**Agent Not Learning Effectively**

1. Enemies spawn in waves with time gaps in between
2. Agent has 4 lives with a window of invincibility
3. Enemies die on the spot if FPS is too low

**From [1] and [2]:**

1. Agent can die whenever during a wave of barrages and still live to wave 4 with similar time of survival
2. Agent can’t learn unless it miraculously dodges every single bullet in a wave that goes slightly random each time

**From [5]:**

1. Agent keeps going into the same bad position (usually top left corner) and dies immediately, doing 1 pixel adjustments per frame while staying in top left. This ‘habit’ either won’t ever happen or will happen everytime and is basically luck based.

**To tackle [4]:**

1. Modified reward func : such that it rewards for more survival time PER LIFE
2. Modified reward func : such that agent gets more survival points DURING BATTLE

**To tackle [6]:**

1. Enhanced Learning: with exp learning
2. Created an enemy line where if the agent crosses the line its rewards get quickly drained

**Results of [9]:**

1. Laptop Simulation: Agent still heading for top left like its addicted to cocaine despite the constant drop in reward
2. Desktop Simulation:Agent actually stayed behind and is doing some actual moves, still getting killed and not improving though

**From [11] and [12]:**

1. Desktop is running simulation at 20FPS, laptop is running simulation at60FPS, from [3], desktop agent seems to have an easier time learning.

**Suggestions for more consistent learning:**

**Enhanced Learning:**  
 Implement DDQN

**Refined States:**

Give agent positions of its own bullets?

Give agent positions of the dropped items for better score?

Remove FOV circle?

**Tune Reward Func?**

**From [13], Better Training:**

Lower difficulty for the agent with fewer enemies at first?