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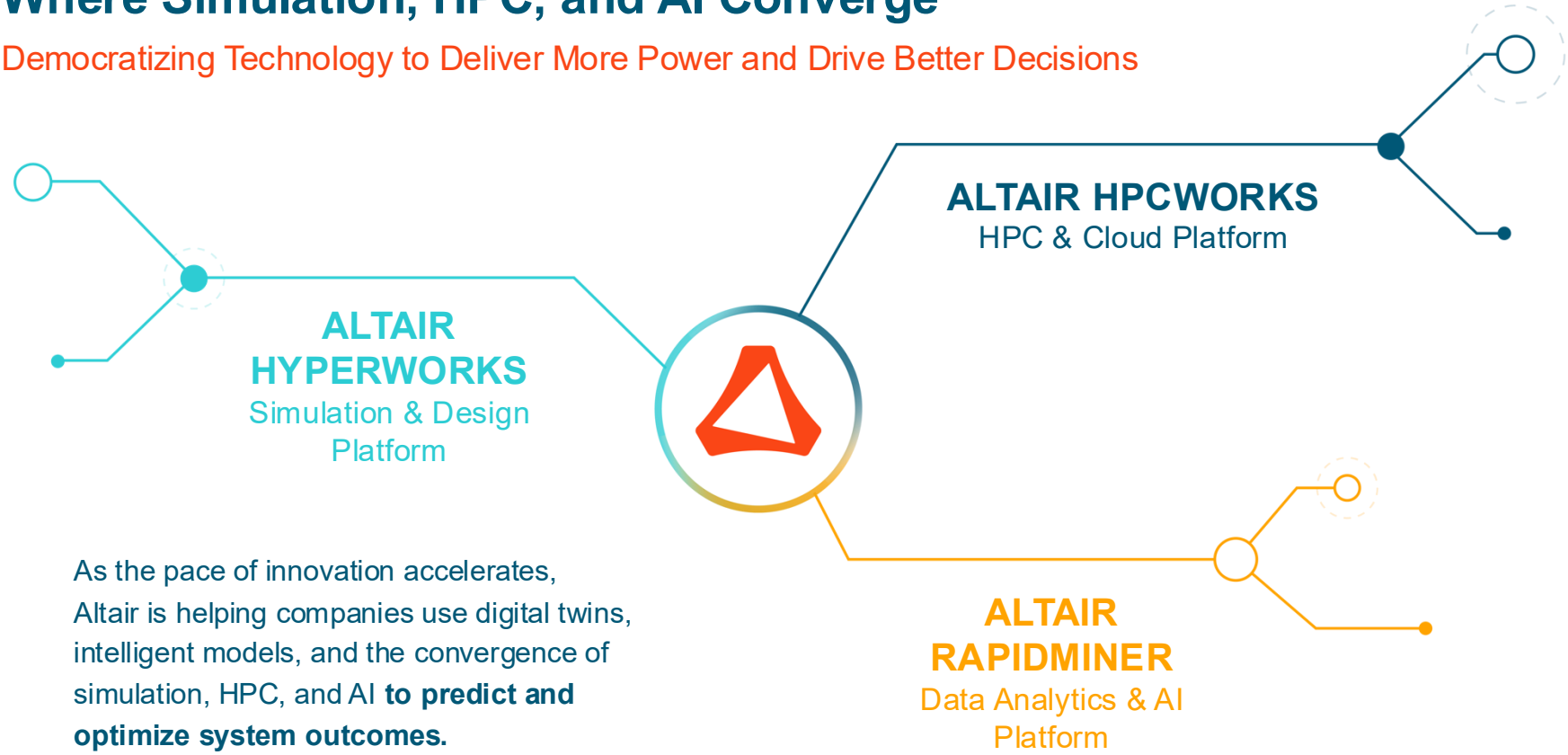
ALTAIR HYPERWORKS DESIGN & SIMULATION PLATFORM

Dr. Panagiotis Natsiavas | Senior Technical Manager

Where Simulation, HPC, and AI Converge

Democratizing Technology to Deliver More Power and Drive Better Decisions



As the pace of innovation accelerates, Altair is helping companies use digital twins, intelligent models, and the convergence of simulation, HPC, and AI **to predict and optimize system outcomes.**

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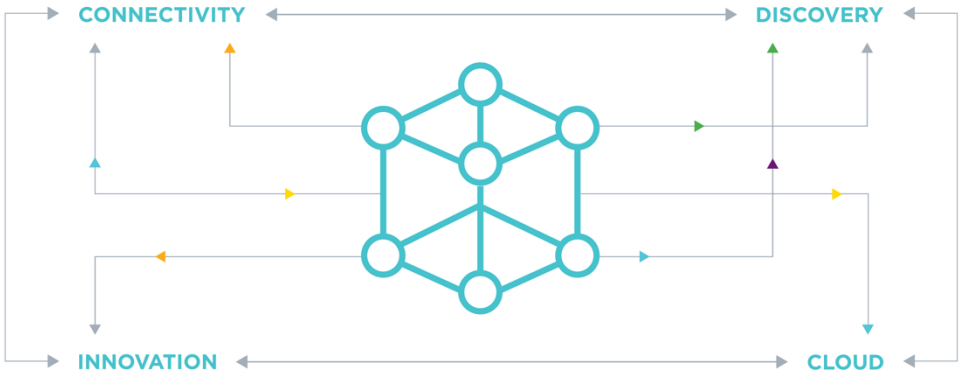
Design & Simulation Platform



Reduce design iterations and physical prototypes	**Empower large exploration of design solutions**	**Foster innovation**	**Help to overcome organizational siloes**

Cutting-edge designs of interconnected, smart products demand optimization across multiple processes & physics

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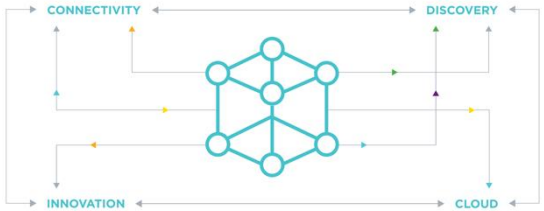
Design & Simulation Platform



