INF436 Machine Learning / Homework 4

Reinforcement Learning: Automated Trading System (ATS) based on the Q-Learning algorithm

Jae Yun JUN KIM*

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Due: Before the next lab session.
Evaluation: Interrogation during the next lab session about:

- code (in group of up to 3 people)
- (theoretical, practical) questions (individual)

Remark:

- Only groups of one/two/three people accepted. Forbidden groups of larger number of people.
- No late homework will be accepted.
- No plagiarism. If plagiarism happens, both the "lender" and the "borrower" will have a zero.
- Code yourself from scratch. No homework will be considered if you solve the problem using any ML library.
- Do thoroughly all the demanded tasks.
- Study the theory for the interrogation.

1 Tasks

1. Download the two files that contain daily stock prices for Bank of America and GE (obtained from Yahoo! Finance), which range from March 29, 2012 to March 28, 2017 (1287 days). Each file contains 7 columns, but you are going to use only the data from two columns: Date and Close (in USD).
2. Separate the dataset in two parts: training and test datasets.
3. Suppose that you initially have 5000 USD and no share. Define the portfolio as a function of time, which is defined as the sum between the cash and the number of shares multiplied by the share value that you have for a given time. You will consider only one financial product at a time (that is, not both). You will consider three actions: hold, buy, and sell. The number of shares that you buy or sell can be considered to be always a same value (at your will). Define the state and the reward at your will. Choose also the learning rate and the discount factor at your will. To simplify the problem, you can ignore the transaction fee. But, if you want to make the problem more realistic, you can consider it as proportional to the volume that you buy or you sell.
4. Implement the Q-learning algorithm explained in class to find the sequence of policies that maximize the portfolio.
5. Test your automatic trader with the test dataset.
6. Repeat both the training and testing procedures separately for both products: Bank of America and GE.
7. Discuss about the performance of your algorithm.

*ECE Paris Graduate School of Engineering, 37 quai de Grenelle 75015 Paris, France; jae-yun.jun-kim@ece.fr