

Abstract

This thesis aims to provide a comprehensive and strong foundation for those who wish to delve into reinforcement learning. The main source of this work is the book [1] by Richard S. Sutton and Andrew G. Barto, which is considered a foundational text in the field of reinforcement learning.

In addition, the article [2] received outstanding attention in the writing of the thesis, which excellently presents the problem approach of RL and control theory and their contemporary intertwining.

Alongside these great works, there will be noted a great number of educational materials for those who wish to delve deeper into the subject.

The thesis contains four chapters, which aim to introduce the reader step by step to the mathematical world of reinforcement learning.

The first chapter contains an easy-to-understand and comprehensive overview, which places RL among other machine learning paradigms and discusses its parallels with human learning.

The second chapter starts to explore the topic with a mathematical eye. In it, after presenting the basic definitions, the basic problem of RL is stated, and then a mathematically idealized approach is presented to solve it, which is none other than the Markov decision process.

The third chapter is about how control theory deals with the question of safe learning and safe working. This chapter builds heavily on what was described previously and aims to provide a completely formal insight into the topic.

The fourth chapter wants to present what has been said through a simple example and put into perspective the possibility of solving more complex problems with the use of reinforcement learning.