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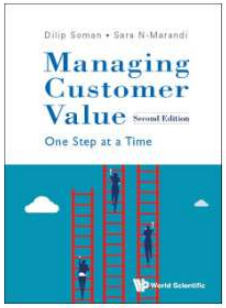

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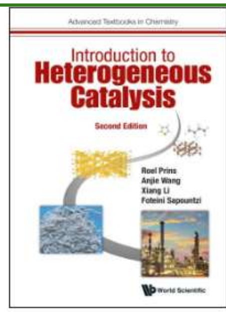

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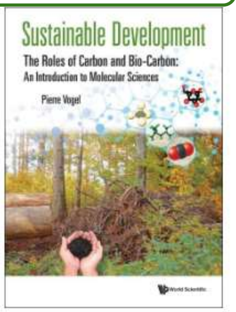

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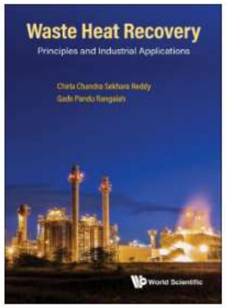

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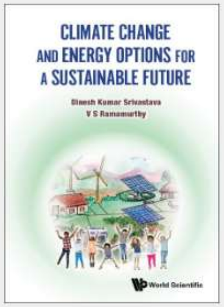

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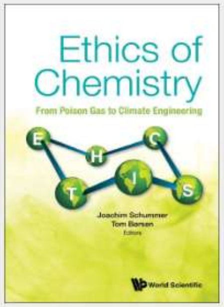

