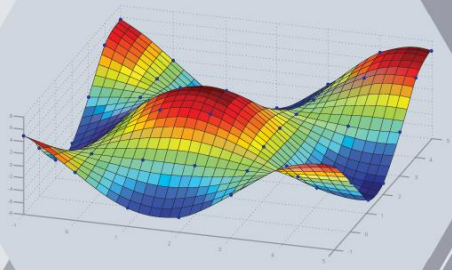
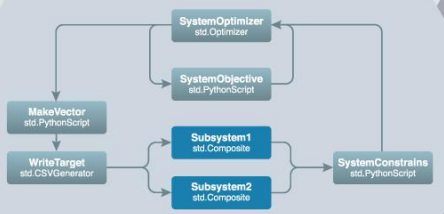
Datadvance User Conference 2018

pSeven





Toulouse, Oct 10-11th, 2018

Laurent Chec
General Director
Datadvance SAS
laurent.chec@datadvance.net

DATADVANCE

pSeven User Conference 2018

Roots of the Company

Company roots goes to French aviation and Russian mathematics:

- DATADVANCE has been incorporated in 2010 as a result of a collaborative research program by:
  - **Airbus Group** – a global leader in aerospace and defense industry
  - **Institute for Information Transmission Problems** – one of the leading mathematical centers in Russia with three Fields prize winners on the staff

AIRBUS GROUP → DATADVANCE

Worldwide presence with business partners

New 2018 technology partners

MSC Software — Simulating Reality, Delivering Certainty — TECHNOLOGY PARTNER

TRANSVALOR

THERCAST FORGE REM3D COLDFORM

The world is changing: Industry 4.0

1st	2nd	3rd	4th
Mechanization, water power, steam power	Mass production, assembly line, electricity	Computer, industrial robots, automation	Cyber-physical systems Customization, build per-order

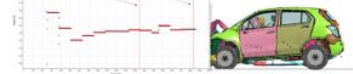
pSeven capabilities

Workflow automation · Design of Experiment · Approximation · Optimization · Uncertainty Quantification

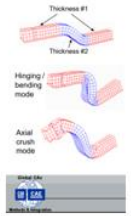
R&D and algorithms improvement never ends

Never stop improving algorithms fostering model QUALITY and optimizer EFFICIENCY

pSeven Beats MOPTA08 Automotive Benchmark



pSeven significantly outperforms most of the results presented in the original publication with reduced number of evaluation required.



Trends and company alignment

Integration platforms all around (ERP, PLM, SDM, PIDO, IOT etc.). Harmonization is a dream.	**Open architecture**
Predictive analytics, predictive maintenance	**Smart Models for complex behaviors**
Collaborative Multidisciplinary strategies	**Nested workflow, batch execution, workflow by reference, cloud deployment**
Model Based Systems Engineering (MBSE) and disciplines	**Most complex smart models export in neutral formats (FMI, C source, Excel etc.) and bridge to MBSE frameworks.**
Centralized architecture. Web access for authors and runners	**pSeven Could deployment (on premises or public cloud). Service based architecture.**

Main pSeven packages

License policy:

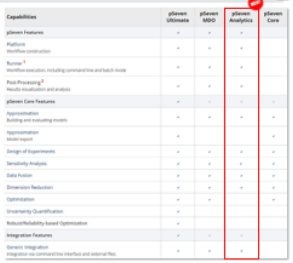
- *pSeven Analytics* - new product package
- Learn more at our website:
  - https://www.datadvance.net/product/licensing

Runner mode available:

- Workflow execution only, with or without post processing.

License files:

- All customers with active maintenance will receive a new license file in order to update to pSeven 6.14



DATADVANCE

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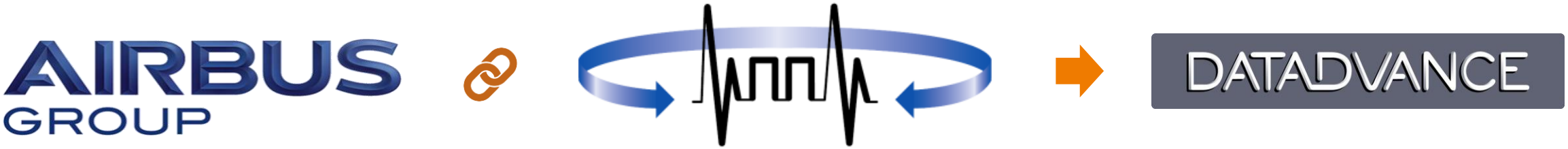

Our customers

Aerospace & Defense

Automotive

Energy, Process & Utilities

Marine & Offshore

Others

© DATADVANCE, 2017

Our team

- DATADVANCE locations:
  - Headquarters are in the Netherlands
  - R&D team of more than 40 highly skilled researchers and engineers (10 PhDs) is in Russi
  - Sales offices are in France and Russia
  - A network of resellers distributes Datadvance solution **Worldwide**

