

Convolutional Models for The Street View House Numbers (SVHN) Dataset

Final Project

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The Street View House Numbers (SVHN) Dataset

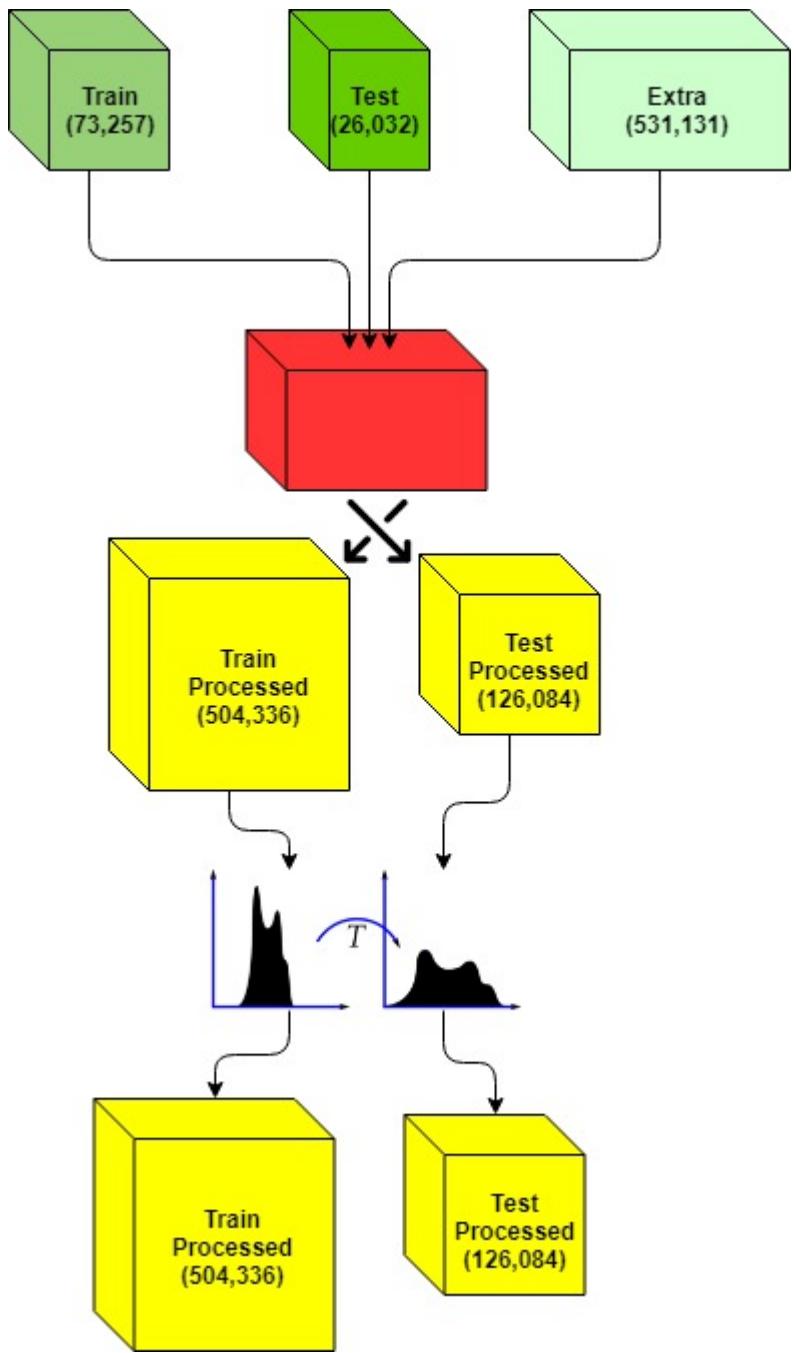