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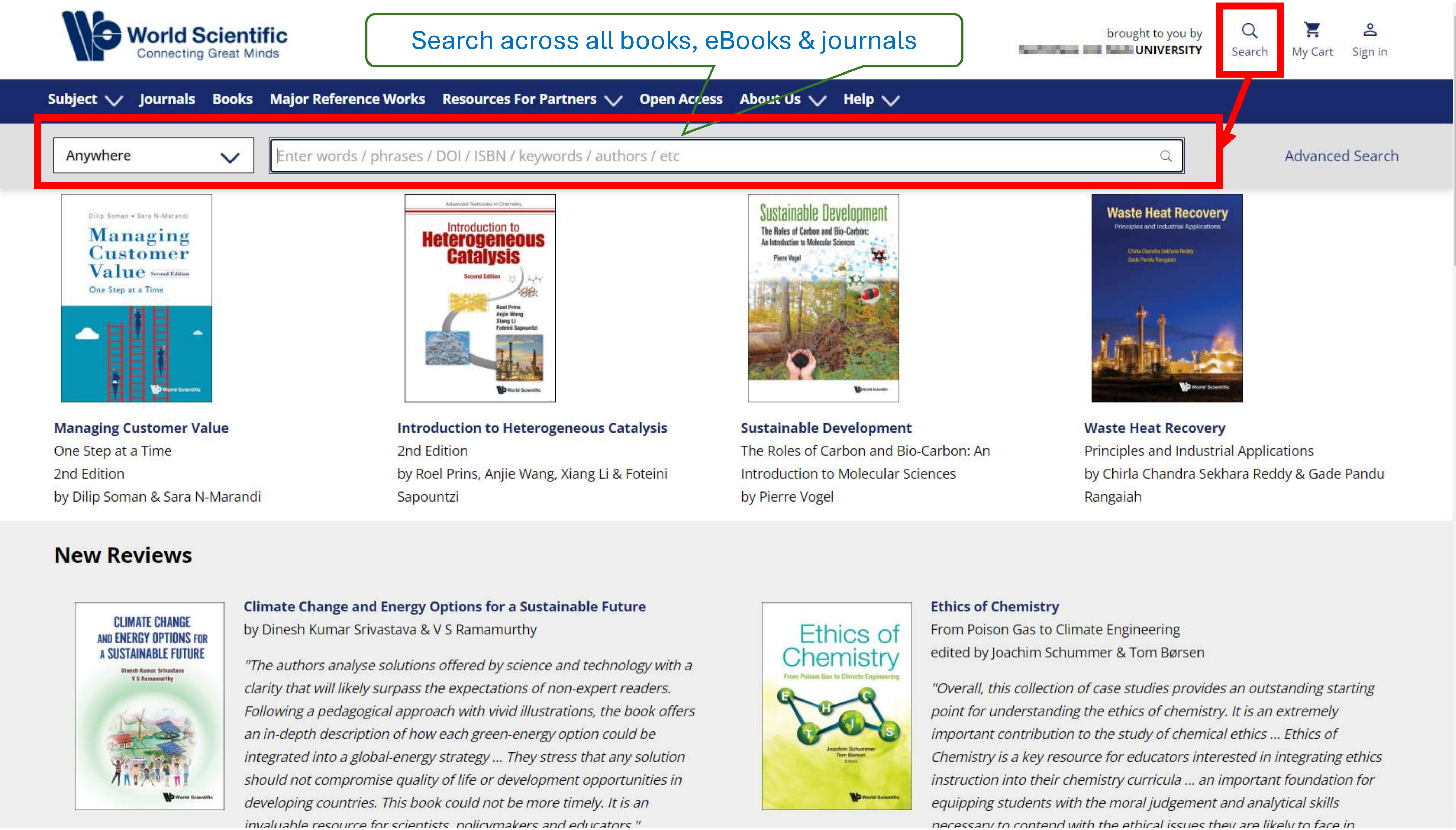
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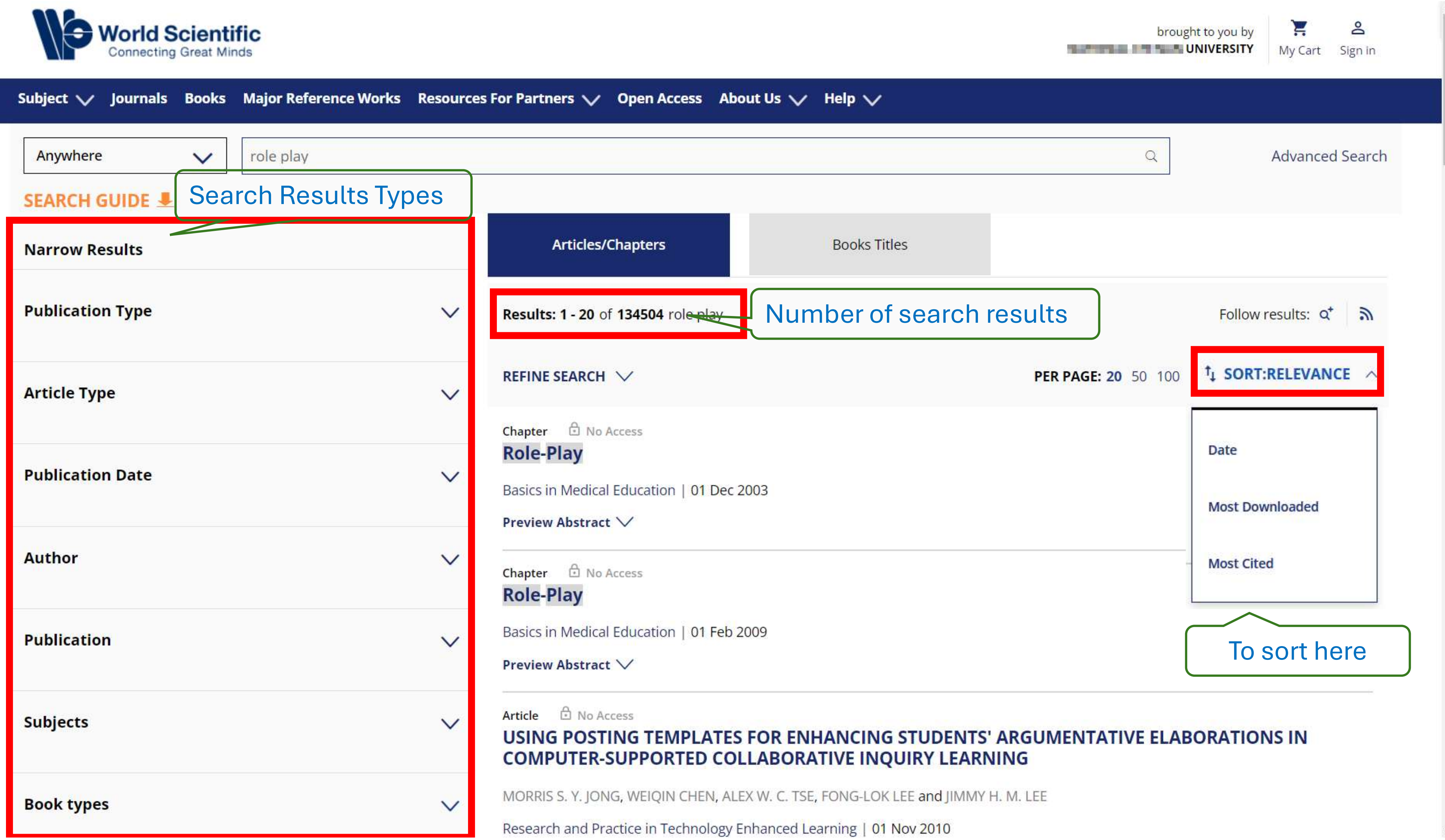