- Close collaboration with research labs:
  - Skolkovo Institute of Technology
  - Massachusetts Institute of Technology
  - Institute of Information Transmission Problem of Russian Academy of Science
  - Institute of Applied Mathematics of RAS
  - Moscow Institute of Physics and Technology
  - Saint Petersburg State Polytechnic University
  - Bauman Moscow State Technical University

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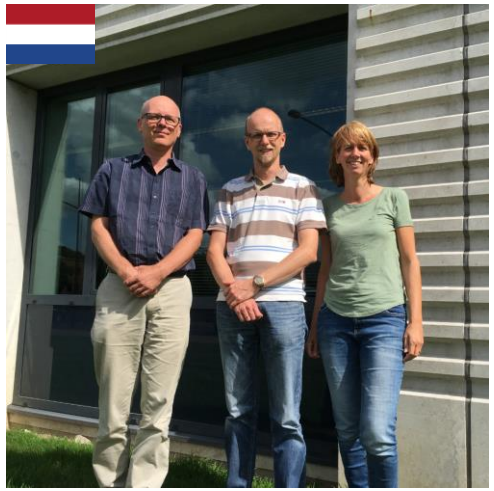
DATADVANCE

Worldwide presence with business partners

2018 newcomers

DAZZTECH

HEC HOLLAND ENGINEERING CONSULTANTS



BIAS MÜHENDİSLİK

THORUS SCISOFT

DATADVANCE

New 2018 technology partners

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Simulating Reality, Delivering Certainty™
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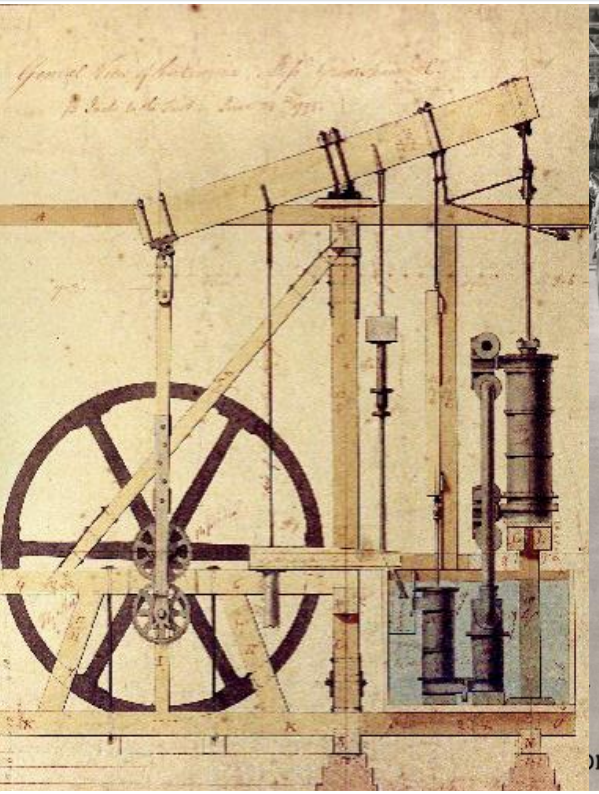
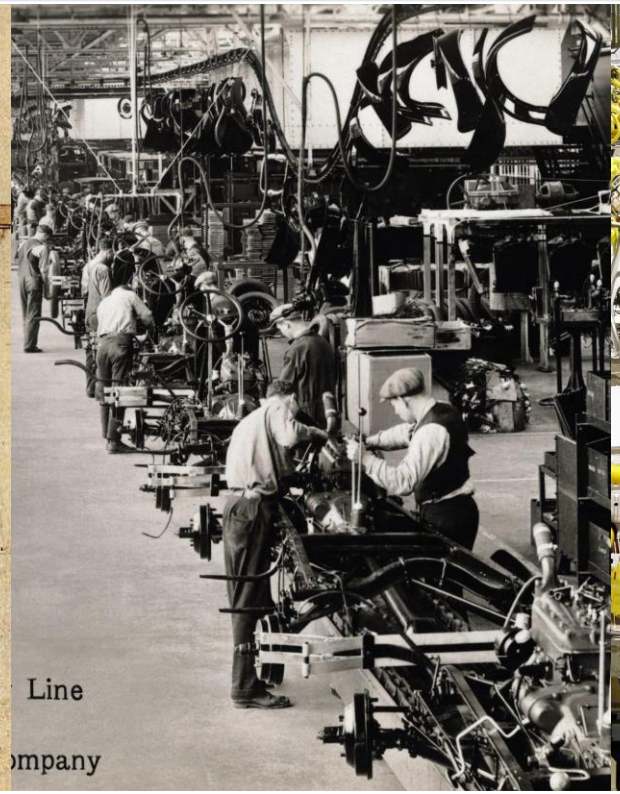
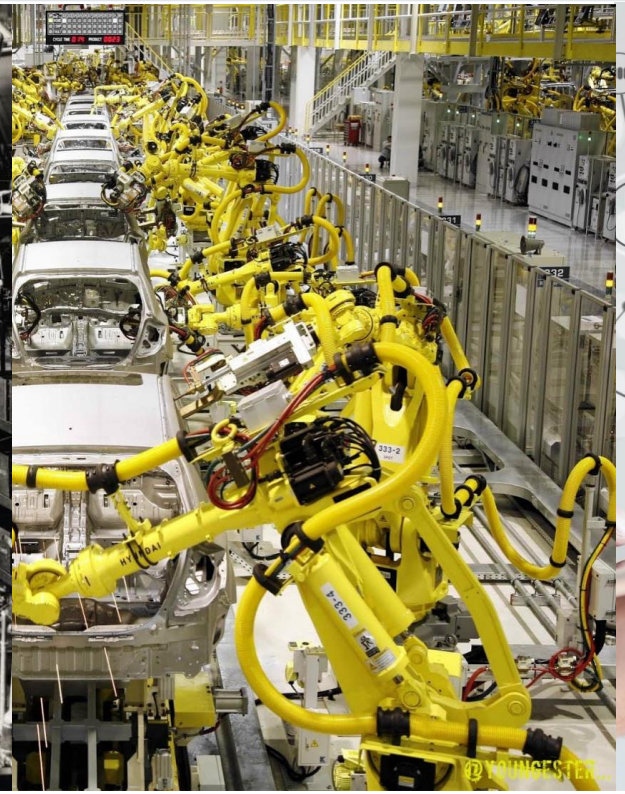
The world is changing: Industry 4.0







