

Using the Philosophy of Reinforcement Learning to Practice Snowboarding

SUBMISSION #0003
IBBB-2019

Abstract

Reinforcement learning is one part of a decades-long trend within artificial intelligence and machine learning towards greater integration with statistics, optimization, and other mathematical subjects. It can also play an important role in our daily life as a guidance of interacting with this world. In this article, I explained how to use some important reinforcement learning technique like transfer learning, pure reinforcement learning and imitation learning to guide the practicing of snowboarding. It can provide some advice for using the philosophy of reinforcement learning to live a better life.

Keywords Reinforcement Learning, Imitation Learning, Transfer Learning, Snowboarding

1. Introduction

Ever since I learned about reinforcement learning, I have always been taking the philosophy of reinforcement learning as the guidance of my life. In this article, I described the process of snowboarding exercising under the guidance of reinforcement learning as an high-level intelligent agent.

2. Background

2.1. Snowboarding

Snowboarding is a recreational activity, and a sport in both Winter Olympic and Paralympic. It involves descending a snow-covered slope while standing on a snowboard attached to a rider's feet. Since snowboarding's inception as an established winter sport, it has developed various styles, each with its own specialized equipment and technique. The most common styles today are: free-ride, freestyle, and

free-carve/race. These styles are used for both recreational and professional snowboarding. While each style is unique, there is overlap between them.

2.2. Reinforcement Learning

Reinforcement learning is learning what to do and how to map situations to actions so as to maximize a numerical reward signal. The learner is not told which actions to take, but instead must discover which actions yield the most reward by trying them. In the most interesting and challenging cases, actions may affect not only the immediate reward but also the next situation and, through that, all subsequent rewards. These two characteristic trial-and-error search and delayed reward are the two most important distinguishing features of reinforcement learning.

3. Method

3.1. Transfer Learning

Concept The transfer learning is about migrating knowledge from one area (the source domain) to another (the target area), enabling to achieve better learning results in the target area.

Training Process When I first tried to practice snowboarding, it was in 2015. Before that, I have been skilled in skiing for 5 years. I thought skiing and snowboarding may have a lot of connections. They both are carried out on the snow and they both need board to slip on the snow. I was so confident that I thought I could master the snowboarding skill soon. So after I put the snowboarding shoes on, I just stood in the holder of the board and headed towards to the foot of the mountain. But when I started to slide, I found it was so different from the control way of skiing. I did not know how to slow down and brake until I crashed into the protecting wall. After a sequence of splash and squelch, I lied down like a dead man in the snow with my belt broken and my glasses ten meters away. People around me praised me that I was a real man.

Conclusion The transfer learning made me hurt myself and that is why I don't want to use it again. If you try to transfer the knowledge by violence, it may not be a good idea.

3.2. Pure RL using exploiting and exploring

Concept If you maintain estimates of the action values, then at any time step there is at least one action whose estimated value is greatest. We call these the greedy actions. When you select one of these actions, we say that you are exploiting your current knowledge of the values of the actions. If instead you select one of the non-greedy actions, then we say you are exploring, because this enables you to improve your estimate of the non-greedy action's value.

Training Process Being afraid of falling badly again, I started to practice on the gentle slope. This time I tried to be a normal and cute agent to practice from a start. I tried to slide at a very low speed and control the direction without falling down. However, the learning process is so slow. I spent a lot time but still not knew how to protect my butt. My pants were totally wet through and the feeling hit deeply into my heart.

Conclusion Pure RL using exploiting and exploring can be a good way to protect you from dying but it also needs a lot of time to train. As an aspirant agent, I cannot wait for so long.

3.3. Imitation Learning

Concept Imitation learning refers to a learning mode characterized by the behavior of imitating an example. In some ways, it's a bit like Auto-encoders and GANs.

Training Process Finally I realized it was a waste of time and money staying in the ski resort, I took off my gloves and googled some tutorials and videos of snowboarding. As a smart agent, I quickly mastered some basic approaches like front-side turn, backside turn and braking. I felt the training curve was starting to grow exponentially. With a sufficient training epochs, I have become a skilled snowboarding player. And as a well-trained agent, I taught some other agents using the same way successfully. The imitation learning appears to be more corresponded to the human nature.

Conclusion Imitation learning may be the most important approach in training snowboarding. It inspires me to learn more about it in my scientific research of life.

4. Experiments

4.1. Equipment

ski suit, ski goggles, ski gloves, snowboarding shoes (rented because I'm poor), snowboard (still rented because I'm so poor and if any sponsorship please contact me: 18222860970@163.com). Figure 1 shows a picture of the training process with the equipment for snowboarding.



Figure 1. A Picture of the Training Process

4.2. Results

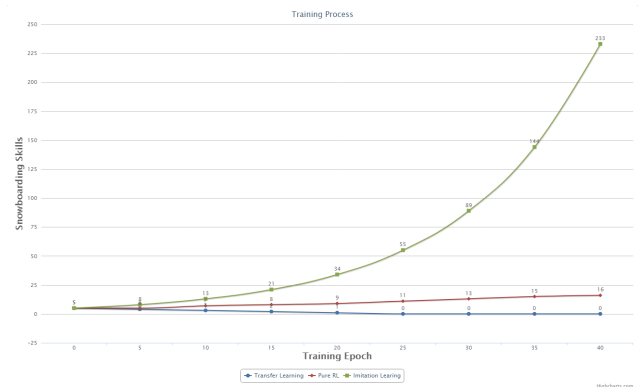


Figure 2. Performance of 3 training curves

As we can see in Figure 2, the blue one is the Transfer Learning, the red one is the Pure RL and the green one is the Imitation Learning. It's obvious that the Imitation Learning has the best result. As the training is still in process, I'll update the results in my academic blog whose URL is hidden in this paper and nobody can see it. The training videos will also be on the website.

5. Summary and Future Work

In this article, I introduced the snowboarding training process of using reinforcement learning technique like transfer learning, pure reinforcement learning and imitation learning and compared their results. The imitation learning may be the new future of reinforcement learning and strong artificial intelligence according to our experiments.

In the following work, I will continue to look for the sponsorship to buy my own snowboard and try to find other important application in my daily life. I think my work can be instructive for the AI research direction in the future.

Acknowledgments

As a fresh man, I want to show my respect to the organizers of IBBB 2019. The website and the awards are so sincere that encouraged me to learn about \LaTeX and bullshitting. And I want to appreciate my friends. My roommate Peng Zhang, who often stays up late until 2 A.M. studying something that he does not want me to know in his little tent. And thanks for asking me to ride for 7 km to eat hotpot in the winter night after everybody was ready to sleep. Yihai Duan also helped me a lot before he got a girlfriend. And I promised Weixun Wang to mention his name when I publish my first paper. I made it! And finally I want to say thank you to my girlfriend Jie Yang for no reason. Thank you all again! Wish the IBBB-2019 a complete success!