Emily Lyon

Deep Reinforcement Learning From Theory to Empirical Research

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Preface

Reinforcement learning is a branch of machine learning (ML), which is different from traditional machine learning such as supervised and unsupervised learning. It focused on learning from agent-environment interactions to achieve certain goal(s) optimally. The learning process is interactive and driven both internally and externally. Rencent developments in other machine learning techniques, especially neural networks, have been driving forces which help advance this field significantly. The improvements in both the scope and the depth of problems being studied and solved in the area are encouraging. This book starts from introduction to math foundations, to recent improvements and advanced topics.

Why This Book

This book is written as a comprehensive introduction to the field of reinforcement learning, with the focus on recent improvements and new techniques in the area. It starts with the introduction to traditional reinforcment learning and its evolution, math foundations in the area, to the recent technique advances in the area that are being applied and developed, including deep reinforcement learning algorithms. Then, one chapter is dedicated to the realistic applications, followed by advanced topics in both academy and industry and attemptive solutions, which make RL-based models and systems empirical.

April, 2024 *Emily Lyon*

Contents

Acronyms

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ABC Spelled-out abbreviation and definition
BABI Spelled-out abbreviation and definition
CABR Spelled-out abbreviation and definition

Chapter 1
Introduction

Abstract Reinforcement Learning nowadays are widely used in various industries, including business, IT, Pharmacy and government, etc.. Along with the development and thrive of WWW and other important computer techniques, such as IOT and neural network, the breath and depth of the use of Reinforcement Learning have improved significantly. In this chapter, we highlight the evolution of Reinforcement Learning. Discuss the use of Reinforcement Learning in our daily life and beyond. Finally, we brifely discuss advanced topics in the area and leave the details to be elaborated in later chapters.

1.1 Evolution of Reinforcement Learning

1.1.1 Basic Reinforcement Learning

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Chapter 4
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Chapter 6
Advanced Topics

6.1 Memorization

6.2 Alignment of Target Network

6.3 Policy Drift and the Solutions

6.4 Sociality and Trust

6.5 Attack Resistance

6.6 Privacy Preservation

6.7 Personalization

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Chapter 7
Empericcal Researches Ongoing

7.1 Adoptations of Neuroscience

7.2 Future of Deep Reinforcement Learning

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Appendix A
Appendix

All's well that ends well

A.1 Math Appendix

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