Natural Hazards
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Discussions

Interactive comment on "The application of Bayesian networks in natural hazard analyses" *by* K. Vogel et al.

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The paper presents a comprehensive methodology for Bayesian network learning with three applications to natural hazards. The methodological aspects are presented in a very concise manner, and are developed over the three examples. The authors are to be complemented for their original and extensive work, which has the potential to motivate many future applications and developments. I clearly recommend publishing this paper in NHESS, following some revisions as listed in the following.

I find the title misleading, as this paper is focusing entirely on learning Bayesian networks (BNs). Based on the title, I expected a broader overview on BNs, in particular addressing also the substantial body of work that has been carried out on modeling

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natural hazards with BNs based on an a-priori understanding of the (in-)dependencies among the involved variables. Also, there is little discussion of how the BN is ultimately used in the process (with the exception of the landslide example). For this reason, the title of the paper should be slightly modified to narrow down the scope, e.g. to "Bayesian Network Learning for Natural Hazard Analyses" or "Applications of Bayesian Network Learning for Natural Hazard Analyses".

[As a comment, and not as a request for modifying the paper, I would like to point to the usefulness of BN in problems when a-prior information on the model structure is available for at least parts of the process, be it through engineering judgment or through existing models. In these contexts, the BN allows to construct complex models in a clear and structured manner, facilitating the inclusion of probabilistic models from different sources. Furthermore, the BN is not least suitable for (near-)real-time risk assessment and decision support, due to its facility for Bayesian inference.]

Overall, the authors use references rather sparingly. Since the paper, due to it covering a wide range of applications, can only briefly touch upon certain aspects, providing additional references would be helpful. This applies in particular to the theory, where additional references should be given whenever the details of the implementation are not provided in the paper (eg. Markov blanket, non-informative prior used for P(theta|DAG), etc). This would strongly help the reader who is interested in implementing the procedures.

In line 28, please clarify why you think that such tools are not known or available. After all, probabilistic methods are used by many.

In line 74 it is stated that "The interactions between those variables, be it measurables, observations or otherwise, therefore really boils down to the question of how the distributions of those random variables interact". I think see what the authors want to say (that all information is contained in the joint probability distribution), but the sentence can easily be misunderstood by people that are less fond of probability. Think of

reformulating this sentence.

In line 83/84 you write that the meaning of the arcs is "depends on (is influenced by, is affected by)". All these statements imply causality. However, the learned BN structures are not necessarily causal; they just encode a dependence structure that – hopefully – is consistent with the true but (following your philosophy) unknown causal structure of the problem.

Line 173: the "a so called stochastic model" sounds a bit weird to me. A large number of different stochastic models are used throughout PSHA, so referring to a specific model by this name does not make sense. Please state more clearly with which model you create the data.

Paragraph starting with line 250: This is an important point. I suggest making an example to illustrate this to the reader.

Second paragraph of section 5: What is the definition of success rate in landslide prediction? Are these statistical predictions, and of what kind? And what scale? (BTW, I strongly agree with the critical view that the authors have on claimed successes.)

The use of the English language seems sometimes inspired by the German language, in particular the position of the verbs. I strongly suggest an English grammar check. A few issues are listed in the following:

Line 6: delete "as those"

L 163: Write "If no . . . is available"

L 193: A comma after "small" is necessary

L 205: "flows" instead of "floss"

L 214: reformulate to "same interval, defined by \Lambda,"

L 227: delete "to"

L 247/8: write "is neglected completly"

L 298 Must be "Another"

L 306: Avoid colloquial "Anyhow" at the beginning of the sentence.

L 309: "profits" must come after regression approach

L 357: delete "for"

L 369: "cannot"

L 385: "was paid to"

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