

# rSMILE, an interface to the Bayesian Network package GeNIe/SMILE

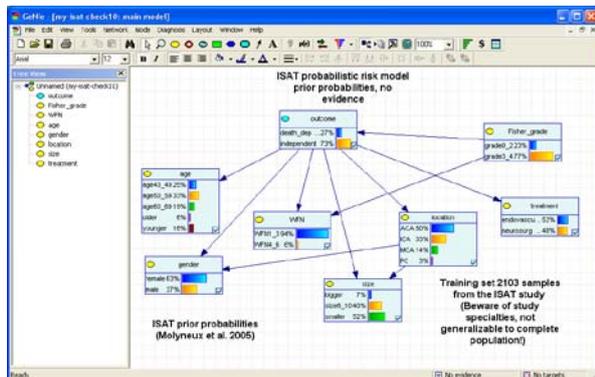
Christoph M. Friedrich<sup>1,\*</sup> and Roman Klinger<sup>1</sup>

1. Fraunhofer Institute for Algorithms and Scientific Computing (SCAI); Department of Bioinformatics; Schloss Birlinghoven; D-53754 Sankt Augustin; Germany

\* Contact author: [friedrich@scai.fraunhofer.de](mailto:friedrich@scai.fraunhofer.de)

**Keywords:** Bayesian Networks, Graphical Models, Interface

Bayesian Networks are well known directed probabilistic graphical models. There are many implementations of graphical models in R and a summary of existing packages is given in [1]. The



learning effort to master these implementations is typically high. The combination GeNIe (Graphical Network Interface) [2,3] and SMILE (Structural Modeling, Inference, and Learning Engine) provides an easy way to develop and diagnose Bayesian Networks with categorical variables and allow the inclusion into other applications with the inference engine provided.

Unfortunately, the implementation does not include evaluation possibilities like cross-validation, bootstrapping or ROC analysis. Users have to implement this externally using the SMILE

interface. To circumvent this problem, rSMILE, an interface using the Rjava bridge [4] and jSMILE the java implementation of SMILE has been developed. rSMILE allows for training the structure and the conditional probability tables as well as inference in R. Existing models can be loaded and new models saved in the GeNIe format. The networks can be inspected using bar chart depictions and graph-layout algorithms like the spring-embedder method. During structural learning with the Greedy Thick Thinning algorithm background-knowledge can be included by enforcing or forbidding edges of the network.

The interface has been successfully applied in the course of the European integrated project @neurIST where rSMILE has been used to develop risk and treatment outcome models for intracranial aneurysms [5].

## Acknowledgements

This work has been partially funded in the framework of the European integrated project @neurIST, which is co-financed by the European Commission through the contract no. IST-027703 (see <http://www.aneurist.org>)

## References

1. Højsgaard, S. *Graphical models in R* webpage. Last accessed 2009-02-20 <http://www.ci.tuwien.ac.at/gR/>
2. Druzdzel, MJ. GeNIe : *A development environment for graphical decision-analytic models*. In : Proceedings of the 1999 Annual Symposium of the American Medical Informatics Association (AMIA). **1999**. Pages 1206
3. Druzdzel, MJ. *GeNIe/SMILE* webpage. Last accessed 2009-02-20 <http://genie.sis.pitt.edu>
4. Urbanek, S. *The Rjava interface*, webpage. Last accessed 2009-02-20 <http://www.rforge.net/rJava/>
5. Friedrich, C. M.; Hofmann-Apitius, M.; Dunlop, R.; Chronakis, I.; Sturkenboom, M. C. J. M.; Risselada, R.; Oliva, B., and Sanz, F. *Initial Results on Knowledge Discovery and Decision Support for Intracranial Aneurysms* Proceedings of HEALTHINF 2008 Conference, INSTICC, **2008**, 265-272