

Table 1: Comparison of different tools on  $BHive_U$  and  $BHive_L$ 

$\mu$ Arch	Predictor	$BHive_U$		$BHive_L$	
		MAPE	Kendall	MAPE	Kendall
RKL	uiCA	0.49%	0.9835	0.92%	0.9755
	CQA 2.16.0			5.69%	0.9123
	Baseline	15.50%	0.7397	9.26%	0.7808
	Analytical	0.42%	0.9860	1.04%	0.9731
TGL	uiCA	0.97%	0.9769	0.98%	0.9731
	llvm-mca-10	25.74%	0.7049	13.80%	0.8486
	CQA 2.16.0			5.44%	0.9139
	Baseline	17.49%	0.7245	11.25%	0.7413
	Analytical	1.15%	0.9717	1.62%	0.9617
ICL	uiCA	1.00%	0.9771	0.77%	0.9759
	OSACA	53.80%	0.3143	21.98%	0.4698
	llvm-mca-10	25.38%	0.7030	13.64%	0.8512
	CQA 2.16.0			5.03%	0.9256
	Baseline	17.54%	0.7230	10.84%	0.7510
	Analytical	1.17%	0.9713	1.36%	0.9681
CLX	uiCA	0.45%	0.9713	0.65%	0.9825
	llvm-mca-10	23.17%	0.7211	13.21%	0.8060
	OSACA	20.83%	0.7511	11.61%	0.8068
	Baseline	15.49%	0.7461	10.31%	0.8021
	Analytical	0.62%	0.9692	1.24%	0.9720
SKL	uiCA	0.45%	0.9798	0.38%	0.9895
	Ithemal	8.28%	0.8172	13.66%	0.7582
	IACA 3.0	13.49%	0.7802	14.26%	0.8290
	IACA 2.3	11.85%	0.8071	8.42%	0.8477
	OSACA	14.95%	0.7639	11.25%	0.8045
	llvm-mca-10	15.61%	0.7258	12.01%	0.8015
	llvm-mca-8	15.39%	0.7434	11.98%	0.8021
	DiffTune	24.48%	0.6626	104.88%	0.6426
	CQA 2.16.0			6.58%	0.8972
	<i>Measured (orig.)</i>	4.40%	0.9113		
	Baseline	17.28%	0.7228	10.03%	0.7999
	Analytical	0.69%	0.9753	1.08%	0.9753
BDW	uiCA	1.08%	0.9805	0.60%	0.9841
	IACA 3.0	14.69%	0.8012	11.47%	0.8725
	IACA 2.3	13.22%	0.8206	5.84%	0.8928
	OSACA	17.52%	0.7456	9.69%	0.8365
	llvm-mca-10	14.23%	0.7793	16.71%	0.8286
	CQA 2.16.0			5.00%	0.9222
	Baseline	16.97%	0.7572	7.44%	0.8332
	Analytical	0.73%	0.9852	1.44%	0.9704
HSW	uiCA	0.76%	0.9850	0.59%	0.9842
	Ithemal	7.38%	0.8400	16.19%	0.7700
	IACA 3.0	15.04%	0.8080	12.00%	0.8733
	IACA 2.3	13.13%	0.8291	5.79%	0.8925
	OSACA	17.84%	0.7463	9.77%	0.8307
	llvm-mca-10	20.29%	0.7835	18.97%	0.8259
	llvm-mca-8	21.08%	0.7784	19.46%	0.8171
	DiffTune	24.80%	0.6997	138.47%	0.6925
	CQA 2.16.0			5.05%	0.9229
	<i>Measured (orig.)</i>	2.49%	0.9379		
	Baseline	17.30%	0.7604	7.57%	0.8314
	Analytical	1.26%	0.9791	1.50%	0.9690
IVB	uiCA	1.50%	0.9609	1.11%	0.9495
	Ithemal	7.08%	0.8212	12.43%	0.7785
	IACA 2.3	13.94%	0.7739	11.54%	0.8271
	OSACA	36.23%	0.4884	24.88%	0.5846
	llvm-mca-10	22.79%	0.7656	20.76%	0.8154
	llvm-mca-8	22.93%	0.7622	20.76%	0.8138
	DiffTune	26.21%	0.6470	82.94%	0.7516
	CQA 2.16.0			4.05%	0.9174
	<i>Measured (orig.)</i>	2.53%	0.9139		
	Baseline	18.81%	0.7243	14.47%	0.7670
	Analytical	1.80%	0.9568	1.52%	0.9624
SNB	uiCA	1.91%	0.9613	0.98%	0.9650
	IACA 2.3	11.91%	0.8194	9.95%	0.8482
	OSACA	36.86%	0.5311	24.75%	0.5659
	llvm-mca-10	22.67%	0.8069	18.34%	0.8455
	CQA 2.16.0			4.07%	0.9238
	Baseline	20.28%	0.7517	15.56%	0.7577
	Analytical	1.95%	0.9586	1.33%	0.9742

