	AFx-Rep
LSTM-C-32	5.0k	0.001	5	5	1.42e-04	0.0050	6.5954	0.0325	1.97e-06	0.0036	0.0041
LSTM-TVC-32	8.0k	0.001	1	0.1	4.94e-05	0.0018	11.0315	0.0108	2.45e-07	0.0022	0.0019
LSTM-C-96	39.7k	0.001	1	0.1	**4.07e-05**	**0.0015**	4.5250	0.0119	1.70e-07	0.0020	0.0015
LSTM-TVC-96	4.6k	0.001	5	5	7.76e-05	0.0029	18.7066	0.0155	1.55e-07	0.0022	0.0016
TCN-F-45-S-16	15.0k	0.005	1	0.1	1.63e-03	0.0627	156.4299	0.3258	1.17e-05	0.0247	0.0658
TCN-TF-45-S-16	42.0k	0.005	10	1	2.99e-04	0.0107	4.5291	0.1596	1.75e-05	0.0197	0.0383
TCN-TTF-45-S-16	17.3k	0.005	10	1	5.49e-04	0.0191	7.1355	0.1041	8.50e-06	0.0138	0.0112
TCN-TVF-45-S-16	17.7k	0.005	10	1	5.98e-04	0.0212	9.9470	0.2359	1.02e-07	0.0166	0.0373
TCN-F-45-L-16	20.1k	0.005	1	0.1	1.25e-03	0.0467	79.8801	0.2689	1.12e-07	0.0257	0.0805
TCN-TF-45-L-16	76.4k	0.005	10	1	1.55e-04	0.0055	7.1107	0.0623	6.67e-08	0.0072	0.0046
TCN-TTF-45-L-16	27.0k	0.005	5	5	3.63e-03	0.1340	16.5099	0.0890	9.66e-07	0.0145	0.0127
TCN-TVF-45-L-16	22.8k	0.005	5	5	1.41e-03	0.0505	6.8365	0.1635	1.56e-06	0.0151	0.0117
S4-F-S-16	8.9k	0.01	1	0.1	2.55e-03	0.0922	18.0766	0.2028	5.39e-08	0.0238	0.0179
S4-TF-S-16	30.0k	0.01	1	0.1	2.16e-04	0.0079	29.8031	0.0568	7.36e-07	0.0049	0.0085
S4-TTF-S-16	10.2k	0.01	10	1	2.15e-04	0.0076	11.0442	0.1101	2.20e-05	0.0123	0.0235
S4-TVF-S-16	11.6k	0.01	1	0.1	1.45e-04	0.0052	28.9949	0.0550	5.23e-07	0.0056	0.0097
S4-F-L-16	29.7k	0.01	5	5	3.89e-03	0.1428	7.7912	0.0745	2.12e-06	0.0070	0.0068
S4-TF-L-16	74.3k	0.01	10	1	8.86e-05	0.0032	4.5734	0.0441	2.45e-07	0.0048	0.0041
S4-TTF-L-16	34.8k	0.01	5	5	2.55e-04	0.0090	9.2914	0.0570	9.88e-07	0.0049	0.0041
S4-TVF-L-16	32.4k	0.01	10	1	1.44e-04	0.0050	**2.7653**	0.0271	1.47e-08	0.0047	0.0030
GB-C-DIST-MLP	4.5k	0.1 (0.01)	5	5	9.26e-03	0.3370	56.1451	**0.5493**	**1.32e-04**	**0.0557**	0.1264
GB-C-DIST-RNL	2.3k	0.1 (1)	0.5	0.5	9.73e-03	0.3560	105.7389	0.4071	4.94e-06	0.0448	0.0649
GB-C-FUZZ-MLP	4.2k	0.1 (0.01)	0.5	0.5	5.93e-03	0.2149	33.0963	0.2608	4.51e-05	0.0213	0.0604
GB-C-FUZZ-RNL	2.0k	0.1 (1)	0.5	0.5	5.90e-03	0.2143	17.0522	0.3807	5.00e-05	0.0546	**0.2399**