- **Consistent Workflow Throughout Products**
- **Broad Portfolio of Solvers Across Multiple Physics**
- **Optimization Leadership**
- **AI / ML Enabled & Augmented Solutions**
- **Cloud Gateway**

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Design & Simulation Platform

Consistent Workflow Throughout Products

Altair SimSolid | Altair Inspire | Altair SimLab | Altair HyperMesh

From Concept Design to Validation through Multiphysics Exploration

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Profitably Deploy Simulation Driven Design Strategies

Pre-Design Analyses	Part Time Analysts	Simulation Expert Analysts
Make better early design decisions with system simulation & solution for designers	Automated Multiphysics workflows for faster analysis and optimization	Fast and detailed modelling of complex designs


Altair SimSolid


Altair Inspire


Altair SimLab


Altair HyperMesh

The Right Model and Scenarios at the Right Time Leveraging Consistently Design Maturity Gain

Conceptual Design → Virtual Validation

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Design & Simulation Platform

From Idea to Innovation – Altair Inspire and SimSolid Accelerate Innovation Speed

Simon Zwingert
ALTAIR-Tech Account Manager

Altair SimLab Overview – A Multidisciplinary Simulation Environment

Spyros Tselikis
ALTAIR - Application Engineer

Novinky v Altair HyperMesh 2025

Martin Kuklik
Advanced Engineering-Tech Manager

Altair SimSolid

Altair Inspire

Altair SimLab

Altair HyperMesh

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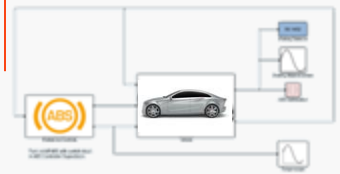
Unified User Experience Across Altair HyperWorks

Streamlining Product Interaction: Consistency in Design, Ease in Transition

Altair Twin Activate

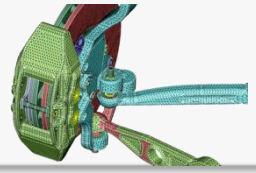


Altair Inspire

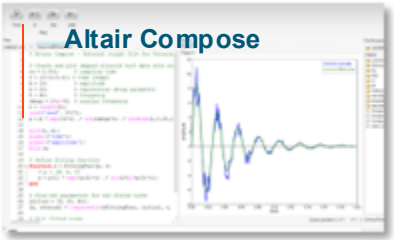
Altair Inspire Studio

Altair HyperMesh

Altair SimLab



Altair Compose



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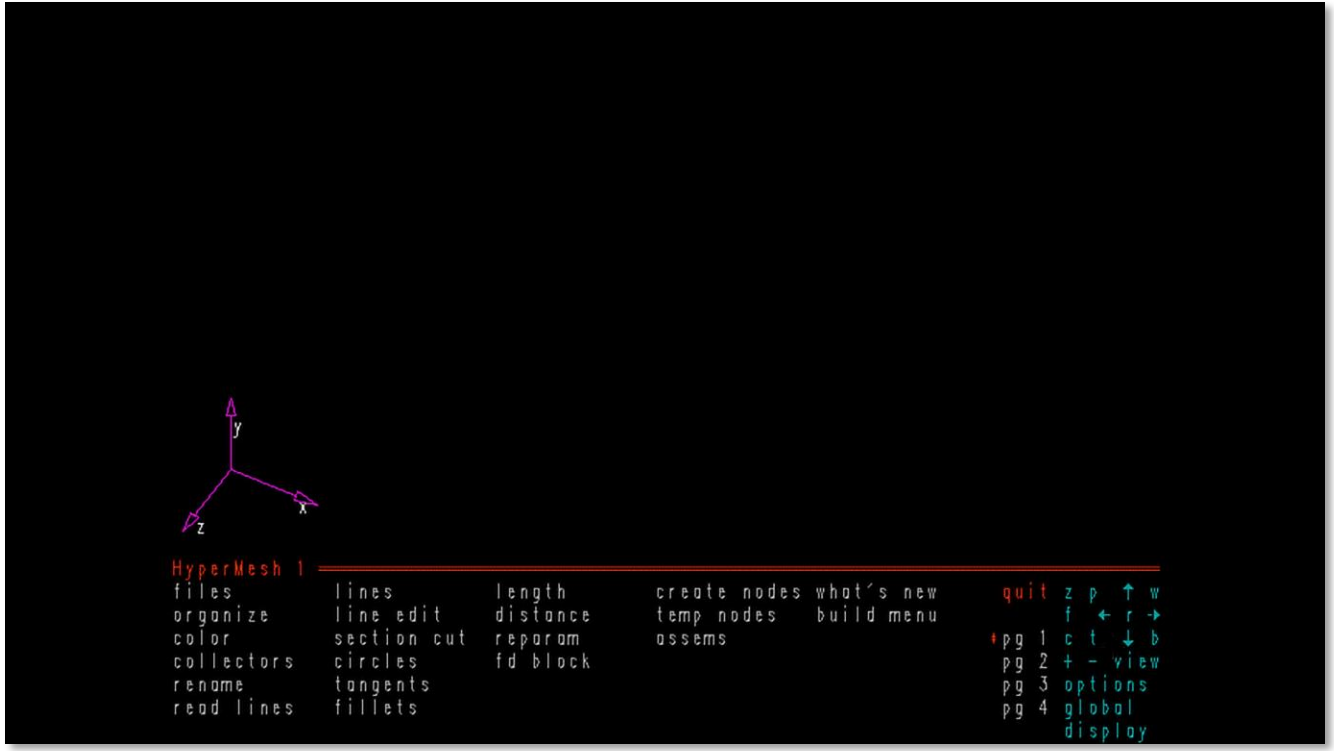
Evolution of HyperMesh: A Visual Interface History