Caffe



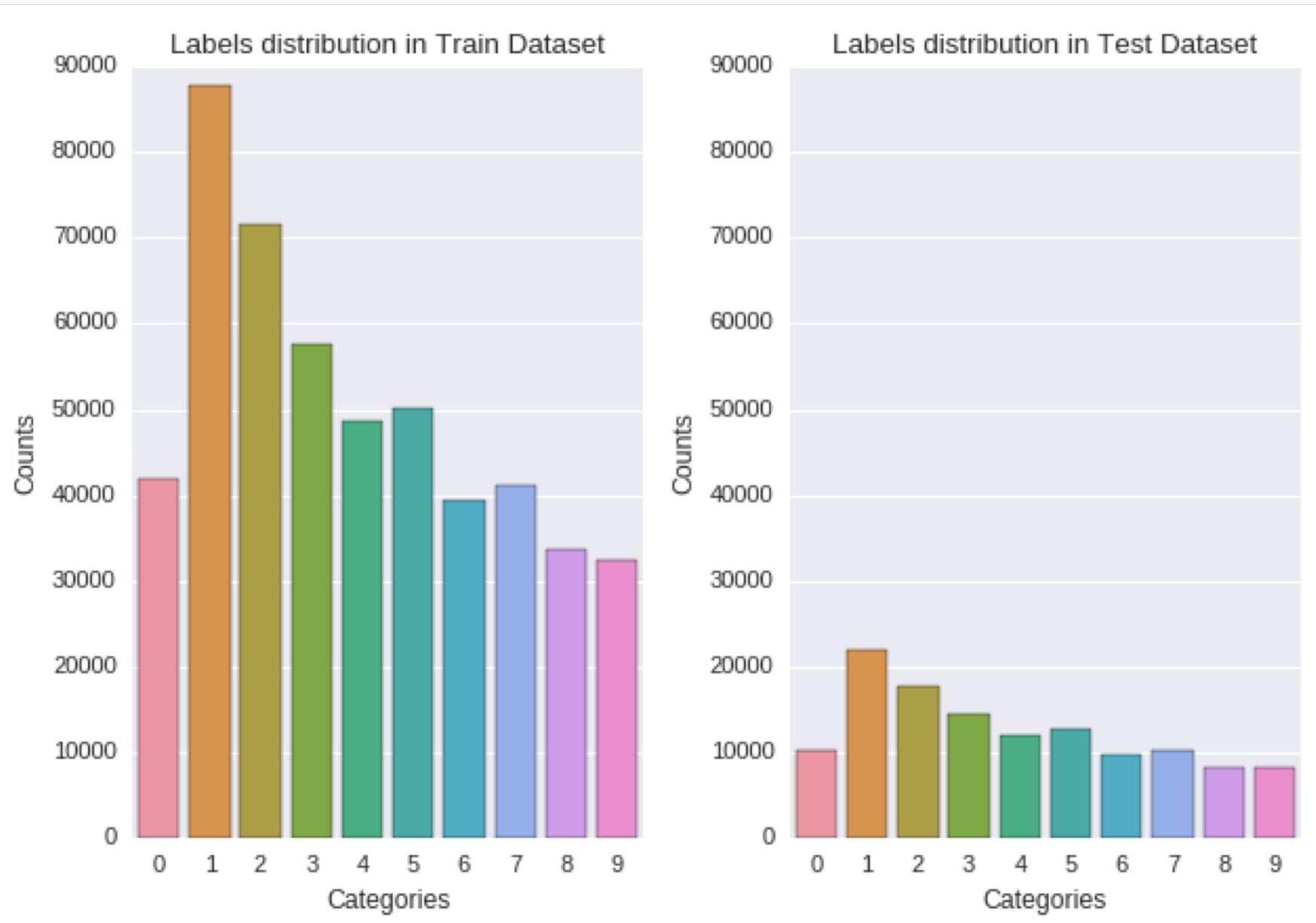
TensorFlow

PYTORCH

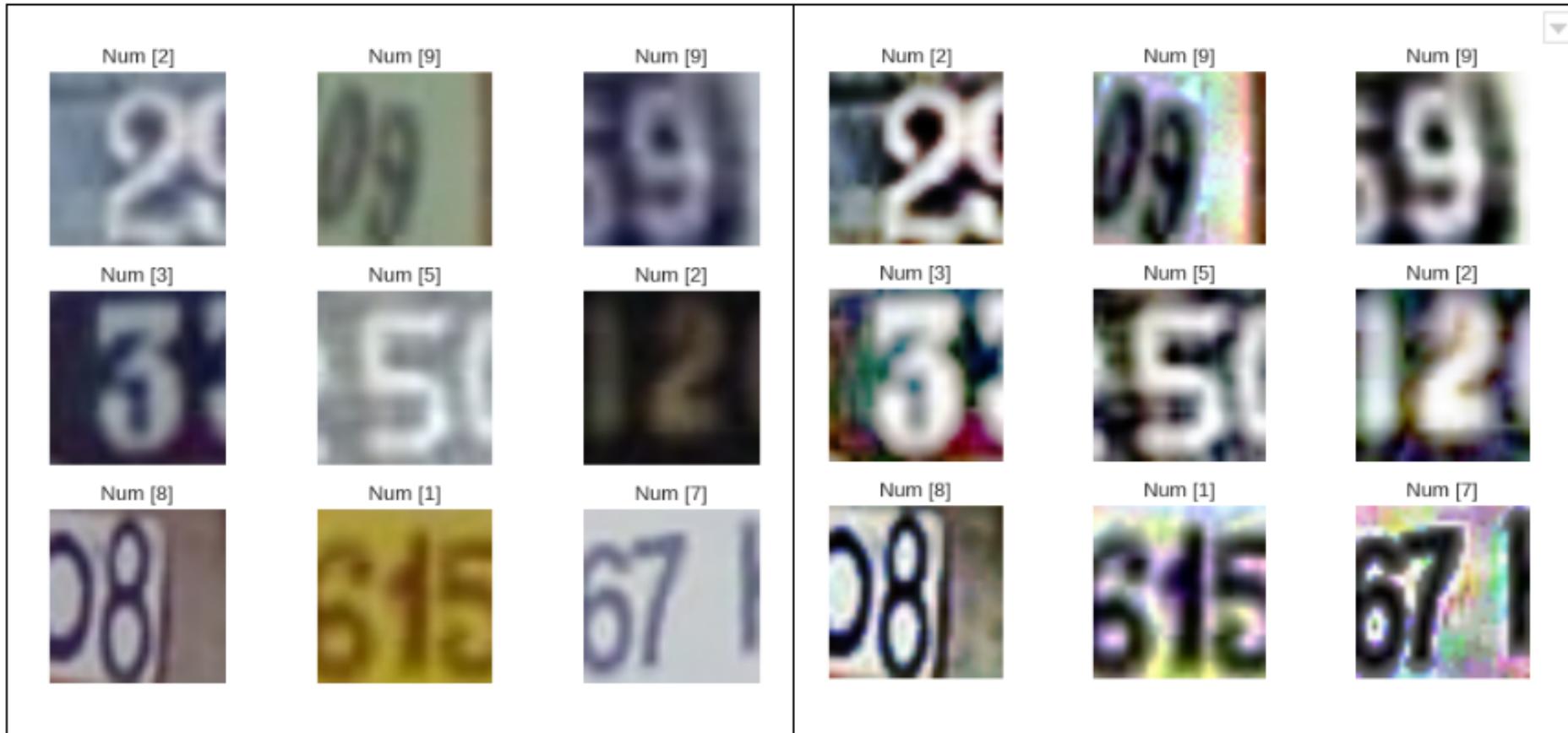
