Dear the editor and reviewers,

Thank you very much for your valuable time spent on reviewing our article. The comments/suggestions are very constructive and we would like to provide responses to all comments/suggested on how we revised our article as follows:

Reviewer 1:

1. Since, the authors choose flu-like disease for a case study, which is a well-known disease. The SEIR model was chosen. However, why is not SEIRS model due to the recovered period is short?

Response: It is typical for the flu-like disease that both exposed (incubation) and infectious periods are very much shorter than the recovered periods. Specifically, the exposed and infectious periods may last only for days whereas the time the recovered agent is inherited with temporarily immunity to the disease last from a single flu season (months) to up to one year. Consequently, the use of SEIRS does not really reflect the behavior of disease spreading of the flu-like disease, except in an extremely sparse system where the spreading is very insubstantial, so it could persist over an extremely long period of time. However, this is not the case considered in this study.

2. In the method section, the authors said, "The sum <ij> takes only on 1st and 2nd nearest neighbor spins to mimic the real space disease transmission.". Could you describe more about the 1st and 2nd nearest neighbor spins? Is it 4 nearest neighbor for the 1st ring and next ring?

Response: For Monte Carlo simulation on 2D square lattice, the 1st nearest neighboring spins are the nearest 4 spins and the 2nd nearest neighboring spins are the next-nearest 4 spins. Thinking of putting agents on 2D square lattice points, if all agents are facing the East direction, the 4 nearest agents will be on the E, W, N and S directions. However, the 4 next-nearest will be on the NE, NW, SE and SW directions. These "1st" and "2nd" nearest neighbor are typically/generally used in Monte Carlo simulation on lattice system (statistical physics field).

5. What is k in "$\sigma_i = k$"?

Response: This sentence was used to describe the Kronecker Delta function, which means that when σ_i and k are equal in value, the Delta function is 1. Therefore, this k parameter is any general parameters used to compare with σ_i. More information could be found in general mathematic books.

6. I think that the authors should replace infp with a well-known symbol for SEIR model for example γ.

Response: Thank you for your suggestion. However, in disease spreading field, the γ parameter is usually reserved for recovery rate, not the infectious period (e.g. consider https://institutefordiseasemodeling.github.io/Documentation/general/model-seir.html). To my best

knowledge, there has yet to define the general representation of the infectious period, though some books may use *D*. Nevertheless, to comply with reviewer's comment, we changed all the *infp* parameters to *D*'s.

7. In this work, the authors set one mcs is a unit of simulation time. How many of mcs refer to a day?
Response: Similar to Condensed Matter physics system, the mcs used cannot be converted to real time unless the specific system has been defined. For instance, in materials system, one needs to calculate the exchange parameter in real energy unit (e.g. using first principles electronic structure calculation) and then calculate the relaxation time. After that this relaxation can be used to convert mcs to real time (e.g. seconds). In the same way, to relate the mcs used in this work to real time, one has to firstly specify what disease is the case of consideration. Then, one may calculate the basic reproduction number. After that by matching the basic reproduction number, we can then scale the mcs unit with real time via infectious period in a real time unit. However, since this work is to investigate general behavior of any flu-like diseases with an emphasis on the critical infectious period, it is more appropriate to report the time in general mcs unit. To find out the critical infectious period in real unit, one has to supply information from a particular disease, such as the infectious period and the system-size dependent basic reproduction number.

8. In the results and discussion section, the authors said, "From the results, the time dependence characteristic of normalized number of agents in {S,E,I,R} states, or {mS, mE, mI, mR}, were found in good agreement with typical disease spreading behavior [3].". However, in the abstract, the authors mentioned that "From the results, good agreement between the simulation and real spreading results was qualitatively evident." How the results were found in good agreement with real spreading (with epidemic data or typical behavior)?
Response: In epidemiology, with the introduction of a single infectious agent into the susceptible pool, the number of S agents drop, the number of E agents increase, the number of I agent increase (with some lag when comparing to the E curve), and the R agents start to increase when some I agents recover. This results in typical SEIR curves in real disease spreading and our simulation results give the same pattern (agreement). More information can be found in reference [3] (given by Vynnycky and White).

9. In the caption of figure 1, N is equal to 10^2 and N is equal to 100^2 in the caption of figure 2. In method N was varied 100 to 200. This may lead the reader confuse how N is equal to.
Response: Thank you for pointing this unclear point out. In figure 1, it shows an example of SEIR curves for $L = 10^2$, so N becomes 10^4. Then, with $c = 0.01$, the number of agents of the system is $n = cN = (0.01)(10^4) = 100$ agents. To correct this error, the caption of figure 1 has been revised.

10. In the results and discussion section, the authors described that infp is equal to 1. However, in the caption of figure 2, infp is equal to 100 mcs. Furthermore, in x-axis, it was labeled infectious period (mcs) and range from 1 to more than 100. This make me confuse how the authors simulate at fixed infp or varied. To find the infpc, how the authors fit the curve in power-law scale. Did the authors fitted from figure 2?

Response: As stated in the article, we have performed many simulations for many infectious periods. In a simulation, system (L), concentration (c) and the infectious period (D) were fixed until simulation ends. Then, we moved to new set of the $\{L,c,D\}$ parameters and perform another simulation. We repeated this procedure until we have enough data to extract the critical infectious period. However, that the reviewer mentioned about "D is equal to 1" is just a part of the sentence "Further, at very high c, D = 1 mcs may lie in the low survivor phase, causing $m^{S'}$ to decrease with increasing c". It is just an example used to describe the behavior of the disease spreading, not that we performed only a single simulation at D = 1. Indeed, as stated in section 2, the infectious period was not fixed but varied up to 600 mcs.

In addition, as already mentioned in section 3 (first few lines on page 4), "the D_C was then extracted from the smoothed γ that yields maximum slope magnitude" (of the $m^{S'}$), not from power law scaling. This is as, from our results, the characteristic of the normalized survivors reflects some similarities of the order parameter in phase transition and critical phenomena theory. Nevertheless, due to restriction on the number of pages, instead of lengthly explanation, we then direct to a fruitful source if readers wish to acquire an enhanced view, i.e. reference [7] (given by Domb).

Reviewer 2:

1. Please submit the pdf file format only.

Response: The pdf file was submitted.

2. Please consider the 4-pages limit (incurred to extra page-charge).

Response: The article has 4 pages.

3. Please strictly revise the manuscript according to reviewers' comments. This is a MINOR revision required.

Response: The article has been revised according to the reviewer's comments/suggestions. (see above).

4. Please double check if the manuscript follows the IOP's Guidelines and Templates. Please USE "JPCSA4Template.docx", READ "JPCSWordTemplateGuidelines.doc", and STRICTLY follow the directions given in "JPCSExampleWordDocument.docx". These files can be downloaded from https://publishingsupport.iopscience.iop.org/author-guidelines-for-conference-proceedings/

Response: The revised article strictly follows the IOP's format.

Yours sincerely,
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