Tracing the User Experience from Inception to the Latest Innovation



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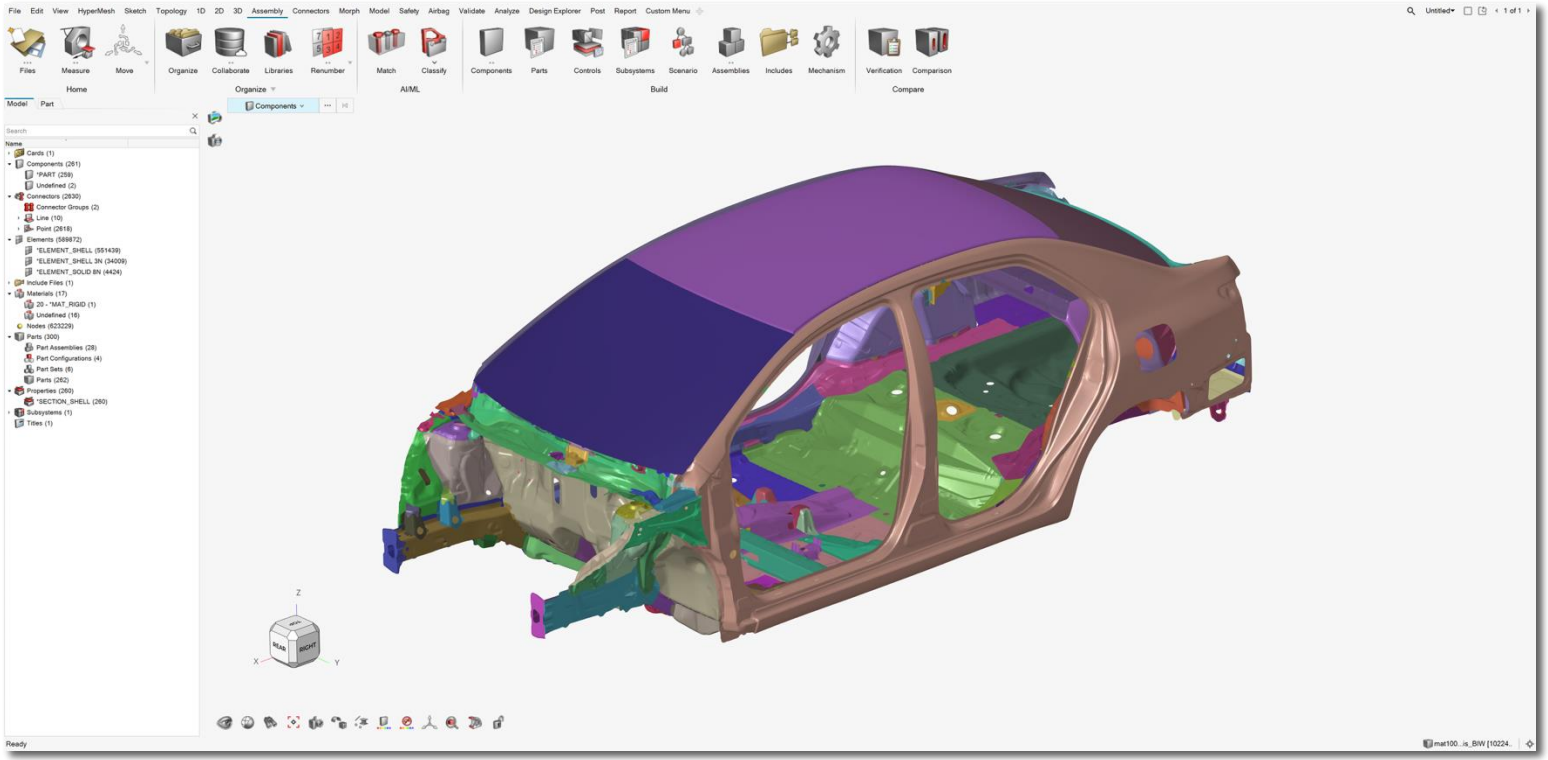
Enhanced User Experience in HyperMesh

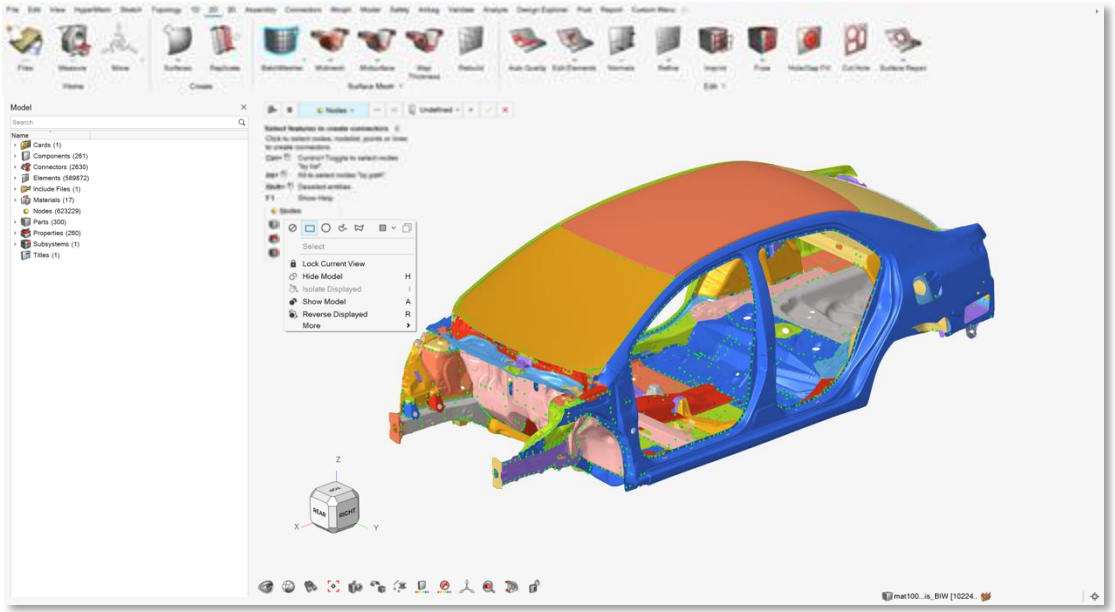
Ensuring Seamless Integration: Models, Scripts, & Processes Remain Uninterrupted



