Reviewer's report

Title: Sparse Learning and Stability Selection for Predicting MCI to AD Conversion Using Baseline ADNI Data

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Reviewer: Richard Caselli

Reviewer's report:

Ye and colleagues present a novel analysis of MCI members of the ADNI cohort incorporating biologically and clinically relevant data that yields an interesting prediction model. The main thrust of this paper is in the mathematical/bioinformatics methods which should be judged by a reviewer with that expertise (to satisfy the technical requirements of this review that is my only compulsory revision and it is not a criticism of the authors or the manuscript; otherwise I have no compulsory or major revisions to suggest). Some additional comments:

1. the major strength of the ADNI data set lies in the biomarker data, ie imaging and CSF. The neuropsychological protocol was essentially derived from that used in therapeutic trials, not in clinical practice so it may not readily translate to clinical diagnosis. Further, biomarker data including CSF measures and apoe genotype are rarely part of the usual clinical diagnostic regimen. This does not invalidate the authors findings, but is simply a caveat that should be mentioned in the discussion. If such data are available, then their model can be used.

2. The observation that individuals performing less well on neuropsychological tests have a higher likelihood of conversion to AD is well established, but again not really the main point of this paper. That this was found to be true increases my confidence in the model but still is not a substitute for review by a bioinformatician.

3. a minor point-though it is frequently mis-stated and the authors are not uniquely at fault for this, it is not technically accurate to state that MCI is a risk factor for Alzheimer's disease. Rather it is a risk factor for progression to dementia (or Alzheimer's dementia). Anyone who does "convert" already had Alzheimer's disease at the MCI stage, they simply were not yet demented. The paper is generally very well written, and this is a minor point that would be consistent with its otherwise high level of precision.

4. Once the method is determined to be valid I would encourage the authors to examine the influence of other common comorbidities on their prediction model such as cardiovascular risk factors disease and depression, family history of dementia, prior head trauma and so forth

Level of interest: An article of importance in its field

Quality of written English: Acceptable
**Statistical review:** Yes, but I do not feel adequately qualified to assess the statistics.

**Declaration of competing interests:**

'I declare that I have no competing interests'