What have we learned by applying the data driven modelling techniques in the field of hydrological modelling?

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Hydrologic data analysis and hydrologic modelling have become major techniques in hydrology and are used for building hydrologic models to generate synthetic hydrologic records, to forecast hydrologic events, to detect trends and shifts in hydrologic records and to fill in missing data and extend the data sets.

Well known, praised and widely used are the so-called conceptual models that are based on the prior theoretical knowledge of all the hydrological processes in the form of theoretically developed or empirically derived equations. A modeller needs a lot of detailed data like river network, land cover, soil characteristics and other geographical data or topographical maps to sucessfully calibrate a conceptual model. The availability of all of the aforementioned data can present quite a significant problem in the process of modelling. On the basis of different approaches to the inclusion of geographical, topographical and other data in conceptual models, we distinguish between distributed, semi-distributed and lumped conceptual models. Empirical, mostly black box models simply connecting input and output hydrlogical data have also been widely used in the field of hydrology, especially in the hydrological praxis.

Data driven modelling on the other hand is based on the analysis of the data characterising the system being modelled, which in most cases means finding the best type of model or combination of those to connect the input and output data characterising the system being modelled, while the assumptions or learning about the physical bases of the system being modelled are not the top priority. Also, there is still a lot of scepticism among many hydrologists regarding the usage of data driven modelling techniques in hydrology, because the development of the models from the data is usually seen as a computational exercise and is not related to physical principles and mathematical reasoning.

This presentation will give a quick overview of more and less successfull applications of some of the data driven modelling techniques in Slovenian hydrological practice (modelling the flow duration curves and estimation of the regional flow duration curve, precipitation interception modelling, low flow and flood forecasting, etc.) and will try to systematically list the pros and cons of using these methods in hydrology. Based on our experience these methods present a very useful way for quick (especially by reducing the man-power spent in the process of model calibration and verification) development of empirically based forecasting models, which in some cases can also provide a firm basis for learning more about the hydrological processes in the particular river basin.