Intuitive Interaction Across Platforms

Key Paradigms of the New Interface

- **Ribbons:** Task-oriented groupings with customization options
- **Entity Selectors:** Targeted entity filtering for focused modeling
- **Idle Mode:** Simplified entity toggling and direct tool application
- **Guide Bars:** Streamlined tool navigation with integrated action prompts
- **View Controls:** Intuitive model exploration with logical shortcuts
- **Intuitive Tools:** Instant search capabilities and user-friendly hints



Motivation

- New and enhanced workflows
- Integrated AI
- Seamless learning process
- Valuable congruent user experience

- Toward scalable, interdisciplinary, multi-physics solutions
- Toward Cloud, collaborative work

Overview of New and Enhanced Features in HyperMesh

All Clients

View Cube

Tool Belt

Extensions

Command Recording

Dark Theme

HyperWorks Report

HyperMesh

Design Explorer

Model Browser

Skeleton Modeling

Design Space

HM POST

Model Reconstruction

Rapid Part Creation

Symmetry

Axisymmetry

Sketch

FE Geometry

Morphing

Etc.

HyperView

Hotspot Finder

Upfront Loader

Notes

Measures and section cuts

Idle mode

Synchronize Result Step

Extract Data

Moving System and Support

Copy Results Data to Clipboard

HyperGraph

Table Client

Dynamic Results

Plot Colors

Stack Math

Cora and ISO curve correlation

Extreme Curves

Flexible Report templates

ASCII Reader Enhancements

MotionView

Move Tool

Run workflow

Rigid Groups

New Create Workflows

Entity Editors

View Controls

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Design & Simulation Platform

Broad Portfolio of Solvers Across Multiple Physics

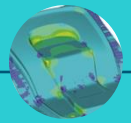
Altair SimSolid

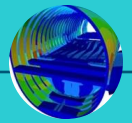
Altair Inspire

Altair SimLab

Altair HyperMesh


Systems Controls


Manufacturing Processes


Durability Vibrations Acoustics


Impact Crash Blast


Heat Transfert


Fluid Dynamics


Electromagnetics Electronics

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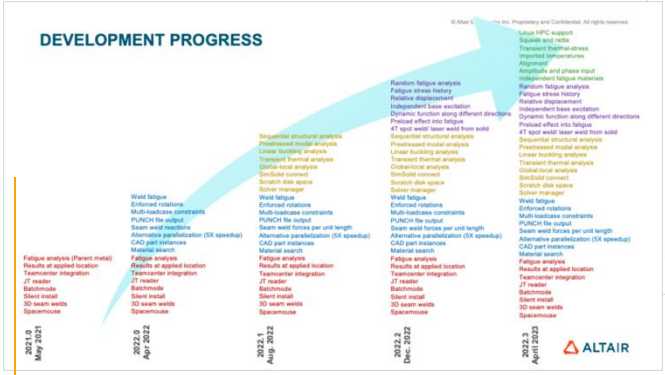
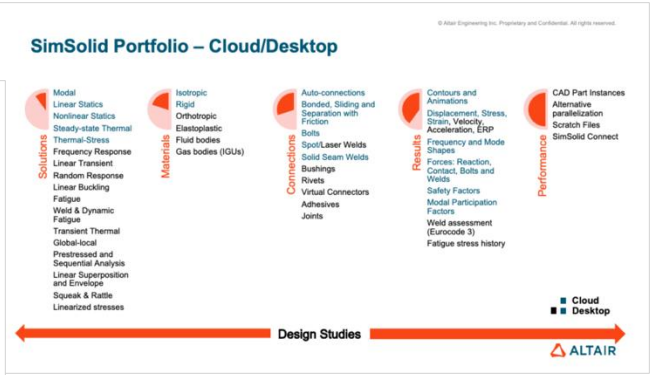
Simulation With SimSolid

A New Paradigm





Development Focus

Usability

Robustness & Performance

Fully-featured structural analysis solution that can analyze complex parts and large assemblies

- **Computational engine is based on breakthrough extensions to the theory of external approximations (a generalization of Finite Element Method – FEM)**
- **No Mesh, No geometric simplification needed**
- **Rapid analysis, results in seconds to minutes vs days and weeks with classical FEM**
- **20+ major releases since Oct 2018**

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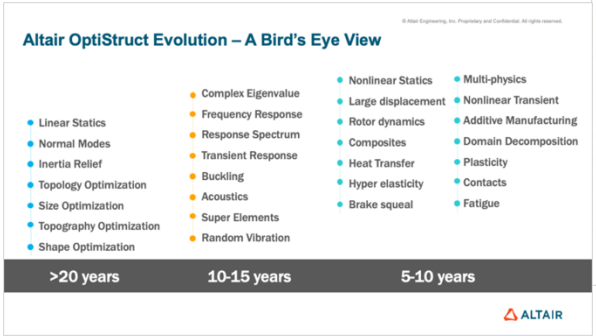
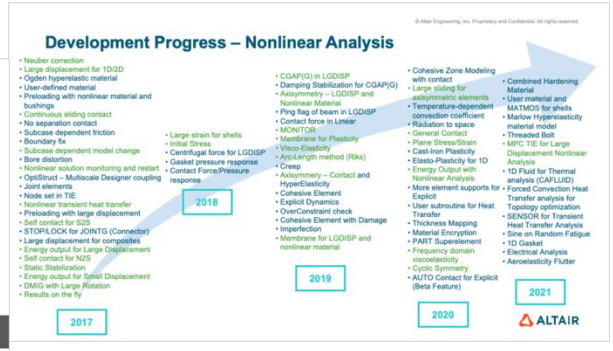
Structural Solutions With OptiStruct