1st	2nd	3rd	4th
Mechanization, water power, steam power	Mass production, assembly line, electricity	Computer, industrial robots, automation	Cyber-physical systems Customization, build per-order

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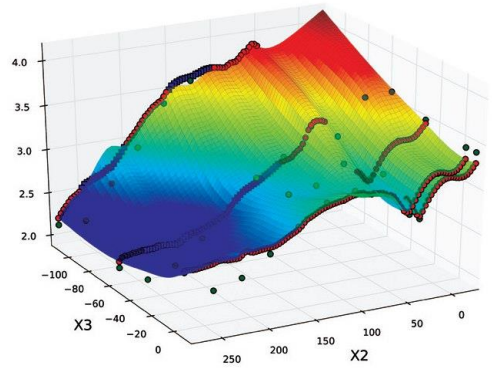
Industry trends

Machine Learning

Smart Model

Artificial Intelligence

Big Data



Analytics

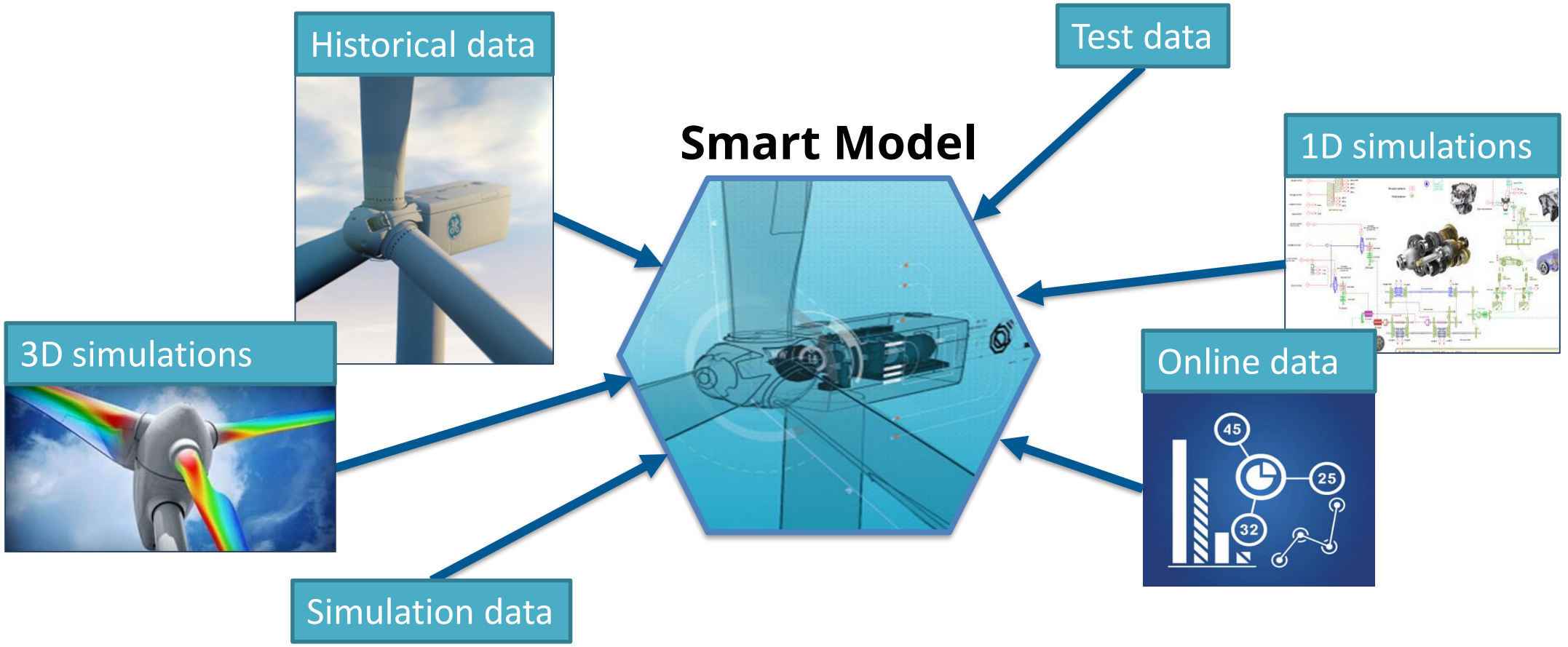
Digital Twin

Sensors

MBSE

DATADVANCE

Smart Model: Connected models and data



- Smart Model are the computerized clones of physical objects at various stages of product life cycle
- Smart Model use **simulation models** and **historical data** from sensors to represent real-time status, working condition or position
- Smart Model can be used for monitoring, diagnostics and prognostics

