

Table 1: FPGA Optimization Table

General						Design						Performance				
Impl.	Model Family	Pattern	Ref.	Model	FPGA	Mem [MB]	Mem.	Compl. [GOPS]	Prec.	DSP [%]	BRAM [%]	Freq. [MHz]	Comp. [GOP/s]	Latency	FPS	Power [W]
RTL	CNN	S	[?]	XC7Z045	HO-ShipNet	-	Off	-	i16	44	44	-	-	1.01 ms	-	1.90
			[?]	XCZU7EV	CloudScout	13.30	Off	-	i7	67	46	115.4	-	141.7 ms	-	3.40
			[?]	XC7A35T	CNN	-	On	-	Orig	-	-	36	1.14	-	-	0.116
			[?]	XC7Z020	Ghost-YOLOS	12.60	Off	8.41G	i16	58	60	150	29.53	320 ms	-	2.98
			[?]	XC7VX690T	Q-IORN	121.51	Off	-	i8	21	27	200	209.60	147.62 ms	6.77	6.32
			[?]	XC7VX690T	A2NN	-	On	14.99G	i8,i32	9	86	200	3047	4.92 ms	203.25	8.27
		F	[?]	XCZU15EG	2D CNN 3D CNN HybridSN	1.20 0.12 20.50	Off Off Off	0.684M 4.231M 101.642M	i8 i8 i8	5 9 37	71 76 80	100 100 100	7.07 3.81 13.18	0.097 ms* 1.11 ms* 7.71 ms*	- - -	8.40 8.40 8.40
			[?]	XC7Z100	CBFF-SSD	-	Off	-	i16	57	60	200	452.80	42.59 ms	-	19.52
			[?]	XCZU3EG	AP2D-Net	-	Off	-	i(mix)	80	75	300	130.20	32.8 ms	30.53	5.59
			[?]	XC7VX690T	Improved YOLOv2 ResNet-34 VGG16	49.40 21.29 14.70	Off Off Off	379.55G 7.33G 30.69G	i8,i32 i8,i32 i8,i32	23 23 23	54 54 54	200 200 200	387 182 344	981.4 ms 40.2 ms 89.1 ms	- - -	14.97 14.97 14.97
			[?]	XC7K325T	LeNet-5 f32 LeNet-5 i8	6.64 1.66	Off Off	- -	f32 i8	34 14	33 16	100 100	-	2.29 ms 2.29 ms	- -	- -
			[?]	XC7A200T	Improved VGG16 Improved YOLOv2	14.80 49.40	Off Off	40.96G 379.55G	i8 i8	12 12	29 29	200 200	23.06 22.17	1780 ms 17120 ms	- -	3.41 3.41
	Trad. ML	S	[?]	XC7Z035	Improved YOLOv2	-	Off	379G	i8,i32	21	74	200	111.50	3400 ms	-	5.96
			[?]	XC7Z020	Decision Tree	-	On	-	i8	10	86	-	-	300 ms*	-	3.50
			[?]	XC7Z020	SVM	-	On	-	Orig	38	-	200	-	0.11 ms*	-	-
			[?]	XC3SD1800A	MLP	-	On	-	i8,i32	26	-	-	-	-	-	-
			[?]	XC6VLX240T	Roller Dung Beetle Clustering	-	On	-	-	-	-	230.52	-	28.9 ms	-	0.12
		F	[?]	XC7VX690T	LPDBL	-	On	-	Orig	14	15	200	-	-	-	-
			[?]	XC6VLX240T	BRAM_DSP LUT_MUL	- -	On On	- -	i8 i8	91 0	52 0	192 189	-	21.28 us 21.28 us	-	4.8W 4.5W
	GNN	S	[?]	XC7VX690T	SAM-GNN	-	Off	-	Orig	13	14	200	-	-	-	-
			[?]	XC7Z020	TriCloudNet + U-Net	3.61	Off	-	-	49	60	-	-	1028 ms	0.97	0.196
			[?]	XC7Z020	CNN	-	On	-	bin	11	100	-	69.80	-	7	2.38
