Author’s response to reviews

Title: Applying Machine Learning to Predict Future Adherence to Physical Activity Programs

Authors:

Mo Zhou (mzhou@berkeley.edu)
Yoshimi Fukuoka (Yoshimi.Fukuoka@ucsf.edu)
Ken Goldberg (goldberg@berkeley.edu)
Eric Vittinghoff (Eric.Vittinghoff@ucsf.edu)
Anil Aswani (aaswani@berkeley.edu)

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Mo Zhou; Yoshimi Fukuoka, PhD, RN, FAAN; Ken Goldberg, PhD; Eric Vittinghoff, PhD; Anil Aswani, PhD

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Author’s Response Letter

Dear Editor and Reviewers,

Thank you so much for reviewing our manuscript and providing your thoughtful comments. We have revised the paper after carefully considering both reviewers’ comments. In addition, we include a detailed reply to reviewer’s comments below. We are happy to address any further comments or concerns and modify the manuscript if needed.
(Reviewer 1): Chen Liang, PhD: Thanks for authors' revision and clarification. Please please find my follow-up suggestions for discretionary revision.

1. The authors stated "The main point we want to express is that this paper is focused less on finding the 'best' ML method for this prediction problem, but rather validating that ML methods can be applied to the physical activity domain with high robustness." This idea makes sense to me. Since only a few machine learning approaches were tested in the study, I would suggest providing a comprehensive justification for why some other machine learning approaches were not tested. Does it suggest any potential limitation of the study? -- In rebuttal, authors already have some good reasons for not using tree models.

Re: That’s a good point. We added “Tree-based models are not evaluated in this paper because their feature importance is difficult to interpret and different evaluation methods can lead to drastically different feature importance ranking.” to the Statistical Models section and added “As a next step, we will evaluate/validate this framework against other ML methods, such as tree-based models.” to the Accuracy and Interpretation of DiPS section under Discussion and Implications.

2. The verbs used in the manuscript were adjusted per previous comments. But I would suggest using the past tense for procedures done. Authors use the simple present tense for many sentences, where it seems the actions are done. For example, on page 10, good use of past tense of a verb is "We used the svm function in the e1071 package in R [44] for ......"; a questionable use of simple present tense of verb is "We train the models using excise relapse for weeks 16-30." It would better express the completed action of training if you use "We trained the model ......".

Re: We updated the verb tenses for the following sentences:

Page 4 Section Review of Mobile Technologies and Physical Activity: “Our prior study, a fully-automated physical activity intervention with a personalized goal setting feature, validate(d) the feasibility of adopting additional levels of automation to improve the efficacy of such programs in a cost-effective way.”

Page 10 Section Train and Test data: “We train(ed) the models using the preprocessed data collected in the first 15 weeks of the study. Then we use(d) the trained model to predict exercise
relapse for weeks 16-30. We compare(d) our logistic regression (LR) model with 18 extracted features to the SVM model to demonstrate prediction accuracy.”

Page 11 Section Simulation: “In order to explore the potential benefit of using DiPS-based intervention, we use(d) simulation to compare a DiPS-based intervention to a random intervention and a steps-based intervention, by assuming a simple dynamic step model with financial incentives.”

(Reviewer 2): Slade Matthews, PhD: The responses to my comments (below) adequately address my concerns. I require no further changes to the manuscript.

Re: Thank you very much for reviewing our paper and providing comments to make it better.