IDAJ CAE Solution Conference 2019

20th >> 21th NOV 2019
>> **Shanghai**, **China**

ESTECO software technologies today and future Challenges

20 Years of Innovation

Zhongli Wen

In 1999 the **knowledge** acquired during an **EU funded project** has been exploited by founding the spin-off company **ESTECO**.

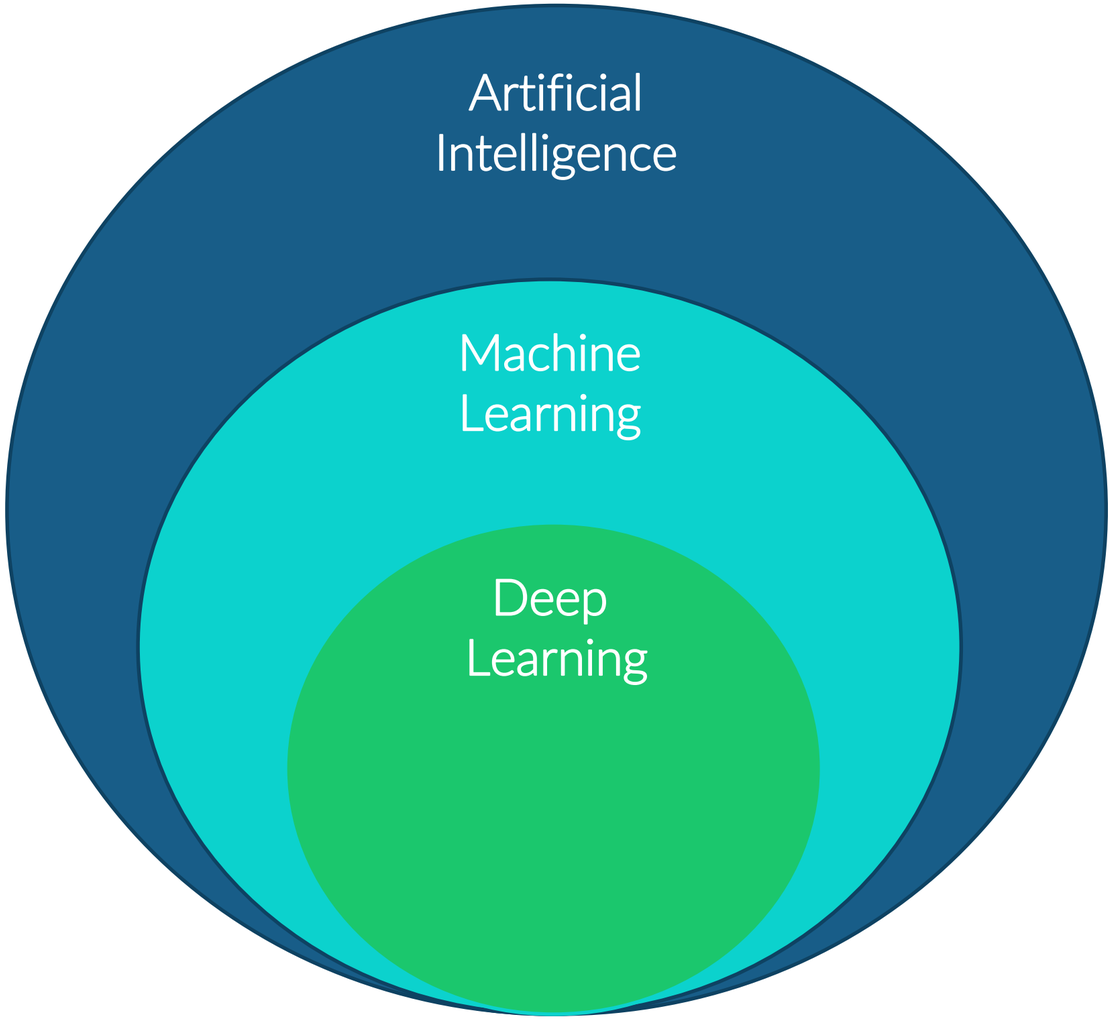
Our Offices

ESTECO North America
Novi, USA

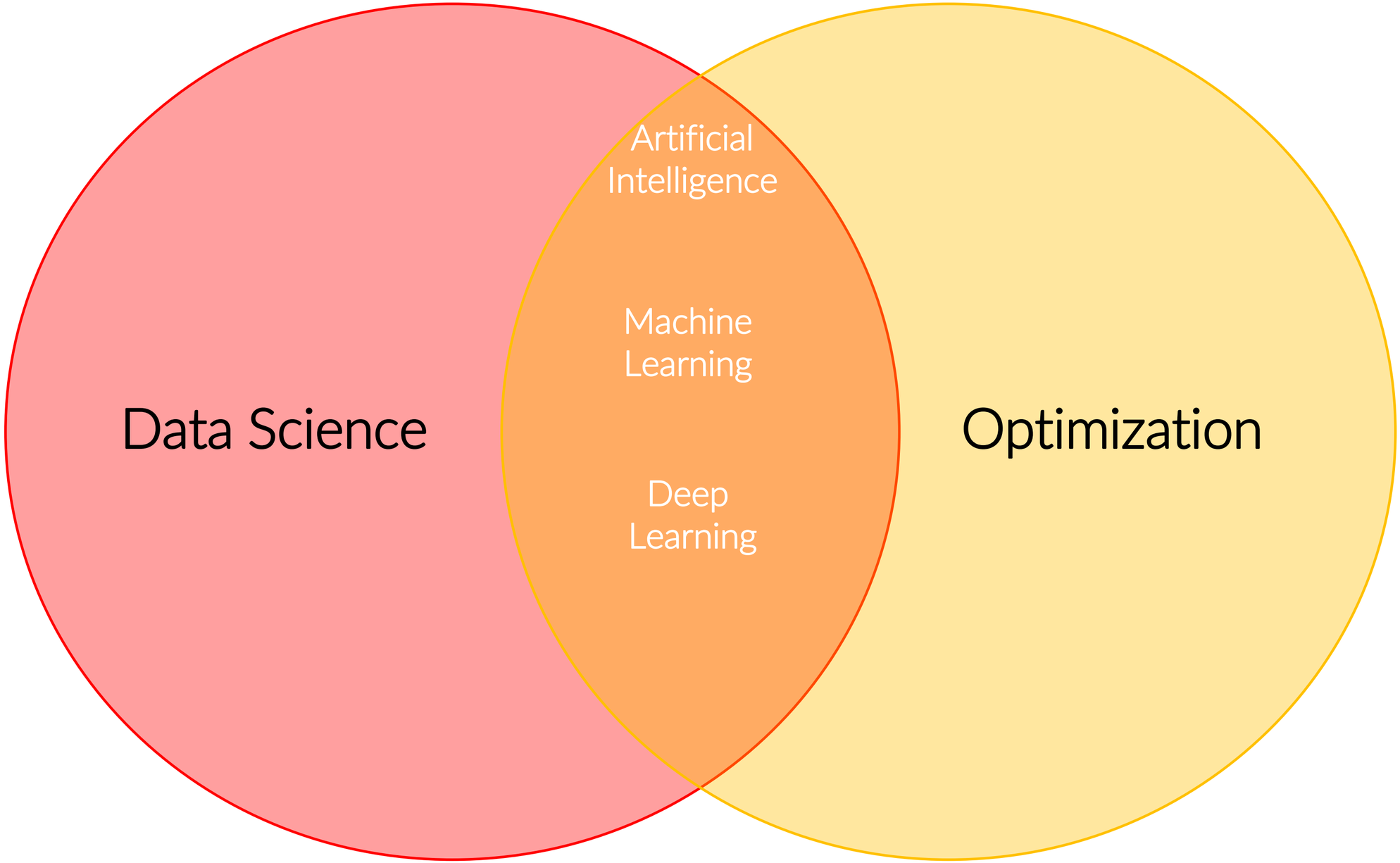
ESTECO HQ
Trieste, Italy

ESTECO Software India
Pune, India

Artificial Intelligence, Machine Learning, Deep Learning

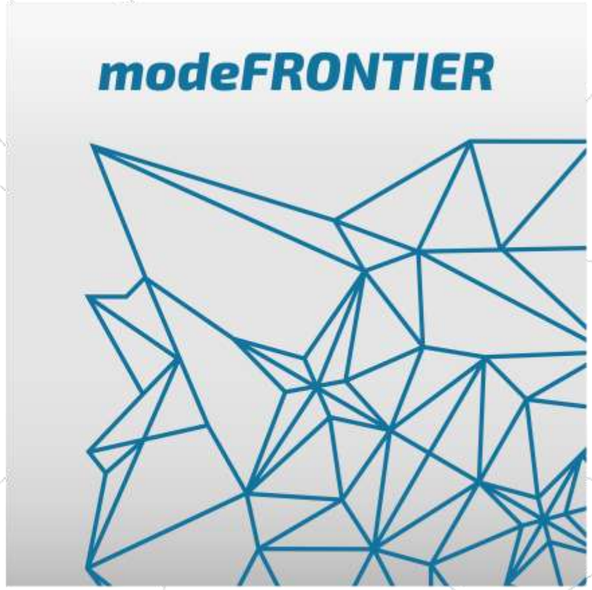


Optimization at the heart of AI and Machine Learning



Our Products

DESKTOP PLATFORM



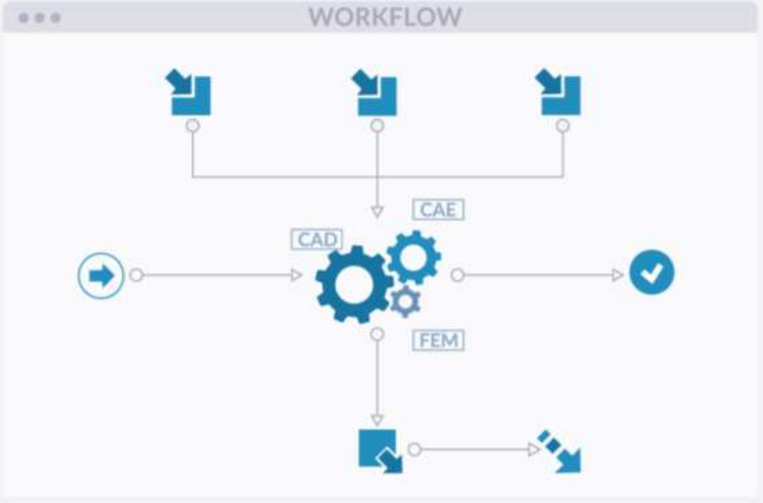
Process automation and optimization of the engineering design process