K Keras



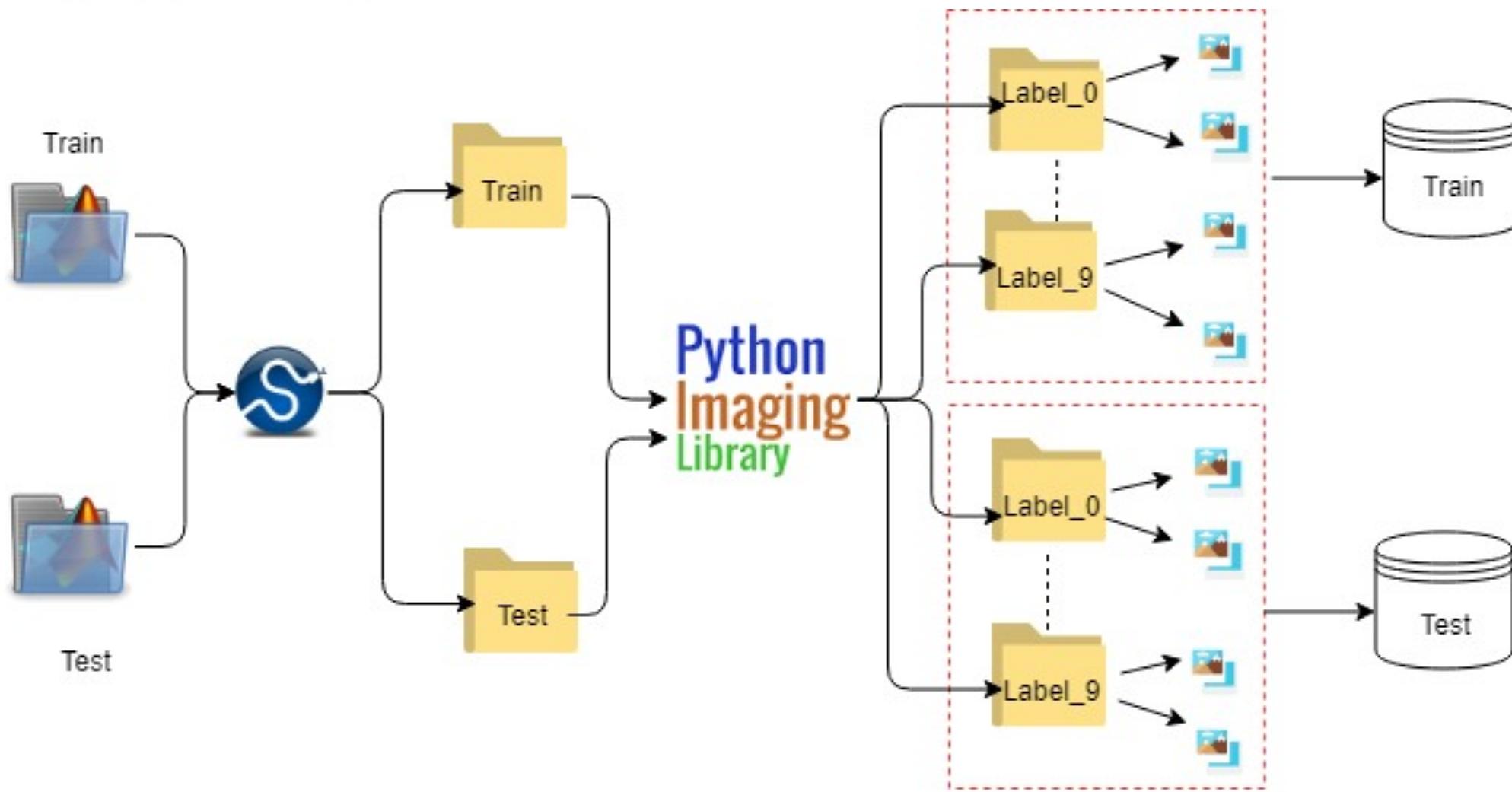
Category Distribution across Train Test Split

