

Geosci. Model Dev. Discuss., referee comment RC1  
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## Comment on gmd-2022-166

Anonymous Referee #1

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Referee comment on "The Intelligent Prospector v1.0: geoscientific model development and prediction by sequential data acquisition planning with application to mineral exploration" by John Mern and Jef Caers, Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2022-166-RC1>, 2022

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I enjoyed reading this paper! It is a nice piece of work on a very interesting topic.

My main comments are related to i) comparison of algorithmic parameters and ii) extensions to 3D. Comment i) requires some work, but I think it should be relatively fast to do in a revision. Comment ii) can be discussed some more and left for future work.

i) Your paper contains a number of cases, but there are limited comparison of the suggested method using different tuning parameters  $m$ ,  $k$ ,  $\alpha$ . I am guessing by tuning some of these one could have a greedy approach at one end versus a very deep one which is more time consuming at the other end. But I don't see much comparison of using various of these (extreme) inputs as it is now. I am also not sure how easy it would be to compare the suggested approach with ones like Q-learning or other RL / value iteration methods for your case?

ii) In practical mining operations, wouldn't there ordinarily be sequential 3D boreholes where one can choose and modify the drilling order / locations? One could also potentially stop data collection (and drilling) in one borehole after a certain depth (before the initial planned depth is reached). Along boreholes one could also have different data collecting frequency. The suggested strategy for collecting data seems a bit restricting in this setting - as it is 2D only in this paper. What more is needed or possible in 3D?

iii) Some detail comments:

- Mark  $a_1$  and  $a_2$  on first axis of Figure 1, as well as have 'x' or similar as the axis label.

- l175: This is accounts?

-Around Table 1, I don't think all these comparison of AI and geo terminology are needed.

-In Sect 4.1 there is a discussion of "actions", and you state 'the agent may acquire measurements (data)'. But at this point in the presentation there is no observation terminology 'o'. Aren't the action here to mine or abandon?

-Not sure  $L(o_{t+1}|\dots)$  is defined in l 225 expression (it comes much later, I think)?

-Algorithm 1, data line should have  $d \leftarrow d + e, e \sim N(0, \sigma_n^2)$

-Sunberg and Kochenderfer, 2018 paper is not on the reference list?

-  $\sigma$  means several different things in the paper and can be a bit confusing.

-You often say Figure X below. You don't need the 'below' here.

-Would it be possible to color-code the histograms in Fig. 15 (+ similar ones) according to 'mine' or 'abandon' ? Couldn't you also have one bar for each outcome here, rather than bins 0-5, 5-10, etc.?

Thanks for a nice paper!