WEB PLATFORM

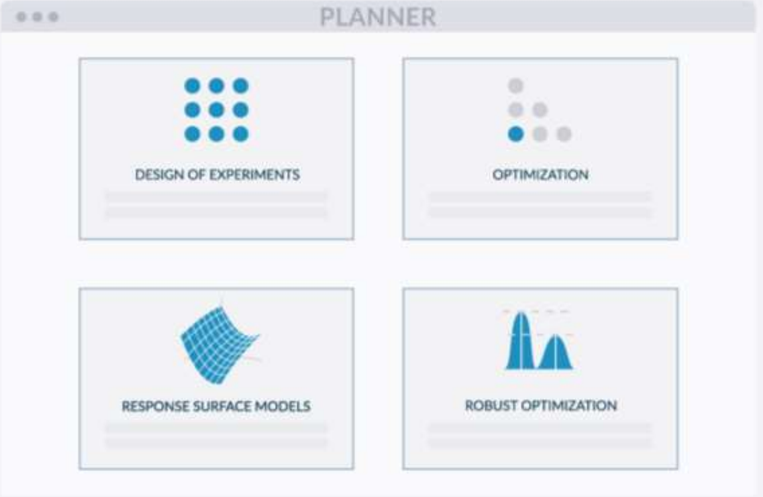
Multidisciplinary business process optimization and enterprise simulation data management

modeFRONTIER

Seamlessly integrate multiple simulation software

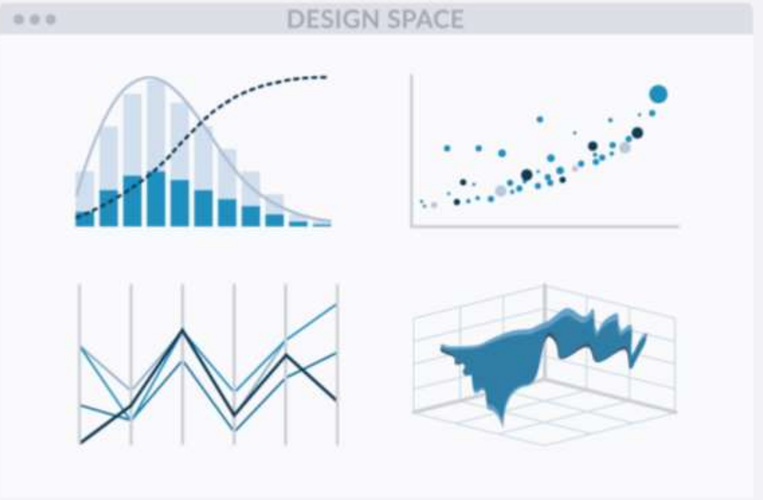


Embrace optimization-driven design with best-in-class algorithms



Execute your process and distribute the computational load

Gain valuable insights from data and make better decisions

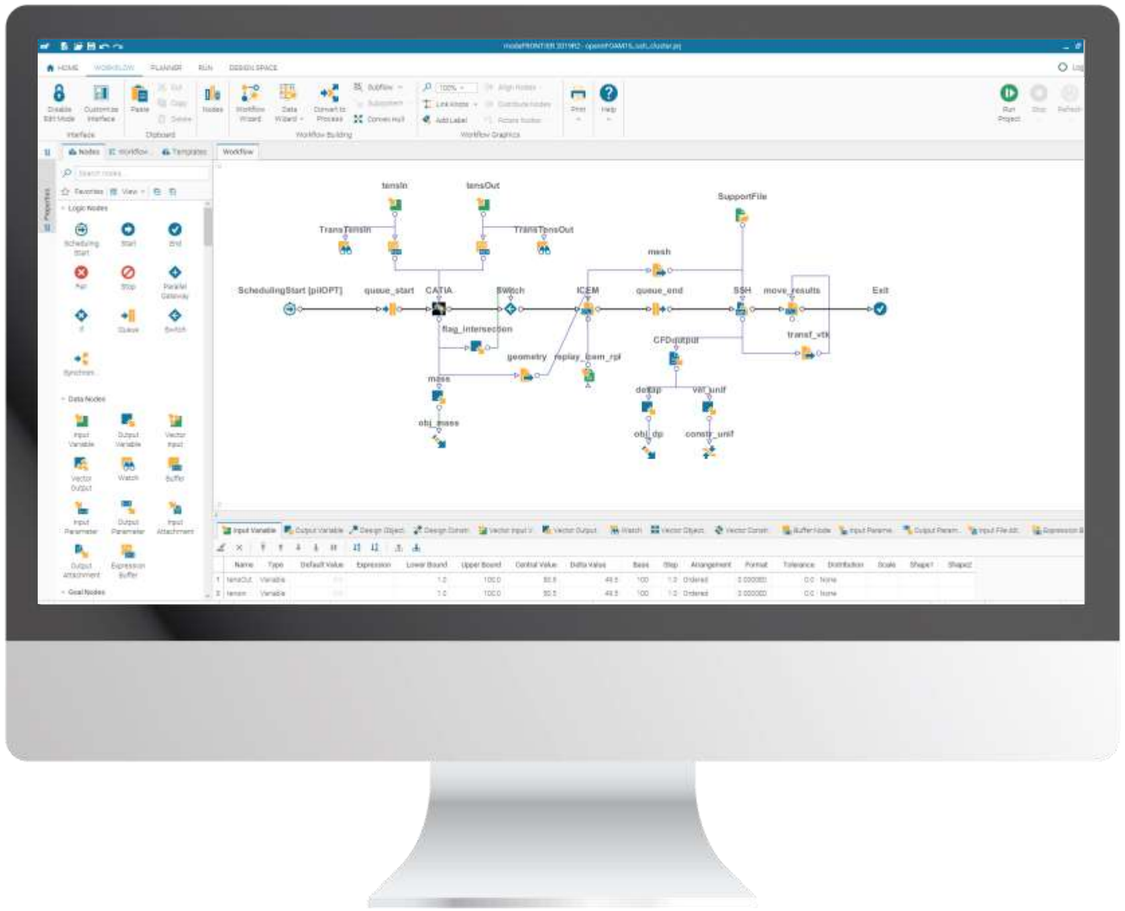


FIND THE OPTIMAL DESIGN, FASTER

Automate simulation with a powerful workflow

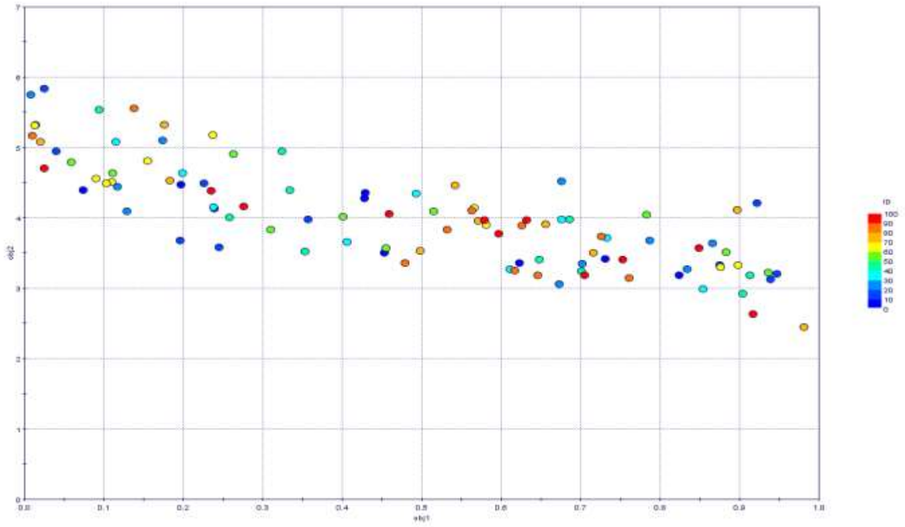
Reduce operational costs
execute complex simulation chains

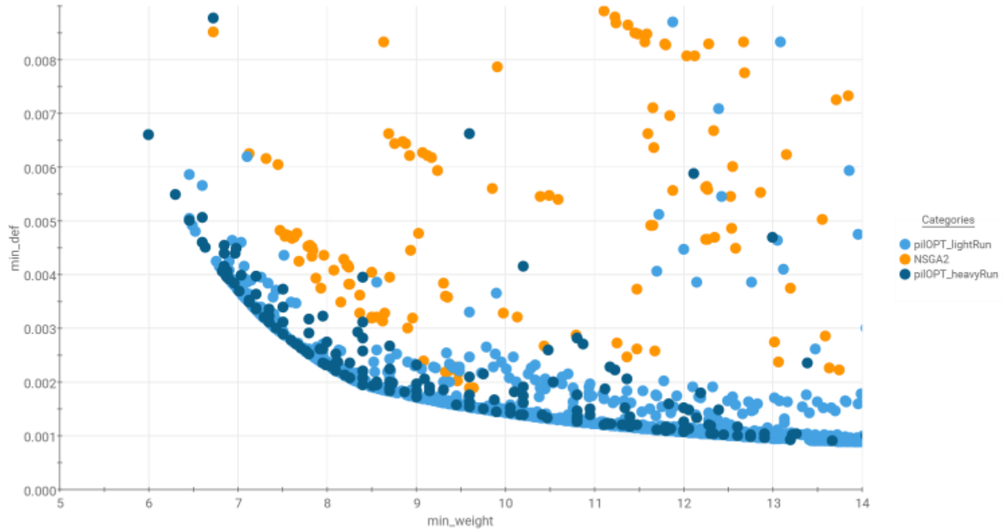
Save time
automatically run
repetitive simulations