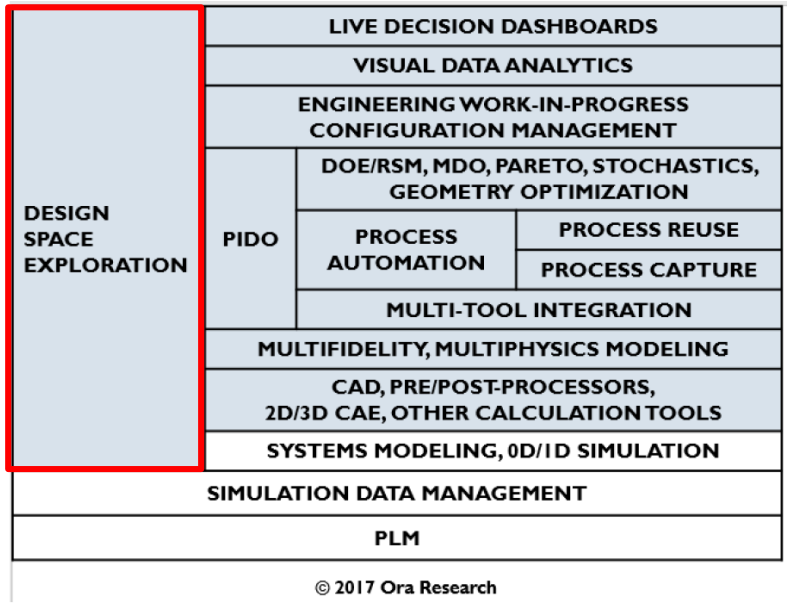
Design Space Exploration in brief

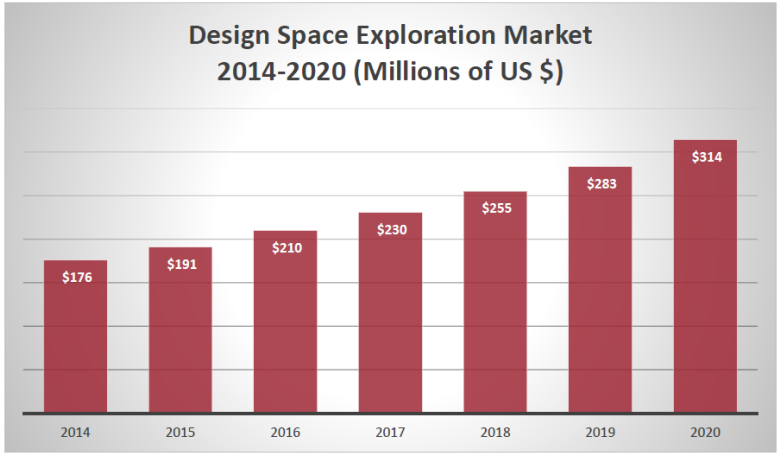
- "***Design Space Exploration*** *is both a class of methods and category of software tools for systematically and automatically exploring very large numbers of design alternatives and identifying those with optimal performance parameters*",

  - B. Jenkins.

- With **Smart Models** one can perform design space exploration easily
  - Understand and develop trust in your model

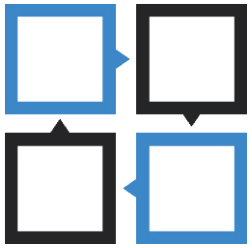
- Mathematical methods:
  - Design of Experiments
  - Sensitivity and Dependency Analysis
  - Surrogate modelling and data analysis
  - Single and Multi-objective Optimization
  - Uncertainty Quantification
  - Robust and Reliability Based Design Optimization