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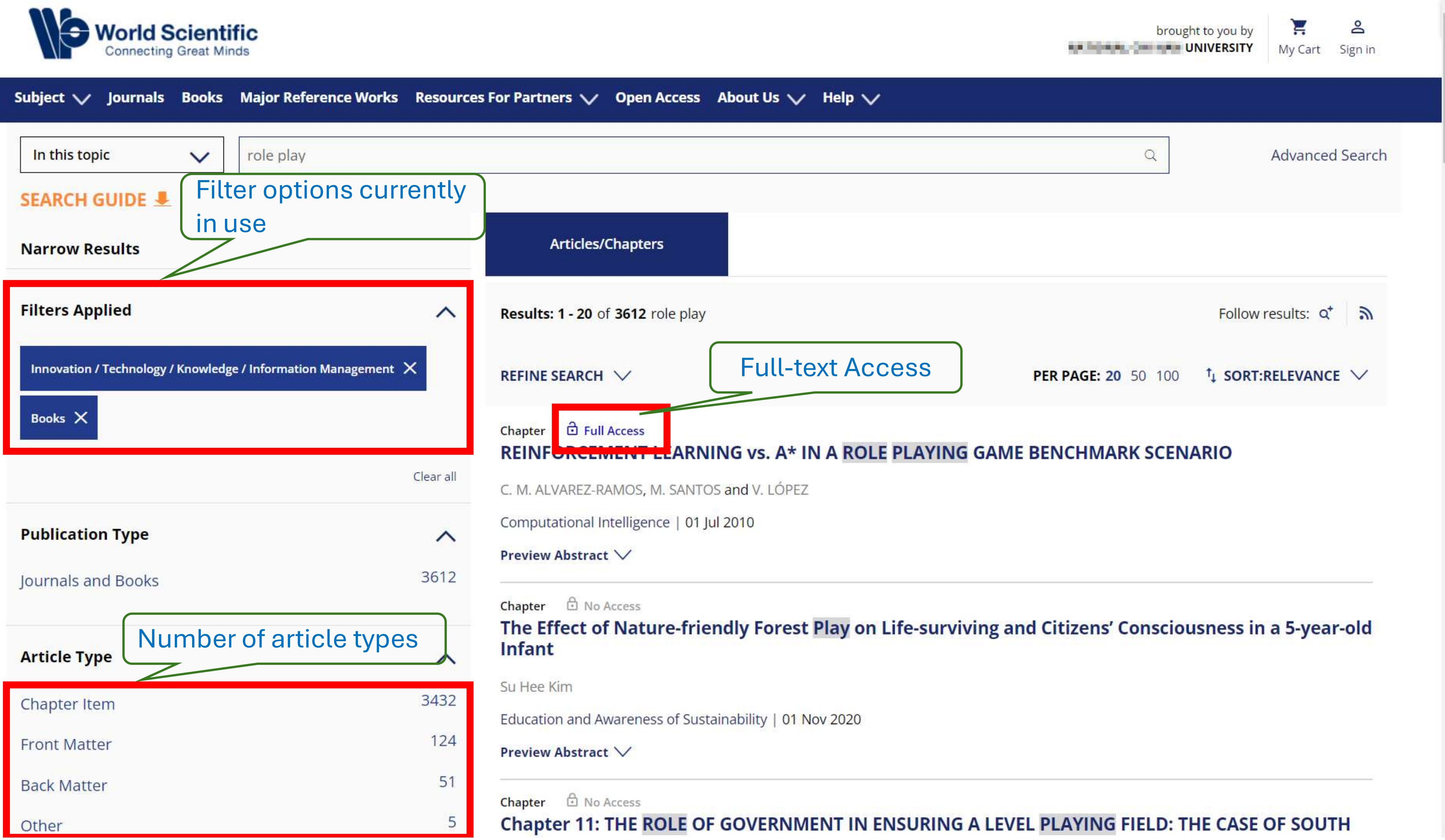
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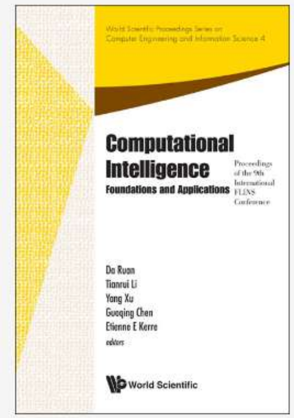

