Supplementary Material for Neural Episodic Control

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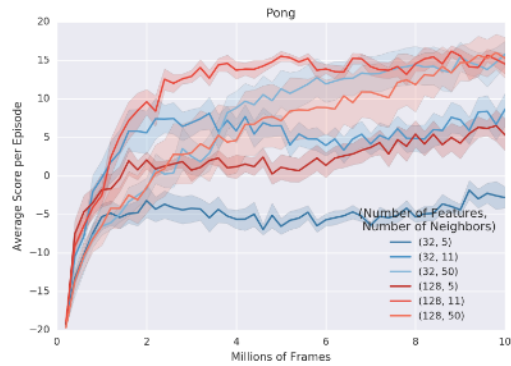## Sensitivity of NEC to Hyperparameters

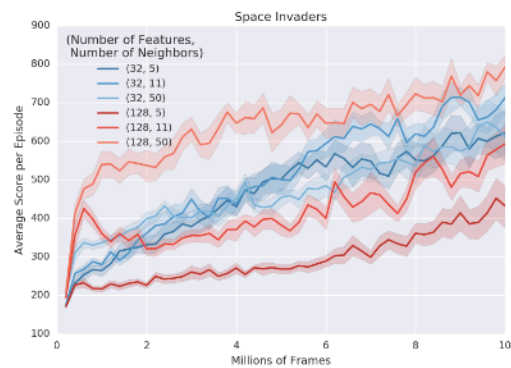*Figure 1.* Effect of Number of Neighbors and Number of Features on Pong.

Figure 2. Effect of Number of Neighbors and Number of Features on Space Invaders.

Figures 1 and 2 show results obtained when varying the number of neighbours and the size of the DND keys. We can observe that large key sizes benefit from the use of more neighbours.

Scores

	A3C	Nature DQN	MFEC	NEC	Prioritised Replay	$Q^*(\lambda)$	Retrace(λ)
Alien	415.5	634.8	1717.7	**3460.6**	800.5	476.8	541.2
Amidar	96.3	126.8	370.9	**811.3**	99.1	134.5	162.9
Assault	720.8	**1489.5**	510.2	599.9	1339.9	1026.6	1331.1
Asterix	301.6	**2989.1**	1776.6	2480.4	2599.7	2588.6	2520.3
Asteroids	1360.1	395.3	**4706.8**	2496.1	854.0	569.8	579.2
Atlantis	36383	14210.5	**95499.4**	51208.0	12579.1	28818.8	44771.1
Bank Heist	15.8	29.3	163.7	**343.3**	70.1	32.8	26.3
Battlezone	2354.2	6961.0	**19053.6**	13345.5	13500.0	8227.2	6762.2
Beamrider	450.2	**3741.7**	858.8	749.6	3249.6	656.2	725.4
Berzerk	593.6	484.2	**924.2**	852.8	575.6	647.9	701.5
Bowling	25	35.0	51.8	**71.8**	30.0	28.4	39.9
Boxing	2.5	31.3	10.7	**72.8**	64.7	22.3	30.7
Breakout	1.5	36.8	**86.2**	13.6	17.7	6.3	10.2
Centipede	3228	4401.4	**20608.8**	12314.5	4694.1	4097.5	4792.9
Chopper Command	1036.7	827.2	3075.6	**5070.3**	1426.5	760.6	801.6
Crazy Climber	70103.5	66061.6	9892.2	34344.0	**76574.1**	64980.6	54177.6
Defender	4596	2877.9	**10052.8**	6126.1	3486.4	3260.8	3275.6
Demon Attack	346.8	5541.9	1081.8	641.4	**6503.6**	4914.8	4836.6
Double Dunk	-17.2	-19.0	-13.2	**1.8**	-15.9	-18.2	-18.3
Enduro	0	364.9	0.0	1.4	**1125.8**	396.0	440.6
Fishing Derby	-89.5	-81.6	-90.3	-72.2	**-48.2**	-84.2	-79.8
Freeway	0	21.5	0.6	13.5	18.6	**22.2**	17.1
Frostbite	218.9	339.1	925.1	**2747.4**	711.3	407.2	325.0
Gopher	854.1	1111.2	**4412.6**	2432.3	1235.3	2292.4	3050.4
Gravitar	215.8	154.7	1011.3	**1257.0**	218.9	121.9	108.9
H.E.R.O.	4598.2	1050.7	14767.7	**16265.3**	5164.5	2223.3	3298.2
Ice Hockey	-8.1	-4.5	-6.5	**-1.6**	-10.2	-11.1	-9.1
James Bond	31.5	165.9	244.7	**376.8**	203.8	64.5	67.2
Kangaroo	55.2	519.6	2465.7	**2489.1**	616.7	520.7	554.6
Krull	3627.6	6015.1	4555.2	5179.2	6700.7	**8169.8**	7399.3
Kung Fu Master	6634.6	17166.1	12906.5	**30568.1**	21456.2	13874.7	18065.8
Montezuma's Revenge	0.1	0.0	**76.4**	42.1	0.0	0.4	2.6
Ms. Pac-Man	770	1657.0	3802.7	**4142.8**	1558.3	1289.9	1401.6
Name This Game	2745.1	6380.2	4845.1	5532.0	**7525.0**	5378.5	5227.8
Phoenix	2542.5	5357.0	5334.5	5756.5	**11813.3**	5771.2	6046.7
Pitfall!	-43.9	**0.0**	-79.0	0.0	0.0	-4.4	-1.5
Pong	-20.3	-3.2	-20.0	**20.4**	6.6	-18.9	-13.3
Private Eye	86.3	100.0	**3963.8**	162.2	100.0	1230.4	80.2
Q*bert	438.9	2372.5	**12500.4**	7419.2	839.0	1812.4	2582.1
River Raid	2312.6	3144.9	4195.0	**5498.1**	4871.8	2787.1	2671.0
Road Runner	759.9	7285.4	5432.1	12661.4	**24746.6**	3133.1	6285.0
Robot Tank	2.4	**14.6**	7.3	11.1	8.5	10.1	9.1
Seaquest	514.1	618.7	711.6	1015.3	**1192.2**	611.7	574.3
Skiing	-20002.7	-19818.0	-15278.9	-26340.7	**-12762.4**	-17055.7	-13880.4
Solaris	2932.7	1343.0	**8717.5**	7201.0	1397.1	2460.0	3211.8
Space Invaders	201	642.2	**2027.8**	1016.0	673.0	545.6	527.9
Stargunner	613.6	604.8	**14843.9**	1171.4	1131.4	877.0	886.7
Surround	-9.9	-9.7	-9.9	**-7.9**	-8.5	-9.8	-9.9
Tennis	-23.8	**0.0**	-23.7	-1.8	0.0	-4.3	0.0
Time Pilot	3683.5	1952.0	**10751.3**	10282.7	2430.2	2323.7	2576.0
Tutankham	108.3	148.7	86.3	121.6	**194.0**	108.3	122.4
Up'n Down	3322.3	18964.9	22320.8	**39823.3**	11856.2	11961.2	13308.4
Venture	0	3.8	0.0	0.0	0.0	21.5	**75.6**
Video Pinball	30548.5	14316.0	**90507.7**	22842.6	24254.5	11507.3	14178.9
Wizard of Wor	876	401.4	**12803.1**	8480.7	1146.6	526.8	420.4
Yars' Revenge	9953	7614.1	5956.7	**21490.5**	9228.5	8884.4	8532.7
Zaxxon	39.7	200.3	6288.1	**10082.4**	3123.5	278.3	168.3

Table 1. Scores at 10 Million Frames