An improved control strategy for gene regulatory networks using batch reinforcement learning

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Abstract: The control of Gene regulatory networks (GRNs) aims at finding a strategy which is used for prevention of undesirable states such as those associated with a disease.In fact the control problem for gene regulatory system means controlling the state of system through intervention of some Input genes called control genes to achieve the goal.In reviewed external control methods these approaches firstly model GRN as a probabilistic boolean network then identify the algorithm to find the best policy. By increasing the number of control genes and also genes within a network, the time complexity and space complexity exponentially increase. A solution to overcome this problem is to use a model-based on batch reinforcement learning and then use an approximate strategy. In our proposed method we use a function approximation based on Gaussian feature matrix, least square liner regression algorithm and a greedy strategy to update supervised learning in proposed batch algorithm. The results in both small and large scales demonstrate that the proposed method, in addition to having the advantages of the previous method also provides a more favorable performance by selecting several genes as control genes along with the number of inputs in Boolean function applied for each gene in the network.

Keywords: Gene regulatory network; control; Batch reinforcement learning

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