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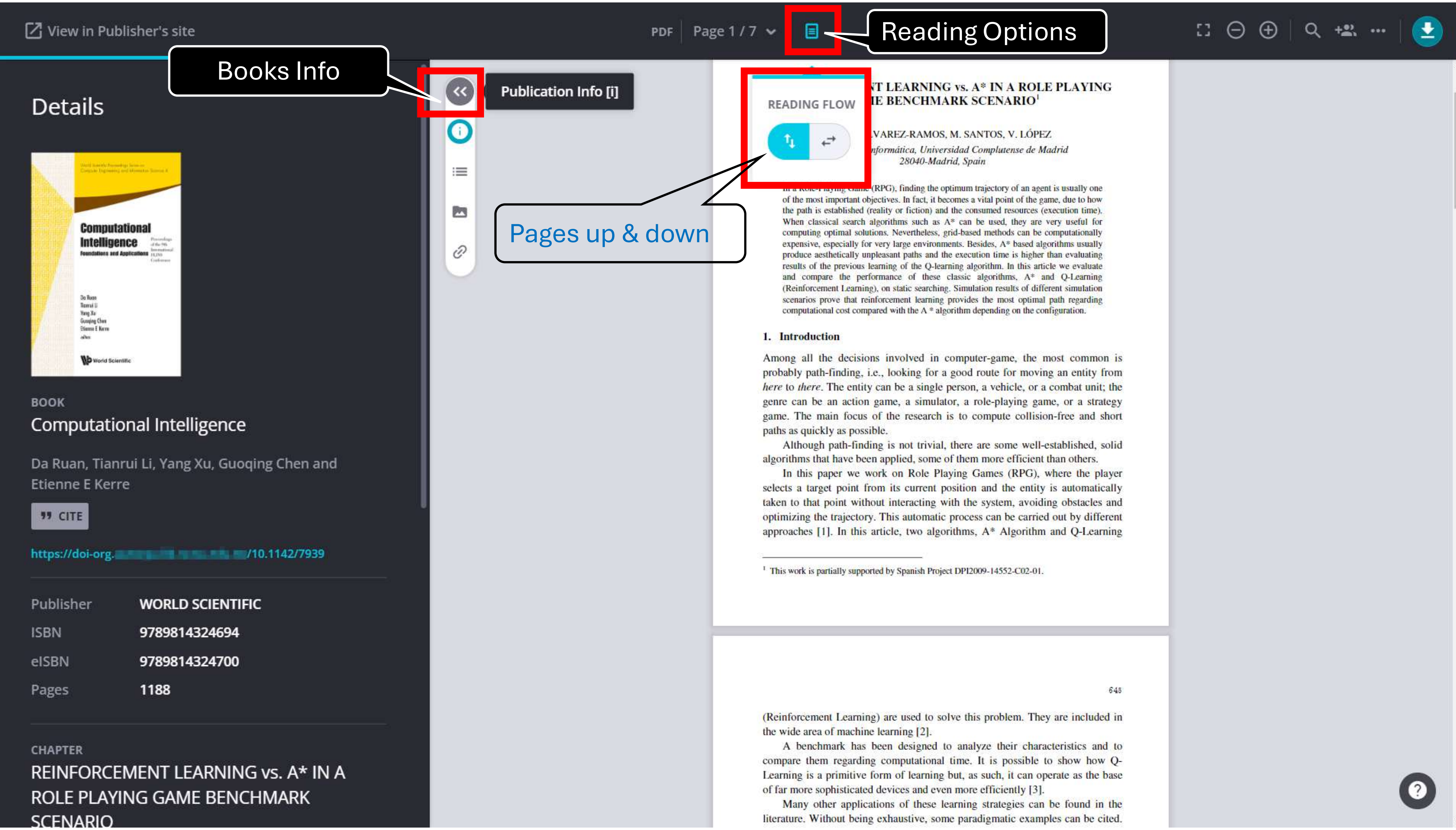
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Although path-finding is not trivial, there are some well-established, solid algorithms that have been applied, some of them more efficient than others.
In this paper we work on Role Playing Games (RPG), where the player selects a target point from its current position and the entity is automatically taken to that point without interacting with the system, avoiding obstacles and optimizing the trajectory. This automatic process can be carried out by different approaches [1]. In this article, two algorithms, A* Algorithm and Q-Learning
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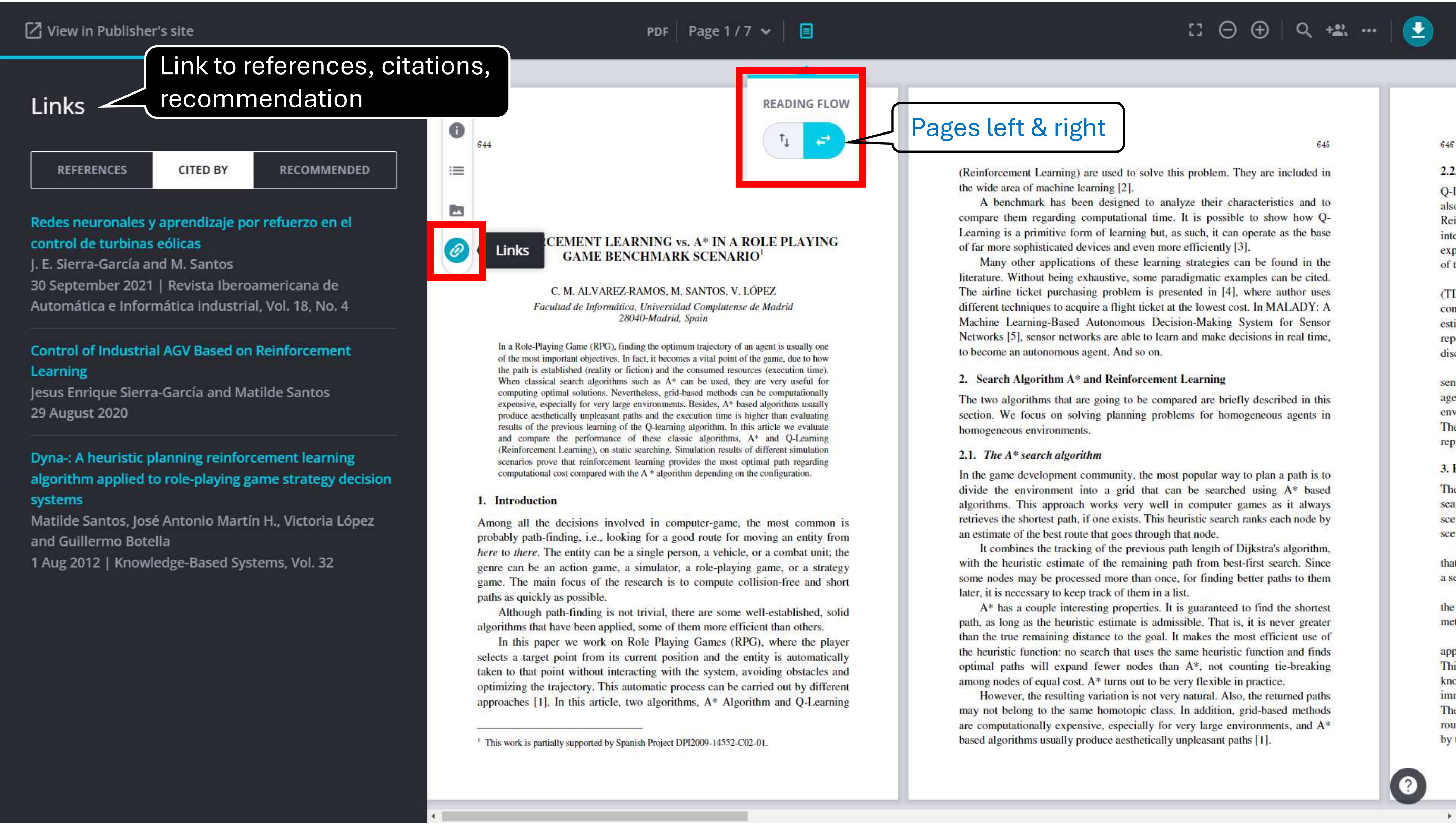
(Reinforcement Learning) are used to solve this problem. They are included in the wide area of machine learning [2].
A benchmark has been designed to analyze their characteristics and to compare them regarding computational time. It is possible to show how Q-Learning is a primitive form of learning but, as such, it can operate as the base of far more sophisticated devices and even more efficiently [3].
Many other applications of these learning strategies can be found in the literature. Without being exhaustive, some paradigmatic examples can be cited.