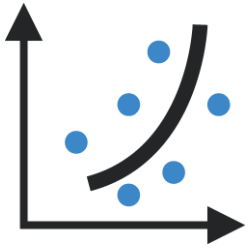
pSeven capabilities

Workflow automation



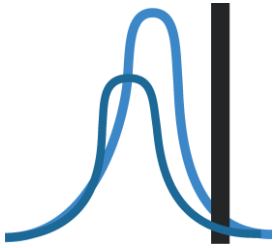
Design of Experiment

Approximation



Optimization

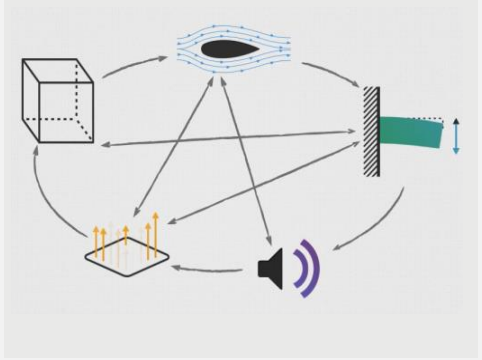
Uncertainty Quantification



DATADVANCE

pSeven building blocks

Process Automation and Integration

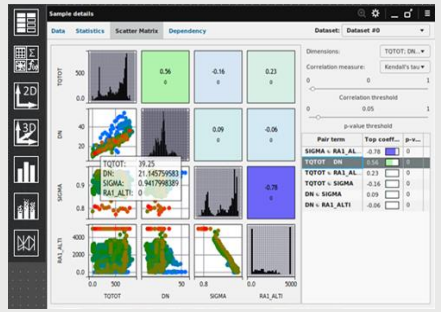