**Table 2: Influence of the simulation of different microarchitectural components on the prediction accuracy**

$\mu$ Arch	Predictor	<i>BHive<sub>U</sub></i>		<i>BHive<sub>L</sub></i>	
		MAPE	Kendall	MAPE	Kendall
CLX (all benchmarks)	uiCA	0.45%	0.9713	0.65%	0.9825
	uiCA with simple front end	8.57%	0.8602	6.23%	0.9048
	uiCA with simple port assignment	2.37%	0.9280	12.20%	0.8613
	uiCA without micro fusion	8.77%	0.8683	3.31%	0.9545
	uiCA without macro fusion	0.48%	0.9699	8.84%	0.8863
	uiCA without LSD unrolling	0.45%	0.9713	6.72%	0.9246
	Baseline	15.49%	0.7461	10.31%	0.8021
	Analytical	0.62%	0.9692	1.24%	0.9720
CLX (benchmarks with moves)	uiCA	0.44%	0.9801	0.45%	0.9836
	uiCA without move elimination	1.79%	0.9654	1.74%	0.9615
	uiCA with full move elimination	0.52%	0.9793	0.48%	0.9846
	Baseline	12.99%	0.8352	9.77%	0.8636
	Analytical	0.71%	0.9779	0.59%	0.9870

Table 3: Influence of different components of the analytical formula on the prediction accuracy

$\mu$ Arch	Predictor	<i>BHive<sub>U</sub></i>		<i>BHive<sub>L</sub></i>	
		MAPE	Kendall	MAPE	Kendall
RKL	Analytical	0.42%	0.9860	1.04%	0.9731
	simple predec	4.38%	0.9024		
	simple dec	0.69%	0.9836		
	only predec	14.84%	0.7291		
	only dec	26.37%	0.6840		
	only dsb			100.00%	0.0078
	only lsd			24.26%	0.6505
	only issue	41.45%	0.6774	29.85%	0.6520
	only portUsage	29.18%	0.5122	26.40%	0.7132
	only lat	88.56%	0.3589	22.55%	0.4428
	only predec+portUsage	9.36%	0.8399		
	only lat+portUsage	22.40%	0.6149	6.59%	0.8467
	everything but predec	9.02%	0.8512		
	everything but dec	1.19%	0.9734		
	everything but dsb			1.04%	0.9731
	everything but lsd			2.52%	0.9556
	everything but issue	0.43%	0.9857	1.06%	0.9724
	everything but portUsage	7.88%	0.8570	7.90%	0.8002
	everything but lat	5.36%	0.8853	14.88%	0.7967
SKL	Analytical	0.69%	0.9753	1.08%	0.9753
	simple predec	5.26%	0.8910	2.71%	0.9514
	simple dec	0.92%	0.9733	1.10%	0.9751
	only predec	20.66%	0.6642	90.60%	0.3659
	only dec	32.59%	0.6599	92.75%	0.3629
	only dsb			26.33%	0.2144
	only issue	33.02%	0.6571	23.12%	0.7013
	only portUsage	26.95%	0.5575	17.79%	0.6583
	only lat	84.90%	0.3472	29.53%	0.3738
	only predec+portUsage	13.78%	0.7894	23.85%	0.5306
	only lat+portUsage	18.93%	0.6786	13.42%	0.7551
	everything but predec	8.65%	0.8642	2.91%	0.9406
	everything but dec	0.96%	0.9726	1.10%	0.9750
	everything but dsb			2.70%	0.9629
	everything but issue	0.76%	0.9736	4.34%	0.9110
	everything but portUsage	12.24%	0.8028	6.01%	0.8471
	everything but lat	6.77%	0.8427	4.62%	0.8823
SNB	Analytical	1.95%	0.9586	1.33%	0.9742
	simple predec	3.59%	0.9293		
	simple dec	3.76%	0.9378		
	only predec	24.55%	0.6879		
	only dec	26.60%	0.7119		
	only dsb			99.98%	0.0488
	only lsd			11.51%	0.7573
	only issue	33.59%	0.7308	29.42%	0.7058
	only portUsage	15.58%	0.7557	12.28%	0.7946
	only lat	85.62%	0.3474	34.78%	0.3770
	only predec+portUsage	18.59%	0.7806		
	only lat+portUsage	10.48%	0.8384	8.57%	0.8854
	everything but predec	5.50%	0.9058		
	everything but dec	4.06%	0.9327		
	everything but dsb			1.33%	0.9742
	everything but lsd			6.45%	0.9119
	everything but issue	1.96%	0.9583	1.35%	0.9737
	everything but portUsage	13.48%	0.8153	7.73%	0.8482
	everything but lat	6.24%	0.8715	4.73%	0.8858

