DEEP Q LEARNING USING TETRIS GAME

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INTRODUCTION

- Tetris is a game that involves placing pieces on top of each other in one of the seven arrangements, so that they fill in a rectangular grid.
- And as the grid gets filled completely it diminishes resulting in points.
- A common human approach to this problem involves looking for open spaces that match the shape of the current piece in play.
- So this project deals with the playing of Tetris game using Deep Q – Learning algorithm.

Demo

SCOPE

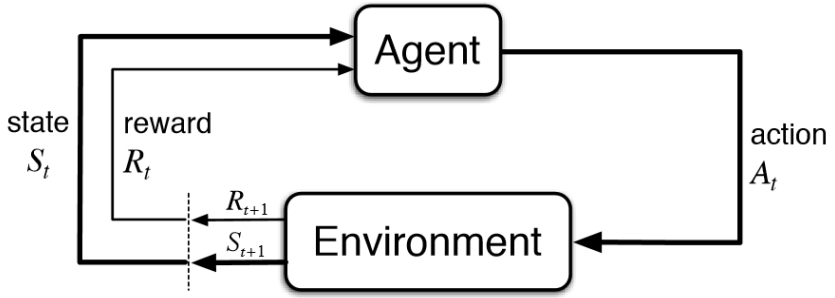
- The Project Dives into the Scope of Machine Learning

- Tools and techniques:
- TensorFlow : A Google's deep learning framework
- Keras : Deep learning framework for training neural network
- OpenCV-python: A python gui library (We will use it to display Tetris game.)
- Tqdm : To show progress bar.
- Cuda : For GPU based machine learning
- Sublime : Text Editior

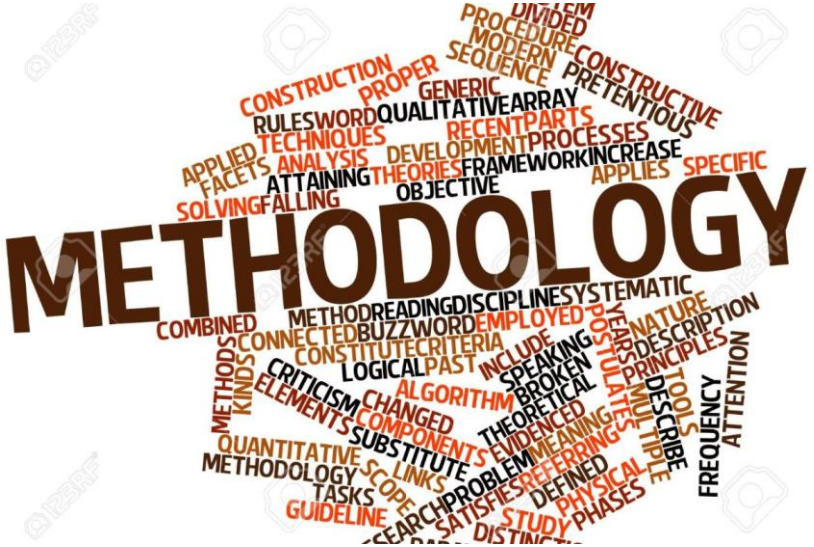
APPROACH

- *Unsupervised Learning:*
  - *Unsupervised learning is a type of machine learning that looks for previously undetected patterns in a data set with no pre-existing labels and with a minimum of human supervision.*
  - *Here I have used Reinforcement Learning with Deep Q Learning for Tetris Game.*