THE FE Solver for linear and non-linear Analysis





Fast-Pace of Development

One Model, One Solver (Multi-Physics)
Pervasive Optimization
High Scalability

R&D continuous investments to reach and maintain technology superiority

Road map driven by customer challenges / needs

Beta testing on customer Use Cases

Work in collaboration with our customers

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NONLINEAR EXPLICIT ANALYSIS

Natively Developed in OptiStruct

- Not an integration with RADIOSS

Standard Analysis Capabilities

- Nodal/Elemental time step
- Mass Scaling, Hourglass Control (strain, viscous)
- Energy output etc…

Common Entities with OptiStruct Implicit

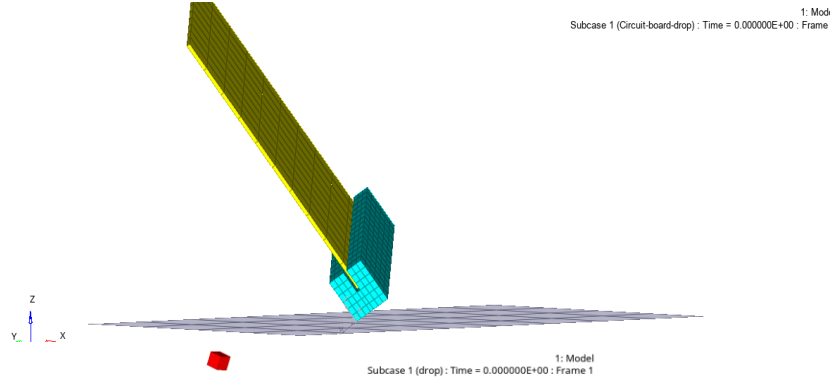
- Material, Properties, Loading etc…

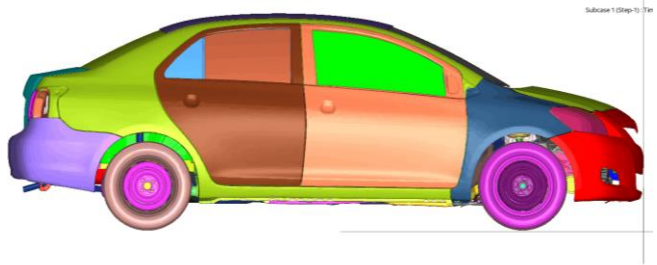
Multi-Physics with single input file

- Implicit and Explicit subcase in one input file

Performance

- Domain Decomposition Parallelization





Introducing OpenRadioss™

The Open-Source Version of Radioss

www.openradioss.org launch September 8th 2022

17000+ Downloads

4000+ Contributions

OpenRadioss Users' Day once every year

Steering committee of thoughtful leaders from Academia and Industry shaping the future in key domains like Biomechanics, materials, including batteries, HPC & performance

► A Disruptive Approach

- Democratize Usage of Explicit Dynamics
- Maximize synergies between research community and industry
- Facilitate knowledge exchange

► An Active Community

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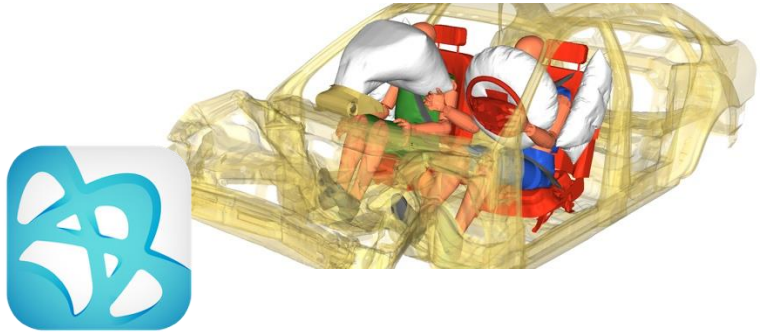
Altair Radioss & OpenRadioss™

Commercial Open-Source Software Model

OpenRadioss open-source version

- Source code publicly accessible from: https://github.com/OpenRadioss
- Upstream version, contributions from a fast-growing community
- Precompiled Linux & Windows executables to run latest builds with no license check
- Support from the community, via forum



Altair Radioss commercial version

- Commercial releases with extensive QA, professional support, documentation & maintenance priority
- Available under Altair Units license
- Encrypted models for dummies & barriers
- Channel valuable community contributions into industrial release

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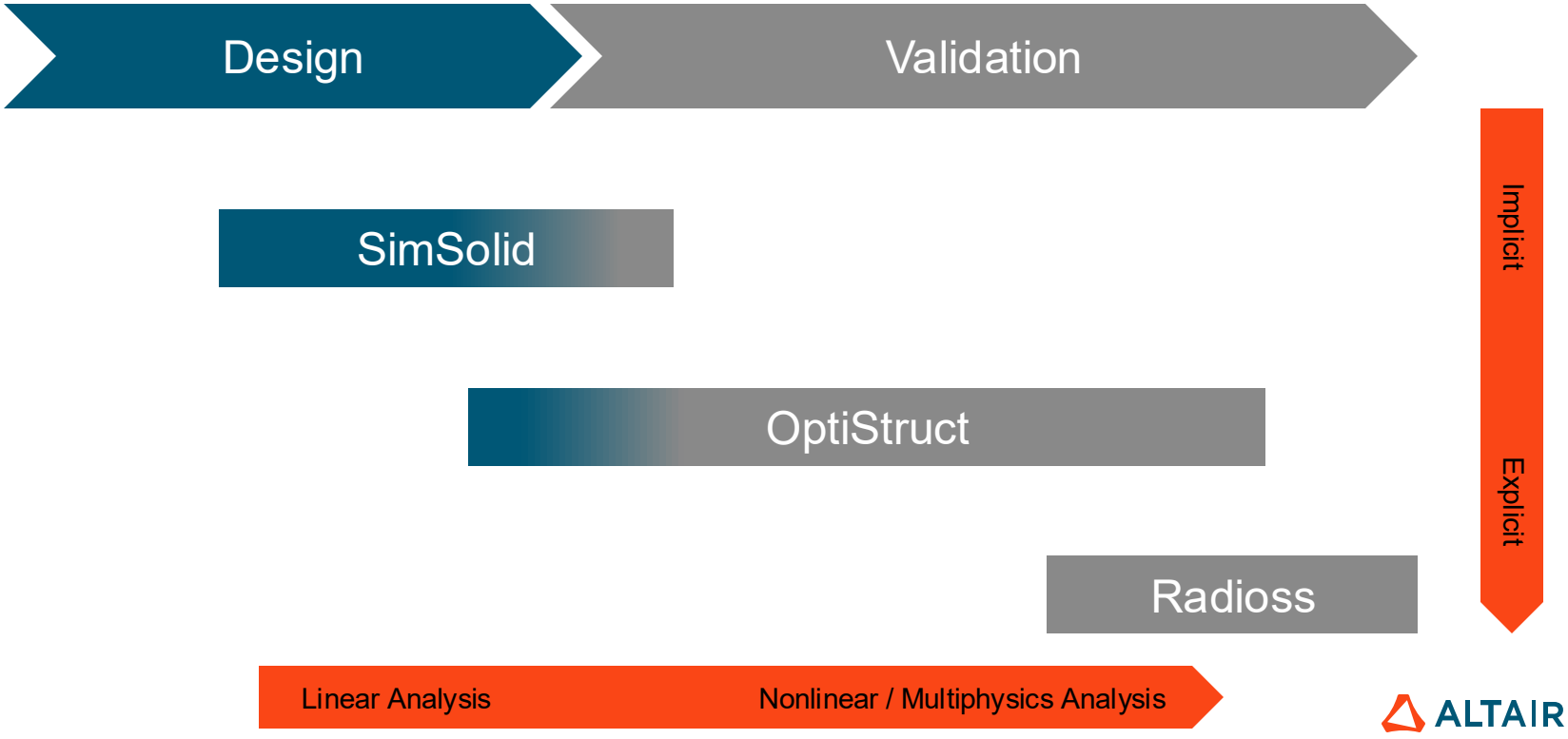
Solutions for Structural Design and Validation