## A HEATMAPS FOR ICE LAKE

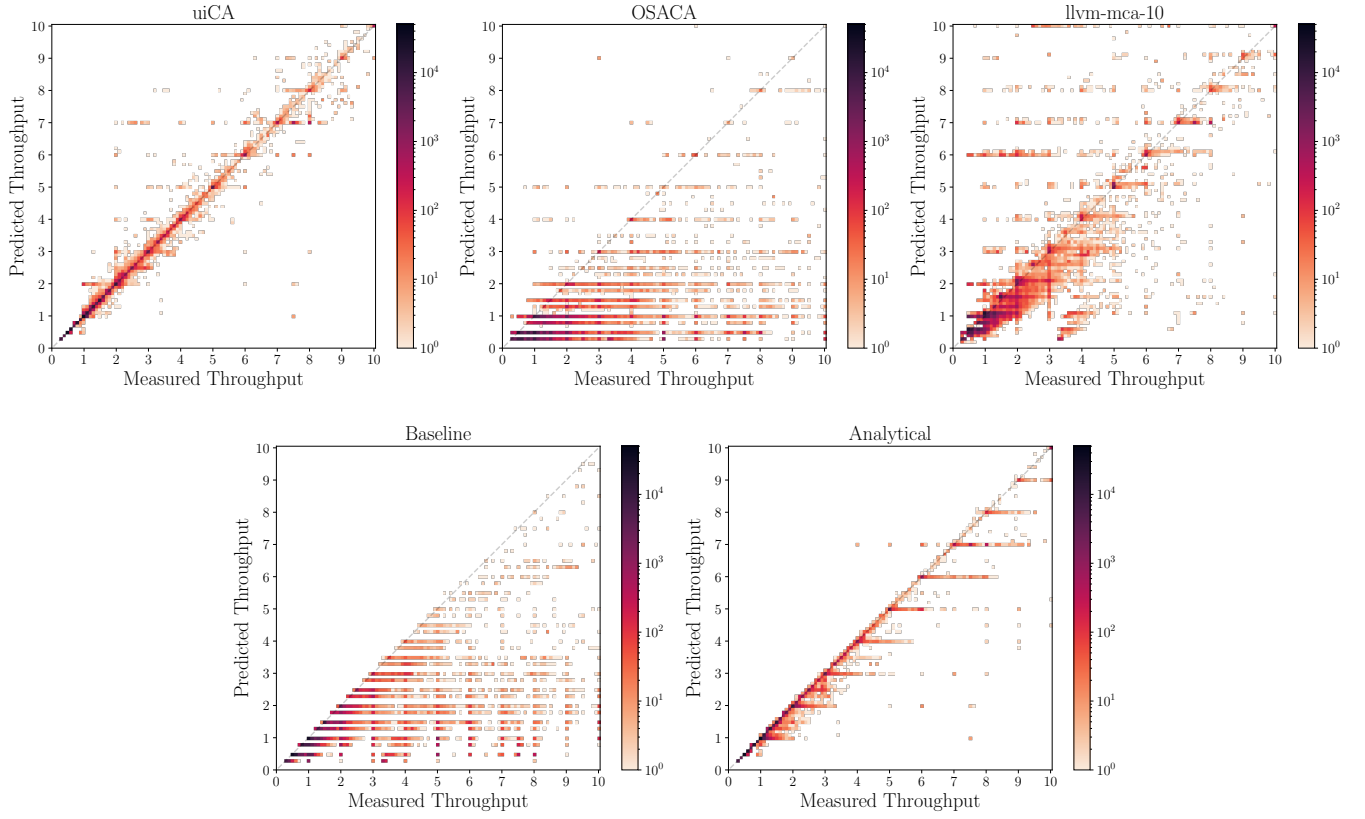
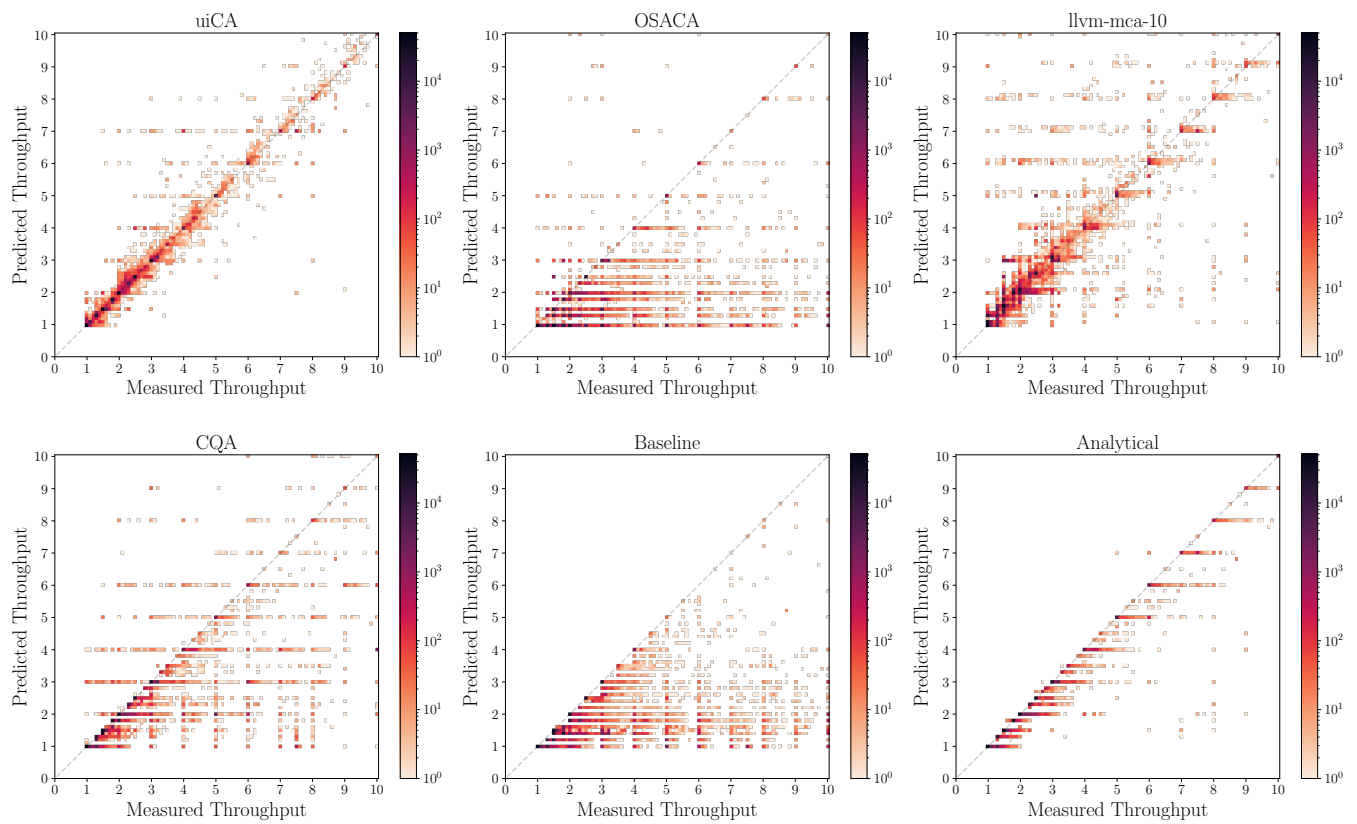