METHODOLOGY

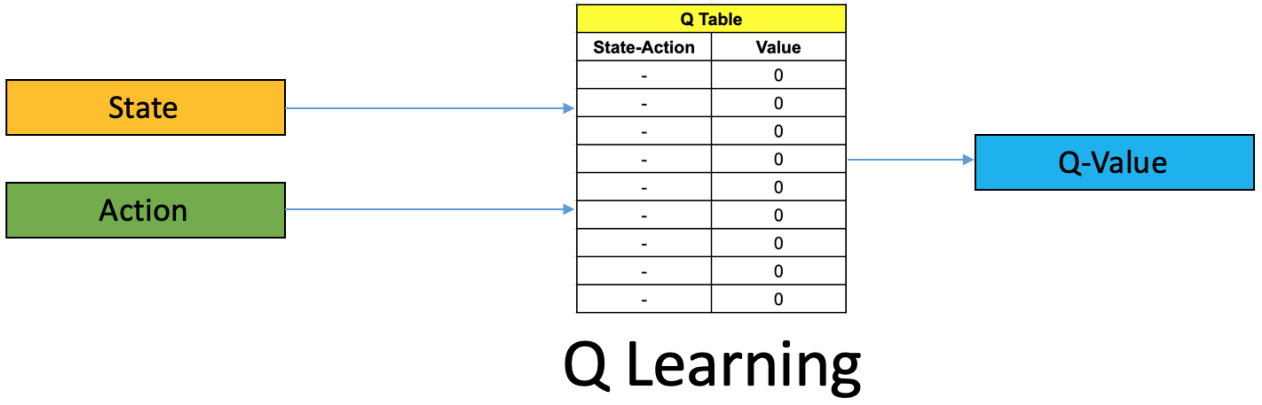


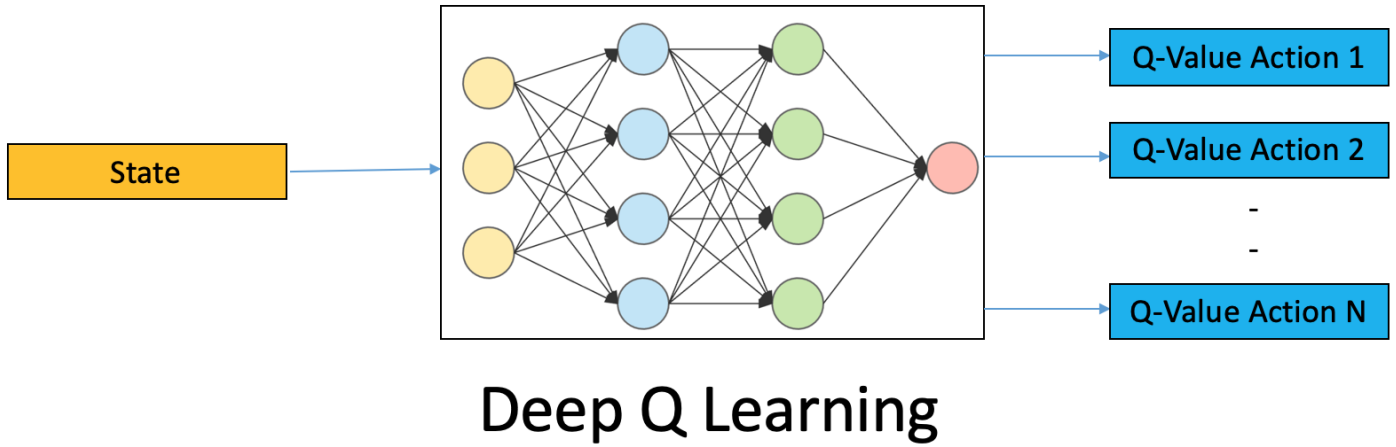
- Reinforcement Learning:
  - Reinforcement learning is the training of machine learning models to make a sequence of decisions. The agent learns to achieve a goal in an uncertain, potentially complex environment. In reinforcement learning, an artificial intelligence faces a game-like situation. The computer employs trial and error to come up with a solution to the problem. To get the machine to do what the programmer wants, the artificial intelligence gets either rewards or penalties for the actions it performs. Its goal is to maximize the total reward.