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Facultad de Informática, Universidad Complutense de Madrid
28040-Madrid, Spain
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Many other applications of these learning strategies can be found in the literature. Without being exhaustive, some paradigmatic examples can be cited. The airline ticket purchasing problem is presented in [4], where author uses different techniques to acquire a flight ticket at the lowest cost. In MALADY: A Machine Learning-Based Autonomous Decision-Making System for Sensor Networks [5], sensor networks are able to learn and make decisions in real time, to become an autonomous agent. And so on.
2. Search Algorithm A* and Reinforcement Learning
The two algorithms that are going to be compared are briefly described in this section. We focus on solving planning problems for homogeneous agents in homogeneous environments.
2.1. The A* search algorithm
In the game development community, the most popular way to plan a path is to divide the environment into a grid that can be searched using A* based algorithms. This approach works very well in computer games as it always retrieves the shortest path, if one exists. This heuristic search ranks each node by an estimate of the best route that goes through that node.
It combines the tracking of the previous path length of Dijkstra's algorithm, with the heuristic estimate of the remaining path from best-first search. Since some nodes may be processed more than once, for finding better paths to them later, it is necessary to keep track of them in a list.
A* has a couple interesting properties. It is guaranteed to find the shortest path, as long as the heuristic estimate is admissible. That is, it is never greater than the true remaining distance to the goal. It makes the most efficient use of the heuristic function: no search that uses the same heuristic function and finds optimal paths will expand fewer nodes than A*, not counting tie-breaking among nodes of equal cost. A* turns out to be very flexible in practice.
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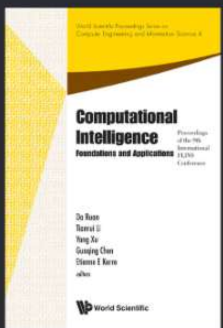