Figure 1: Heatmaps for  $BHive_U$  for basic blocks with a measured throughput of less than 10 cycles/iteration on Ice Lake



**Figure 2: Heatmaps for  $BHive_L$  for basic blocks with a measured throughput of less than 10 cycles/iteration on Ice Lake**

## B HEATMAPS FOR SKYLAKE

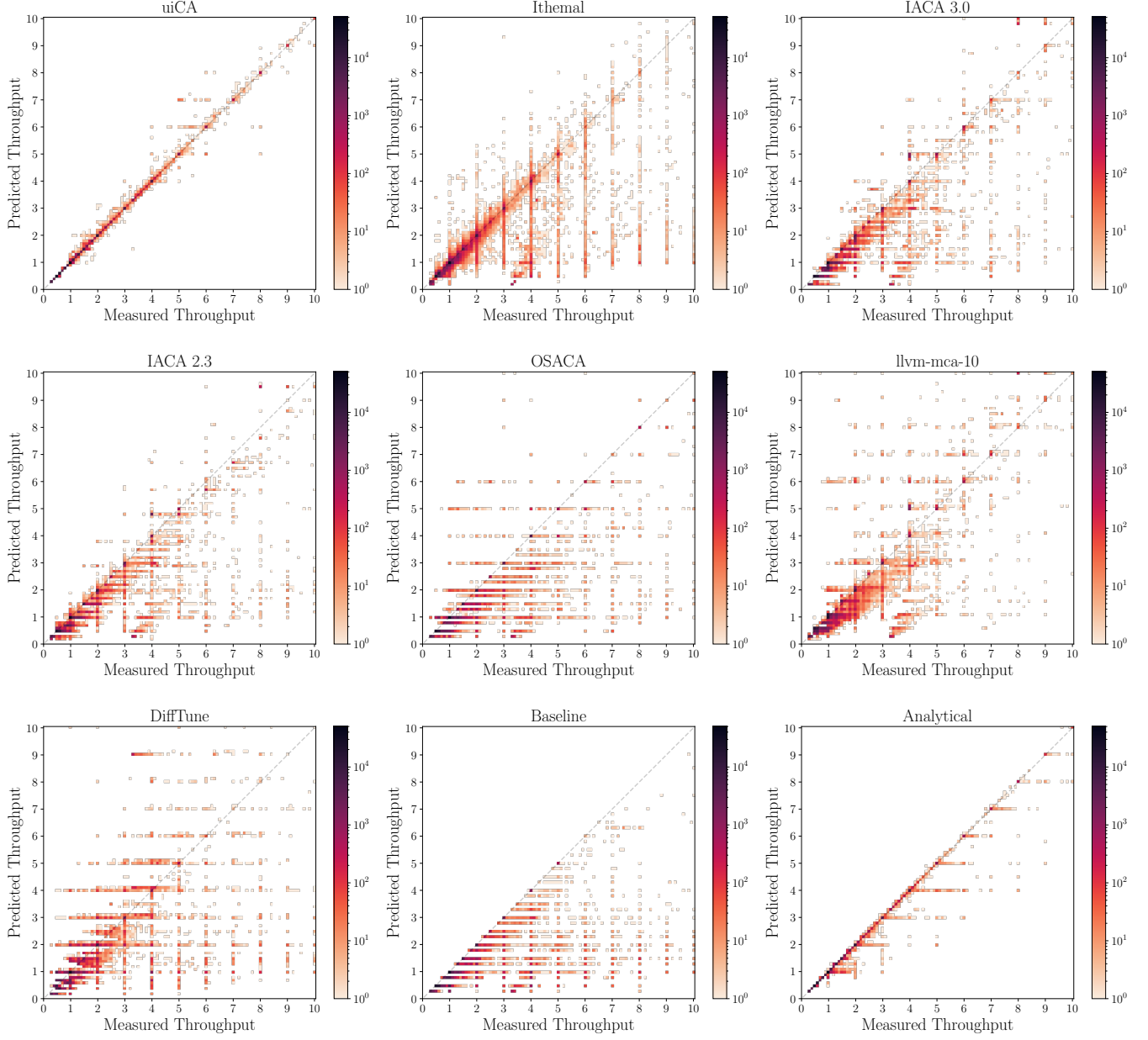


Figure 3: Heatmaps for  $BHive_U$  for basic blocks with a measured throughput of less than 10 cycles/iteration on Skylake