Powerful Workflow Execution Engine

pSeven Core

Efficient Data Mining and Optimization

Data Analysis and Visualization



pSeven Platform

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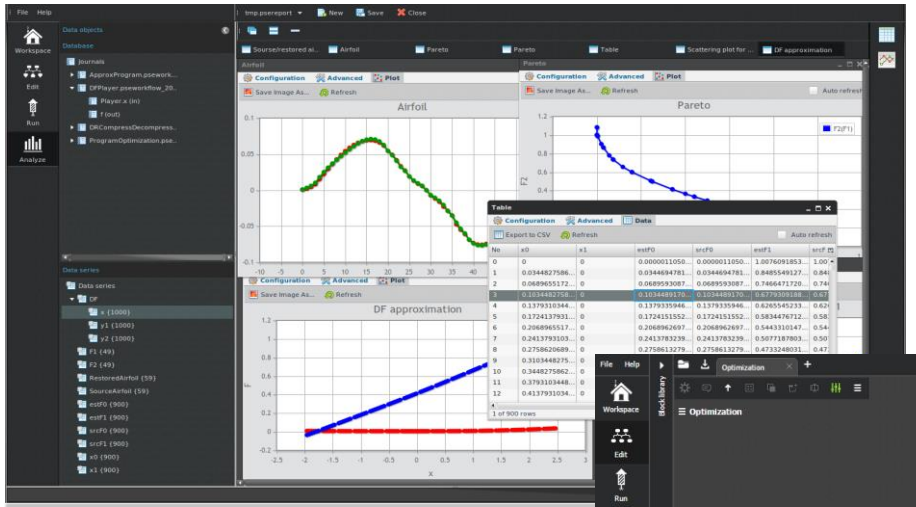
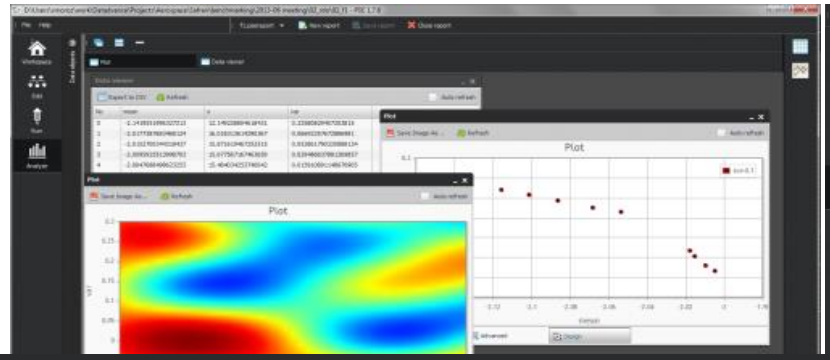
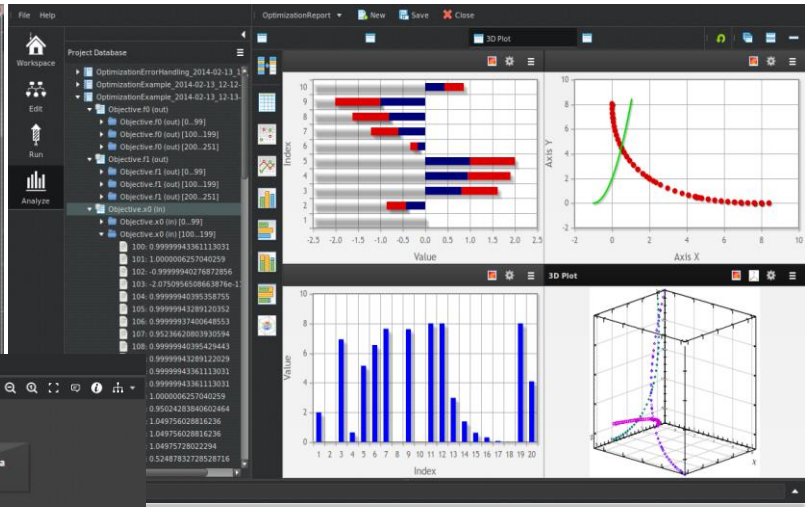
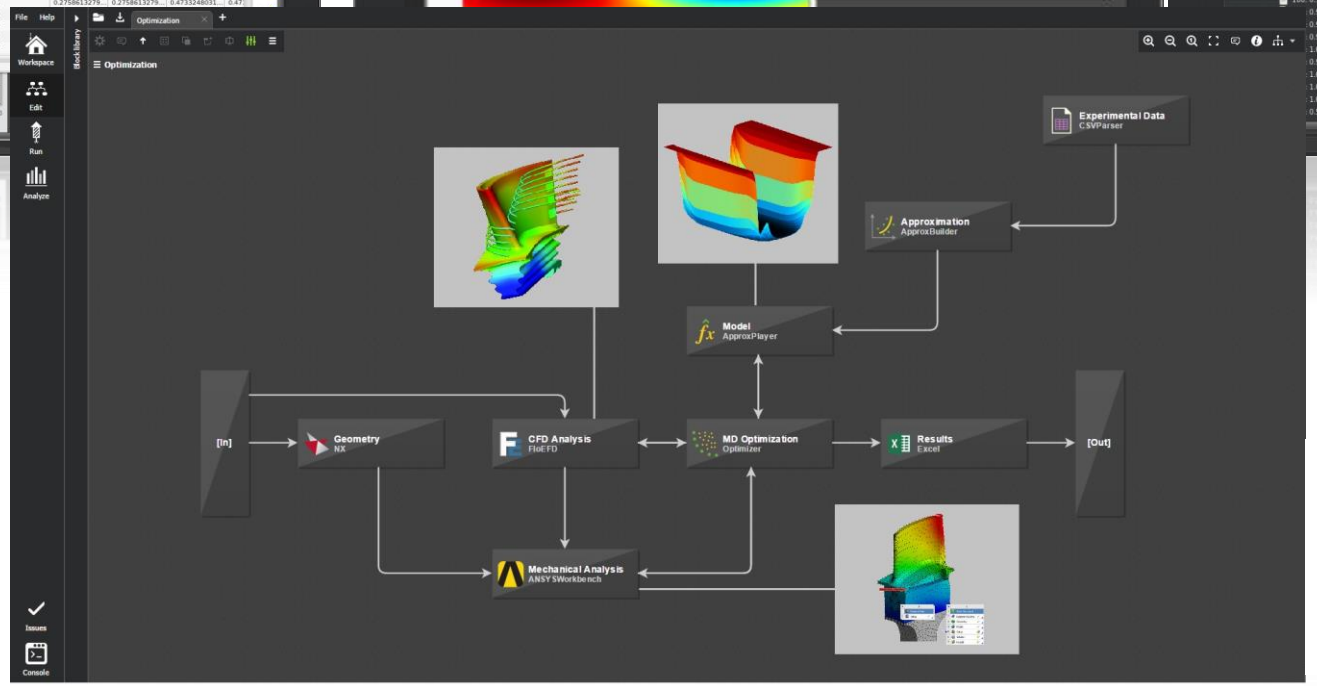
DATADVANCE