Improve performance
evaluate thousands
of design simultaneously

pilOPT: AI one-click optimizer





Explore multi-disciplinary design projects with conflicting objectives

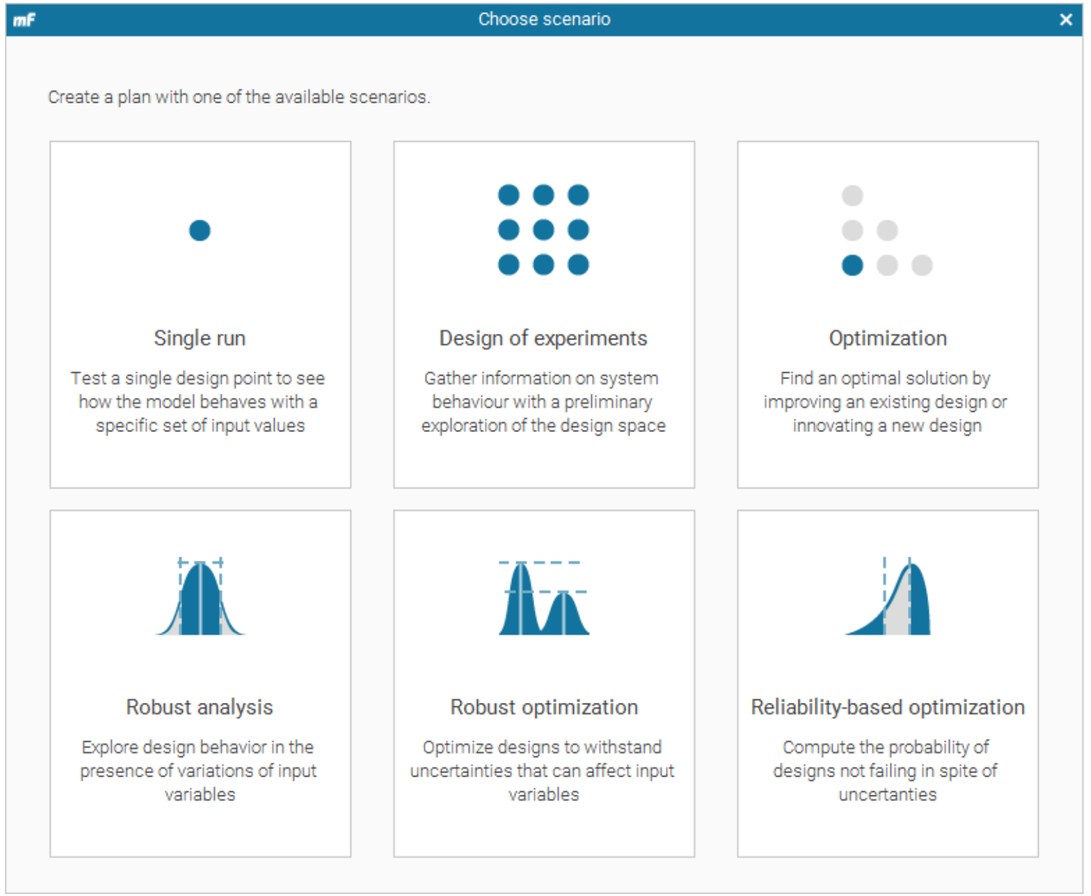
Pick the right design with a full suite of optimization algorithms

Deliver better, more competitive products in less time

Speed up the creation of your studies

Separate the process automation flow from the design exploration strategy.

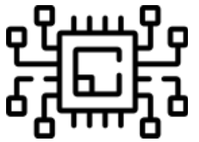
Easily configure different exploration campaigns



Apply multiple campaigns on the same design problem

Machine Learning in mF: when they are efficient

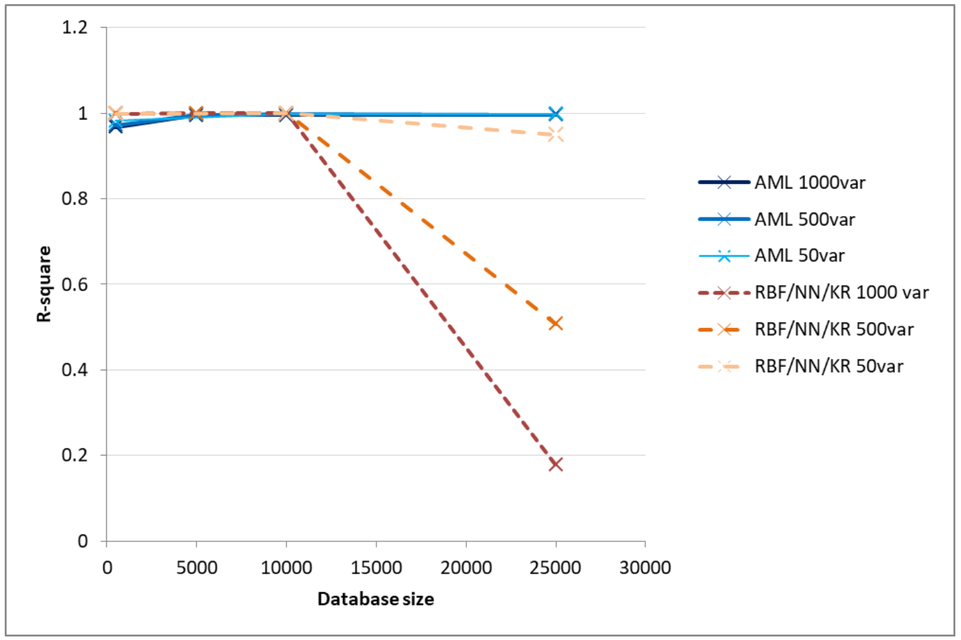
- Large datasets (over 5000 designs)
- Large number of variables (up to hundreds)
- Catalogue variables (unordered)
- Efficient for time-series data

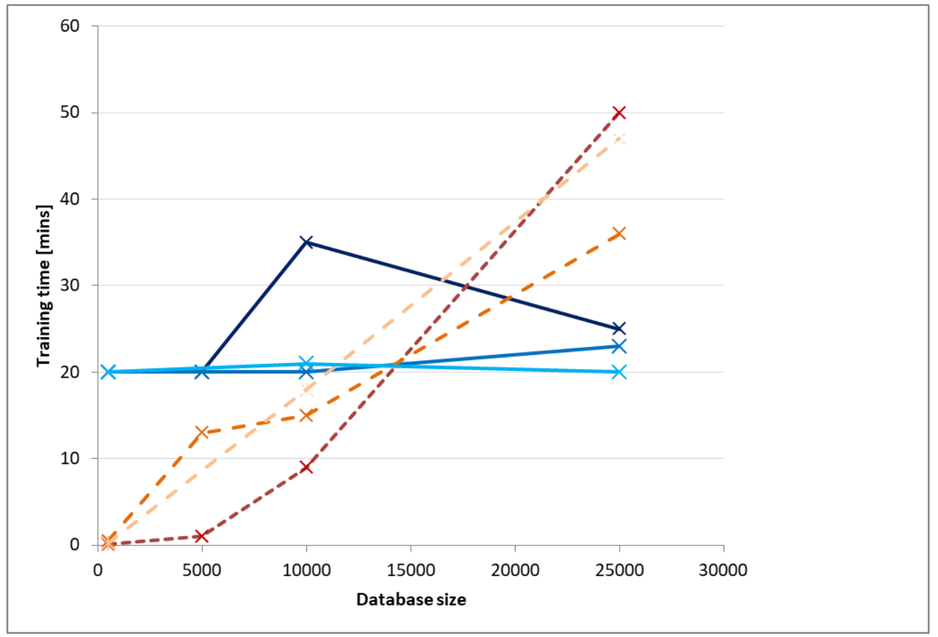


Note: RSM Training includes Cross-validation (Run Logs)

Machine Learning: efficiency vs problem size

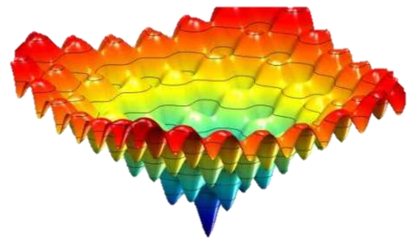
When database size increases, only AML (and DRF, GBM) keeps high efficiency
The effect is more evident as the number of variables increases





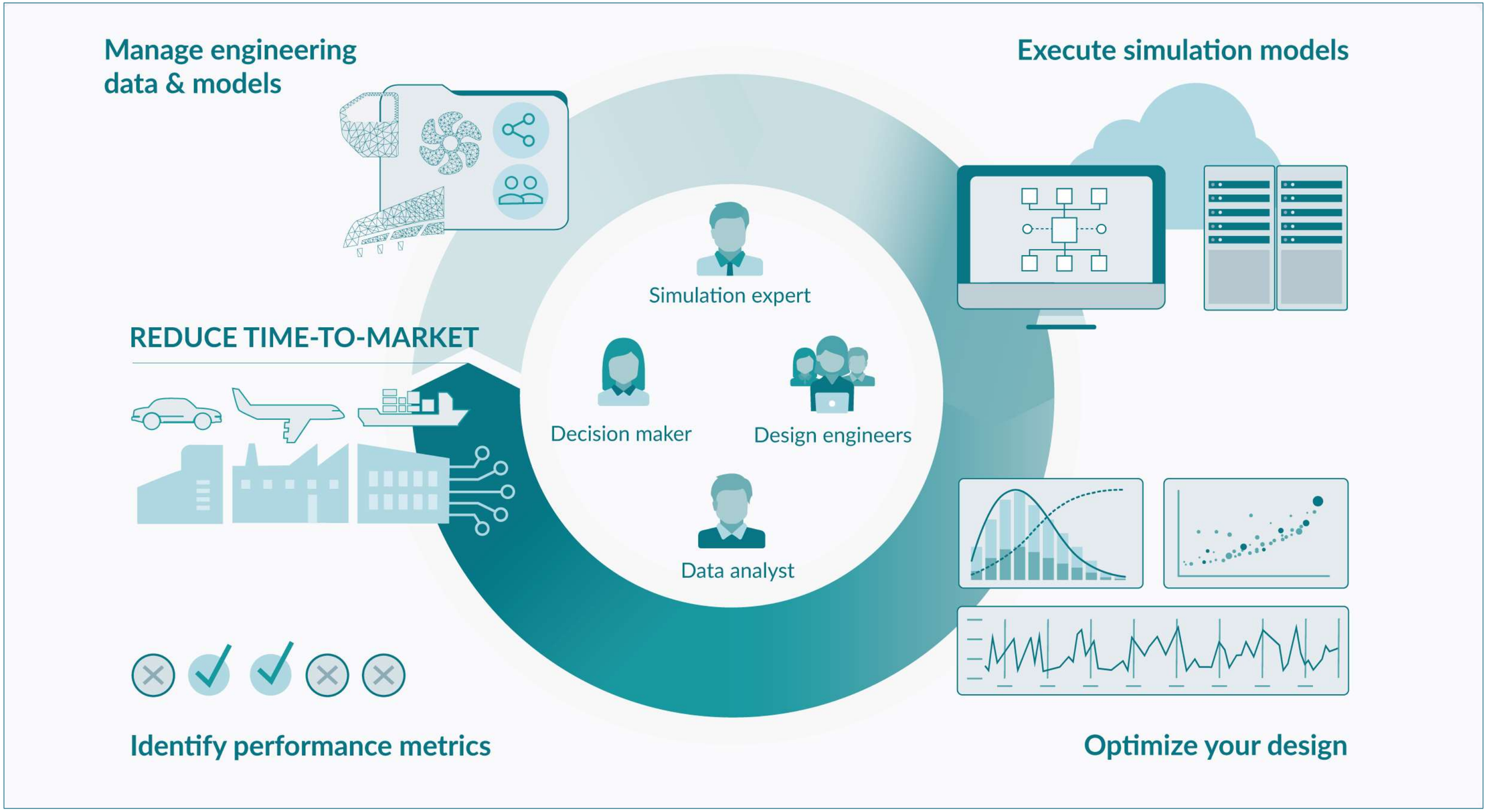
- Ackley function scalable problem
  https://en.wikipedia.org/wiki/Ackley_function