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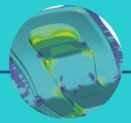
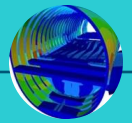
Design & Simulation Platform

Optimization Leadership

Altair SimSolid | **Altair Inspire** | **Altair SimLab** | **Altair HyperMesh**


Systems Controls


Manufacturing Processes


Durability Vibrations Acoustics


Impact Crash Blast


Heat Transfert


Fluid Dynamics


Electromagnetics Electronics

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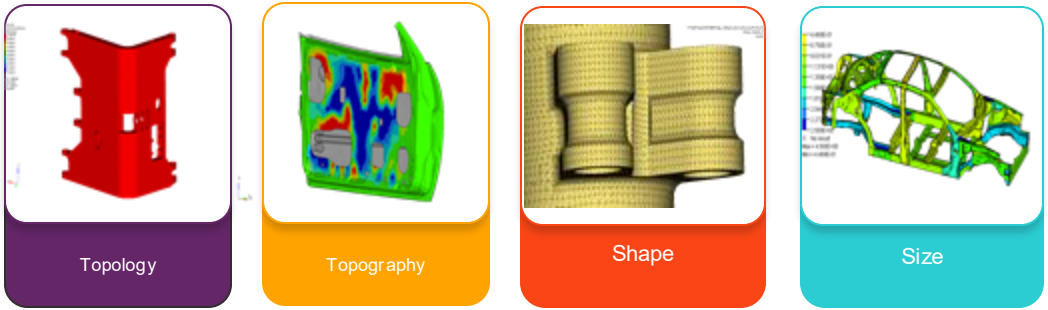
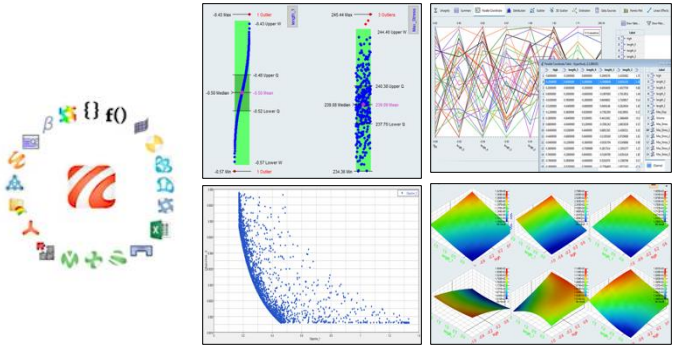
More than 30 years of Experiences in Structural optimization and Design Exploration



OptiStruct Embedded Optimization Technology



More than 30 years of Experiences in Structural optimization and Design Exploration

Conceptual optimization

Create new design and ideas

Parametric and Shape Optimization

Fine tune design

HyperStudy optimization and Design Exploration

Design Of Experiments + Process Integration

Understand design sensitivities, parameters importance
Find trade-offs, perform what-if studies
Connection to both Altair and third-party software
Integrate your own software through python API

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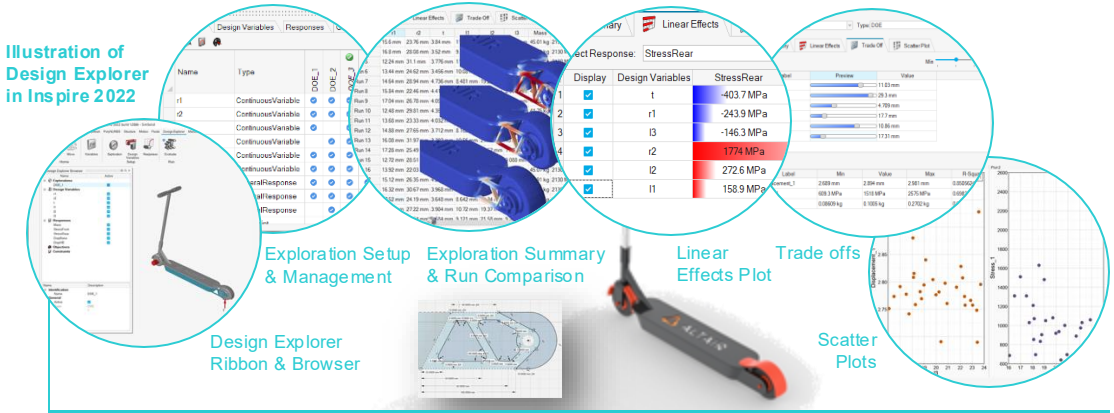
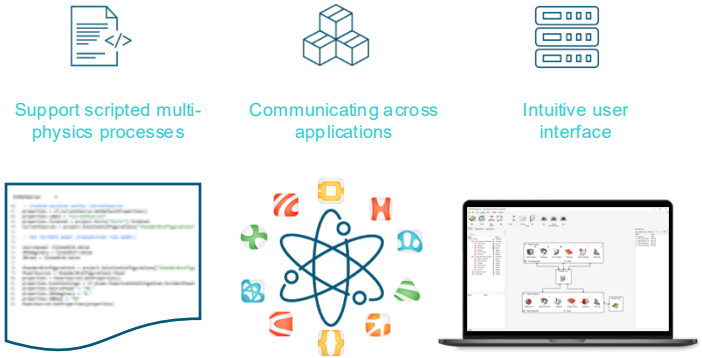
Continuously Developing End-To-End Technology and Workflows

