Dear Editor and anonymous reviewers,

Thank you for your review and valuable comments for helping us improve the manuscript. Submitted is the revised version with changes highlighted and we include responses (in blue color) to each comment and corresponding text modifications (in green color) in this document. In summary, we followed your suggestions and addressed all the remaining problems including the clarification of model evaluation and number of models used, and correction of the inconsistent citations and some typos.

Details of the revisions are provided in the following response letter and revised manuscript.

Thank you for considering our manuscript for publication with the journal and we look forward to hearing your decision.

Qing Zhu on the behalf of all coauthors

Reviewer #1

The authors of "AttentionFire_v1.0: interpretable machine learning fire model for burned area prediction over tropics" have presented a substantial revision to their manuscript which addresses my previous concerns. The methods and the framing of the results are greatly improved.

Thank you for the positive comments.

I have two minor follow-ups which are listed below.

1. Line 228 - 233: This sounds like a rigorous method including validation, training, and testing data. However, I'd suggest the description be further edited for clarity. I also recommend including some justification for the proportion of the data withheld.

Thanks for the suggestions. We have edited the description to make it clearer and included the justification for proportion of the data withheld.

Line 228-238, section 2.2:

For each model, we iteratively leave one-year dataset (one of all 19 year dataset during 1997-2015, ~5% of all dataset) out (i.e., a holdout dataset such as the dataset in 2015 that model has never seen) for testing, one year data (~5% of all dataset, such as the dataset in 2014) for validation (the model was stopped for training and its parameters were saved when it showed the highest performance on the validation dataset to avoid overfitting during training (Yuan et al., 2022b; Jabbar and Khan, 2015)), and use the remaining dataset (~90% of all dataset, such as the dataset during 1997-2013) for model training (i.e., tuning model parameters). Such evaluation scheme quantified model performance on deducing the temporal dynamics of fires at the annual-scale that is critical for future projections while leveraging as much data as possible for model training.

2. Line 269: it would be good to see the total number of models used noted early in this paragraph for clarity.

We clarified the number of models used in the early part of the paragraph. Bellows are the revisions to the manuscript.

Line 275-279, section 2.3:

For future projection (2016-2055) of burned area with AttentionFire model, land use changes (Hurtt et al., 2020), population growth, projected climate and fuel from five fully coupled Earth System Model (ESM) simulations of CMIP6 (O'neill et al., 2016) under low (SSP126) and high (SSP585) emission scenarios were used as the ML model input, respectively.

Reviewer #2

The revised version of Li et al. on AttentionFire_v1.0 fire model has significantly improved compared with the previous version of the manuscript. The revised manuscript has considerable more detail in the comparison of machine learning models, allowing for better framing of the context of the work presented. More details about the dataset, model, and analysis have been added to aid comprehension. Section 3.4, which previously only relied on one scenario in the CESM model, has now been vastly improved. In regards to my previous comments on the manuscript, I am satisfied with the authors' response and edits. The detailed comparison of the state-of-art in machine learning models' application to fire predictions (Table 1), clarification on ML models, and the archival of baseline ML models used in the work are major improvements in the manuscript's presentation. Added information on the input datasets used in the AttentionFire model (Table 2) will aid reproducibility and understanding of the model. The authors' inclusion of future potential work directions and guidance on the applicability of Attention-based ML models in wildfire prediction in other regions is also helpful for future research.

In summary, I appreciate the authors' attention to the reviewers' previous comments and can recommend the manuscript for publication after technical corrections. I particularly look forward to seeing a coupled version of AttentionFire in models in the future.

Thank you for the review and great comments for helping us improve the manuscript.

Specific comments:

1. Table 1, Decision Tree: "easy to interoperate the single tree". Not sure what you mean here. Do you refer to (single) decision trees being easier to construct or interpret?

Sorry for the typo. We have corrected the sentence as "easily interpretable with its single tree structure".

2. L519 / Table S2: The authors note that a single-core of a i9-9900K CPU was used. Could you confirm that the models were trained on a CPU and not GPU?

All the models were trained on a CPU rather than GPU because some baseline models such as random forest and decision tree were commonly trained on the CPU. Here we compared the computational cost of the models and focused on the algorithm differences, therefore, we run all the models on the same processing unit (i.e., same single CPU). We clarified that all the models were trained on a CPU.

Table S2, Line59-61:

"Since some baseline models (e.g., random forest and decision tree) were commonly trained on the CPU, the results here were derived with single core of Intel® Core™ i9-9900K CPU (3.60 GHz) instead of GPU"

Technical corrections:

1. Please check the citation and formats for correctness. For example, van der Werf et al. or Werf et al. are used inconsistently throughout the manuscript, or capitalization of NOAA (Table 2). Also Zhu et al., 2021 in L553 refers to the GMDD preprint but I believe the paper has since been published in GMD.

Thanks for pointing out those mistakes. We have checked the citation and formats and corrected those mistakes through the manuscript.

2. L231: "tunning" -> "tuning"

Revised as suggested.

3. L301: "grided" -> "gridded"

Revised as suggested.