Review of: "Deep Learning Modeling for Prediction of Cognitive Task Related Features from Resting-state fMRI Data"

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Tokuhiro et al have conducted an interesting study showing that a graph convolutional network incorporating an LSTM component can outperform logistic regression in predicting an IQ score, derived from the Kohs block design task, using resting state fMRI. Some strengths of the study include the size of the participant cohort, the complex neural network derived, and the effort to make the neural network more interpretable. I think the paper has some shortcomings and I would suggest the following as potential improvements:

- The introduction could be structured a little better. For example, resting state fMRI is mentioned before MRI. There is not context given for the default mode network (why is it relevant?), there is no summary paragraph at the end, that concisely explains the gap in the literature the paper hopes to fill.
- Further to the above, there are quite a few papers on prediction of cognitive traits/behaviors using rsfMRI & linear regression or deep learning. e.g https://pubmed.ncbi.nlm.nih.gov/32062083/, https://www.nature.com/articles/nprot.2016.178 , there are many more. I think more context would benefit the paper.
- The above is also relevant in benchmarking model performance, Meskaldji et al use data from 57 subjects to perform their predictions. This is on the smaller side, and true brain-behavior relationship effect sizes may be much smaller (https://www.nature.com/articles/s41586-022-04492-9)
- The figure 1 schematic is good in principle but it and its accompanying text is a little hard to interpret. For example I figured out how the kNN was implemented to reduce the matrix size from reading Wang et al, but it is not clear from this paper alone.
- The following statement is not supported by the data: "In comparison, the drop in the accuracy of resting-state FCs using cGCN-LSTM was small and captured the characteristics of resting-state FCs." A drop in model performance from an R squared of 0.39 to 0.11 is not small, it is a substantial reduction.
- I am not entirely clear on why the model was built with and without age as a predictor. This requires more explanation.
- Using the AAL atlas alone for behavior prediction may be harming the model performance, as functionally derived atlases tended to work better than structural atlases for brain behavior modelling.
- Figure 4 is hard to interpret. I would recommend a different kind of chordplot, or perhaps just a matrix heatmap.
- Overall the paper, and the discussion in particular, is sparse in terms of method and literature references. This should be improved and the discussion expanded.

I want to state that I find the idea of rating a paper out of 5 stars problematic. It is not sufficient for capturing an assessment of the work in my opinion. However, I could not post the review without doing it.