

Mutual Information using various neural estimators

Parameters:

Output Gain = 1.0

AR coefficients = [0.2881365609398022, 0.22070961647376935, -1.010492634789413]

Input Noise = 1.0

Output decay time = 0.2

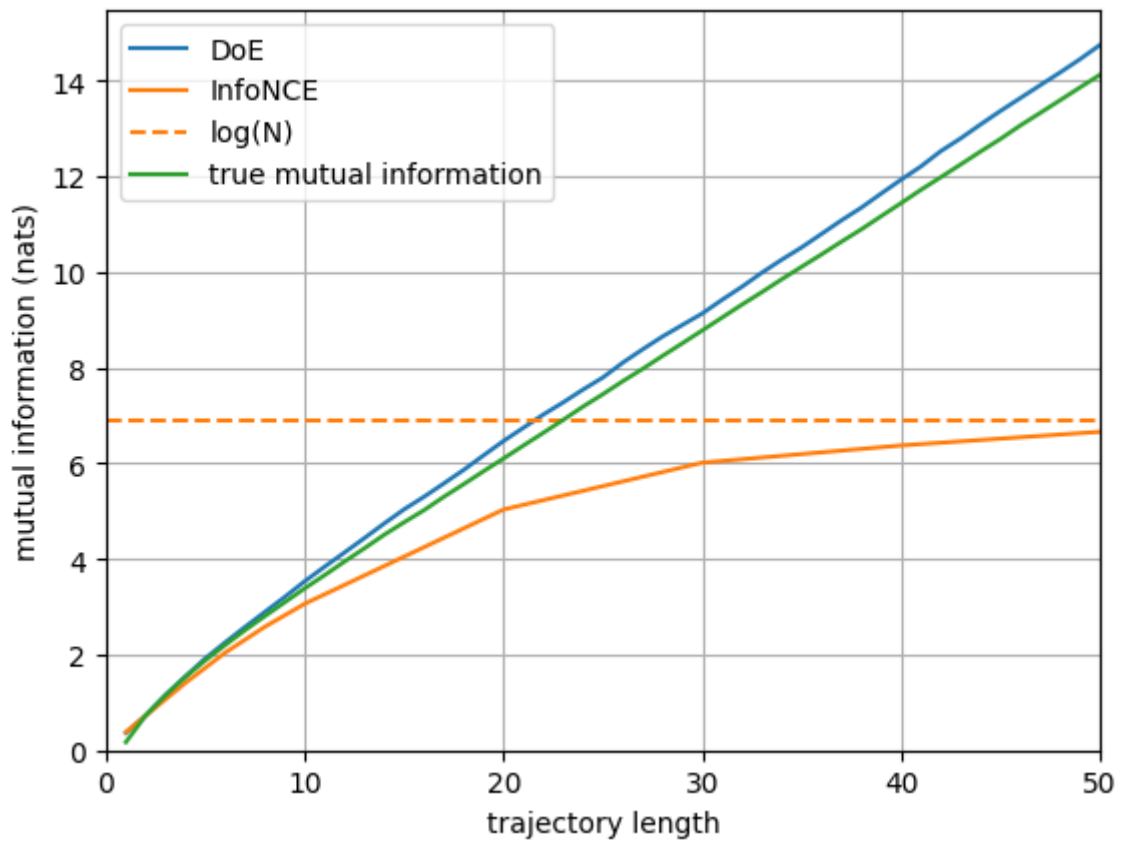
Output Noise = 0.2

The mutual information increases with trajectory length. The Difference of entropies estimator slightly overestimates the mutual information. The InfoNCE estimate is a lower bound. However, InfoNCE itself is upper bounded by $\log(N)$ where $N = 1000$ in our case.

Possible Questions:

How do these estimates depend on the complexity of the input process (here we have an AR(3) process)?

How does ML-PWS compare to DoE?



InfoNCE data

length	MI	logN	model_path
1	0.379955	6.907755	/home/reinhardt/ml-pws/notebooks/lightning_logs/version_35/checkpoints/epoch=9-step=200.ckpt
2	0.724323	6.907755	/home/reinhardt/ml-pws/notebooks/lightning_logs/version_36/checkpoints/epoch=9-step=200.ckpt
4	1.410111	6.907755	/home/reinhardt/ml-pws/notebooks/lightning_logs/version_37/checkpoints/epoch=9-step=200.ckpt
6	2.042599	6.907755	/home/reinhardt/ml-pws/notebooks/lightning_logs/version_38/checkpoints/epoch=9-step=200.ckpt
8	2.584308	6.907755	/home/reinhardt/ml-pws/notebooks/lightning_logs/version_39/checkpoints/epoch=9-step=200.ckpt
10	3.064266	6.907755	/home/reinhardt/ml-pws/notebooks/lightning_logs/version_30/checkpoints/epoch=9-step=200.ckpt
20	5.03454	6.907755	/home/reinhardt/ml-pws/notebooks/lightning_logs/version_31/checkpoints/epoch=9-step=200.ckpt
30	6.013926	6.907755	/home/reinhardt/ml-pws/notebooks/lightning_logs/version_32/checkpoints/epoch=9-step=200.ckpt
40	6.374468	6.907755	/home/reinhardt/ml-pws/notebooks/lightning_logs/version_33/checkpoints/epoch=9-step=200.ckpt
50	6.660032	6.907755	/home/reinhardt/ml-pws/notebooks/lightning_logs/version_34/checkpoints/epoch=9-step=200.ckpt

