

# 1 Datasets

Below a list of all used yuv-sequences is given. Most of these are commonly used for compression standards development, but do not overlap with the CTC Sets (version G1010).

Due to storage limitations and the huge correlation between consecutive frames, not all frames of each video are used. In explicit, of each sequence at least the 2nd and 27th frame is used. After the 27th ever  $n$ th frame is used with

$$n = \left\lfloor \frac{25 + \frac{f_c}{40}}{4} \right\rfloor \quad (1)$$

depending the number of frames  $f_c$  in the sequence. This dependency was introduced in order to hinder properties of longer sequences from being overrepresented in the respective sets.

Note that sequences in 4:4:4 format are only used for the training and validation of the luma prediction networks.

As described in the paper, some of the patches with low variance are excluded from the set in order to adapt better to the complex regions, that need the highest bitrates. In order to do so the variance of each feature area  $v_f$  and rounded to integer. The maximum number of patches  $c_{max}$  with each variance value, that is added to the set is calculated than the average occurrence over the 95-percentile  $p_{95}(v_f)$  of the variance distribution.

$$c_{max} = \frac{\#patches}{p_{95}(v_f)} \quad (2)$$

Among the samples with the same variance the ones to be discarded are selected randomly.

The resulting number of training samples for the different configurations after the variance distribution correction are listed below alongside the number of parameters to be learned and the relation between the two:

Number of Trainingsamples			Number of trained Parameters for C2 architecture with CRCO			Sample / Parameters Relation for C2 architecture with CRCO		
Blocksize	Luma	Chroma	Blocksize	Luma	Chroma	Blocksize	Luma	Chroma
4	51.38M	12.08M	4	1.11M	4.33M	4	46.29	2.80
8	35.15M	8.30M	8	1.66M	12.25M	8	21.17	0.68
16	21.50M	5.05M	16	2.81M	40.76M	16	7.65	0.12
32	5.84M	–	32	5.30M	–	32	1.10	–

## 1.1 Trainingset Resources

No.	Sequence Name	Resolution	Format	Depth	Rate	Frames	Source
1	AerialCwod	3840x2160	4:2:0	10bit	30fps	600	Huawei
2	BallUnderwater	1920x1080	4:2:0	8bit	120fps	1200	U Bristol
3	Bluesky	1920x1080	4:2:0	8bit	25fps	217	Taurus Media
4	Bookcase	1920x1080	4:2:0	8bit	120fps	1200	U Bristol
5	BrickBushesStatic	3840x2160	4:2:0	10bit	60fps	600	U Bristol
6	BricksLeaves	3840x2160	4:2:0	10bit	60fps	600	U Bristol
7	BridgViewTraffic	3840x2160	4:2:0	10bit	60fps	600	Huawei
8	BubblesClear	1920x1080	4:2:0	8bit	120fps	1200	U Bristol
9	BuildingHall	3840x2160	4:2:0	10bit	50fps	1000	Huawei
10	BundNightSpace	3840x2160	4:2:0	8bit	30fps	300	SJTU
11	CarbetCircleFast	1920x1080	4:2:0	8bit	120fps	1200	U Bristol
12	CarpetSlowTrans	1920x1080	4:2:0	8bit	120fps	1200	U Bristol
13	City	1280x720	4:2:0	8bit	60fps	600	ABC
14	Concrete	352x288	4:2:0	8bit		574	Bosch
15	ConstructionField	3840x2160	4:2:0	8bit	30fps	300	SJTU
16	Crew	1280x720	4:2:0	8bit	60fps	600	NASA
17	CrossRoad1	3840x2160	4:2:0	10bit	50fps	1000	Huawei
18	CrossRoad3	3840x2160	4:2:0	10bit	50fps	1000	Huawei
19	CrowdRun_crop	2560x1600	4:2:0	8bit	50fps	500	SVT
20	CStoreGoods	720x1280	4:2:0	8bit	30fps	300	Huawei
21	CStoreWalking	720x960	4:2:0	8bit	30fps	300	Huawei
22	Cyclists	1280x720	4:2:0	8bit	60fps	600	Demografx
23	DrivingRecorder1	720x960	4:2:0	8bit	30fps	300	Huawei
24	DropsOnWater	1920x1080	4:2:0	8bit	120fps	1200	U Bristol
25	DucksTakeOff	3840x2160	4:2:0	8bit	50fps	500	SVT