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REINFORCEMENT LEARNING vs. A* IN A ROLE PLAYING GAME BENCHMARK SCENARIO

REINFORCEMENT LEARNING vs. A* IN A ROLE PLAYING GAME BENCHMARK SCENARIO[1]

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Facultad de Informática, Universidad Complutense de Madrid
28040-Madrid, Spain

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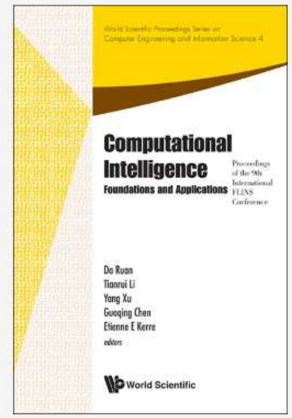

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Abstract:

In a Role-Playing Game (RPG), finding the optimum trajectory of an agent is us ctives. In fact, it becomes a vital point of the game, due to how the path is established (reality or fiction) and ime). When classical search algorithms such as A* can be used, they are very useful for computing optimal s ethods can be computationally expensive, especially for very large environments. Besides, A* sthetically unpleasant paths and the execution time is higher than evaluating results of the previous learning of the Q-learning algorithm. In this article we evaluate and compare the performance of these classic algorithms, A* and Q-Learning (Reinforcement Learning), on static searching. Simulation results of different simulation scenarios prove that reinforcement learning provides the most optimal path regarding computational cost compared with the A * algorithm depending on the configuration.

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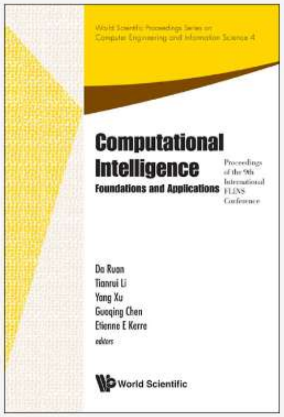

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Abstract:

In a Role-Playing Game (RPG), finding the optimum trajectory of an agent is usually one of the most important objectives. In fact, it becomes a vital point of the game, due to how the path is established (reality or fiction) and the consumed resources (execution time). When classical search algorithms such as A* can be used, they are very useful for computing optimal solutions. Nevertheless, grid-based methods can be computationally expensive, especially for very large environments. Besides, A* based algorithms usually produce aesthetically unpleasant paths and the execution time is higher than evaluating results of the previous learning of the Q-learning algorithm. In this article we evaluate and compare the performance of these classic algorithms, A* and Q-Learning (Reinforcement Learning), on static searching. Simulation results of different simulation scenarios prove that reinforcement learning provides the most optimal path regarding computational cost compared with the A * algorithm depending on the configuration.

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