- Validation performed using 20% of database
- The dotted curves report the best result obtained with one of RBF, NN or KR methods
- The dashed lines report results for AML, which are the same as DRF or GNM other ML methods



Ford's **Yan Fu** publicly mentions **SOMO** for the first time during ESTECO **UM14** in Trieste, Italy.

VOLTA

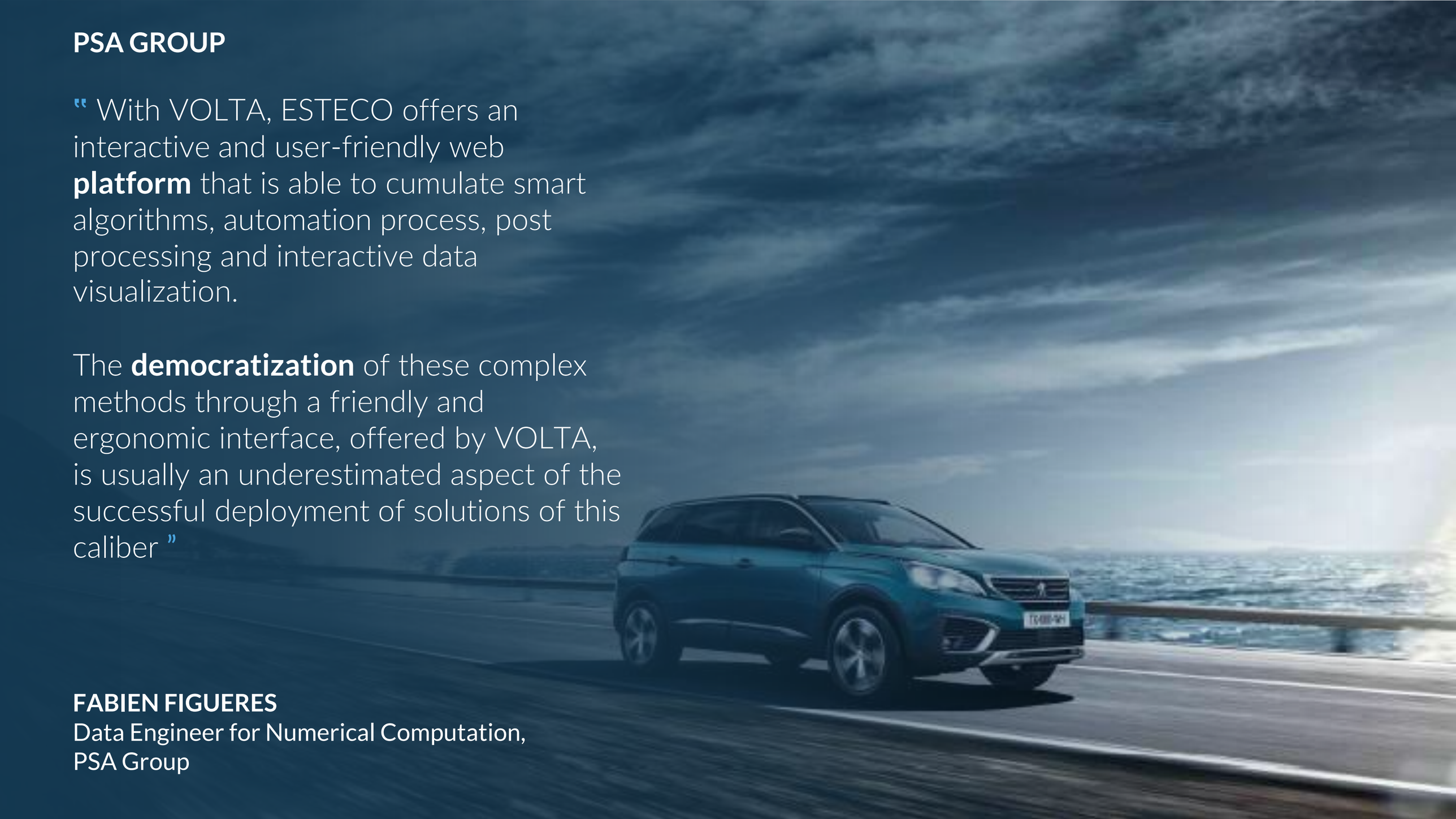

Manage engineering data & models
Execute simulation models
Simulation expert
REDUCE TIME-TO-MARKET
Decision maker
Design engineers
Data analyst
Identify performance metrics
Optimize your design


VOLTA advisor

PSA GROUP

" With VOLTA, ESTECO offers an interactive and user-friendly web **platform** that is able to cumulate smart algorithms, automation process, post processing and interactive data visualization.

The **democratization** of these complex methods through a friendly and ergonomic interface, offered by VOLTA, is usually an underestimated aspect of the successful deployment of solutions of this caliber "

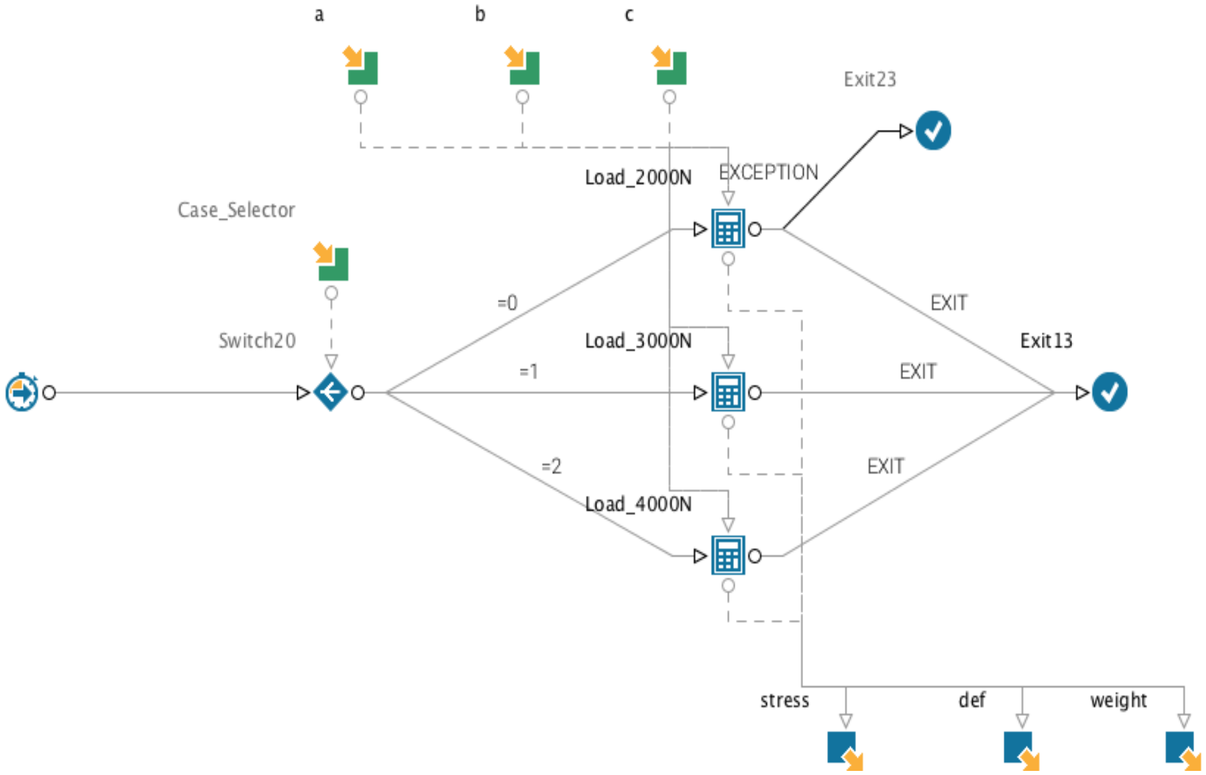


FABIEN FIGUERES
Data Engineer for Numerical Computation,
PSA Group

A **strong** and **continuous** research is the base of all **ESTECO** technologies

