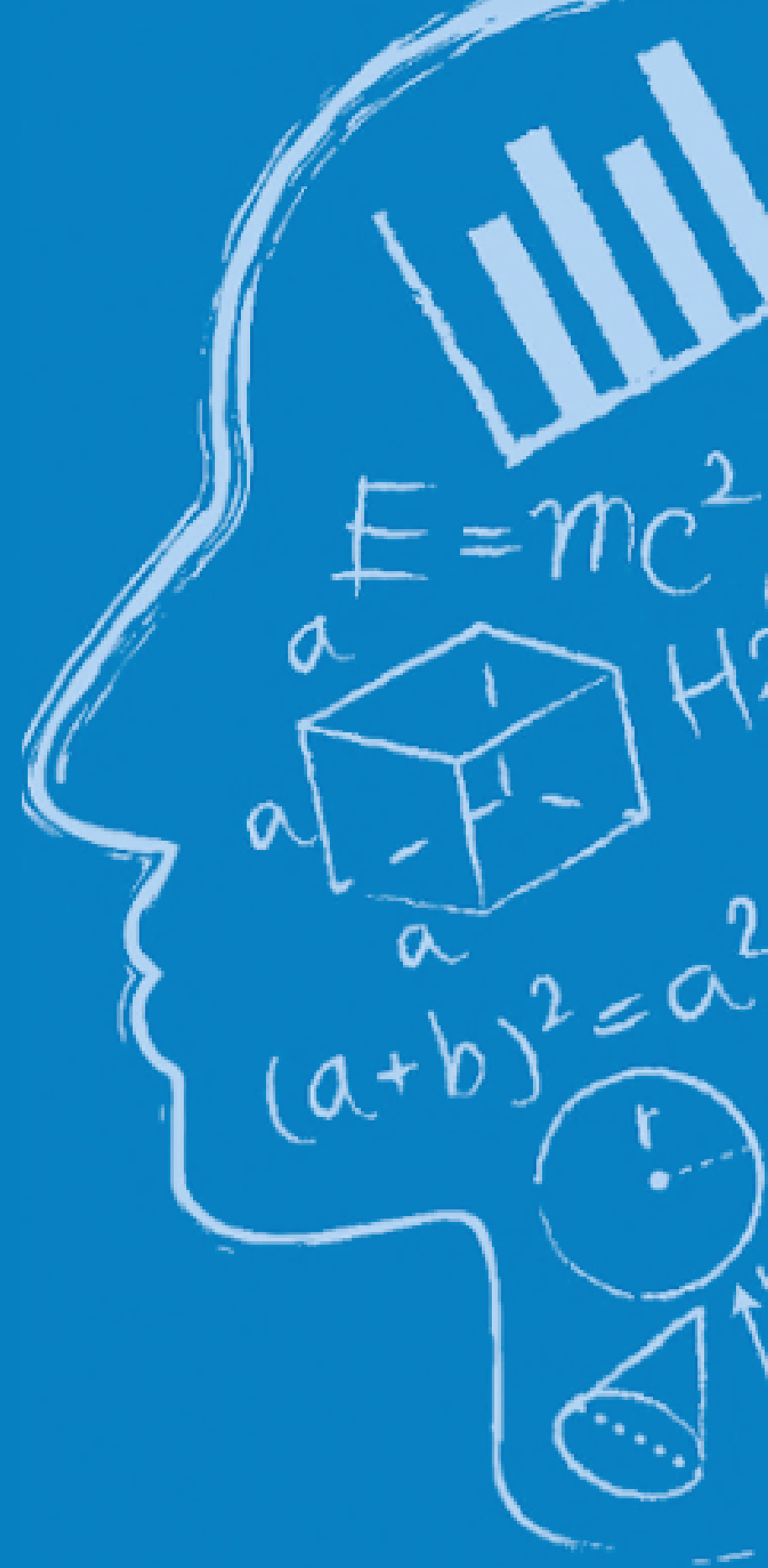


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DYNAMIC PREDICTION OF AN EVENT USING MULTIPLE LONGITUDINAL MARKERS: A MODEL AVERAGING APPROACH

ABSTRACT:

Dynamic event prediction, using joint modeling of survival time and longitudinal variables, is extremely useful in personalized medicine. However, estimating joint models that include multiple longitudinal markers remains a computational challenge due to the large number of random effects and parameters that need to be estimated. We propose a model-averaging strategy to combine predictions from several joint models for the event, including models with only one longitudinal marker or pairwise longitudinal markers. The prediction is computed as the weighted mean of the predictions from the one-marker or two-marker models, with the time-dependent weights estimated by minimizing the time-dependent Brier score. This method enables us to combine a large number of predictions issued from joint models to achieve a reliable and accurate individual prediction. The advantages and limitations of the proposed methods are highlighted by comparing them with the predictions from well-specified and misspecified all-marker joint models, as well as one-marker and two-marker joint models, using the available PBC2 dataset. The method is used to predict the risk of death in patients with primary biliary cirrhosis. The method is also used to analyze a French cohort study called the 3C data. In our study, seventeen longitudinal markers are being considered to predict the risk of death.



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