No.	Sequance Name	Resolution	Format	Depth	Rate	Frames	Source
26	Flowers2	1920x1080	4:2:0	8bit	120fps	1200	U Bristol
27	FlowerVase	832x480	4:2:0	8bit	30fps	300	Ntt Docomo
28	FoodMarket4	3840x2160	4:2:0	10bit	60fps	720	Netflix
29	Fountains	1920x1080	4:2:0	10bit	30fps	300	SJTU
30	FreeSardines1	3840x2160	4:2:0	10bit	60fps	600	BCOM
31	IceAerial	1920x1080	4:2:0	10bit	30fps	300	DJI
32	IceRiver	1920x1080	4:2:0	10bit	30fps	300	DJI
33	IceRock	1920x1080	4:2:0	10bit	30fps	300	DJI
34	InToTree	3840x2160	4:2:0	8bit	50fps	500	SVT
35	Jets	1280x720	4:2:0	8bit	60fps	550	ABC
36	Katana	3840x2160	4:2:0	10bit	50fps	500	BCOM
37	Keiba	832x480	4:2:0	8bit	30fps	300	Ntt Docomo
38	LakeWalking	720x960	4:2:0	8bit	30fps	300	Huawei
39	LampLeaves	3840x2160	4:2:0	10bit	60fps	600	U Bristol
40	Library	3840x2160	4:2:0	8bit	30fps	300	SJTU
41	Marathon	3840x2160	4:2:0	8bit	30fps	300	SJTU
42	Metro	1920x1080	4:2:0	10bit	60fps	600	Huawei
43	Netflix_Aerial	4096x2160	4:2:0	10bit	60fps	1199	Netflix
44	Netflix_BarScene	4096x2160	4:2:0	10bit	60fps	1199	Netflix
45	Netflix_Boat	4096x2160	4:2:0	10bit	60fps	300	Netflix
46	Netflix_BoxingPractice	4096x2160	4:2:0	10bit	60fps	254	Netflix
47	Netflix_Crosswalk	4096x2160	4:2:0	10bit	60fps	300	Netflix
48	Netflix_Crosswalk	1920x1080	4:2:0	10bit	60fps	300	Netflix
49	Netflix_Dancer	4096x2160	4:2:0	10bit	60fps	1199	Netflix
50	Netflix_DinnerScene	4096x2160	4:2:0	10bit	60fps	1199	Netflix
51	Netflix_FoodMarket	1920x1080	4:2:0	10bit	60fps	600	Netflix
52	Netflix_Narrator	4096x2160	4:2:0	10bit	60fps	300	Netflix
53	Netflix_PierSeaside	4096x2160	4:2:0	10bit	60fps	1199	Netflix
54	Netflix_RollerCoaster	4096x2160	4:2:0	10bit	60fps	1199	Netflix
55	Netflix_SquareAndTimelap	4096x2160	4:2:0	10bit	60fps	600	Netflix
56	Netflix_TunnelFlag	4096x2160	4:2:0	10bit	60fps	600	Netflix
57	Netflix_WindAndNature	4096x2160	4:2:0	10bit	60fps	1199	Netflix
58	Nightroad	3840x2160	4:2:0	10bit	60fps	1200	Huawei
59	OldTownCross	3840x2160	4:2:0	8bit	50fps	500	SVT
60	Optis	1280x720	4:2:0	8bit	60fps	600	Demografx
61	PaintingTilting	1920x1080	4:2:0	8bit	120fps	1200	U Bristol
62	PaperStatic	1920x1080	4:2:0	8bit	120fps	1200	U Bristol
63	ParkJoy	2560x1600	4:2:0	8bit	50fps	500	SVT
64	ParkLake	3840x2160	4:2:0	10bit	50fps	1000	Huawei
65	ParkRun	1280x720	4:2:0	8bit	50fps	504	SVT
66	ParkRunning1	3840x2160	4:2:0	10bit	50fps	762	Huawei
67	ParkRunning3	3840x2160	4:2:0	10bit	50fps	500	Huawei
68	ParkSunny	720x1280	4:2:0	8bit	30fps	300	Huawei
69	ParkWalking	720x1280	4:2:0	8bit	30fps	300	Huawei
70	Pedastrian_Area	1920x1080	4:2:0	8bit	25fps	375	Taurus Media
71	PlasmaFree	1920x1080	4:2:0	8bit	120fps	1200	U Bristol
72	PondDragonflies	1920x1080	4:2:0	8bit	120fps	1200	U Bristol
73	Raven	1280x720	4:2:0	8bit	60fps	600	NASA
74	ResidentalBuilding	3840x2160	4:4:4	10bit	30fps	600	SJTU
75	RitualDance	1920x1080	4:2:0	10bit	60fps	600	Netflix
76	RiverBed	1920x1080	4:2:0	8bit	25fps	250	Taurus Media
77	Rowing2	3840x2160	4:2:0	10bit	60fps	600	BCOM
78	RushHour	1920x1080	4:2:0	8bit	25fps	500	Taurus Media
79	RushHour	3840x2160	4:4:4	10bit	30fps	300	SJTU
80	Sailormen	1280x720	4:2:0	8bit	60fps	600	ABC
81	Scarf	3840x2160	4:4:4	10bit	30fps	253	SJTU
82	Sheriff	1280x720	4:2:0	8bit	60fps	600	Demografx
83	ShieldPart	1920x1080	4:2:0	8bit	50fps	100	SVT
84	ShuttleStart	1280x720	4:2:0	8bit	60fps	600	NASA
85	SintelFiltered	4096x1744	4:4:4	8bit	25fps	102	Blender

