

# Parameter estimation using dynamic non parametric Bayesian networks

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**Abstract.** Non parametric Bayesian networks (NPBNs) are directed graphical models that associate nodes with random variables and arcs with conditional copulae. These conditional copulae, together with the one-dimensional marginal distributions, and the conditional independence statements implied by the graph uniquely determine the joint distribution, and every such specification is consistent [1]. The development of NPBNs is based on regular vines and the relationship between these two models is described in [2]. If the NPBN does not depend on time it is called a static NPBN. For time series modelling a dynamic NPBN is more appropriate. One can interpret a dynamic NPBN as instances of a static NPBN connected in discrete slices of time. A recent application of dynamic NPBNs is in the field of reservoir engineering. When simulating a reservoir one must account for the physical and chemical processes taking place in the subsurface. Rocks' and fluids' properties are very important when describing the flow in porous media. We are concerned with estimating the permeability field of a reservoir. A two phase, 2D flow model was implemented for a synthetic reservoir simulation exercise. The estimated permeabilities obtained using the NPBN based approach are presented and compared with the ones obtained using one of the most popular methodologies in this field, the Ensemble Kalman filter (e.g. [3, 4]).

## References

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