

OPTIMAT v2

UTC for Computational Engineering

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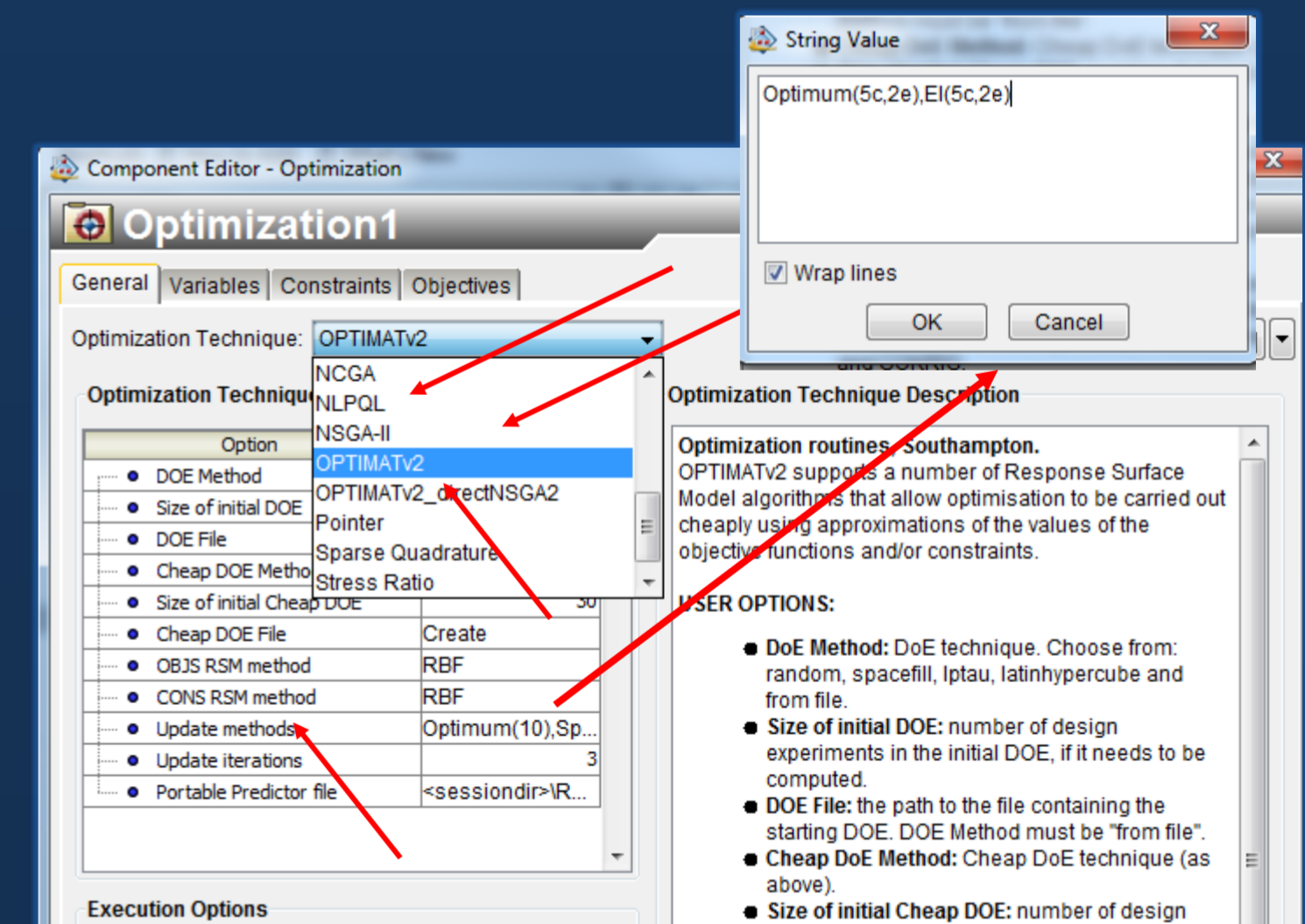
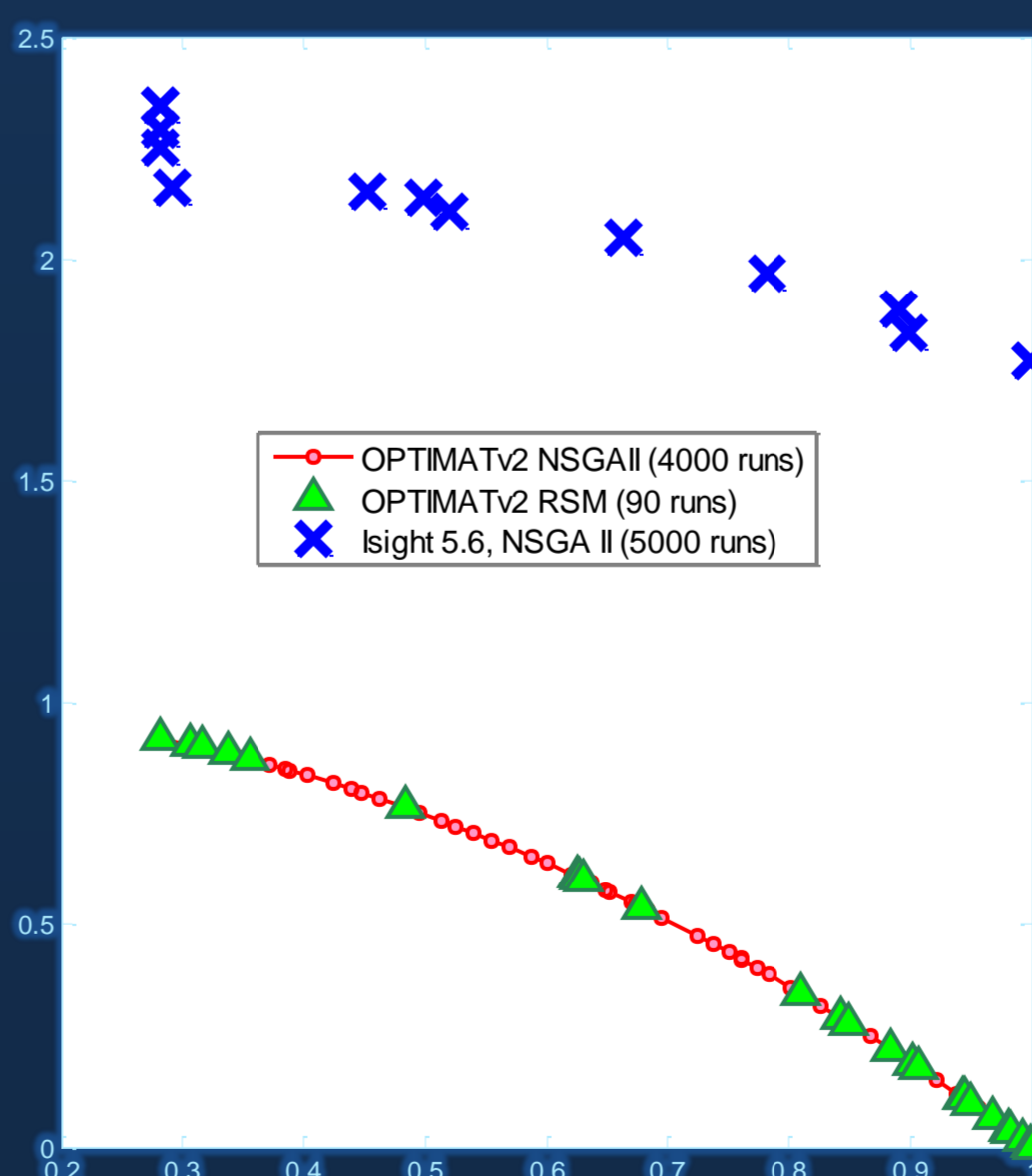
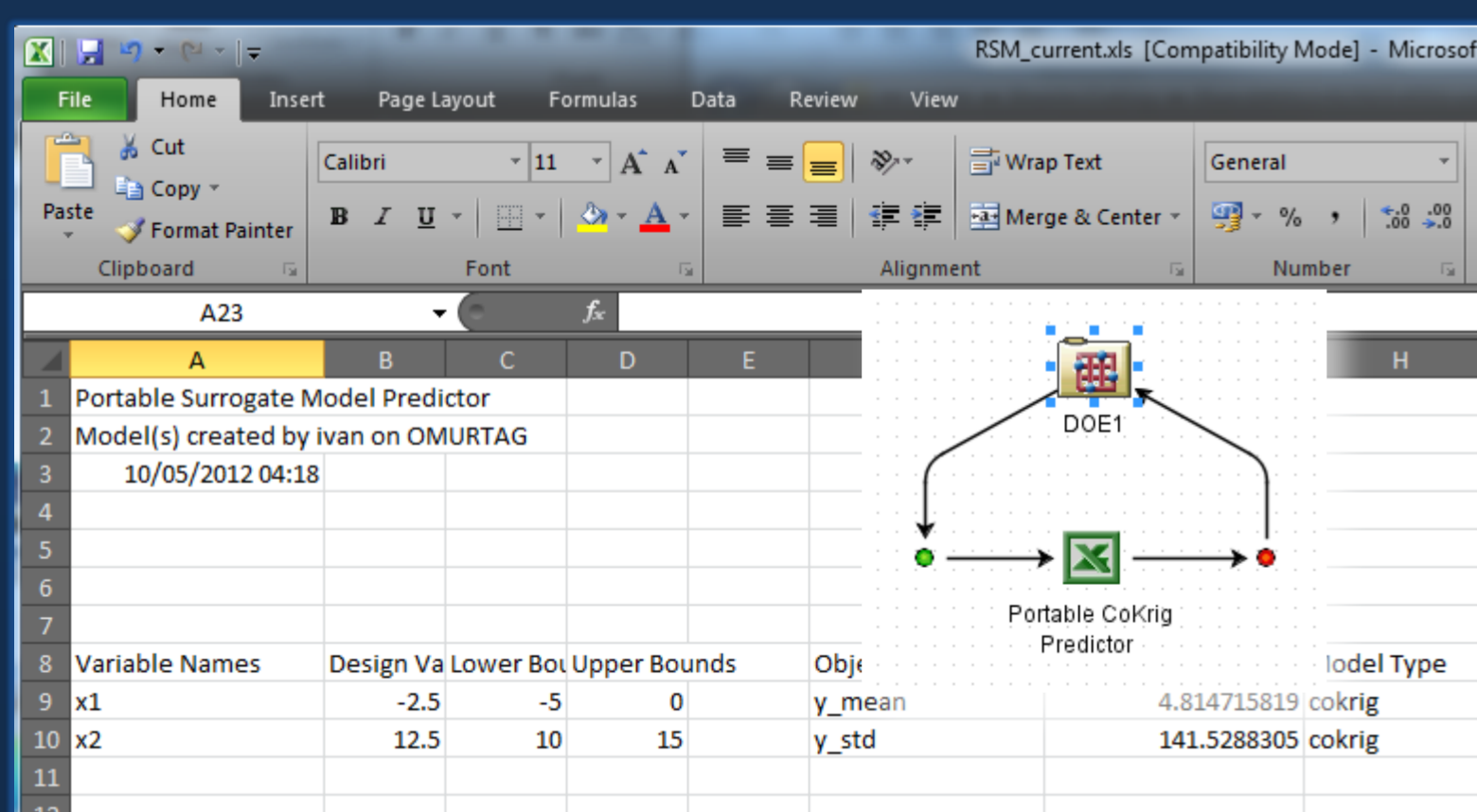
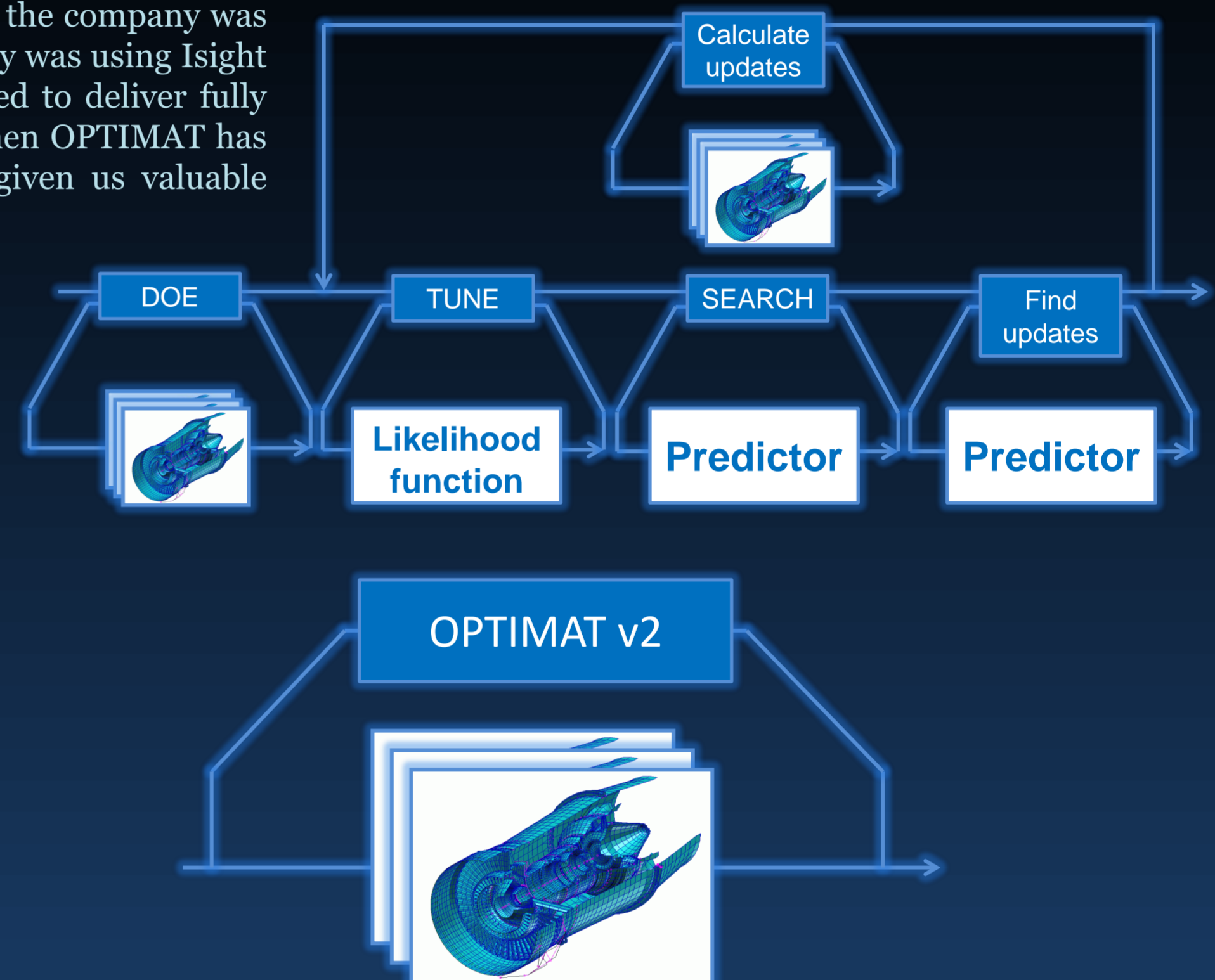
Since its formation the Southampton University Technology Centre (UTC) has supplied a range of optimization tools to Rolls-Royce – OptionsNSGA2, OptionsNSGA2_RSM, OPTIMAT. Their first major application in the company was with the WEM (Whole Engine Modelling) team, during the VIVACE project. At the time the company was using Isight v8. An EngPC was left for 3 days and after intensive computations and a burned CPU, it managed to deliver fully automatically a design that was significantly better than the base design used by the team. Since then OPTIMAT has been used by various teams and put under scrutiny tests by researchers in Bristol who have given us valuable feedback. We listened and improved.