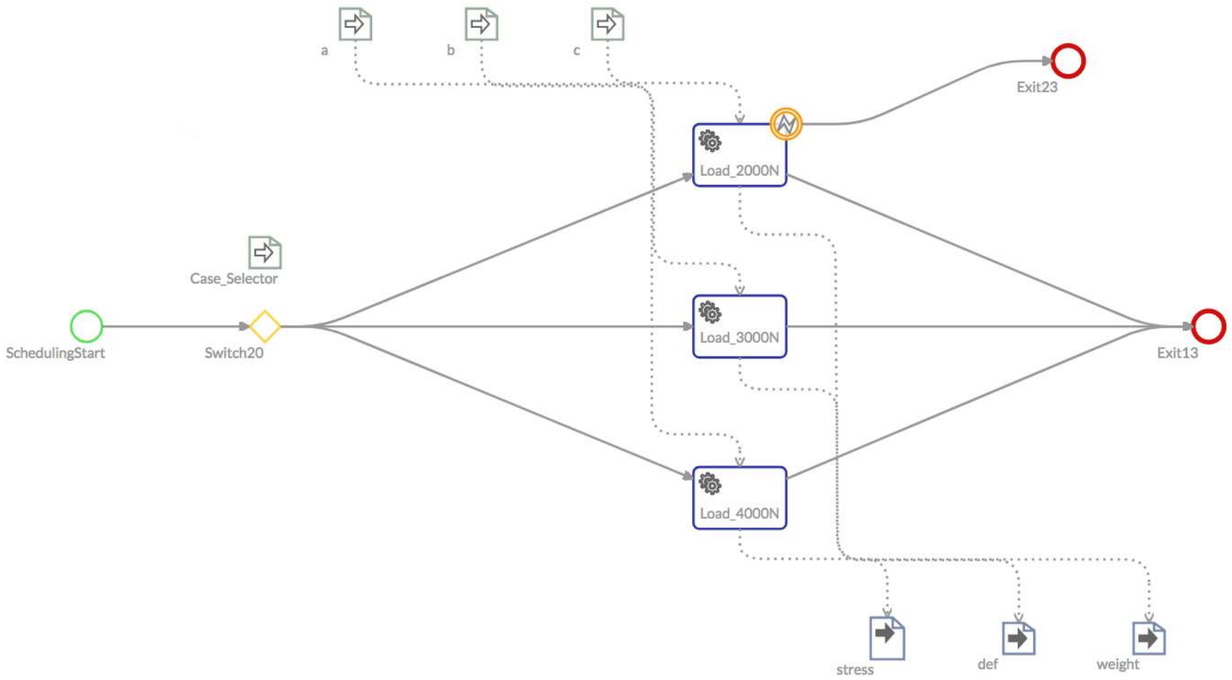
Our Legacy

Proprietary Formats



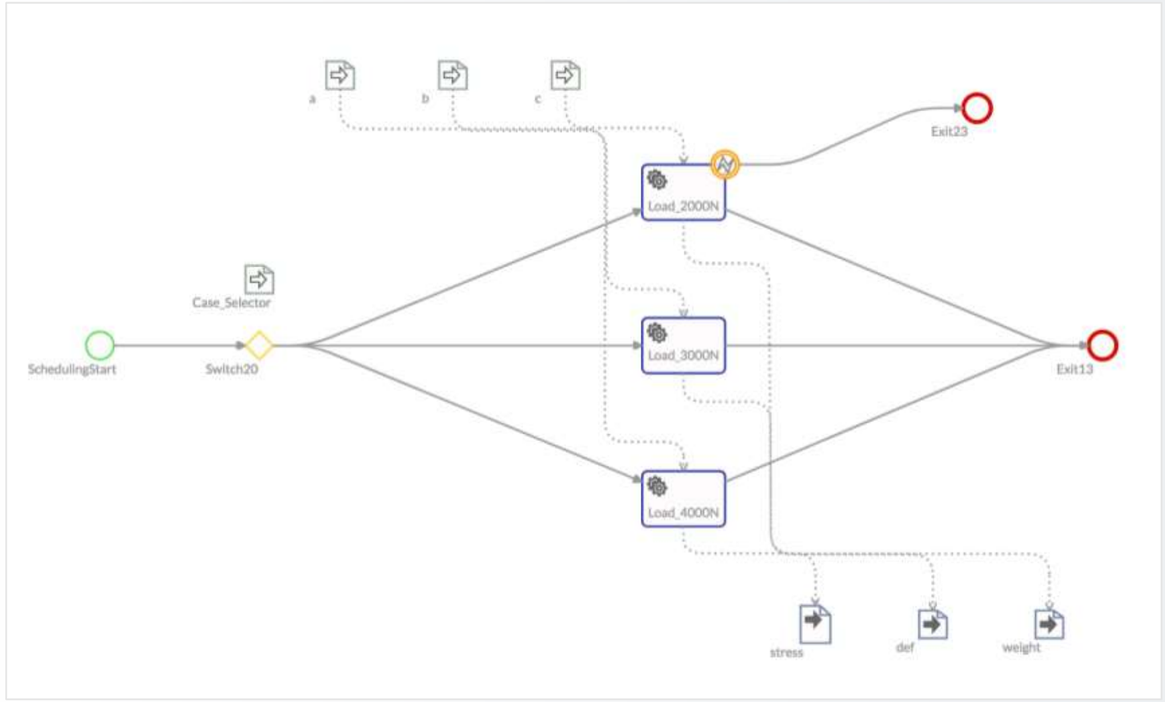
Our Aim

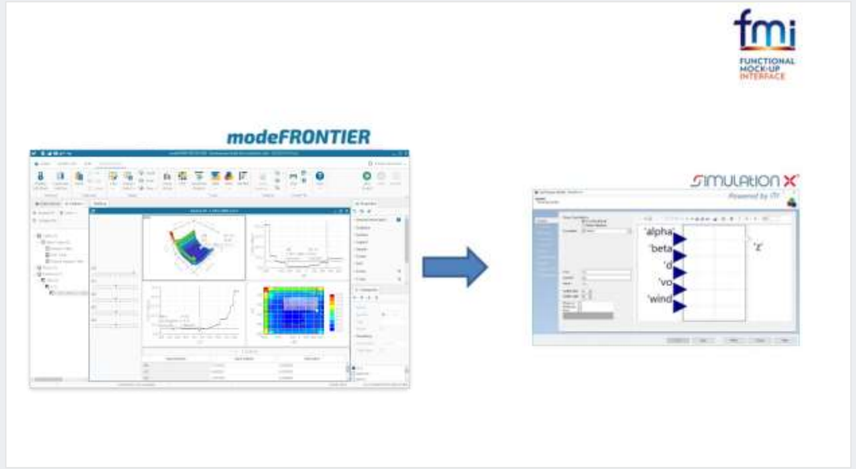
International Standards



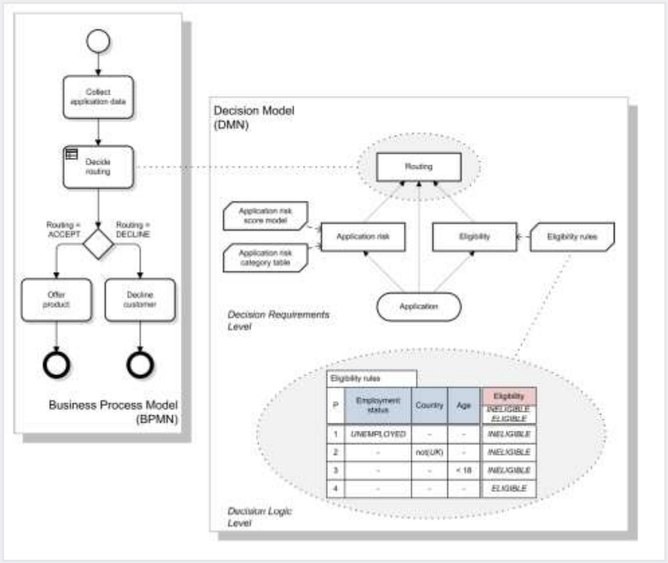
Our Standards

Business **P**rocess **M**anagement **N**otation





Functional **M**ock-up **I**nterface



Decision **M**anagement **N**otation

OBJECT MANAGEMENT GROUP®

Our technology inspires companies to **create, capture** and **cultivate** engineering knowledge

