Unique Variance Found by Variance Partitioning is Superior to Total Variance Explained as a Model Comparison Metric

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Presentation Abstract Summary Computational models are commonly evaluated by the amount of variance that they explain in withheld data. However, comparing models based on total variance explained can obscure information about model performance. Here, we describe variance partitioning analysis, which estimates the extent to which different models explain shared or unique variance. To show the benefit of variance partitioning, we analyze previously collected fMRI data recorded while human subjects viewed natural movies. We fit two encoding models to these data, one that quantifies motion energy, and one based on a convolutional neural network (CNN). We used the fit models to predict responses in a withheld part of the data set. Model comparisons based on total variance explained favor the motion energy model in hMT+ and the CNN model in Extrastriate Body Area (EBA) and Lateral Occipital cortex (LO). However, both models explain small but significant amounts of unique variance in EBA, LO, and hMT+. This suggests that hMT+ represents information that is captured by the CNN model but not by the motion energy model, and vice versa for EBA and LO. Thus, variance partitioning reveals information about model performance that is not present in comparisons based on total variance explained.

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