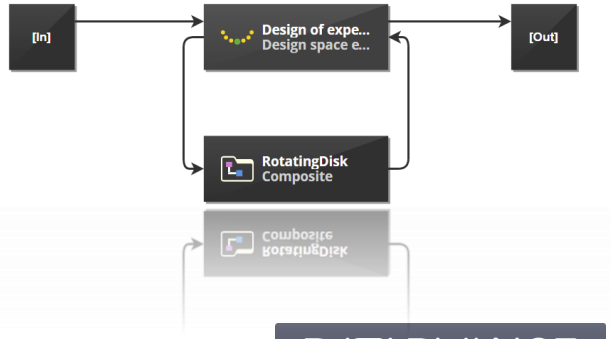
Enhanced user experience











DATADVANCE

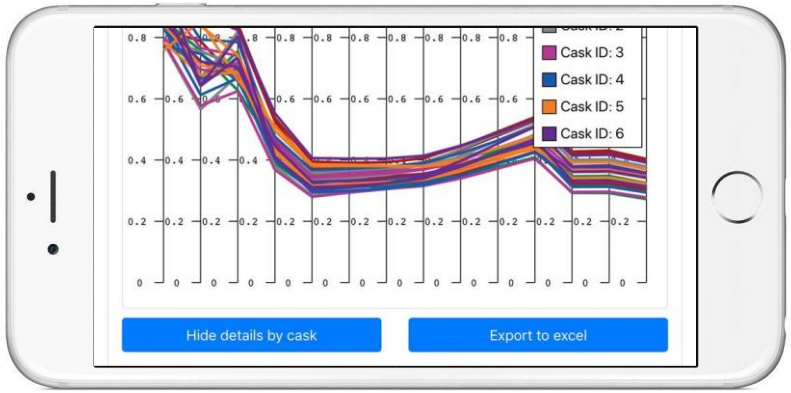
Standardization and democratization

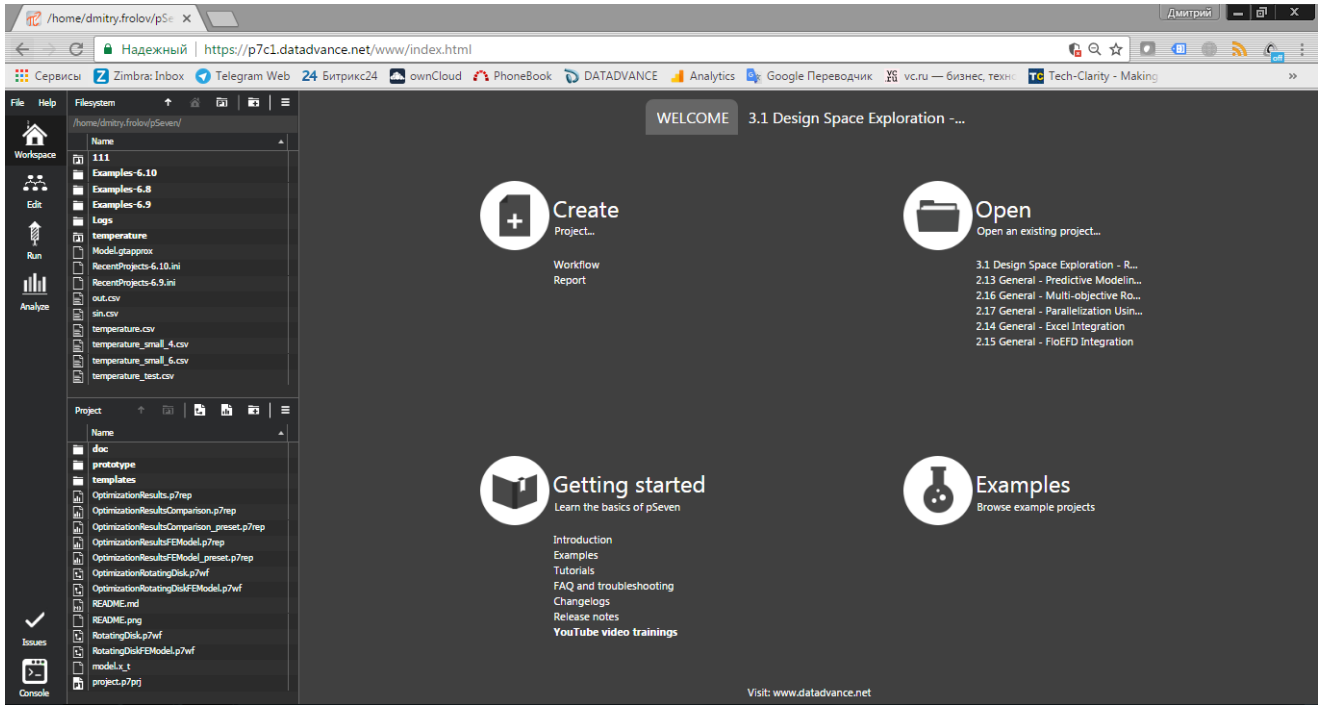
pSeven platform architecture is web-based:

- Backend: Tornado server
- Frontend: Chromium (QtWebEngine)
- Seamless transition to full web solution in future releases

pSeven Cloud can be already run from browser

Easy to add web customer layer





pSeven Cloud in browser

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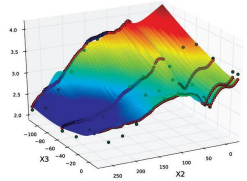
SmartSelection: Design Space Exploration for any engineer

Leading edge technology made available to any engineer

Problem description

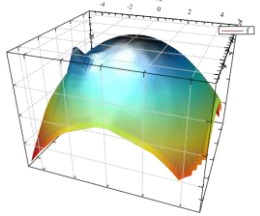
SmartSelection

Approximation



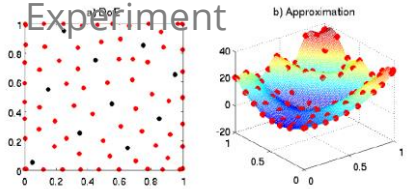
13 Techniques

Optimization



16 Algorithms

Design Of Experiment



NEW!