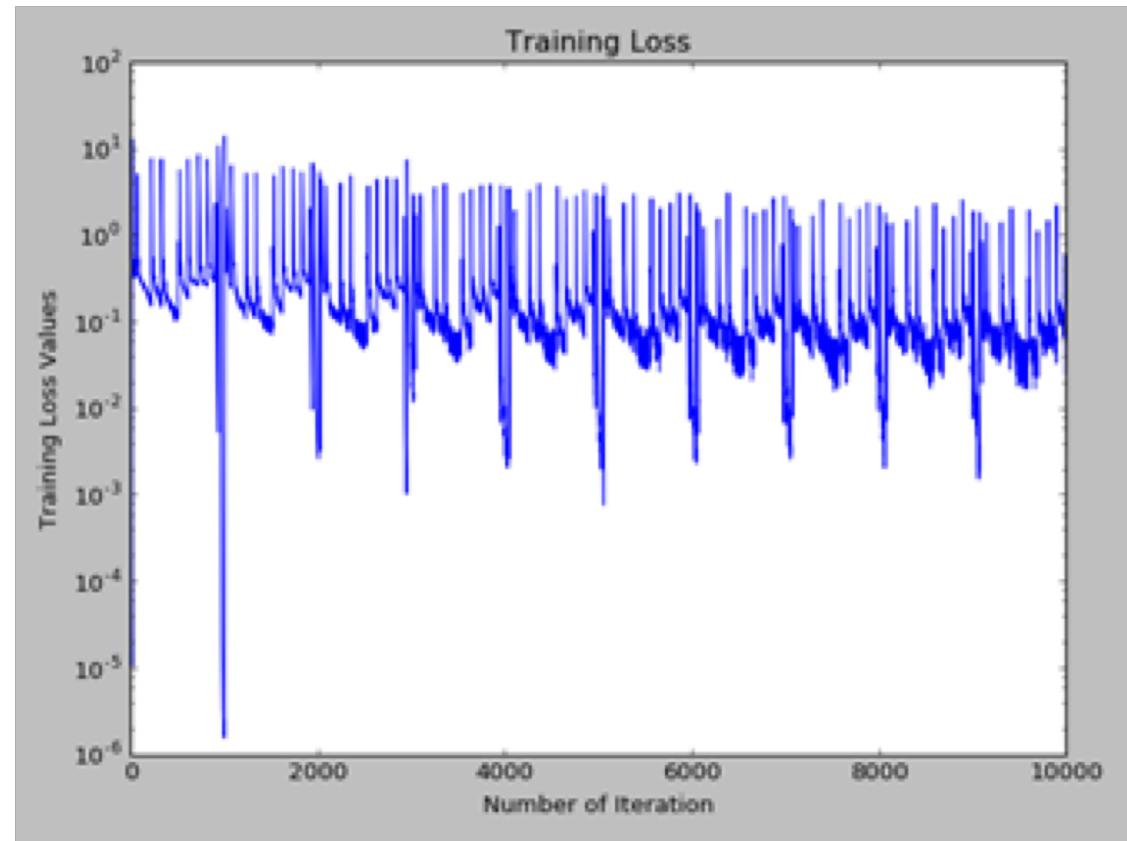
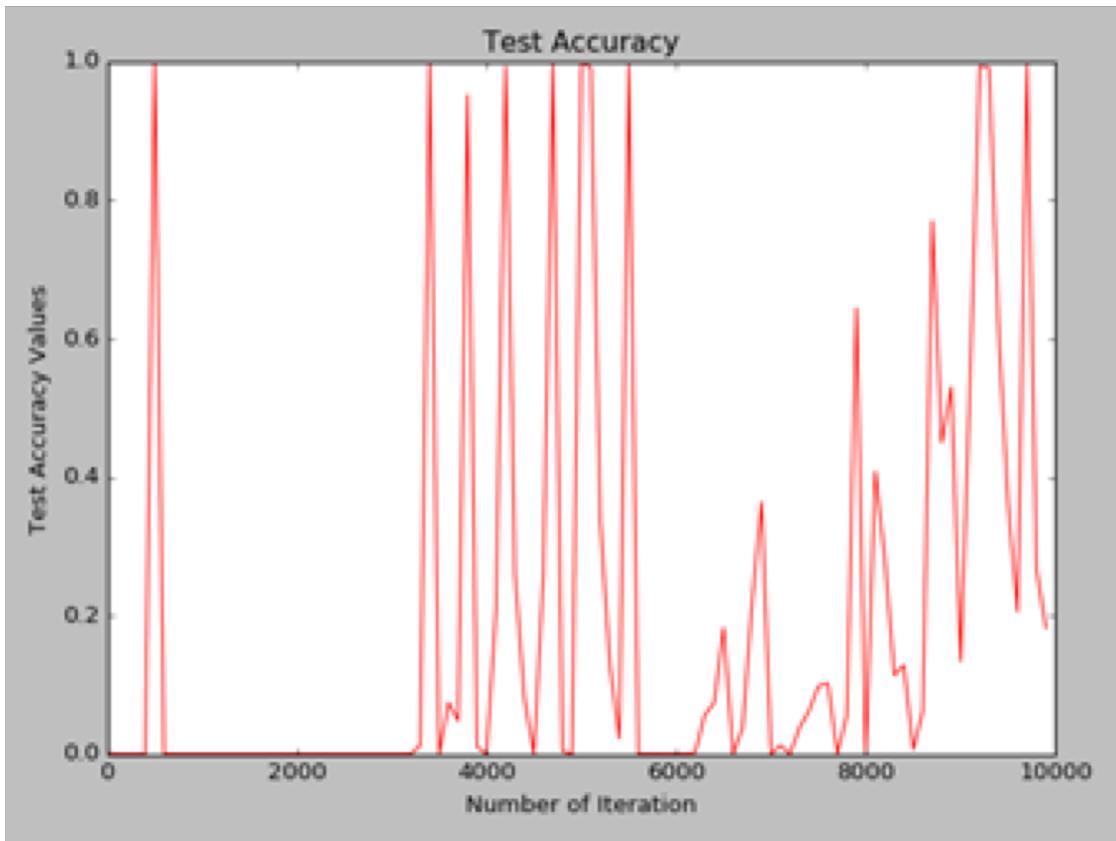