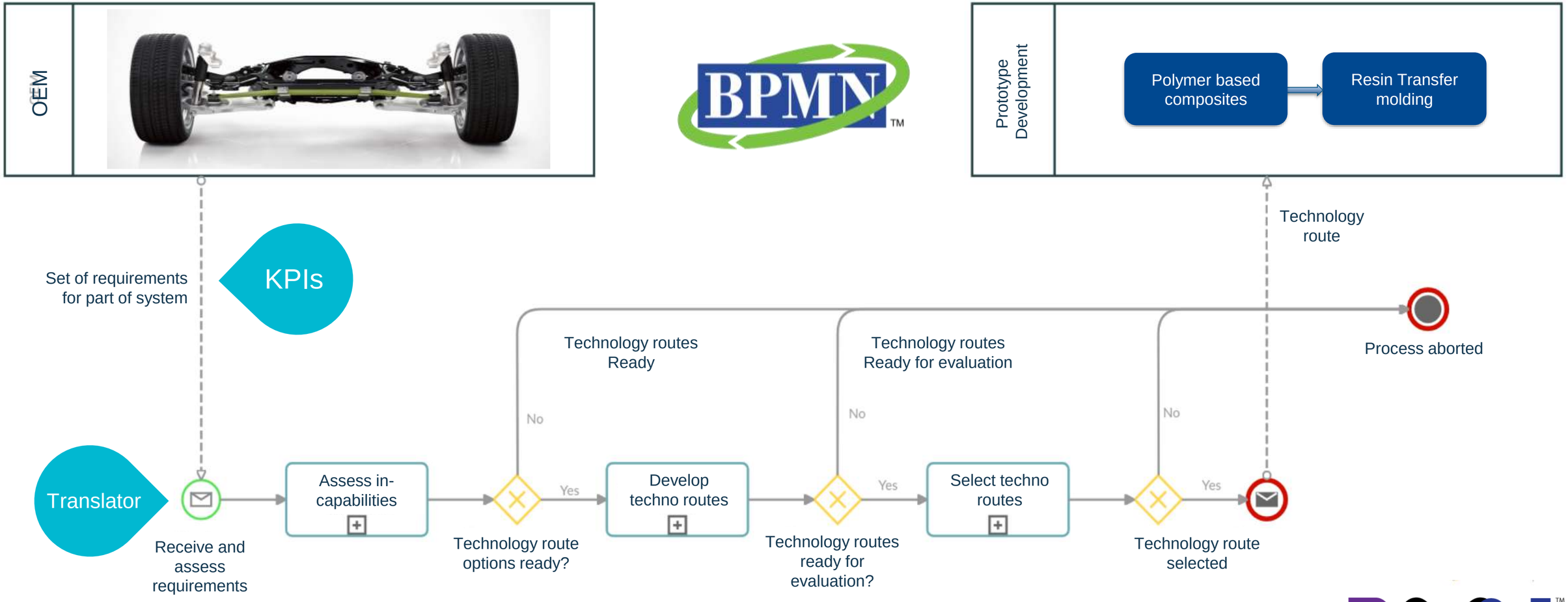
COMPOSELECTOR Project

Technology in Action

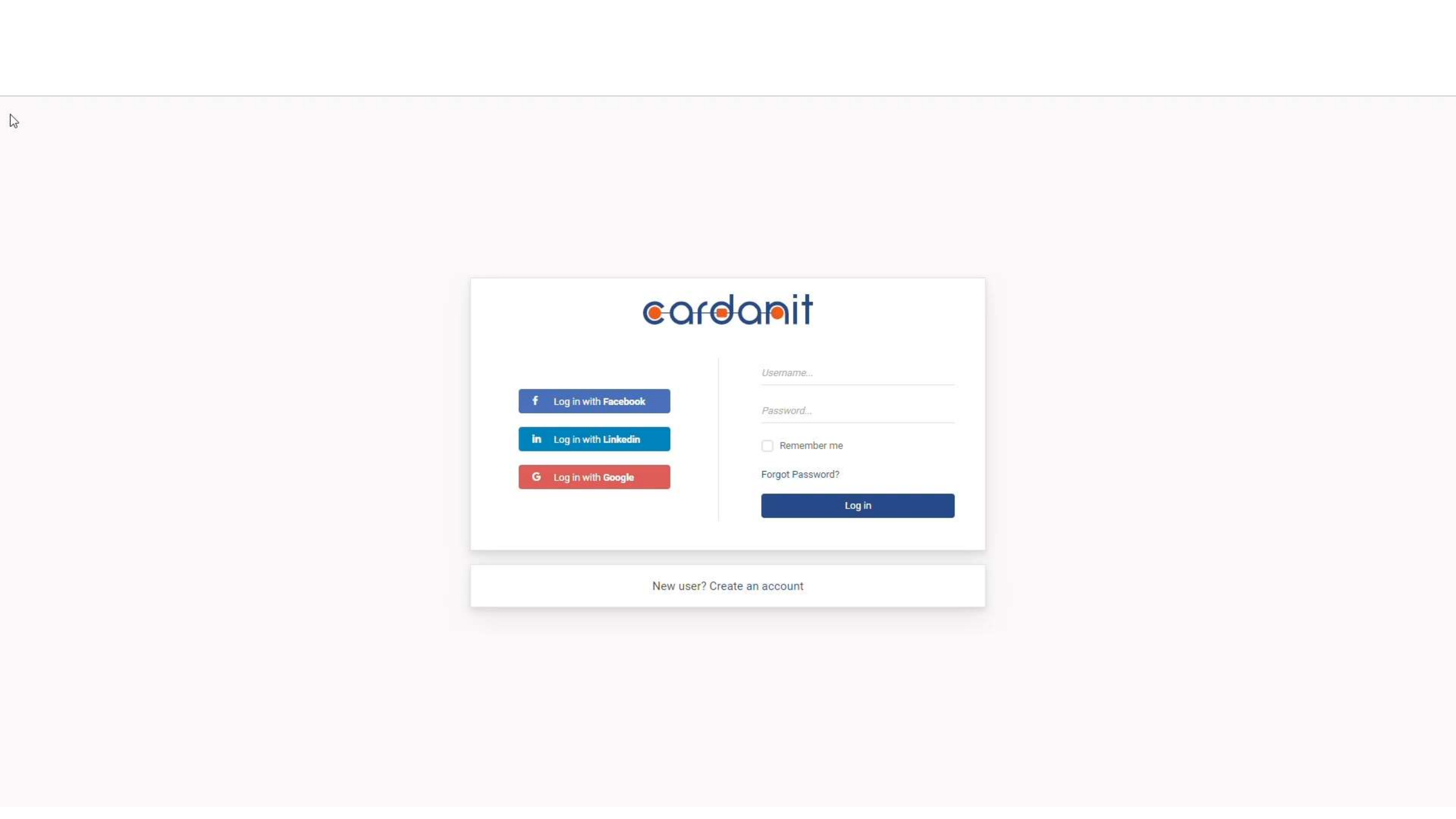
COMPOSELECTOR
Polymer Composites
Business Decision Support System

European Commission | Horizon 2020 European Union funding for Research & Innovation

Business process analysis with BPMN and DMN



GOODYEAR
DOW
AIRBUS
DMN

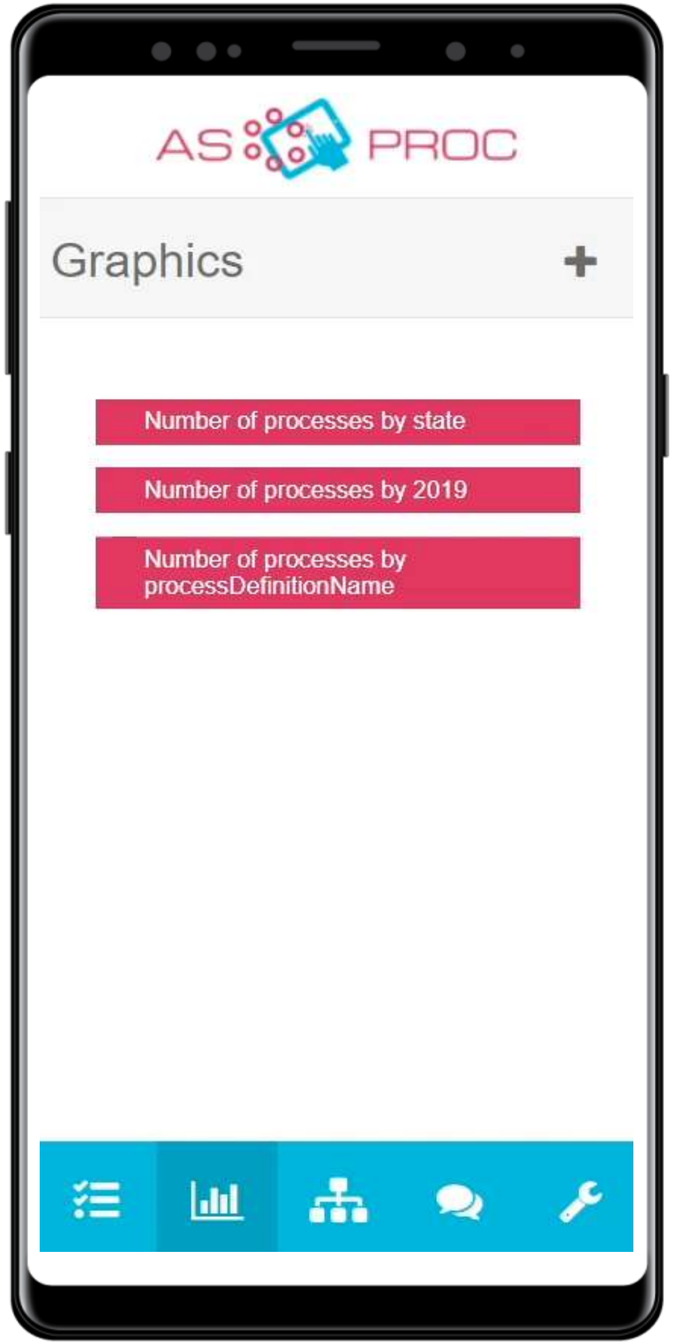

cardanit
Log in with Facebook
Log in with Linkedin
Log in with Google
Username...
Password...
Remember me
Forgot Password?
Log in
New user? Create an account

The Monitoring App

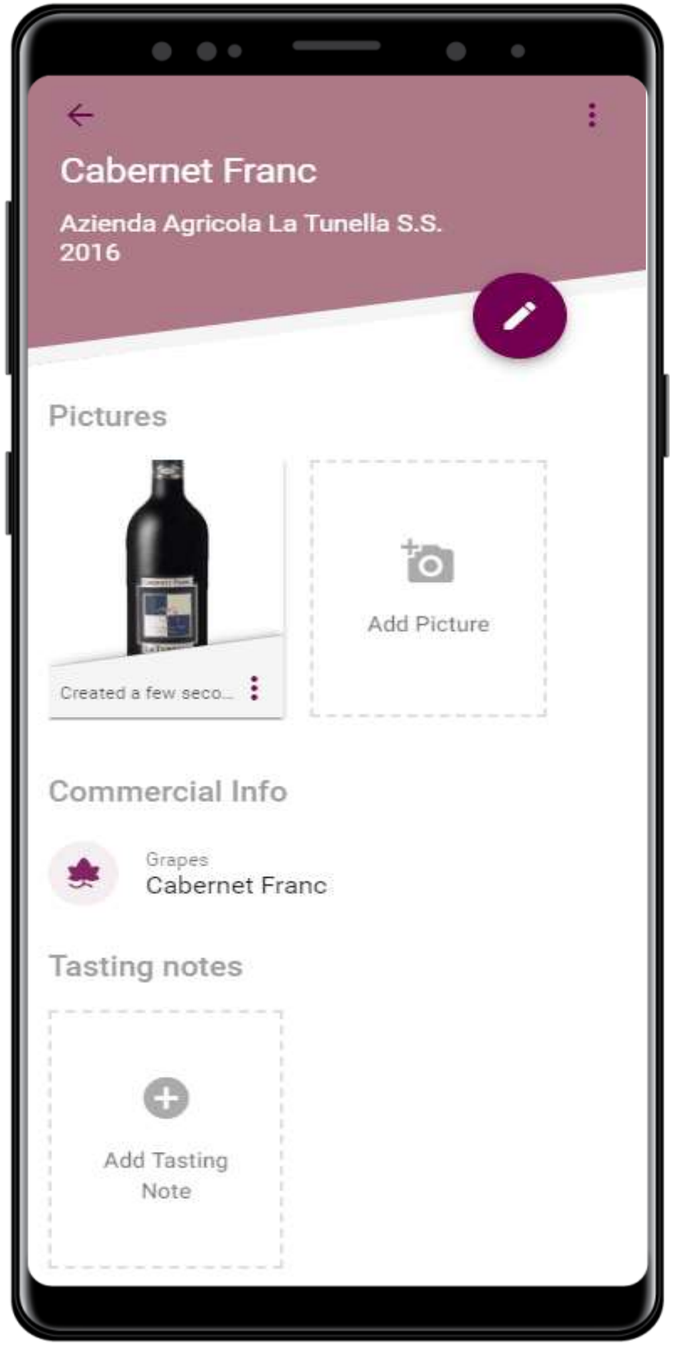
Works on **iOS, Android** and also on web browsers.