DoE estimate data

length	MI	checkpoint_path
1	0.365411	lightning_logs/version_27/checkpoints/epoch=49-step=2000.ckpt
2	0.730909	lightning_logs/version_27/checkpoints/epoch=49-step=2000.ckpt
3	1.160791	lightning_logs/version_27/checkpoints/epoch=49-step=2000.ckpt
4	1.545205	lightning_logs/version_27/checkpoints/epoch=49-step=2000.ckpt
5	1.923273	lightning_logs/version_27/checkpoints/epoch=49-step=2000.ckpt
6	2.256821	lightning_logs/version_27/checkpoints/epoch=49-step=2000.ckpt
7	2.580661	lightning_logs/version_27/checkpoints/epoch=49-step=2000.ckpt
8	2.894378	lightning_logs/version_27/checkpoints/epoch=49-step=2000.ckpt
9	3.207939	lightning_logs/version_27/checkpoints/epoch=49-step=2000.ckpt

10	3.534306	lightning_logs/version_27/checkpoints/epoch=49-step=2000.ckpt
11	3.83913	lightning_logs/version_27/checkpoints/epoch=49-step=2000.ckpt
12	4.135774	lightning_logs/version_27/checkpoints/epoch=49-step=2000.ckpt
13	4.436716	lightning_logs/version_27/checkpoints/epoch=49-step=2000.ckpt
14	4.743464	lightning_logs/version_27/checkpoints/epoch=49-step=2000.ckpt
15	5.038952	lightning_logs/version_27/checkpoints/epoch=49-step=2000.ckpt
16	5.301213	lightning_logs/version_27/checkpoints/epoch=49-step=2000.ckpt
17	5.580572	lightning_logs/version_27/checkpoints/epoch=49-step=2000.ckpt
18	5.864162	lightning_logs/version_27/checkpoints/epoch=49-step=2000.ckpt
19	6.168099	lightning_logs/version_27/checkpoints/epoch=49-step=2000.ckpt
20	6.467591	lightning_logs/version_27/checkpoints/epoch=49-step=2000.ckpt
21	6.744048	lightning_logs/version_27/checkpoints/epoch=49-step=2000.ckpt
22	7.01976	lightning_logs/version_27/checkpoints/epoch=49-step=2000.ckpt
23	7.273846	lightning_logs/version_27/checkpoints/epoch=49-step=2000.ckpt
24	7.542728	lightning_logs/version_27/checkpoints/epoch=49-step=2000.ckpt
25	7.795448	lightning_logs/version_27/checkpoints/epoch=49-step=2000.ckpt
26	8.105362	lightning_logs/version_27/checkpoints/epoch=49-step=2000.ckpt
27	8.384584	lightning_logs/version_27/checkpoints/epoch=49-step=2000.ckpt
28	8.652175	lightning_logs/version_27/checkpoints/epoch=49-step=2000.ckpt
29	8.894314	lightning_logs/version_27/checkpoints/epoch=49-step=2000.ckpt
30	9.134048	lightning_logs/version_27/checkpoints/epoch=49-step=2000.ckpt
31	9.421328	lightning_logs/version_27/checkpoints/epoch=49-step=2000.ckpt
32	9.694315	lightning_logs/version_27/checkpoints/epoch=49-step=2000.ckpt
33	9.987486	lightning_logs/version_27/checkpoints/epoch=49-step=2000.ckpt
34	10.25943	lightning_logs/version_27/checkpoints/epoch=49-step=2000.ckpt
35	10.51623	lightning_logs/version_27/checkpoints/epoch=49-step=2000.ckpt
36	10.7975	lightning_logs/version_27/checkpoints/epoch=49-step=2000.ckpt
37	11.08072	lightning_logs/version_27/checkpoints/epoch=49-step=2000.ckpt
38	11.34659	lightning_logs/version_27/checkpoints/epoch=49-step=2000.ckpt
39	11.64146	lightning_logs/version_27/checkpoints/epoch=49-step=2000.ckpt
40	11.93112	lightning_logs/version_27/checkpoints/epoch=49-step=2000.ckpt
41	12.20846	lightning_logs/version_27/checkpoints/epoch=49-step=2000.ckpt
42	12.52868	lightning_logs/version_27/checkpoints/epoch=49-step=2000.ckpt
43	12.79522	lightning_logs/version_27/checkpoints/epoch=49-step=2000.ckpt
44	13.08637	lightning_logs/version_27/checkpoints/epoch=49-step=2000.ckpt
45	13.36833	lightning_logs/version_27/checkpoints/epoch=49-step=2000.ckpt
46	13.63732	lightning_logs/version_27/checkpoints/epoch=49-step=2000.ckpt
47	13.90666	lightning_logs/version_27/checkpoints/epoch=49-step=2000.ckpt
48	14.17325	lightning_logs/version_27/checkpoints/epoch=49-step=2000.ckpt
49	14.44933	lightning_logs/version_27/checkpoints/epoch=49-step=2000.ckpt
50	14.74616	lightning_logs/version_27/checkpoints/epoch=49-step=2000.ckpt