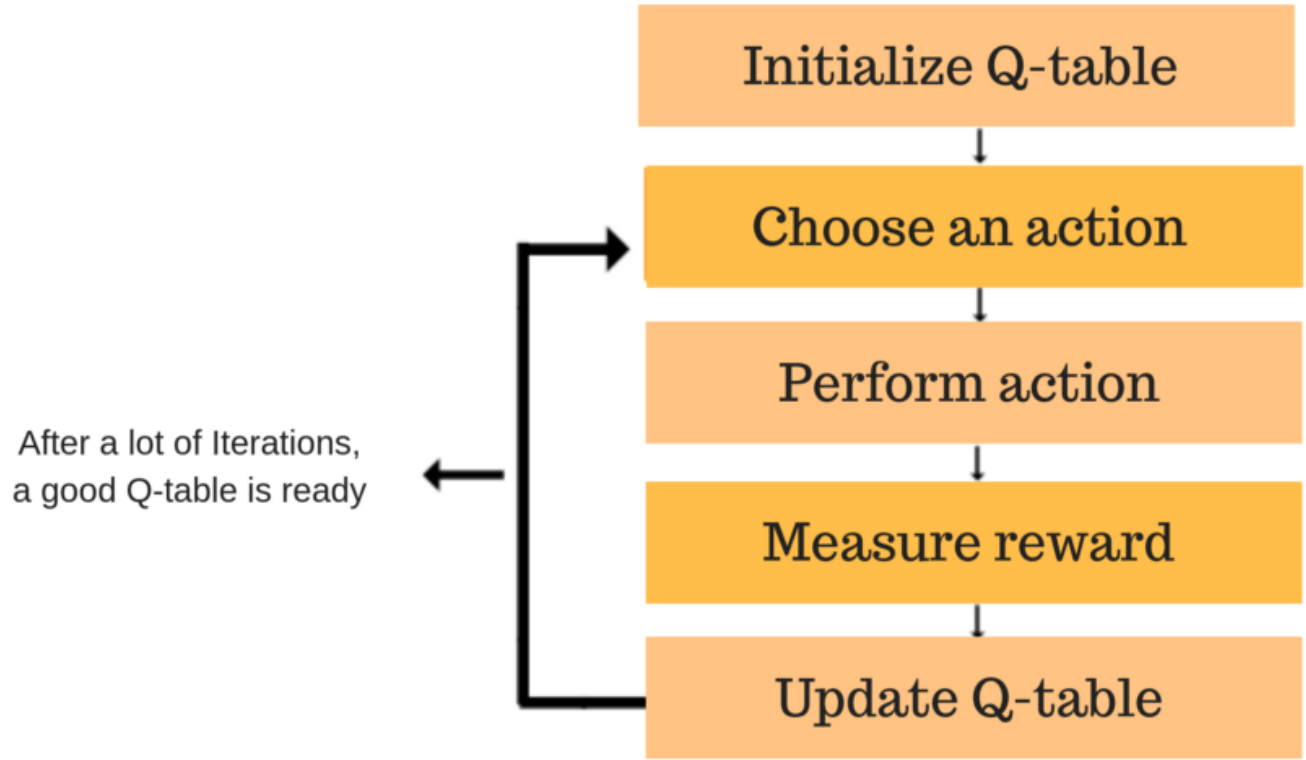
Q-LEARNING

- Q-learning is a model-free reinforcement learning algorithm to learn a policy telling an agent what action to take under what circumstances. It does not require a model of the environment, and it can handle problems with stochastic transitions and rewards, without requiring adaptations.
- Q-learning stores data in tables. This approach falters with increasing numbers of states/actions since the likelihood of the agent visiting a particular state and performing a particular action is increasingly small.





Q- LEARNING ALGORITHM



Q- LEARNING IMPLEMENTATION

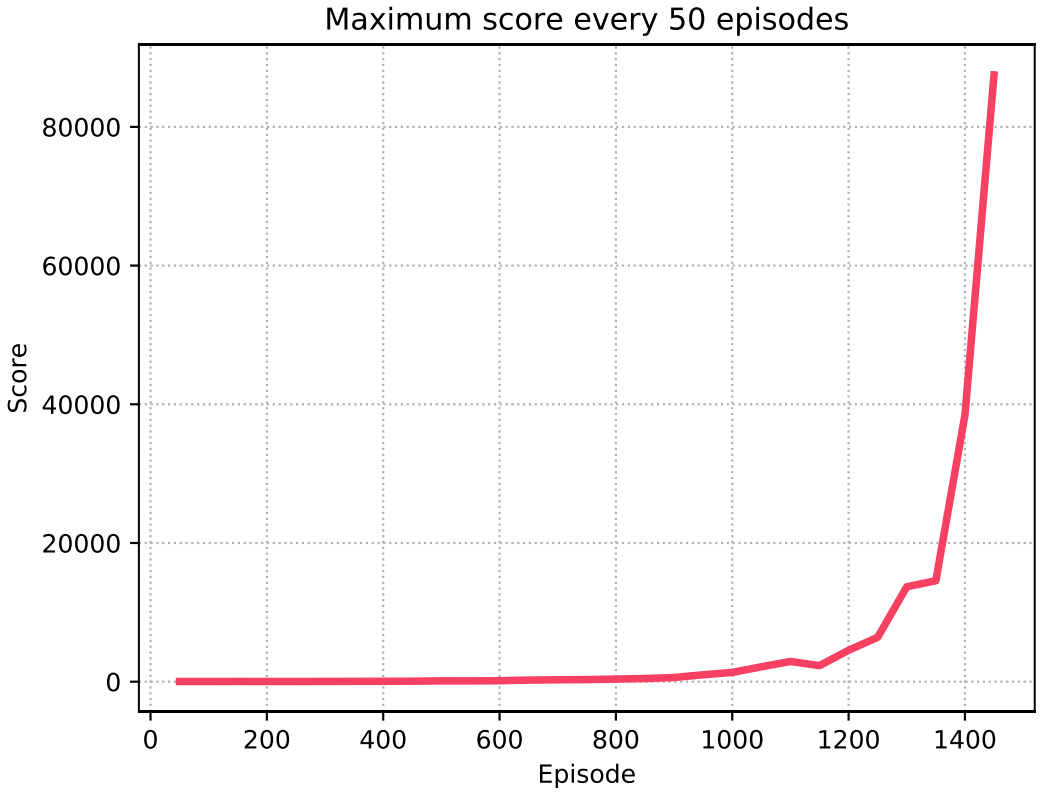
Let's Get Into The Code

EVALUATION CRITERIA

- Each block placed yields 1 point.
- When clearing lines, the given score is number_lines_cleared^2 × board_width.
- Losing a game subtracts 1 point.
- An arrangement is valid only if each brick aligns with at least one another brick along its full side.

OUTCOME

- From the given graph it can be inferred that after 1400 training episodes we can get the highest result.



Here Score is Multiplied by 10 for better graph results.

FUTURE SCOPE

- Deep Q – Learning can be used in various sectors wherever Reinforcement learning is applicable.
- Some of the future scopes are:

- Health Care
- Robotics
- Finance
- Gaming
- NLP

CONCLUSION

- From this assignment I have learned implementation of Q – Learning Algorithm on Tetris Game, Implementation of neural network and Interfacing with graphics through python programming.


ANY QUESTIONS?
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thank you!