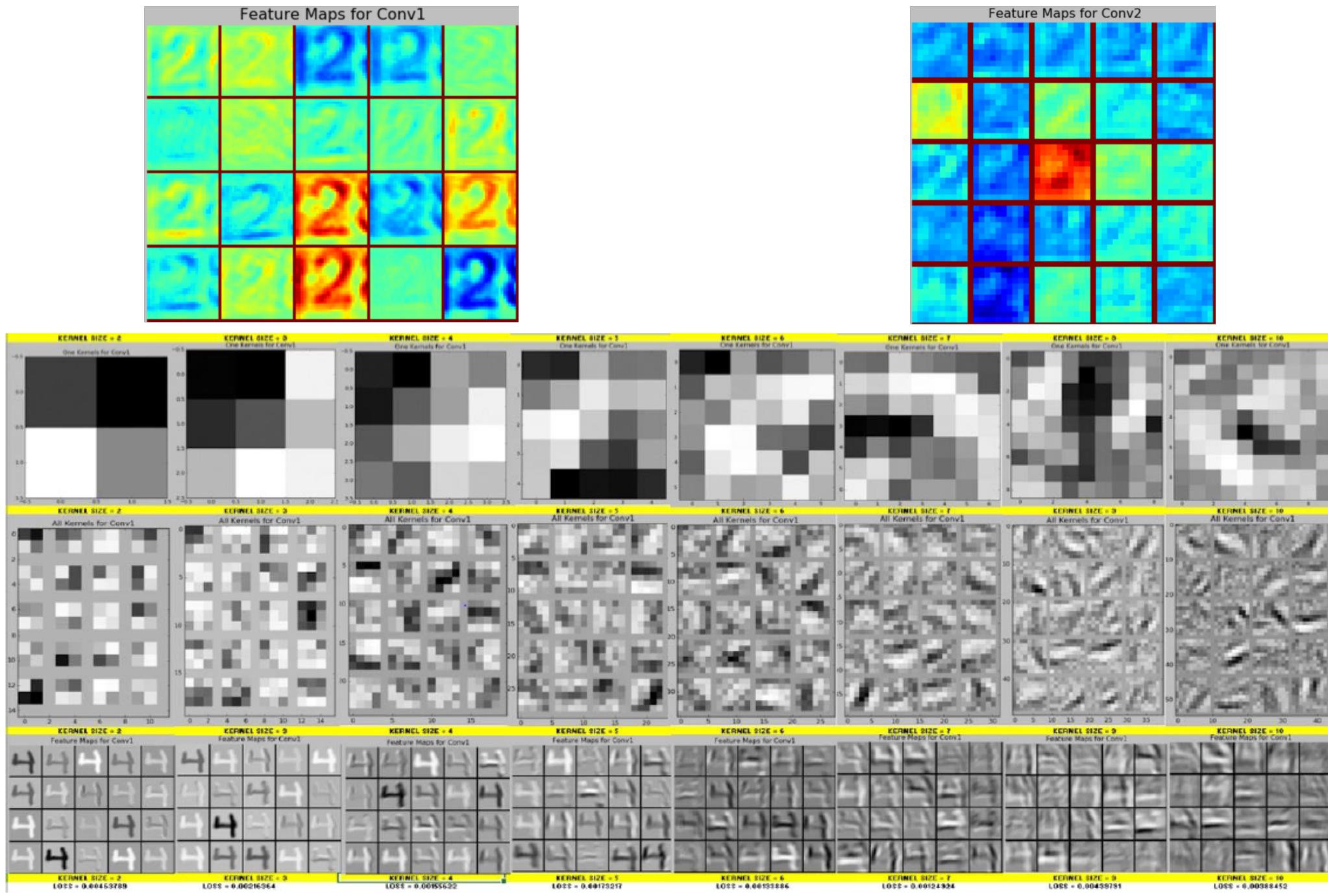
Histogram Equalization



Caffe









Output of Convolutional Layer

$$\frac{X-K+2P}{S} + 1$$

The Convolutional network architecture consists of these layers:

