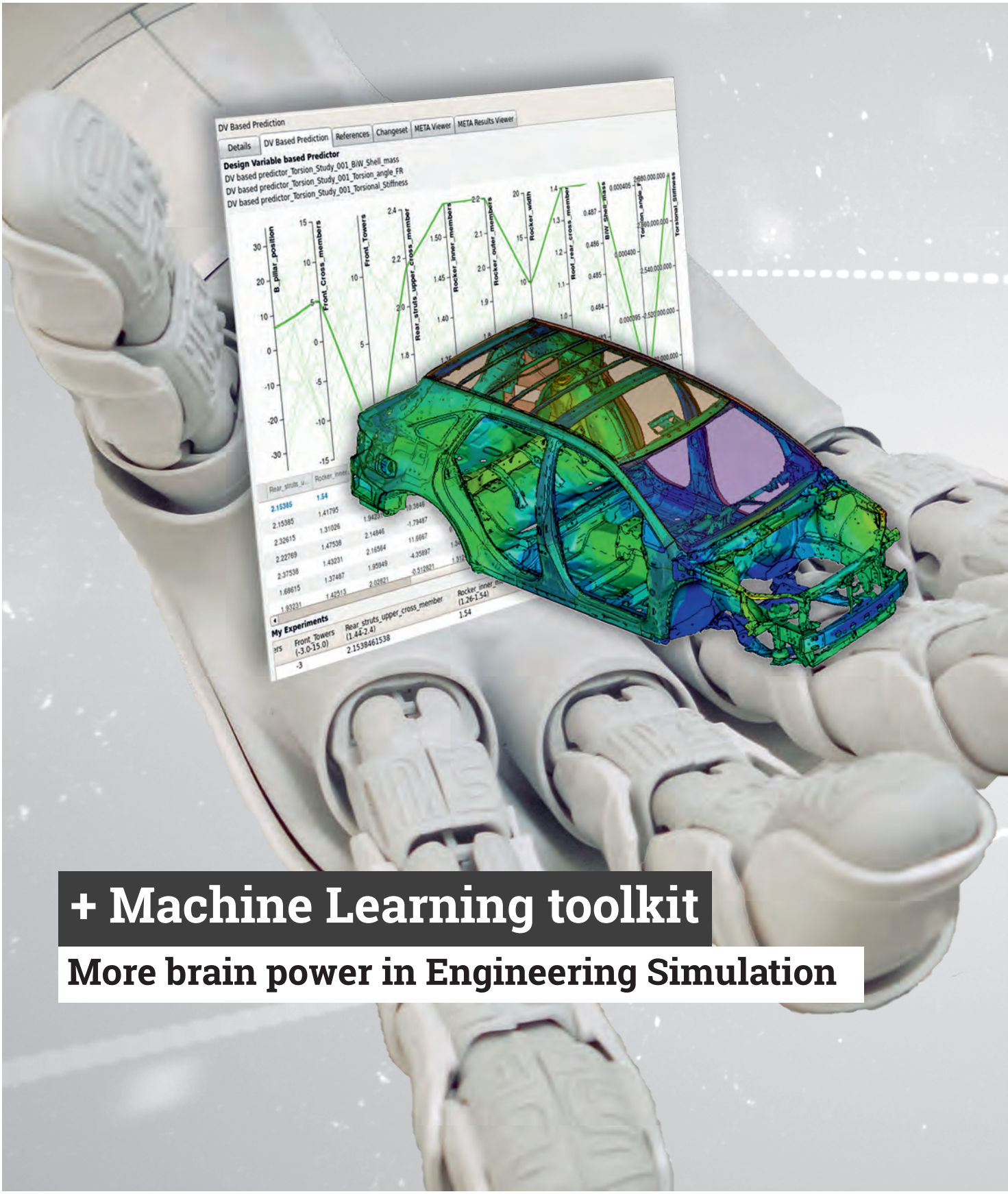
BETA
SIMULATION SOLUTIONS

physics on screen



+ Machine Learning toolkit

More brain power in Engineering Simulation

+ ML toolkit

Employ Machine Learning
in Engineering Simulation

Capture and apply your engineering knowledge by training predictive models. Speed up simulation, allow for more design experiments, and take full advantage of Machine Learning in engineering simulation

The ML toolkit add-on powers the BETA software suite and makes the training and use of Machine Learning prediction models possible. This enables the analysis of cases of models' behaviors in a fraction of the FE analysis time. Combining a FE simulation driven, and a data driven approach, the training of such predictive models is achieved by employing past data, taking advantage of previously acquired knowledge, utilizing the latest python Machine Learning libraries.

Innovative Machine Learning tools have been implemented in BETA CAE Systems applications through the ML toolkit add-on, with the aim to accelerate product design, validation, and to democratize CAE along the product development process.

The coupling of data analytics techniques and simulation data management, provides the ability to train predictive models. These predictors can forecast responses based on finite element models input or Design variable values.

Machine learning Training

The training of Machine Learning models takes place in KOMVOS through a dedicated interface using simulation runs as the training dataset. Prediction of single scalar values, 2d plots, 3d field results, and design space exploration is performed through a user friendly and efficient prediction window.

The Latest available Python Machine Learning algorithms are implemented in the ML toolkit, which is synchronized for Linux and Windows platforms.

Types of ML algorithms

Two types of ML algorithms are available:

- Data Driven Design Variable based algorithm. Trained based on models Design variables and selected responses.
- Simulation Driven Feature-based algorithm. Trained based on the finite element model (BiW) and first torsion, vertical/lateral bending modes frequency values.

The advanced Design Variable Data driven Machine Learning algorithms, provide a generic solution that can be used for any parametric investigation of a design.
Feature-based Machine Learning functionality is used to create predictive models that will accurately predict the first torsional, first lateral and vertical bending mode

Features

- Machine Learning functionality using the latest python libraries
- Machine Learning predictive models, to predict FE model's behavior
- Optimization using Response Surface Models created using Machine Learning
- Recognition of Embedded Clips, powered by Machine Learning
- Reduced IT complexity having all required libraries in single environment
- Offline single installation in a shared directory for both linux and windows platforms.
- Synchronized environments for both linux and windows platforms
- GPU acceleration

Benefits

- Reduce time to market while increasing product quality
- Make captured simulation knowledge usable
- Speed up simulation processes enabling more design experiments

Incremental Training of existing Predictors is also available providing the ability to "update" existing predictors with new training data, improving training time and accuracy.

Optimization

Machine learning can also be used to train response surface models that can be used for optimization purposes, and to aid design space exploration. ANSA's Optimization tool is coupled with DM functionality. This means that DOE experiments can be stored either in a local/network path DM or in the SPDRM (as enterprise DM solution) or in a 3rd party DM System, and can be used directly as training data. Response Surface Models (RSM) can be trained and Optimization studies can be defined and run within the Optimization tool.

Embedded Clips

Recognition of embedded clips is also powered by Machine learning.
This allows for the generation of a Library with Clips that can be called and identify Clips in real time.

Datasets and Reporting

BETA CAE Systems' simulation software suite constitute powerful tools with the capability to create datasets to train Machine Learning algorithms that can predict and display responses (single scalar, 2D, 3D) in a fraction of the actual FE solution time. Results overview and comparison of the Simulation runs, predictions of results for theoretical runs and creation of new experiments are some of the available capabilities that can assist in engineering decision making.

To enhance the compatible software of BETA CAE Systems with Machine Learning, requires that the optional "ML toolkit" has been installed, and the respective license feature is enabled, which is available upon request.

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