**CHAPTER 1**

**INTRODUCTION AND REQUIREMENTS**

* 1. **Objective of the Mini Project**

The primary objective of this research is to develop and implement an artificial intelligence (AI) system capable of autonomously learning to walk without pre-programmed instructions or predefined motion patterns. Initial simulations were conducted in controlled virtual environments, where the AI agent began with no prior knowledge of locomotion. Through iterative learning cycles, the agent was rewarded for movements that resulted in forward progression and penalized for falls or collisions.

The reward-based system facilitated the gradual refinement of walking techniques, eventually leading to stable and efficient locomotion. The framework incorporates neural networks that adapt to dynamic changes and unforeseen obstacles, emulating the natural learning processes found in biological organisms. It explores the principles of reinforcement learning, implement algorithms that enable autonomous learning and analyze the challenges and breakthroughs in teaching an AI to walk.

This includes the following specific goals:

1. **Design and Development**: Create an AI framework based on reinforcement learning algorithms that can interact with its environment to optimize walking strategies through trial and error.
2. **Simulation and Training**: Conduct simulations in virtual environments to enable the AI agent to learn locomotion from scratch, refining its walking techniques through iterative learning cycles.
3. **Algorithm Optimization**: Apply advanced deep reinforcement learning techniques, such as Proximal Policy Optimization (PPO) and Deep Q-Networks (DQN), to handle high-dimensional input spaces and dynamic environments effectively.
4. **Neural Architecture**: Develop a neural network architecture that mimics biological learning processes, incorporating mechanisms for memory, prediction, and adaptation to enhance the AI's learning efficiency and walking stability.