OPTIMATv2 is the result of the hard work and collaboration between Rolls Royce and the UTC over several years. Most of it has been completely rewritten taking into account performance, ease of use and maintenance. It now includes a range of state-of-the-art technology:

- Optimized Genetic Algorithm (GA) and Non-Sorting GA (NSGA2) algorithms – for single and multiobjective optimization
- High quality RBF (radial basis functions), Kriging and CoKriging PSO (particle swarm optimization) tuner – single and multifidelity models
- Constraint models are build with individual set of data each.
- Local searches of optimal points
- Construction and searching of local RSM (response surface models) for improved accuracy
- Intelligent and highly customizable update point selection, using metrics such as Expected Improvement, Root of the mean squared error, Prediction, Spacefill, K-Mean clustering, Probability of Feasibility of Constraints, etc.
- Special attention paid to de-clustering of updates
- Avoidance of bad points (designs which failed to solve)
- Parallel tuning and searching

The OPTIMATv2 suite also includes

- An automatic Portable Predictor – Excel spreadsheet which can be used to predict tuned RSMs
- Two Isight plugins (RSM Tune and RSM Eval) designed to tune and predict RSMs independently of the OPTIMAT optimization driver. Data structure is fully compatible and interchangeable with OPTIMATv2
- Standalone DOS version can be run without the need for the MATLAB environment. It can be invoked independently from the DOS prompt, a batch script or Windows desktop.
- HPlot utility for interactive visualization of the obtained RSMs and updates – applicable to all three releases
- The NSGA2 algorithm has been optimized and also exposed for direct usage in Isight.
- Settings are reduced and simplified to the very essential minimum. Much wider range of settings are available for the advanced user for further customization.



OPTIMATv2 can run in three modes

- An Isight optimizer plugin
- MATLAB toolbox
- Standalone DOS version can be run without the need for the MATLAB environment. It can be invoked independently from the DOS prompt, a batch script or Windows desktop.

OPTIMATv2 has been developed under the Strategic Investment in Low-Carbon Engine Technology (SILOET) project, RD6, WP2.6, Task 2.6.3.1