Can be used to query the business layers getting information about **current** and **previous processes**.

Supports business decision making activities by interacting directly with **BPMN** and **DMN** processes in execution.



Unconventional **Digital Twins**



Unconventional Digital Twins

The idea of a digital twin is not new. It goes back to **computer aided design** and engineering representations of things.

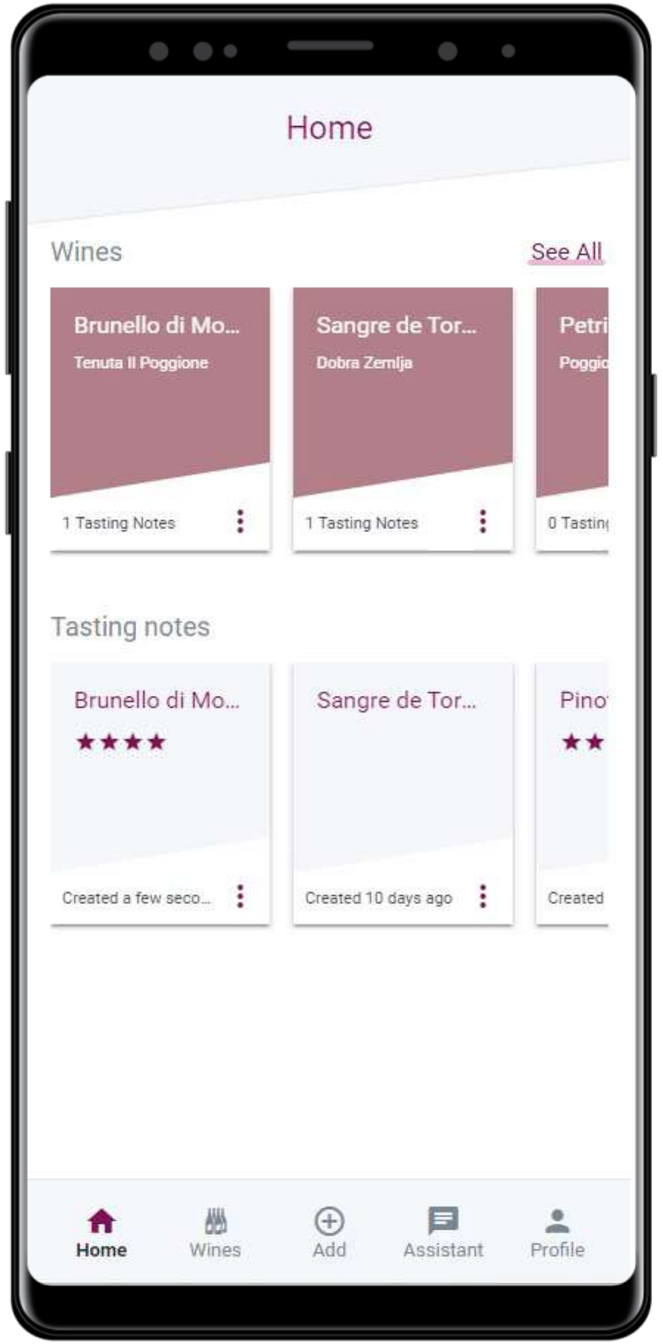
Today it is expanding also on **mapping online profiles of customers**; not only objective properties but also the **subjective user experience** when they look for a new car or a wine for the dinner

This new family of mobile applications is built to **collect, analyze** and **model** the user's behavior.

AI based Mobile Advisors

A new family of mobile **advisors** based on advanced AI technologies (e.g. *Google Assistant*, *Amazon Alexa* or *Apple Siri*) can leverage **citizen generated content** to train its engines.

The advisor makes available to all “citizens” the **collective knowledge**



PETROBRAS

300+ organizations have chosen ESTECO to consolidate specialized **expertise**, streamline **teamwork** and boost **product development** across a wide spectrum of industrial sectors.

" modeFRONTIER proved to be invaluable in helping us to address the complex problem of selecting the main dimensions of a deep water floating production system, where there is potentially a huge number of alternatives to be evaluated "

DR. MAURO COSTA DE OLIVEIRA
Naval architect at CENPES, Petrobras Research Center

50% Automotive

20% Aerospace

15% Energy

15% Other

FORD MOTOR COMPANY

" We see ESTECO more as a **partner** than a software vendor; they are always ready and willing to help us advance our methods and become more proficient in the use of design optimization techniques.

Currently we are introducing Uncertainty Quantification and Reliability into our modeFRONTIER studies and 2 ESTECO engineers have gone through formal DFSS training in order to better support us in this process "

MARIO FELICE, MANAGER
Global Powertrain NVH & Systems CAE

Our Customers & Industries

Embraer
Leonardo
Lockheed Martin
Bombardier
FCA
Ford
Honda
PSA Group
Toyota
Volvo Cars Corporation