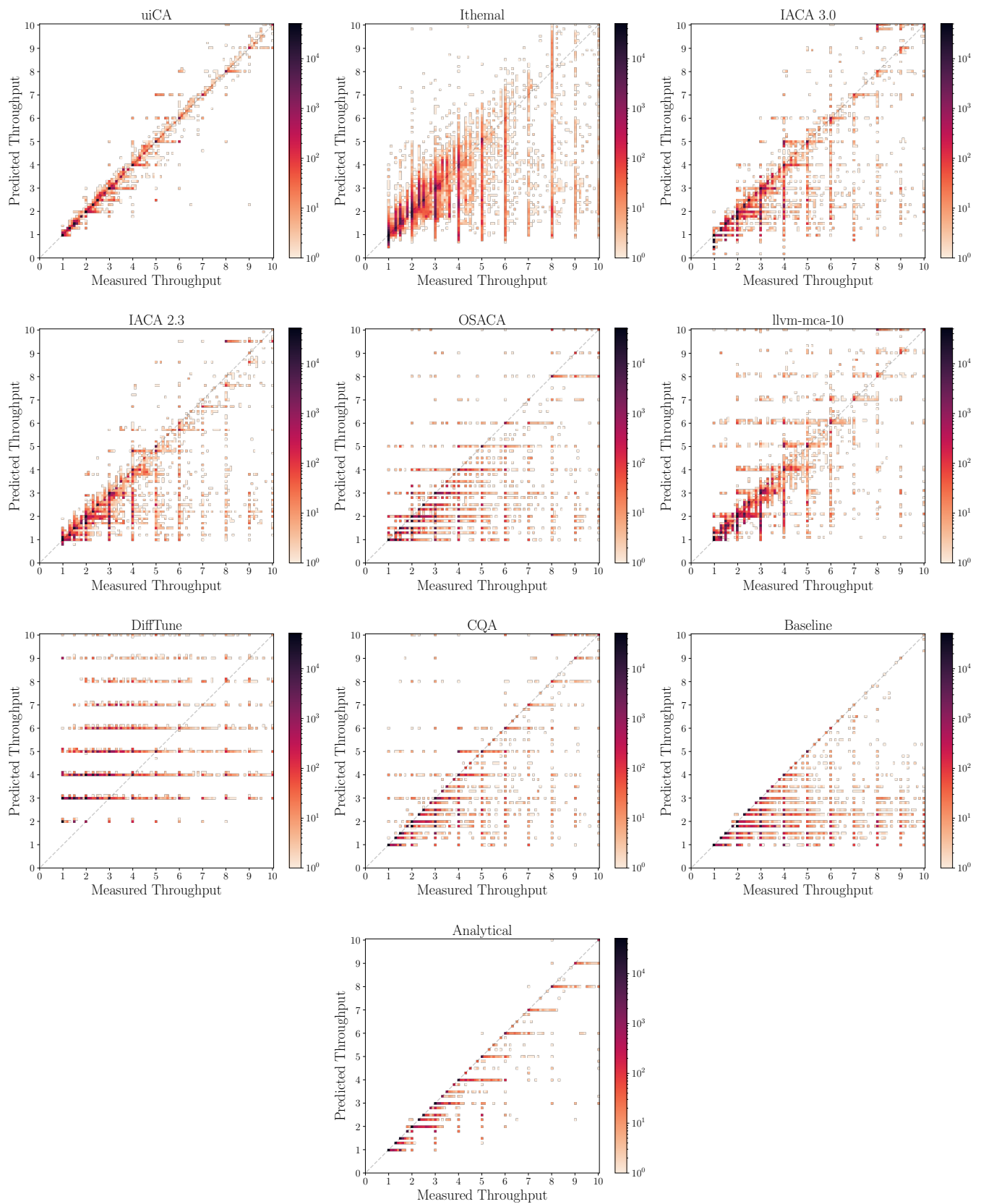


Figure 4: Heatmaps for  $BHive_L$  for basic blocks with a measured throughput of less than 10 cycles/iteration on Skylake

