This manuscript introduces a novel machine-learning-based approach for scanning complex parameter spaces that commonly arise in new physics theories. The authors compare the performance of their method with more conventional Markov Chain Monte Carlo (MCMC) techniques. Two illustrative examples are provided: one based on a toy two-dimensional function, and the other on a supersymmetric model featuring a $B-L$ gauge symmetry. The proposed method is interesting and appears promising. However, several important aspects require further development before the manuscript can be considered for publication.

While the comparison to traditional MCMC methods is appreciated, the work would benefit significantly from benchmarking against more modern scanning techniques such as those implemented in the `BSMArt` package (refs. [22,23]), which employs active learning for efficient exploration of BSM parameter spaces. A head-to-head comparison in terms of performance and computational efficiency would be particularly valuable for potential users seeking practical guidance on method selection. In this context, including detailed and quantitative timing benchmarks with a breakdown of the computational cost per step, is essential. Timing results should also indicate the computing environment used (*e.g.* CPU model, GPU availability, memory), as such information is crucial for reproducibility and fair comparisons.

Turning to the physics application, the authors choose a supersymmetric model motivated by dark matter, neutrino masses and anomalies pointing to the presence of a new states with a mass of 95 GeV. Given these motivations, it would be appropriate to include constraints relevant to all these phenomena, such as those from the dark matter relic abundance and direct/indirect detection constraints, neutrino observables, electroweak precision tests and LHC searches. At present, the study appears superficial: the scan focuses primarily on a subset of scalar states and the broader phenomenological implications are left unexplored. If the authors opt to present only a limited physics application as currently done, it would arguably be more appropriate to adopt a simplified model framework rather than a complex supersymmetric scenario. Moreover, the treatment of experimental uncertainties in the objective function remains unclear.

Another important concern pertains to the method's coverage of parameter space. In the shown examples, the authors note that viable regions may be missed (as seen in figure 3(c)). Although they mention that the algorithm can be guided to avoid such pitfalls, this feature appears not to be activated by default. It is thus not clear why a mechanism to mitigate this issue is not implemented systematically. This indeed raises concerns regarding the robustness of the method, particularly in the $B-L$ supersymmetric scan where unexplored viable regions could remain. Somehow, without such proper safeguards, there is a risk that the algorithm may become trapped in local minima and fail to explore the full viable space.

In addition, I have a list of more minor comments.

1. The choice of references in the introduction is unusual and should be revised. For instance, the discussion of anomalies (refs. [3,4]) cites theoretical papers instead of the original experimental studies. Standard supersymmetry references are omitted (in favour of self-citations). Furthermore, the list of references related to the 95 GeV excess (refs. [9-12]) is incomplete and should be expanded to reflect the broader literature.

2. The manuscript introduces a large number of acronyms and abbreviations, including several that are uncommon. This hampers readability. The authors are encouraged to minimise the use of non-standard abbreviations.

3. The sentence '*The computational cost associated with numerically evaluating a specific configuration of a BSM model using a typical High Energy Physics (HEP) software toolbox is high.*' would benefit from a more precise and quantitative statement.

4. In the introduction, it would be useful to cite representative works that rely on MCMC methods for BSM parameter space exploration, to better contextualise the need for alternative approaches.

5. Section 2.2 aims to briefly describe the model under consideration, but the current summary is overly concise. Reliance on external references makes the section insufficiently self-contained. At a minimum, the authors should include a table listing the quantum numbers of all superfields, as well as the supersymmetry-breaking Lagrangian. This would greatly aid the reader in understanding the scalar mass matrices discussed later as many parameters appear without being defined beforehand. Finally, note that the χ_2 superfield is never introduced explicitly.

6. A reference to the `HiggsTools` framework should be included, alongside `HiggsBounds` and `HiggsSignals`.

7. It would be helpful to include information on how to access the code developed for this study (with a link to the associated public repository).