Predicting Latent Variables with Knowledge and Data: A Case Study in Trauma Care

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Abstract

Making a prediction that is useful for decision makers is not the same as building a model that fits data well. One reason for this is that we often need to predict the true state of a variable that is only indirectly observed, using measurements. Such 'latent' variables are not present in the data and often get confused with measurements. We present a methodology for developing Bayesian network (BN) models that predict and reason with latent variables, using a combination of expert knowledge and available data. The method is illustrated by a case study into the prediction of acute traumatic coagulopathy (ATC), a disorder of blood clotting that can cause fatality following traumatic injuries. There are several measurements for ATC and previous models have predicted one of these measurements instead of the state of ATC itself. Our case study illustrates the advantages of models that distinguish between an underlying latent condition and its measurements, and of a continuing dialogue between the modeller and the domain experts as the model is developed using knowledge as well as data.

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