

ARTICLE REVIEW

THE EVOLUTION GAME THEORY APPLICATION IN MULTIPLE MYELOMA CANCER

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1 Introduction

In the context of the examination of the course, we, members of group 1, are asked to review the article of the group 4 that talks about evolution game theory application in multiple myeloma cancer .

2 Review

2.1 the introduction explains clearly the content of the paper

The introduction is divided into two parts: cancer and computation of evolution game theory. The first part starts by pointing the number of casualties due to cancer in 2012. The reader should be impressed by the given figures and after a brief but concise definition of tumor and cancer, we understand the urge to find a treatment. But to achieve that, they explain well and in a simple way why studying tumor microenvironment is the open door. We slowly understand the abstraction we can create between the evolution game theory (EGT) and the MM (multiple myeloma) malignant cells, the microenvironment involving OB (osteoblast) and OC (osteoclast) cells. The Figure 1 helps a lot to understand the interactions between those cells.

Their talk about computation of evolution game theory in the introduction gives us an overview of what to expect in the Methods section.

The last paragraph tells us that the team did an extension of the existing work and give a short explanation why it is interesting. Overall it a good introduction.

2.2 there is sufficient background information to understand the relevance of the work

If the reader has some good notions in game theory, he will definitely understand this paper because each explanation points are briefly but clearly introduced in order to not loose the reader. Even if some formula are difficult to understand without thinking a little bit.

2.3 the methods are clearly explained

They provide good explanation of the replicator equation. They also give us indication on which third party software to use in order to do the task ourselves, Dynamo3S for example. Their choices of using a discrete game scenario and a finite population model are also justified. We would suggest a more structured text for the algorithm flow or progress, a turn by turn description of the algorithm.

2.4 the results answer the questions asked in the paper

They provide example of treatment (by drug for example) in their results and they show how the model react by explaining clearly which parameters changes and which consequences it has on the system. Moreover the figures that they put into the paper helps the reader to better understand how the model (and generally the cancer) can be influenced by changing some things .

2.5 all questions are answered

The main question is: "How the MM cell signals influence badly cancer prognosis". The article explores the issue in its entirety by considering all the different possible schemes and parameters variations. There is also an other question henced at the end of the introduction. "Does blocking just a part of the MM signal could be sufficient to change the fate of the disease ?" This question is answered as expected at the end of the treatment of the disease section in the discussion.

2.6 the conclusion is sufficient

There is no conclusion in this paper, however we take the discussion part as a conclusion. In that part the reader can find a summary of the results and can see how they influence the system. Moreover the discussion can be more or less understood even if we have not read the result part yet (but obviously to fully understand it, the reader has to go through the results sections).

2.7 the overall style is adequate

The overall style is adequate to a science article and the figures are in the right place in the text and not at the end of the article, this is great for the reader who can read this paper without wasting time in scrolling to view the figures.

The mathematical formula are well separated from the text so that the reader can easily see them. An important point in a scientific paper are the references, indeed they provide a complete and "legal" reference. In other words the paper has a professional and clear style that would lead people to read it.

2.8 things missing in the discussion

A step by step algorithm description for the algorithms used during the simulations would help to understand better how it was precisely implemented.

3 3 positive points concerning the work, clearly specifying why you think they are well-done or interesting

- Very good overall explanation and source citing, the sources are cited in a way that does not alterate the reading experience.
- Self explanatory figures which provide clear and simple explanation. It is almost possible to understand the whole process just par looking at the figures and the corresponding explanations. Indeed it is often disturbing to stop readng in order to look at a figure and then to come back in the text.
- The supplementary part of the article gives an attractive and interesting aspect to the article. Indeed the results of the simulation leads to an interesting conclusion about the possibility to change the disease fate by reducing the MM signals.

4 3 negative points, which may include missing/unclear explanations or suggestions for improvement

- We suggest a turn by turn description of the algorithm progress. The way it is described does not give a good look on the proper execution process, it would be helpfull to have a decomposition of the algorithms in steps to have a better overview of it and maybe understand better the intuition behind the given results.
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- The "supplementary files" part look useless because the reader would not have access to these files

5 at least 3 clear and relevant questions on the content or the methods used which can be asked

- Where does the formulae to calculate the position of the saddle point comes from ?
- Why do you use the Fermi function to calculate the probability ?
- How can poeple contribute to this research ?