New and Consistent User Experience





Design Explorer

A Complete, Seamless Integrated workflow for quick optimization set-up and results processing

Common module across solutions: Inspire, HyperWorks

Features adapted to analyst profiles: e.g. AI augmented features available only for HyperWorks advanced users for now

- Trade offs & Physics AI (Field Prediction)
- Scatter Plots & Expert AI (Clustering/Classification)

Pulse

Platform to build and execute complex processes

Cross applications e.g. HM-OS-AcuSolve-HV-HG

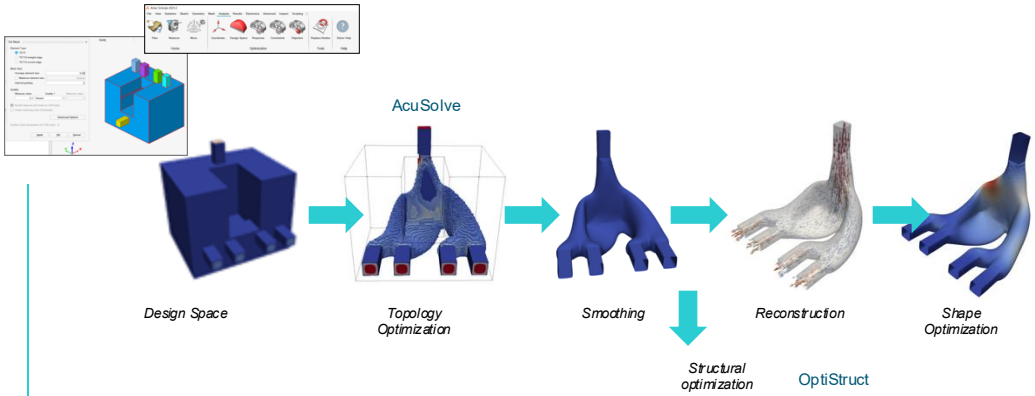
Low code, block diagram

1st script and later repeat easily

ALTAIR

Continuously Developing End-To-End Technology and Workflows

Optimization for Thermal and Fluids



Navier-Stokes CFD Optimization process and workflows

Conceptual Optimization

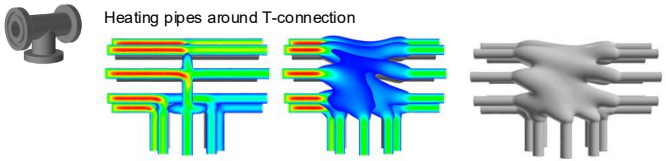
Create new design and ideas

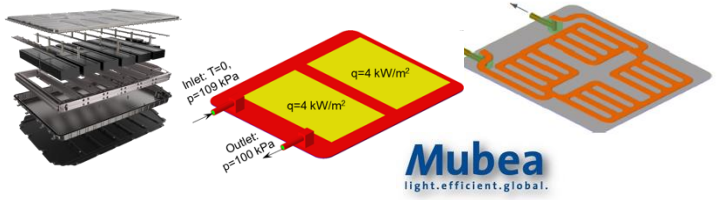
Parametric and Shape Optimization

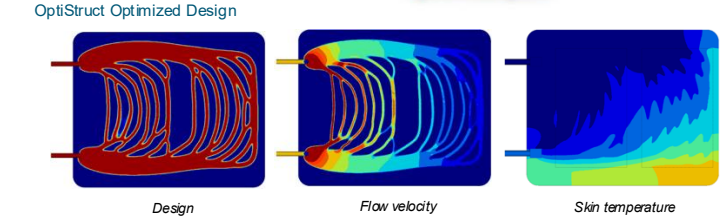
Fine tune design.

Design Of Experiments

Understand design sensitivities, parameters importance







Cooling Channel Optimization with Darcy flow

Conceptual Optimization

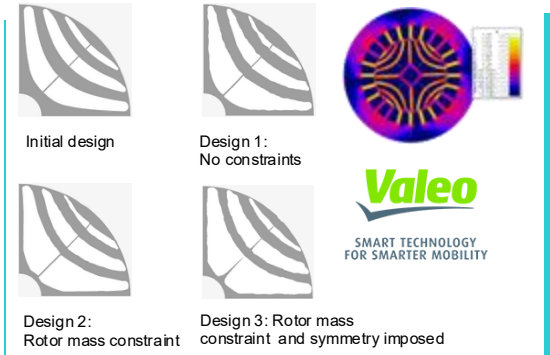
Linear potential Darcy flow model. Runs fast and suitable at design phase

