Preface

Reinforcement learning is a branch of machine learning (ML) that is different from traditional machine learning areas 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. Recent developments in other machine learning techniques, especially neural networks, have been driving forces that 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.

Why This Book

This book is written as a comprehensive introduction to the field of reinforcement learning, with a focus on recent improvements and new techniques in the area. It starts with an introduction to traditional reinforcement learning and the evolution of reinforcement learning, to the math foundations, and 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 realistic applications, followed by advanced topics in the academy and industry with attempted solutions, which make RL-based models and systems empirical.

Chapter Summary

Chapter 1. Introduction, presents the basic RL concepts, main branches of RL, and real-world applications.

Chapter 2. Mathematics in Reinforcement Learning, presents the mathematics foundations of RL problems and those of its main branches.

Chapter 3. Deep Reinforcement Learning models, presents popular deep reinforcement learning models with a focus on recent improvements.

Chapter 4. Empirical Reinforcement Learning Systems, presents several real-world reinforcement learning systems.

Chapter 5. Performance Evaluations, describes evaluation criteria of RL algorithms and systems.

Chapter 6. Advanced Topics, presents difficulties and pinpoints to design and implement functional RL systems.

Chapter 7. Researches Ongoing, desribes ongoing topics in the area and briefly talks about the integration of RL into related scientific areas.

Draft, Jan. 2021 *Emily Lyon*