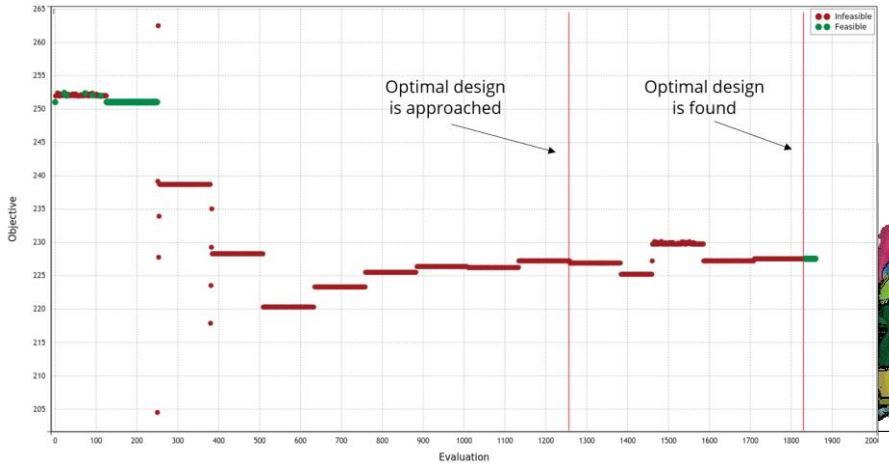
16 Techniques

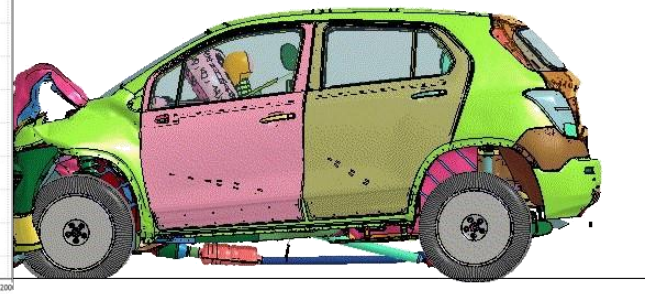
DATADVANCE

R&D and algorithms improvement never ends

Never stop improving algorithms fostering model QUALITY and optimizer EFFICIENCY

[pSeven Beats MOPTA08 Automotive Benchmark]





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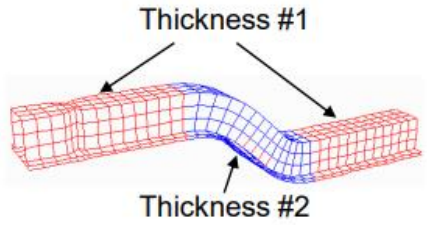
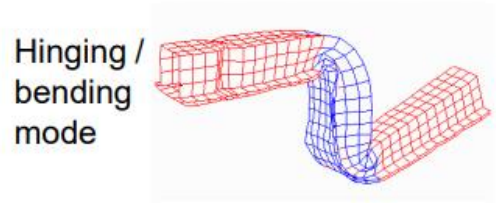
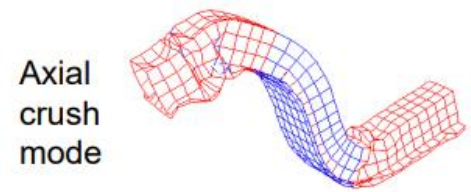






Global CAx
GM CAE
Methods & Integration

DATADVANCE

Trends and company alignment

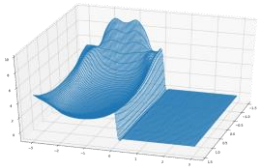
Integration platforms all around (ERP, PLM, SDM, PIDO, IOT etc.). Harmonization is a dream.

Open architecture

REST API GraphQL python JavaScript

Predictive analytics, predictive maintenance

Smart Models for complex behaviors



Collaborative Multidisciplinary strategies

Nested workflow, batch execution, workflow by reference, cloud deployment

Model Based Systems Engineering (MBSE) and disciplines

Most complex smart models export in neutral formats (FMI, C source, Excel etc.) and bridge to MBSE frameworks.

fmi FUNCTIONAL MOCK-UP INTERFACE

Centralized architecture. Web access for authors and runners

pSeven Could deployment (on premises or public cloud). Service based architecture.

DATADVANCE

Main pSeven packages

License policy:

- *pSeven Analytics* - new product package
- Learn more at our website:
  - https://www.datadvance.net/product/licensing

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Capabilities	pSeven Ultimate	pSeven MDO	pSeven Analytics (NEW!)	pSeven Core
pSeven Features	✓	✓	✓	
Platform Workflow construction	✓	✓	✓	
Runner[1] Workflow execution, including command line and batch mode	✓	✓	✓	
Post-Processing[2] Results visualization and analysis	✓	✓	✓	
pSeven Core Features	✓	✓	✓	✓
Approximation Building and evaluating models	✓	✓	✓	✓
Approximation Model export	✓			✓
Design of Experiments	✓	✓	✓	✓
Sensitivity Analysis	✓	✓	✓	✓
Data Fusion	✓	✓	✓	✓
Dimension Reduction	✓	✓	✓	✓
Optimization	✓	✓		✓
Uncertainty Quantification	✓			
Robust/Reliability-based Optimization	✓			
Integration Features	✓	✓	✓	
Generic Integration Integration via command line interface and external files	✓	✓	✓	

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Thank you

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