Smart Charging of Electric Car using Deep Reinforcement Learning

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This work addresses the problem of finding an efficient strategy for charging an electric vehicule (EV). This problem can be solved by a greey approach (i.e. charging the vehicule as soon as it arrives) but the more EVs penetrate the car market, the more this strategy might overload the electric distribution grid at commuting hours. To overcome this, one can postpone the charging during night or during low prices period of the electric market.

Inspired by the work of [1], we developed an algorithm that optimizes the charging strategy to minimize the charging cost based on day-ahead prices. It has to : - satisfy different constraints : operating constraints, battery power level, quality of service for the car owner...; - operate in an uncertain environment : unknown car departure or arrival time, unknown house consumption...

We detail the problem as a Markov decision process under uncertainty. We applied an A3C reinforcement learning algorithm (as described in [2]) to learn an efficient charging strategy. We use a variation of the algorithm using LSTM [3] to cope with temporal consistency of decisions. We present some preliminary results on real data showing the improvement of the strategy over the learning iterations.

References

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