- Input Layer (Batch_size, channels=3, height=32, width=32)
- Convolutional Layer (in_channels=3, out_channels=16, kernel_size=5, stride=1, padding=1)
- ReLU
- Max-Pooling Layer (kernel_size=2, stride=2, padding =0)
- Convolutional Layer (in_channels=16, out_channels=32, kernel_size=5, stride=1, padding=1)
- ReLU
- Max-Pooling Layer (kernel_size=2, stride=2, padding =0)
- Dropout Layer (p=0.2)
- Fully-connected Layer (in_features=6*6*32, out_features=10)

Output of Pooling Layer

$$\frac{X-K}{S} + 1$$

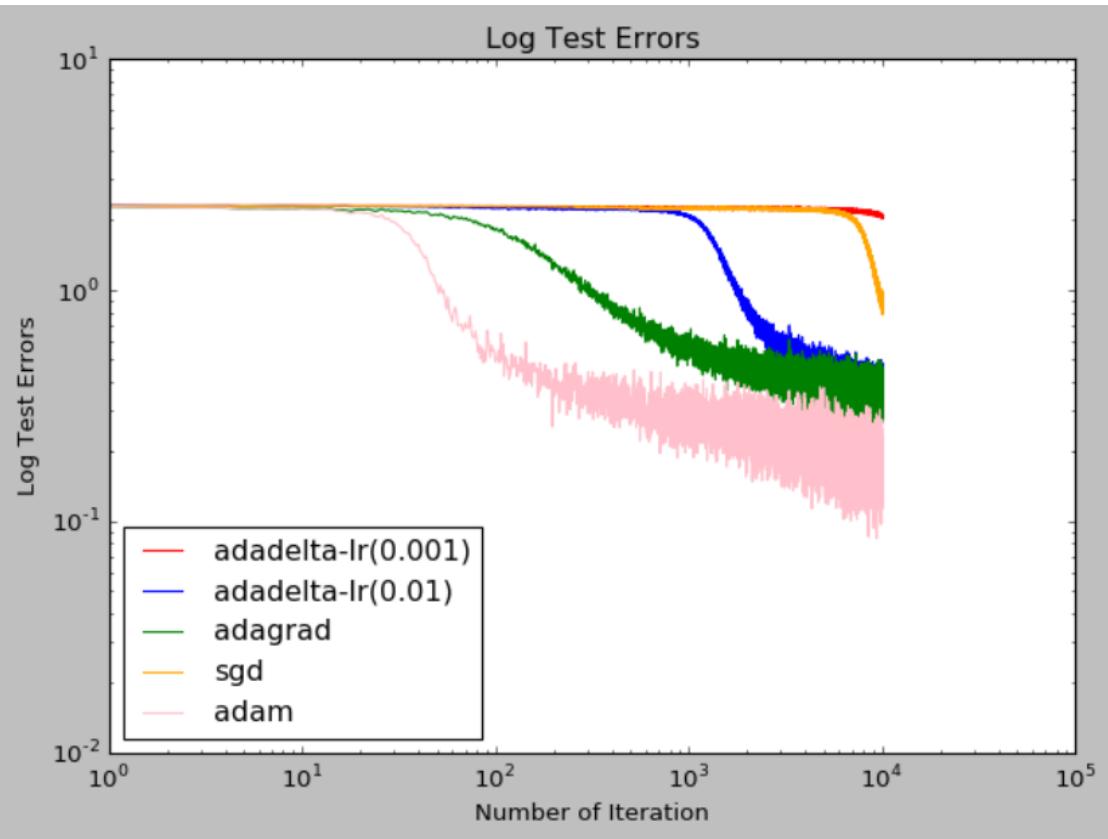
where X = Image height/width

K = Kernel Size

P = Amount of padding

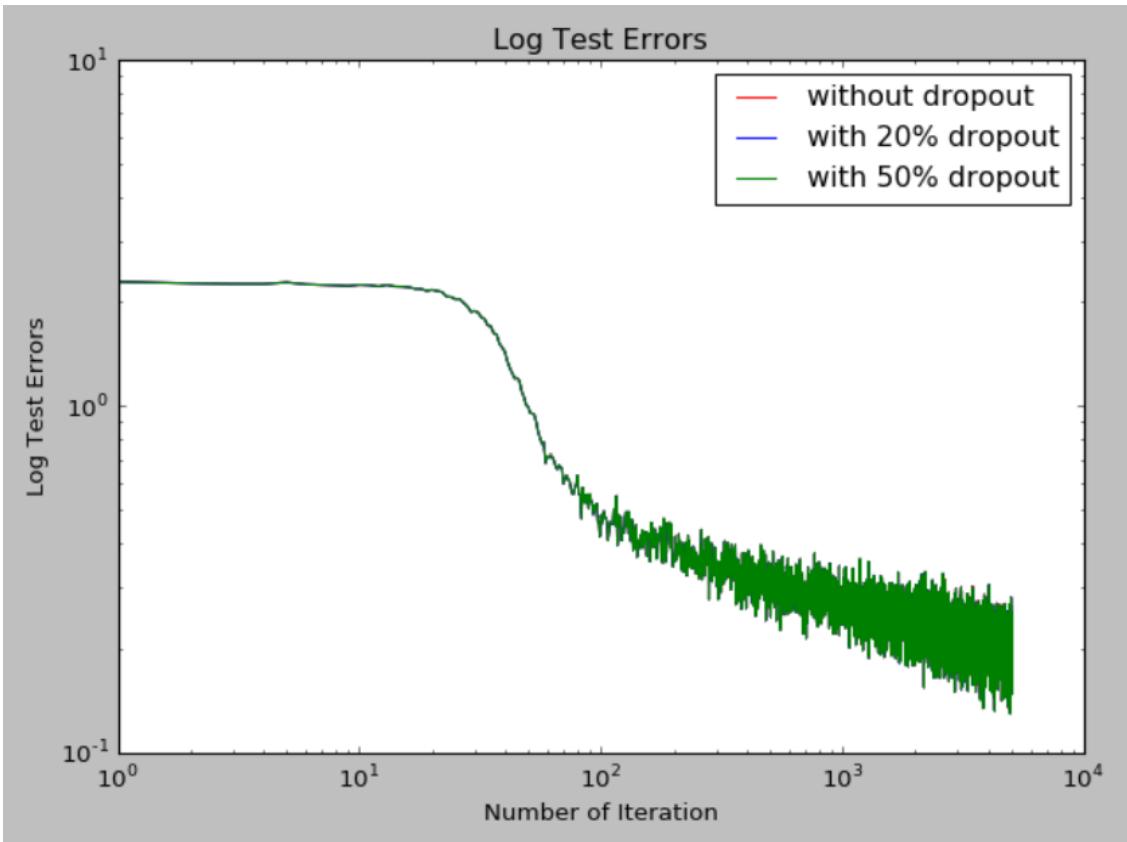
S = Stride

Optimizers



Optimizer	Test Accuracy	F1 score	Time(mins)
Adam	95%	0.948	27.19
Adagrad	89%	0.891	26.8
Adadelta(lr = 0.01)	89%	0.892	26.65
SGD	77%	0.748	26.61
Adadelta	29%	0.136	26.62

Dropouts



Dropouts	Test Accuracy	F1 score
0.2	95%	0.948
0.5	95%	0.948
0	92%	0.918

Confusion Matrix

		PREDICTED										
		label 0	label 1	label 2	label 3	label 4	label 5	label 6	label 7	label 8	label 9	RECALL
TARGET	label 0	9868	133	39	17	53	12	137	21	24	114	0.95
	label 1	55	21235	75	51	228	32	44	164	23	27	0.97
	label 2	22	107	17217	79	102	40	30	69	53	111	0.97
	label 3	9	128	135	13532	66	239	76	57	100	79	0.94
	label 4	11	224	74	31	11771	16	51	33	13	48	0.96
	label 5	10	50	41	185	40	12004	176	11	33	41	0.95
	label 6	60	51	19	60	65	121	9233	15	93	15	0.95
	label 7	10	338	157	51	59	11	16	9593	14	29	0.93
	label 8	36	68	48	139	55	67	152	12	7744	94	0.92
	label 9	77	82	74	65	59	53	26	28	62	7667	0.94

Network Diagram

