Reinforcement Learning: Key Features.

The most curios beings in a room full of people belonging to different stages of life are the children. From a child's point of view the environment around them is similar to a science lab, they try and explore everything present in order to find out the purpose of any particular entity. Children are constantly learning and changing according to their own little experiences of the environment. They do not carry a rule book for the task or the result they desire. This property of learning from the task and without having a pre-determined set of conclusions when transformed into Machine learning came to know as reinforcement learning. Let's know more about how does reinforcement learning differ from the other forms of machine learning and know some interesting problems that can be solved. Put the rule book aside for a few moments and let that curious inner child present within you learn something new today.

The question arises "why there is a need of 'Reinforcement Learning'?" machine learning have supervised learning, unsupervised learning, natural language processing and much more yet to be discovered. These learnings and processing come with set of examples, objects characterized into categories. The new input is tested against these categories itself. But what's the thrill in knowing the possible outcome of the given output beforehand. The reward is much sweeter when the goal to be achieved is through the less traveled or in many cases untraveled path. That's where reinforcement learning is introduced.

The need of reinforcement gives arise to another question if you are curious enough "How does this method work?" There are some jargons, frequently used in "Artificial intelligence and Machine learning" from basics to advance level. The flow of reinforcement learning task can be understood by using these frequent jargons. Agent, environment, tasks, goal, path are some of them. There is an agent who performs tasks to achieve a goal. There are paths which take the agent towards the goal. There is no predetermined set of paths and task which will take agent towards the goal. The concept of learning by doing is used by the agent to reach the goal. Each step taken determines the next step. Whether the result will be highly rewarding or the goal will not be reached will be determined by the choice of path taken by the agent.

There is possibility of failure to reach the goal using reinforcement learning. But as mentioned earlier like a child the agent learns by doing the tasks. All the paths that proved to be fruitful and rewarding in the past are chosen again, the unfruitful path might be ignored. But like a child, agent does not stop at the previously explored paths, the curiosity to explore new paths is still alive in the agent. The journey of exploitation and exploration to reach the goal is never ending, as the journey of learning continues to find new paths and maximum reward to reach the goal.

Every algorithm discovered till date have an application in some or the other field. Where and how the reinforcement learning is applied in real life example is explained in detail by "Richard S. Sutton and Andrew G. Bart" in their book "Reinforcement Learning: An Introduction." The following section is dedicated to understand the application and examples explained by "Richard S. Sutton and Andrew G. Bart" in their book.

The book explains the real time application of reinforcement learning by using similar examples:

- Strategy used by chess players to make the next possible move.
- Optimization of cost depending on the production by controllers of any production house
- A cub learning to walk and run.
- Robot deciding of charging or continuation of work depending on previous data of time taken to charge and current data of power left.
- Grocery shopping and cooking by an individual a simple task but requires real time data of entities left and entities to be bought. Ingredients to add to make the meal healthy and tasty.

The above tasks have different agents at different level. The agent in real life can be at beginner level, intermediate level or at expert level. No matter the level the reinforcement learning can be used by the agent to reach the goal. An individual new to cooking will not repeat the same mistake while cooking after certain time period. “Why does he do that?” the answer is simple the real time environment of individual and the intensity of reward after the path chosen proved to be a learning opportunity for the individual . So next time the exploitation and exploration of reinforcement learning is applied.

One might wonder as a part of human nature “Are there any limitations to our learning??” the answer is given by authors in their book “Yes, there is.” The learning by doing method takes a life time of an agent to identify the most rewarding path and exploration might seem incomplete in some cases. This limitation is covered by Genetic algorithms, by determining the optimized structure of rewards for a complete life time of an agent.

Machine learning and Artificial intelligence is a growing field. The result of a simple task is encapsulation of months and years of hard work of researchers, scientist and technology enthusiasts. The environment of machine learning and artificial intelligence contains infinite number of paths to reach the goal of improvement. All the researchers, scientist and enthusiast work together to reach the goal. The analysis of path of previous researchers and the determination to discover and implement new path is often proved to be rewarding.

If human being is learning by doing then it is not surprise if the machine learning and artificial intelligence which is the idea of cognitive properties of human being has a branch where the agent itself is learning by doing. The branch of “Reinforcement learning” is interesting if related and explained using real life examples. The branch is practical implementation of what a human being does in the environment new and unfamiliar to them.