No.	Sequance Name	Resolution	Format	Depth	Rate	Frames	Source
86	SmokeClear	1920x1080	4:2:0	8bit	120fps	1200	U Bristol
87	Sparkler	3840x2160	4:2:0	10bit	60fps	600	U Bristol
88	Spincalendar	1280x720	4:2:0	8bit	60fps	550	BBC
89	Square	3840x2160	4:2:0	10bit	60fps	600	Huawei
90	Squirrel	1920x1080	4:2:0	8bit	120fps	1200	U Bristol
91	Stockholm	1280x720	4:2:0	8bit	50fps	504	SVT
92	Sunflower	1920x1080	4:2:0	8bit	25fps	500	Taurus Media
93	TallBuildings	3840x2160	4:4:4	10bit	30fps	600	SJTU
94	Tempete	352x288	4:2:0	8bit	30fps	260	?
95	Tennis	1920x1080	4:2:0	8bit	24fps	240	Nakajima Lab
96	TractorPart	1920x1080	4:2:0	8bit	25fps	100	Taurus Media
97	TrafficAndBuilding	3840x2160	4:4:4	10bit	30fps	300	SJTU
98	TreeShade	3840x2160	4:2:0	8bit	30fps	300	SJTU
99	TreeWills	3840x2160	4:2:0	10bit	60fps	600	U Bristol
100	Vidyo1	1280x720	4:2:0	8bit	60fps	600	Vidyo Inc
101	Vidyo3	1280x720	4:2:0	8bit	60fps	600	Vidyo Inc
102	Vidyo4	1280x720	4:2:0	8bit	60fps	600	Vidyo Inc
103	VintageCar	1920x1080	4:2:0	8bit	25fps	300	BBC
104	Wood	3840x2160	4:2:0	8bit	30fps	300	SJTU

## 1.2 Validationset Resources

No.	Sequance Name	Resolution	Format	Depth	Rate	Frames	Source
1	BigShips	1280x720	4:2:0	8bit	60fps	600	ABC
2	CalmingWater	3849x2160	4:2:0	10bit	60fps	600	U Bristol
3	MountainBay	3849x2160	4:2:0	10bit	30fps	300	?
4	Netflix_DrivingPOV	4096x2160	4:2:0	10bit	60fps	1199	Netflix
5	Night	1280x720	4:2:0	8bit	60fps	460	ABC
6	Panslow	1280x720	4:2:0	8bit	60fps	550	BBC
7	Paris	352x288	4:2:0	8bit	15fps	150	Picturetel
8	PeopleOnStreet	2560x1600	4:2:0	8bit	30fps	150	?
9	Runners	1920x1080	4:2:0	10bit	30fps	300	SJTU
10	Station2	1920x1080	4:2:0	8bit	25fps	313	Taurus Media
11	ToysAndCalendar	1920x1080	4:2:0	8bit	?	250	?

## 2 Architecture and Training Parameters

Parameter	Default Values
Batch Size	384
Initial Learning Rate	0.00013
Adam parameter beta 1	0.87500
Adam parameter beta 2	0.99950
Regularisation weight	0.00100
Fully Connected Layer Size	512
Convolutional Layer Size	64