The Exploris AI platform

For more then ten years we have been developing the Exploris Artificial Intelligence platform. It allows for fast development of novel diagnostic and therapeutic solutions. As a pioneer in AI, we are one of the first companies having solutions which have been validated in clinical studies. The Cardioexplorer test for example, is more accurate than many established diagnostic procedures. Products in development like Heart Failure Explorer and Breast Cancer Explorer allow for personalized therapy, resulting in better outcome and more safety and convenience for patients. The approach is applicable to any disease area.

The availability of data is a bottleneck for AI implementation, especially with deep learning. Without a lot of data deep neural networks perform worse. Therefore deep learning solutions still solve very basic problems.

Exploris pursues another way. The Exploris AI platform has been built to achieve also robust results on small datasets[1] and we have automated the modeling process itself. Based on the inherent information in the data our software engine selects autonomously which methods to apply and their optimal parameters, which attributes to use and how to combine them functionally. The engine consists also of a set of enhanced validation procedures and stress testing capabilities. Important to mention, it is not a black box. An extensive repository documents each modeling step and provides the derived parameterization and formulas. In the initial phase of data analysis we relinquish on human expert knowledge in order to focus on the hidden information in the data. Only such an approach allows for the detection of new insights by the software itself.

The used techniques for data analysis, modeling and optimization

The data analysis and modeling process is a multilayer, multiple method process including the following methods from the area of pattern recognition and machine learning:

- Ensemble tree methods based on classification and regression tree
- Logistic regression and ensemble logistic regression methods
- Voting algorithms for ensembles of classifiers
- Automated search for non-linear functional combinations of attributes relevant for the clinical task
- Univariate scaling, categorization and risk mapping methods
- Self Organizing Maps for clustering and classification
- Evolutionary optimization methods

The approach is implemented as an autonomous modeling process, and is able to detect complex patterns and inherent relationships in the data. An evolutionary optimization process combined iteratively variables of the input data, their univariate or multivariate functional transformations and weak classifiers which are built with methods like decision trees, logistic regressions, clustering, categorization or risk mapping. Thousands of unique models get evaluated in the course of optimization.

[1] Although the Exploris platform is not limited to small datasets. In a project with a pharma company it provided also exceptional results in huge datasets (proteomics project with 20'000 factors per patient).

Evaluated models are built from multiple layers where the output of one method or transformation could be the input for another. The capability to combine various pattern detection methods leads to a higher pattern detection quality and ability to find complex, non-linear dependencies in the data.

One unique ability of this approach is to achieve the desired sensitivity/specificity and to steer the modeling process in the desired direction allowing to build models with very low false positive or false negative rates.

Exploring different other methods and tools has led us to the insight that the Exploris platform outperforms current AI tools when applied to patient individual diagnostics and therapeutic tasks.

Usually, population statistics is used to proof AI based solutions. But real diagnostic and therapeutic solutions should be validated on hard endpoints (e.g. stenosis y/n) and on individual patients. Therefore we finally proof the models in clinical studies, with individual patients.

This automated data analysis and modeling approach reduces the amount of required manpower remarkably and allows us, if the data is available, to produce new diagnostic tests and therapeutic solutions within few months.

Toedistrasse 52 ● CH 8002 Zurich ● Phone ++41 44 283 29 21 ● Fax ++41 43 344 52 77 ● info@exploris.info ● www.exploris.info