## C HEATMAPS FOR HASWELL

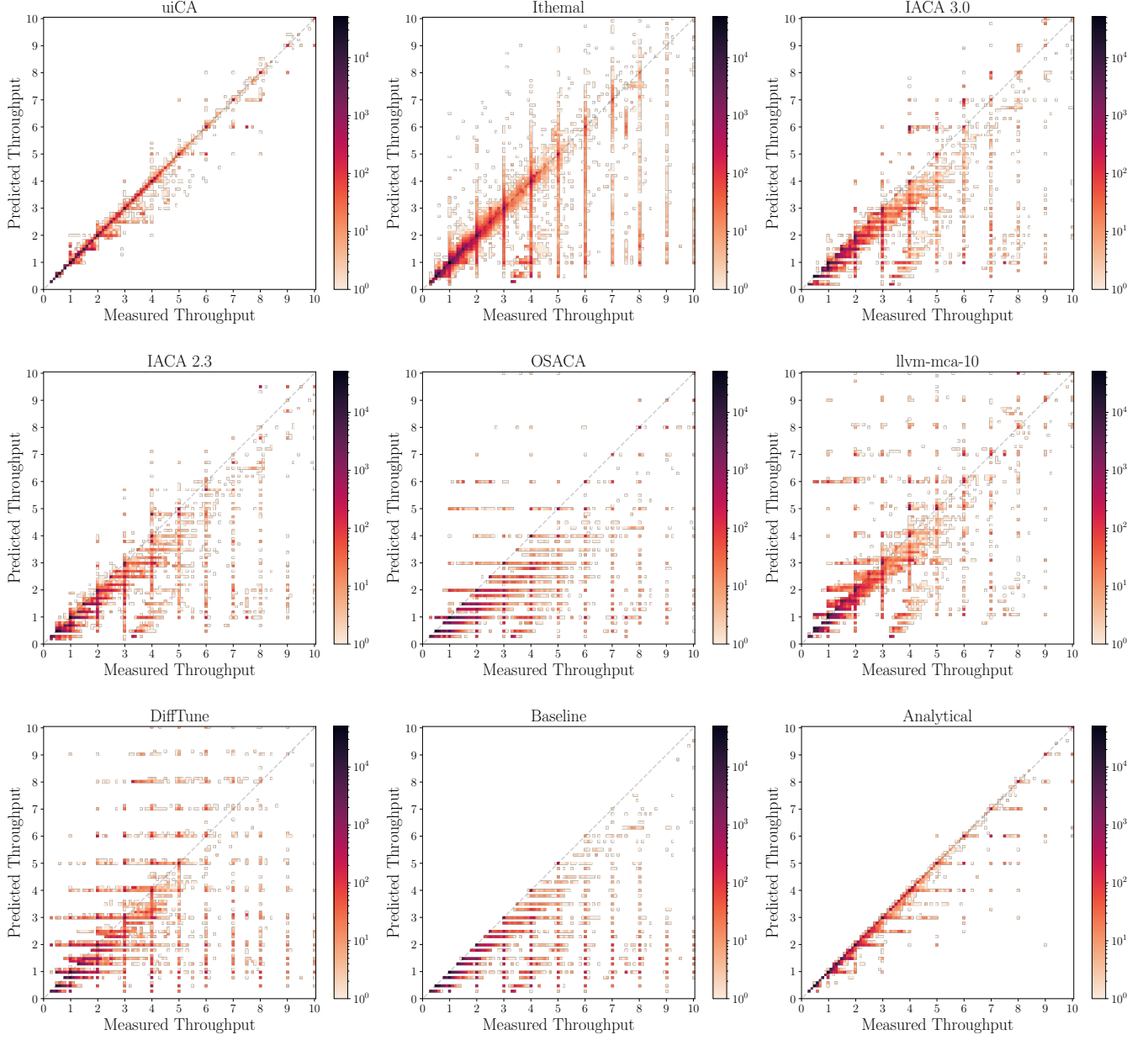


Figure 5: Heatmaps for *BHive<sub>U</sub>* for basic blocks with a measured throughput of less than 10 cycles/iteration on Haswell



