

A Discussion of Results

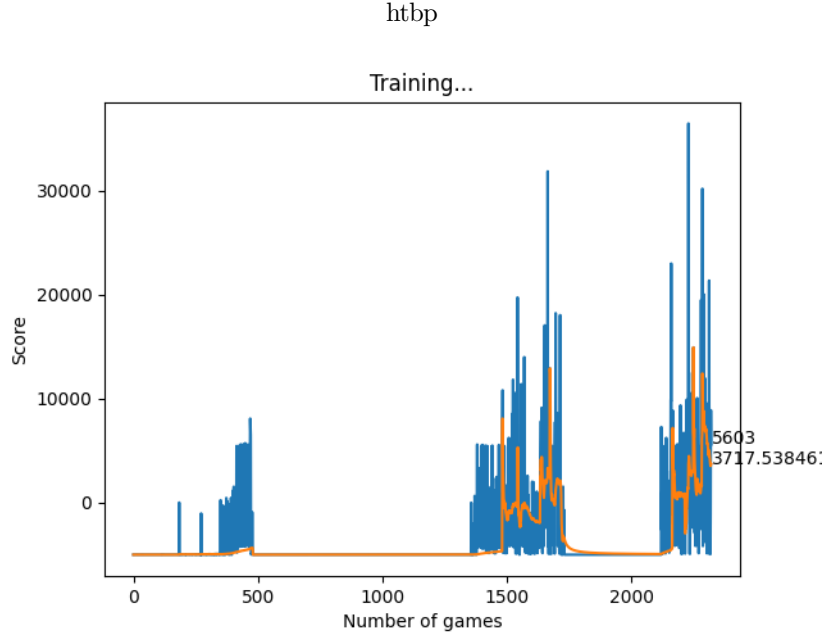


Fig. 1: Learning graph for 21L iterations

Figure 1 shows the learning graph for the 21 lakh iterations. It can be seen that the running average of return in each episode is increasing gradually. The agent learned to avoid the incorrect actions. The number of incorrect actions selected was very high initially (i.e. 0 to 400 and 500 to 1300). The number of incorrect pacing actions observed in the first 3L iterations was 695 whereas in the last 3L (19L to 21L) iterations was 98. The sequence of atrial events can be observed from the "AA-distribution" video where the frequency of the A-A intervals are plotted as a graph and all the graphs generated throughout the simulation were compiled to a video. The red, purple and blue, grey bars represent the time after which AS, enforced AP, correct AP and incorrect AP occurred from the previous AS. After the epsilon greedy training approach for the first 1L iterations itself, the number of incorrect actions selected were decreased significantly.

The tables Table 1 and Table 2 are the sequence of atrial events occurred during simulation after 11 lakh and 21 lakh iterations respectively. The agent eventually learned to select the atrial pace when the pause occurs also learning the current value of *hrv* parameter.

Row Col	Col 1	Col 2	Col 3	Col 4	Col 5
Row 1	(0, 787)	(0, 897)	(0, 876)	(0, 876)	(1, 984)
Row 2	(0, 703)	(0, 876)	(0, 897)	(0, 897)	(1, 940)
Row 3	(0, 747)	(0, 897)	(0, 897)	(0, 876)	(0, 876)
Row 4	(1, 887)	(0, 800)	(0, 876)	(0, 943)	(1, 1007)
Row 5	(0, 682)	(2, 927)	(2, 1001)	(2, 1001)	(0, 700)
Row 6	(2, 926)	(2, 1001)	(0, 954)	(1, 943)	(2, 1106)
Row 7	(0, 583)	(2, 927)	(0, 959)	(2, 1043)	(0, 646)
Row 8	(0, 917)	(0, 917)	(1, 993)	(0, 696)	(0, 891)
Row 9	(0, 891)	(1, 957)	(0, 730)	(0, 891)	(0, 865)
Row 10	(0, 865)	(1, 905)	(0, 782)	(0, 835)	(0, 835)
Row 11	(1, 852)	(0, 833)	(1, 853)	(0, 832)	(0, 835)
Row 12	(0, 835)	(0, 805)	(1, 819)	(0, 818)	(0, 805)
Row 13	(0, 805)	(0, 805)	(0, 843)	(0, 794)	(0, 736)
Row 14	(1, 799)	(0, 700)	(0, 805)	(1, 873)	(0, 764)
Row 15	(0, 805)	(0, 805)	(0, 823)	(0, 573)	(0, 860)
Row 16	(0, 860)	(1, 935)	(0, 752)	(0, 860)	(0, 935)
Row 17	(0, 752)	(0, 860)	(0, 860)	(0, 860)	(0, 860)
Row 18	(0, 860)	(1, 864)	(0, 823)	(0, 860)	(1, 878)
Row 19	(0, 1018)	(2, 1115)	(0, 574)	(2, 927)	(0, 969)

Table 1: Sequence of atrial events occurred during simulation after 11L iterations

Row Col	Col 1	Col 2	Col 3	Col 4	Col 5
Row 1	(0, 777)	(0, 801)	(0, 801)	(0, 702)	(1, 869)
Row 2	(0, 562)	(0, 792)	(0, 629)	(1, 760)	(0, 525)
Row 3	(0, 629)	(1, 760)	(0, 525)	(0, 629)	(1, 720)
Row 4	(0, 565)	(0, 629)	(1, 720)	(0, 565)	(0, 629)
Row 5	(0, 601)	(1, 700)	(0, 529)	(0, 676)	(1, 748)
Row 6	(0, 631)	(0, 676)	(0, 676)	(1, 809)	(0, 570)
Row 7	(0, 676)	(0, 676)	(0, 676)	(1, 720)	(0, 659)
Row 8	(0, 645)	(1, 718)	(0, 599)	(0, 645)	(0, 645)
Row 9	(0, 614)	(1, 680)	(0, 575)	(0, 614)	(0, 614)
Row 10	(1, 680)	(0, 575)	(0, 614)	(0, 614)	(1, 632)
Row 11	(0, 623)	(0, 614)	(0, 601)	(1, 641)	(0, 588)
Row 12	(0, 601)	(0, 601)	(1, 626)	(2, 1116)	(0, 809)
Row 13	(0, 601)	(0, 652)	(1, 731)	(0, 600)	(0, 600)
Row 14	(0, 652)	(0, 652)	(1, 812)	(0, 519)	(0, 652)
Row 15	(0, 652)	(1, 750)	(0, 581)	(0, 714)	(1, 719)
Row 16	(0, 736)	(0, 714)	(0, 714)	(0, 616)	(1, 682)
Row 17	(0, 577)	(0, 601)	(1, 642)	(0, 587)	(0, 601)
Row 18	(0, 699)	(2, 1111)	(0, 314)	(0, 699)	(0, 699)
Row 19	(0, 699)	(1, 829)	(0, 596)	(0, 699)	(0, 699)
Row 20	(0, 699)	(1, 794)	(0, 631)	(0, 797)	(1, 872)
Row 21	(0, 749)	(0, 797)	(0, 797)	(0, 797)	(1, 915)
Row 22	(0, 706)	(0, 797)	(0, 705)	(1, 774)	(0, 663)
Row 23	(0, 705)	(1, 746)	(2, 1124)	(0, 431)	(0, 758)
Row 24	(1, 812)	(2, 1146)	(0, 572)	(0, 845)	(0, 845)

Table 2: Sequence of atrial events occurred during simulation after 21L iterations