Mahindra
TAFE
Volvo Trucks
ABB
Bajaj
BASF
Cummins
FAW
Whirpool
Sony

Automotive

Aerospace

Industrial Equipment

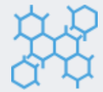
Construction

Energy & Environment

Consumer Goods

Marine & Offshore

Electronics



Biotechnology

Our Customers & Industries

CHINA

FAW Group

Shanghai Tenneco Exhaust System

BYD Auto

Honda China

Liuzhou Wuling Engine

SAIC Volkswagen Automotive

China Shipbuilding Power Engineering Institute

Automotive

Aerospace

Industrial Equipment

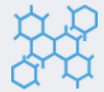
Construction

Energy & Environment

Consumer Goods

Marine & Offshore

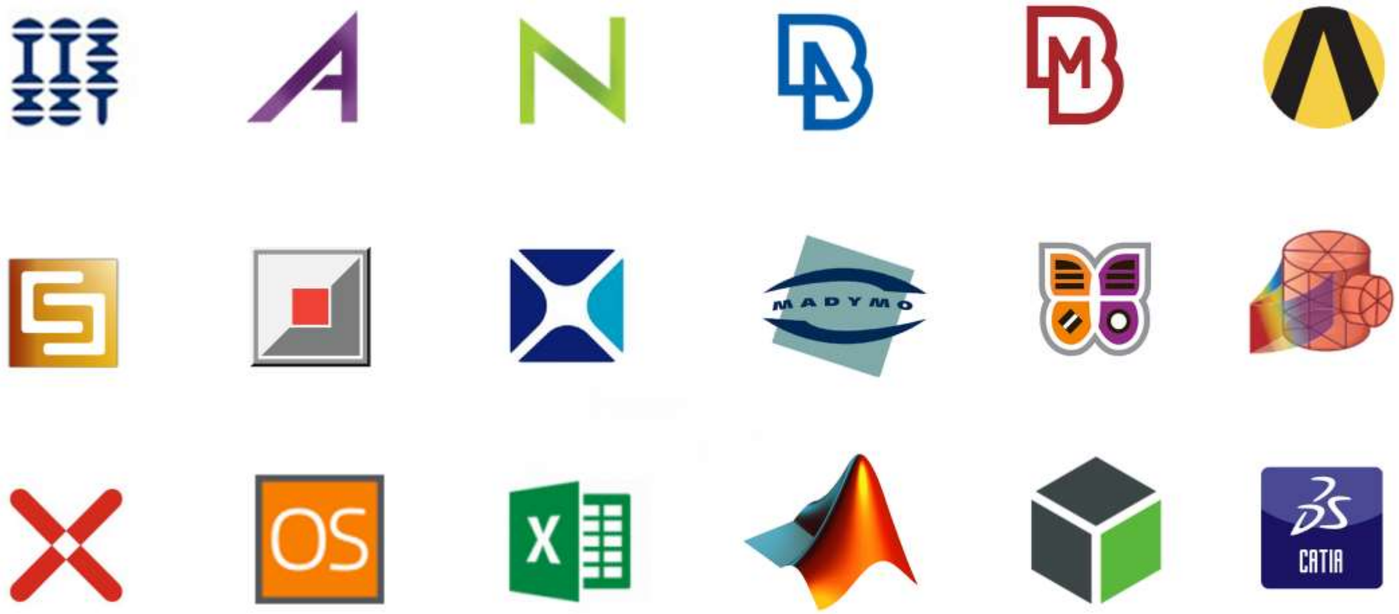
Electronics



Biotechnology

Our Technical Partners

Seamless integration at hand



Our solutions are fully integrated with the most commonly used engineering tools

Our Alliances

Creating value for our customers

Building coherent solutions with best in class third party software

Our Channel Partners

Our Channel Partners

Our Scientific Foundation

Spin-off

of a European Funded Project in the late 90's

Academy

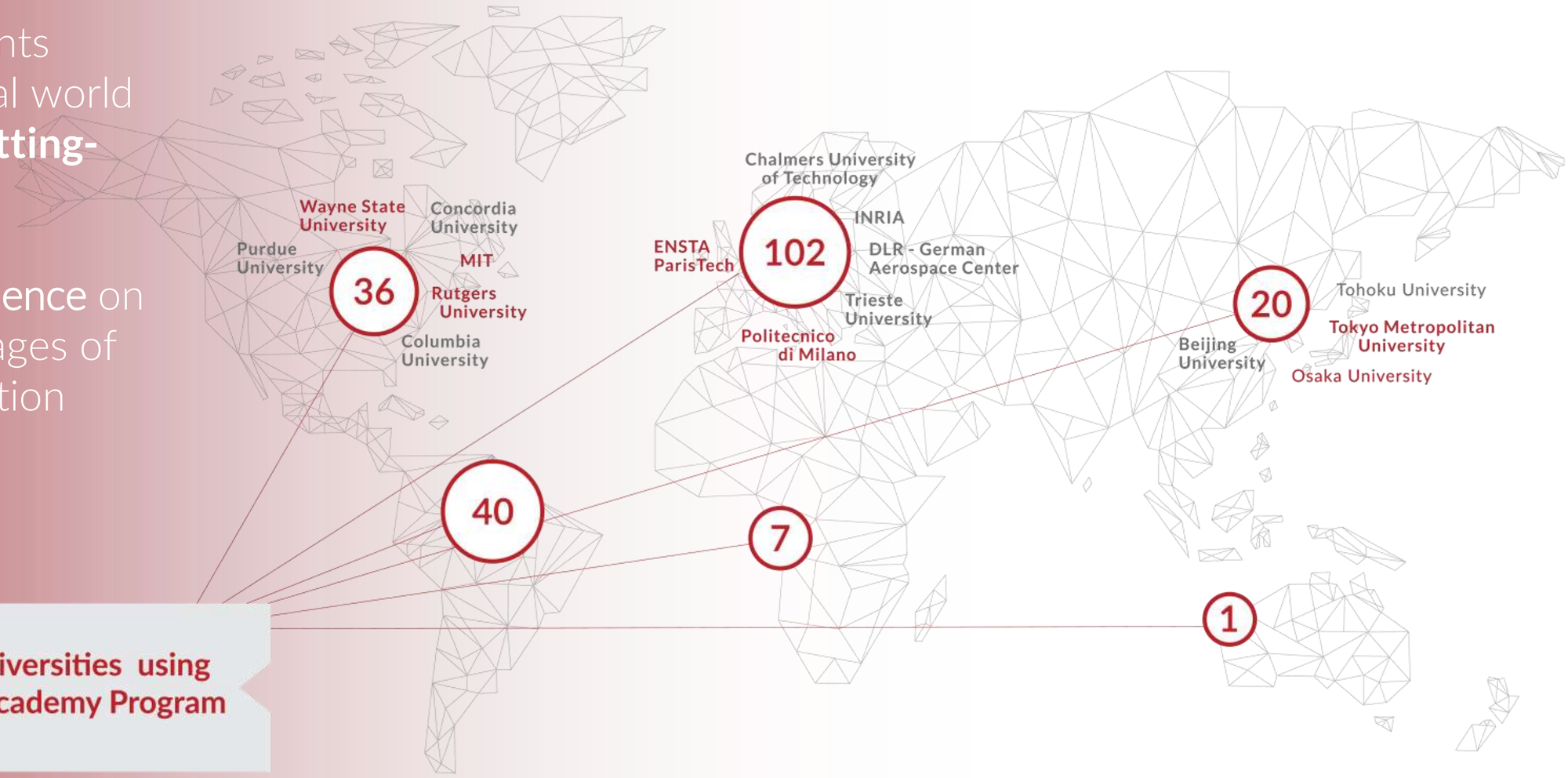
A community of practice built around modeFRONTIER, our multidisciplinary optimization platform.

- Software license
- Training & seminars
- Design competitions & events

Our Community

student licenses	professor licenses	PhD candidates	scientific papers
218	189	187	1182

We bring students closer to the real world by providing **cutting-edge software technology** and **hands-on experience** on the different stages of design optimization process.



number of universities using the ESTECO Academy Program

Our Research Projects

COMPOSELECTOR
Polymer Composites
Business Decision Support System
European Commission | Horizon 2020 European Union funding for Research & Innovation

Business Decision Support System

GASVESSEL

Natural gas (CNG) transportation system

UNCERTAINTY MANAGEMENT FOR ROBUST INDUSTRIAL DESIGN IN AERONAUTICS
UMRIDA

Uncertainty Management for Robust Industrial Design in Aeronautics

UTOPIÆ
Uncertainty Treatment and Optimisation in Aerospace Engineering

Training and research network

POR FESR 2014 2020 Friuli Venezia Giulia
OPPORTUNITÀ PER UNA CRESCITA SOSTENIBILE
iCAST

Numerical modeling technologies of processes and products

esa
space solutions

Robust Design Optimization of Space Missions

1999
Sailing boat fin keel
Naos Ship Design

Optimization algorithms
Response Surface Models

Hybridization of a multi-objective genetic algorithm, a neural network and a classical optimizer for a complex design problem in fluid dynamics

CarloPoloni[a] AndreaGiurgevich[b] LukaOnesti[c] ValentinoPediroda[a]
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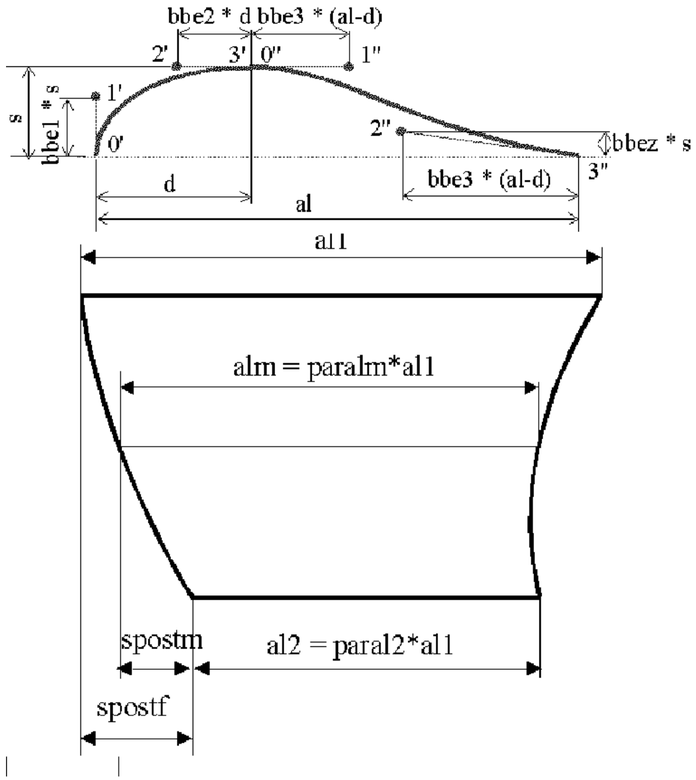
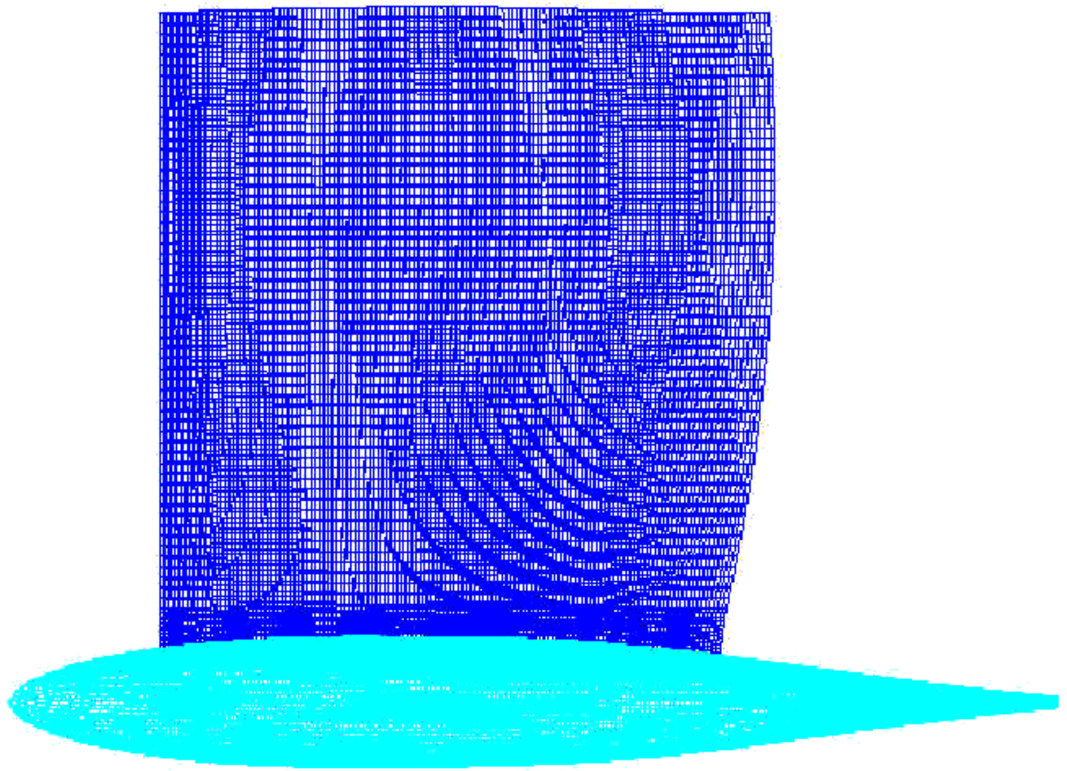
Received 30 March 1999, Available online 31 May 2000
https://doi.org/10.1016/S0045-7825(99)00394-1

Hybridization of a multi-objective genetic algorithm, a neural network and a classical optimizer for a complex design problem in fluid dynamics



spostf = parspostf*al1

spostm = parspostm*spostf



ESTECO and AMERICA’S CUP

LUNA ROSSA

PIRELLI

PRADA

ESTECO

OFFICIAL SUPPLIER

modeFRONTIER
makes it easy to set up
complex and
multidisciplinary
optimization problems


Flying on water
with modeFRONTIER

Save the date

um 2020

ESTECO
INTERNATIONAL
USERS' MEETING

Trieste, ITALY » **29-30 SEPT**

See you in 2021

um 2021 ESTECO NORTH AMERICA USERS' MEETING

Detroit area, MI

36TH AMERICA'S CUP
PRESENTED BY PRADA
AUCKLAND 2021

Thank you!

esteco.com