Introduction:

The field of artificial intelligence has advanced rapidly in the past decade, with deep learning and reinforcement learning emerging as key areas of research. In this proposal, we aim to tackle the problem of developing an AI agent that can learn to play Atari games at a superhuman level, using deep reinforcement learning and Q-learning algorithms.

Problem Statement:

The problem statement for this proposal is to develop an AI agent that can learn to play Atari 2600 games at a superhuman level. The AI agent must learn to identify the game environment, interpret the game state, and take actions that maximize its score. The challenge lies in designing a reinforcement learning algorithm that can learn complex strategies and overcome obstacles in real time. The solution requires using deep neural networks as function approximators to estimate the action-value function and the Q-learning algorithm to update the parameters of the neural network.

Application Domain:

The proposed AI agent has applications in the gaming industry, where it can be used to develop smarter and more efficient game agents. It can also be applied to other domains such as robotics and autonomous systems, where the agent can learn to navigate and perform tasks in complex environments.

Plan to Tackle:

The proposed solution involves developing an AI agent using a combination of deep reinforcement learning and Q-learning algorithms. The model will be trained using a large dataset of human-expert demonstrations and further refined through trial and error by playing against itself.

The first step in developing the AI agent is to implement a deep reinforcement learning algorithm that can interpret the game state and take actions to maximize the score. The algorithm will use a neural network as a function approximator to estimate the action-value function. The Q-learning algorithm will then be used to update the parameters of the neural network based on the rewards received by the agent.

To improve the performance of the AI agent, we will explore the use of Exponential Moving Average Based Multiagent Reinforcement Learning Algorithms, which can help the agent learn more efficiently by leveraging the experiences of multiple agents. We will also explore Reinforcement Learning with Augmented Data, which involves using generated data to supplement the training dataset, further improving the performance of the AI agent.

Cite Reference Papers:

We plan to cite the following papers in our proposal report:

1. "Playing Atari with Deep Reinforcement Learning" (base paper) - This paper introduced the concept of using deep reinforcement learning to play Atari games and demonstrated that the AI agent can learn to play the games at a superhuman level.
2. "Deep Reinforcement Learning" - This paper provides a comprehensive overview of deep reinforcement learning algorithms and their applications.
3. "Q-learning Algorithms: A Comprehensive Classification and Applications" - This paper provides a detailed classification of Q-learning algorithms and their applications, which will be useful in selecting the most appropriate algorithm for our AI agent.
4. "Exponential Moving Average Based Multiagent Reinforcement Learning Algorithms" - This paper introduces the use of exponential moving average based multiagent reinforcement learning algorithms and their potential to improve the performance of AI agents.
5. "Reinforcement Learning with Augmented Data" - This paper explores the use of augmented data to supplement the training dataset in reinforcement learning algorithms.
6. "Human-level control through deep reinforcement learning" - This paper demonstrates the ability of deep reinforcement learning algorithms to achieve human-level performance in complex tasks.
7. "Revisiting the Arcade Learning Environment: Evaluation Protocols and Open Problems for General Agents" - This paper discusses the challenges and open problems in developing general AI agents that can learn to play Atari games at a superhuman level.

Artificial Intelligence Techniques:

The AI agent will be developed using various artificial intelligence techniques such as deep learning, reinforcement learning, and Q-learning. We will use deep neural networks to estimate the action-value function, which maps the state of the game to a value representing the expected reward. Q-learning will be used to update the parameters of the neural network, which helps the AI agent learn to take actions that maximize its score. Additionally, techniques such as experience replay and target networks can be used to improve the stability and performance of the AI agent.

In conclusion, this research aims to develop an AI agent that can play Atari games at a superhuman level using Q-learning and deep reinforcement learning techniques. The objective is to analyze the performance of the AI agent and compare it with state-of-the-art algorithms. Our research has potential applications in game development, entertainment, and education.