			[?]	XC7VX690T	CNN2@0.7 CNN4@0.7 CNN6@1.6	0.09 0.11 0.09	On On On	0.45G 0.56G 0.6G	i7 i7 i7	64 69 76	21 21 18	250 250 250	298 306 235	0.7 ms 0.7 ms 1.6 ms	652 636 384	5.80 6.60 5.10
			[?]	XCZU9EG	Improved YOLOv3	8.50	Off	-	i8	-	-	-	-	7 ms	-	-
HLS	Trad. ML	S	[?]	XCKU040	AlexNetLite MobileNetv1Lite	- -	- -	5.71G 0.05G	i16 i16	31 31	39 39	200 200	- -	- -	- -	- -
			[?]	XCZU7EV	Deep Belief Network	-	On	-	f32	10	0	250	-	5.4 ms	-	-
		F	[?]	U280	GNN	-	Off	-	Orig	43	37	260	400	27 ms	759	38.00
			[?]	XCZU7EV	GNN	0.96	On	2.13M	f32	74	91	125	-	0.105 ms	9500	6.30
			[?]	XC7Z020	CNN	-	On	-	bin	-	-	-	-	330 ms	-	-
	FINN	S	[?]	XC7Z045	BNN	-	On	-	bin	-	-	-	-	21.14 ms	-	-
			[?]	XC7Z020	CloudSatNet-1 Q2 CloudSatNet-1 Q4	1.43 3.06	On On	- -	bin i4	14 14	- -	100 100	- -	- -	15.46 15.47	2.52 2.59
			[?]	XCZU19EG	ETAUS	-	On	329.9G	i8	-	-	106.25	329.90	107.8 ms	9.3	1.65
			[?]	XCZU7EV	RFA-YOLO	24.75	On	-	i8	-	-	200	-	-	27.97	15.82
			[?]	XCZU7EV	YOLOv4 YOLOv4-tiny 3L	245 24.10	On On	105.9G 15.32G	i8 i8	- -	- -	100 100	- -	107.94 ms 19.18 ms	17.9 125	30.1 26.40
Vitis AI	CNN	F	[?]	XCZU3EG	ENet ESPNet FPN U-Net	0.36 0.33 5.84 7.40	On On On On	4.06G 3.71G 17.30G 96.68G	i8 i8 i8 i8	70 70 70 70	75 75 75 75	300 300 300 300	- - - -	- - - -	25.2 11.7 14.1 2.7	3.36 3.08 4.03 3.38
			[?]	XCZU9EG	ResNet-50 SICNet	- -	On On	- -	i8 i8	- -	- -	- -	- -	10.7 ms 1.8 ms	93.02 530.66	- -
			[?]	XCZU7EV	Improved YOLOv4-tiny	-	On	-	i8	-	-	300	-	-	295.9	20.00
			[?]	XCK26	YOLOv4-MobileNetv3	5.69	On	-	i8	59	-	200	-	-	48.14	7.20
			[?]	XCZU9EG	ResNet-18+YOLOv2	-	Off	-	i8	-	-	250	-	-	46	-
	MATLAB	S	[?]	XC7A35T	CAG-SC2S CAL-SC2S SVM	- - -	- - -	- - -	i32 i32 i32	93 96 49	21 25 6	70.40 65.20 72.40	- - -	5.27 us* 5.70 us* 5.12 us*	- - -	0.31 0.36 0.22
		F	[?]	5CSXC6	C-FCN++	0.047	On	4.7K	i16	-	-	100	-	150 ms	7	-
			[?]	XC7K325T	LeNet-5	-	Off	-	f32	-	33	100	-	2.29 ms	-	-
	VGT	S	[?]	XCZU3EG	SSD 0.25x SSD 0.5x SSD 1.0x	- - -	Off Off Off	4.04G 15.65G 61.60G	i8 i8 i8	73 73 -	47 55 -	200 200 200	138 150 158	- - -	34.18 9.6 2.56	2.40 2.60 2.00
			[?]	XC7Z020	Lightweight CNN	-	Off	4.6G	i8	70	25	100	-	-	60.0	3.30
		Trad. ML	[?]	XC7Z020	MLP	-	On	-	Orig	26	1	-	-	-	-	0.13
			[?]	XC7Z020	Weightless Neural Systems	-	On	-	Orig	-	-	-	-	-	-	-