Reinforcement Learning in a Nonstationary Environment: The El Farol Problem

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BiblioGov. Paperback. Book Condition: New. This item is printed on demand. Paperback. 44 pages. Dimensions: 9.7in. x 7.4in. x 0.1in.This paper examines the performance of simple learning rules in a complex adaptive system based on a coordination problem modeled on the El Farol problem. The key features of the El Farol problem are that it typically involves a medium number of agents and that agents pay-off functions have a discontinuous response to increased congestion. First we consider a single adaptive agent facing a stationary environment. We demonstrate that the simple learning rules proposed by Roth and Erev can be extremely sensitive to small changes in the initial conditions and that events early in a simulation can affect the performance of the rule over a relatively long time horizon. In contrast, a reinforcement learning rule based on standard practice in the computer science literature converges rapidly and robustly. The situation is reversed when multiple adaptive agents interact: the RE algorithms often converge rapidly to a stable average aggregate attendance despite the slow and erratic behavior of individual learners, while the CS based learners frequently over-attend in the early and intermediate terms. The symmetric mixed strategy equilibria is unstable: all three learning...

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