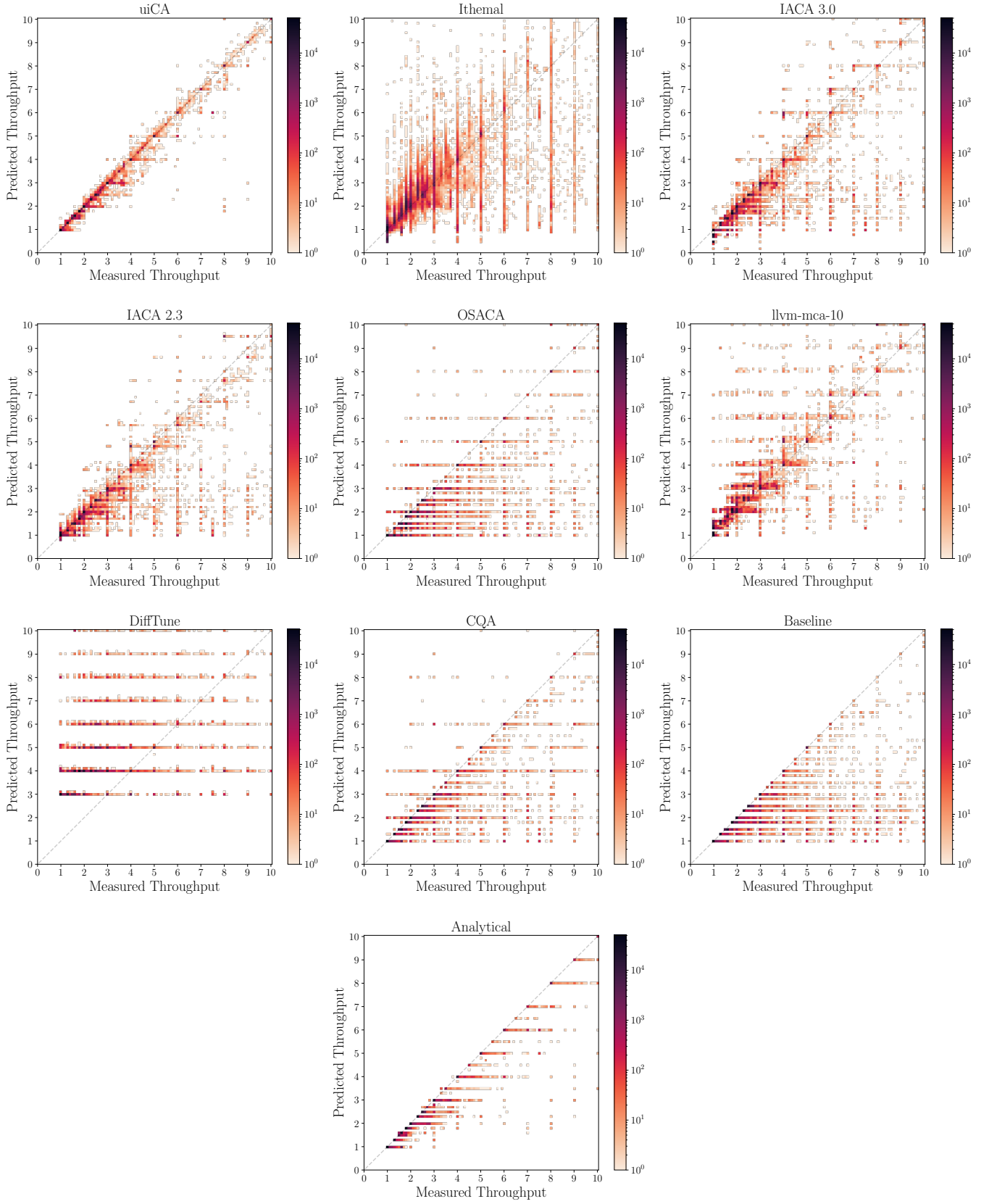


Figure 6: Heatmaps for  $BHive_L$  for basic blocks with a measured throughput of less than 10 cycles/iteration on Haswell

## D HEATMAPS FOR IVY BRIDGE

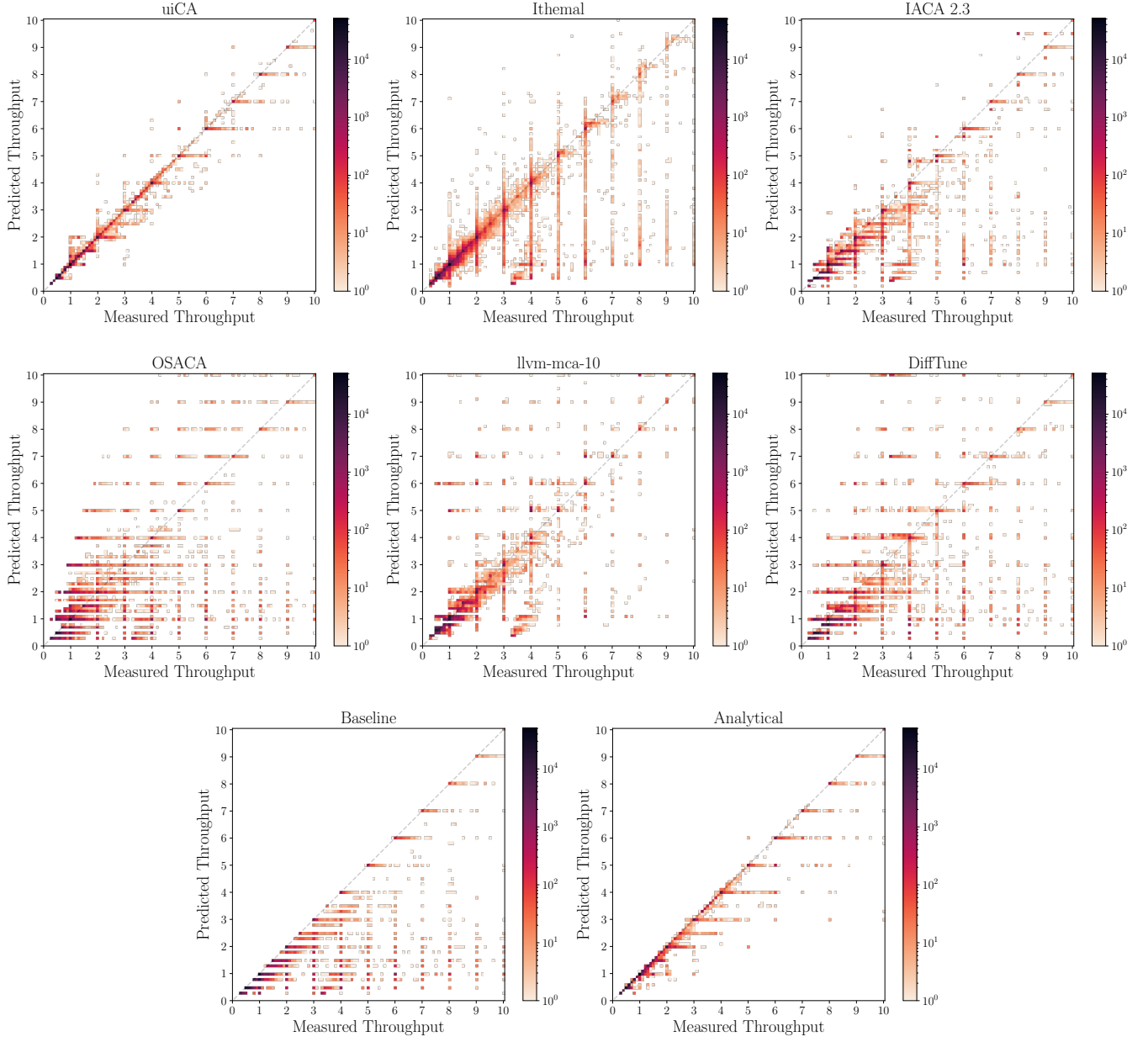
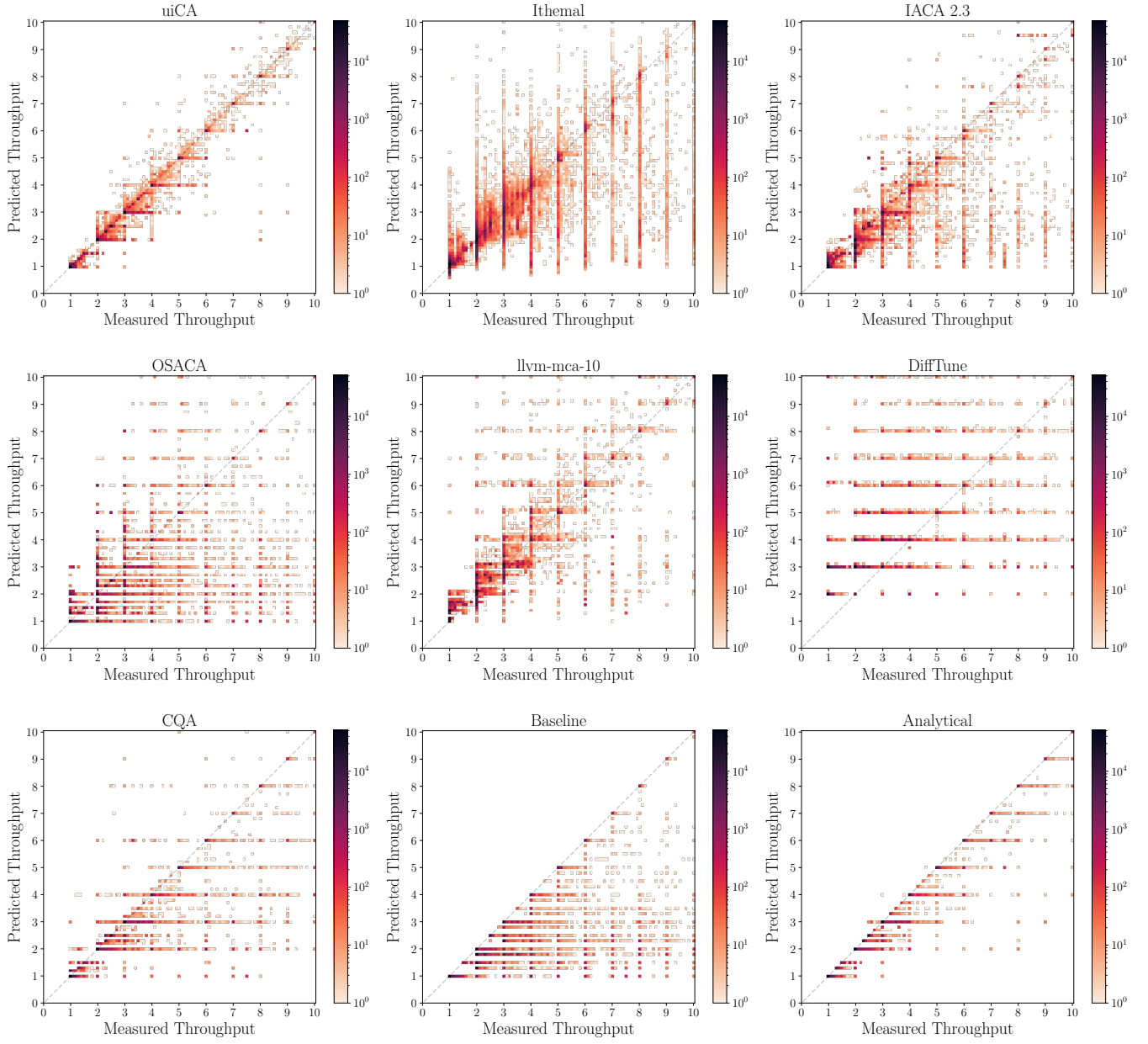


Figure 7: Heatmaps for  $BHive_U$  for basic blocks with a measured throughput of less than 10 cycles/iteration on Ivy Bridge



**Figure 8: Heatmaps for  $BHive_L$  for basic blocks with a measured throughput of less than 10 cycles/iteration on Ivy Bridge**