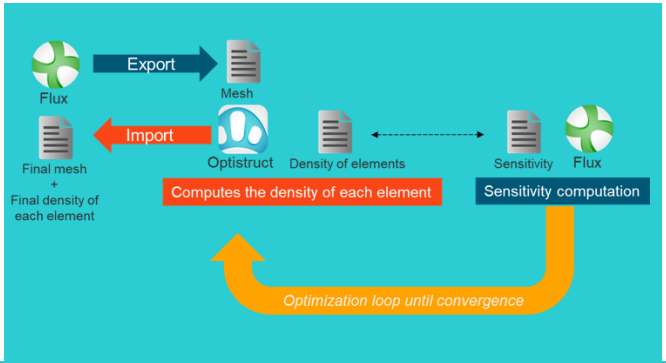
Applications: Forced convection in Electric motor, Machine tool (casting, forming) conformal cooling, Battery pack cooling, Cooling plate for electronic devices

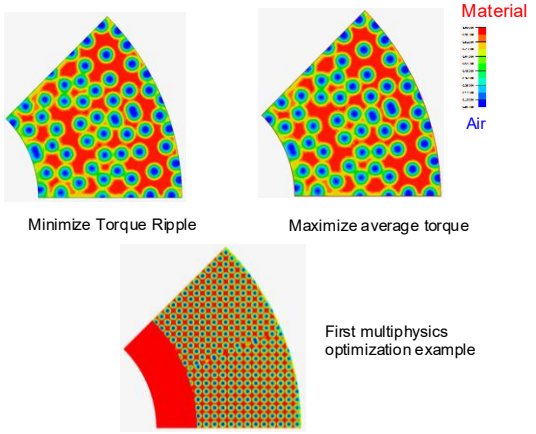
ALTAIR

Continuously Developing End-To-End Technology and Workflows

Optimization for Electromagnetics







Free Shape Optimization

Magnetostatic & Transient Magnetic

Linear and Non-Linear Material,
Parametric study (without remeshing)
Parametric distribution
Magnets allowed (no change of the orientation)
Remeshing during the optimization

Multiple Responses

Torque
Torque Ripple
Force on face region
Sum of Flux trough the coils
Flux trough a list of faces / list of lines
Magnetic forces

Constraints allowed

Volume of a part of the device
Symmetries on the existing responses

Topology Optimization

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HYPERWORKS

Design & Simulation Platform

AI / ML Enabled & Augmented Solutions

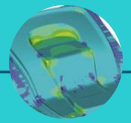
Altair SimSolid

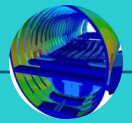
Altair Inspire

Altair SimLab

Altair HyperMesh


Systems Controls


Manufacturing Processes


Durability Vibrations Acoustics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Added Value with Altair AI

Augmenting toolkit

Increasing productivity

Capturing knowledge

Altair Products for CAE+AI: Definition

HyperStudy
Design Exploration and Optimization

Multi-disciplinary data science environment to learn patterns, predict performance and optimize designs.

physicsAI Studio
Design Exploration in AltairOne

Data science, engineering simulation, and HPC combined into one tool you can access from your browser.

Design Explorer
Design Exploration in HM/Inspire

Beginning-to-end workflow providing **multi-run** (Optimization & DOE) setup, execution, interpretation.

RapidMiner
Low/No Code Data Science

Enterprise-ready data science platform.

shapeAI
Geometry Recognition

Automatic geometry recognition to train ML models for clustering and classification.

physicsAI
Fast Physics Predictions

Fast physics predictions with geometrical deep learning (GDL) using historical simulation data.

romAI
ROM, System Identification

Turn 3D simulations and test data into computationally efficient deep learning models to be used in system-level applications.

Spyros Mallios
Business Development Manager

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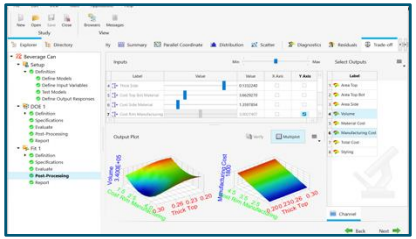
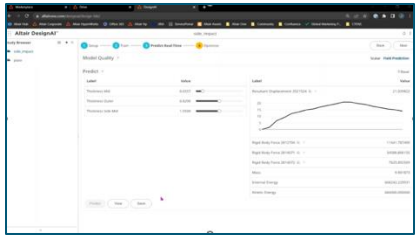
Altair Products for CAE+AI

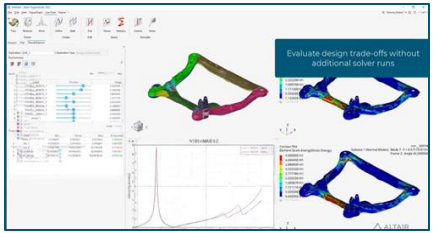
HyperStudy
Design Exploration and Optimization



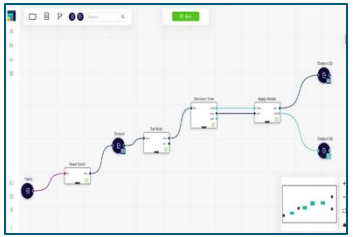
physicsAI Studio
Design Exploration in AltairOne



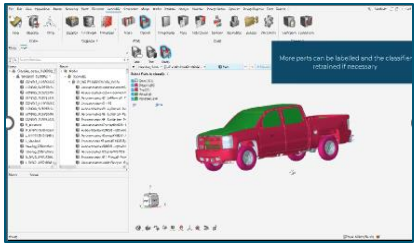
Design Explorer
Design Exploration in HW/Inspire



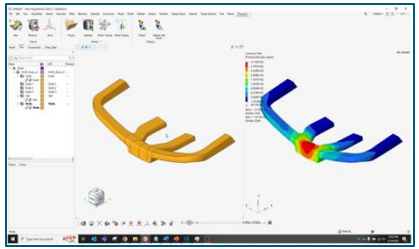
RapidMiner
Low/No Code Data Science



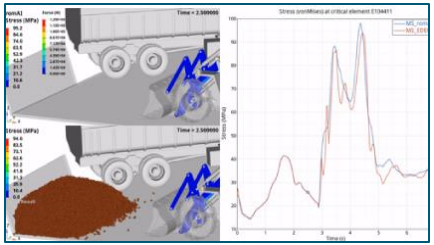
shapeAI
Geometry Recognition



physicsAI
Fast Physics Predictions



romAI
ROM, System Identification



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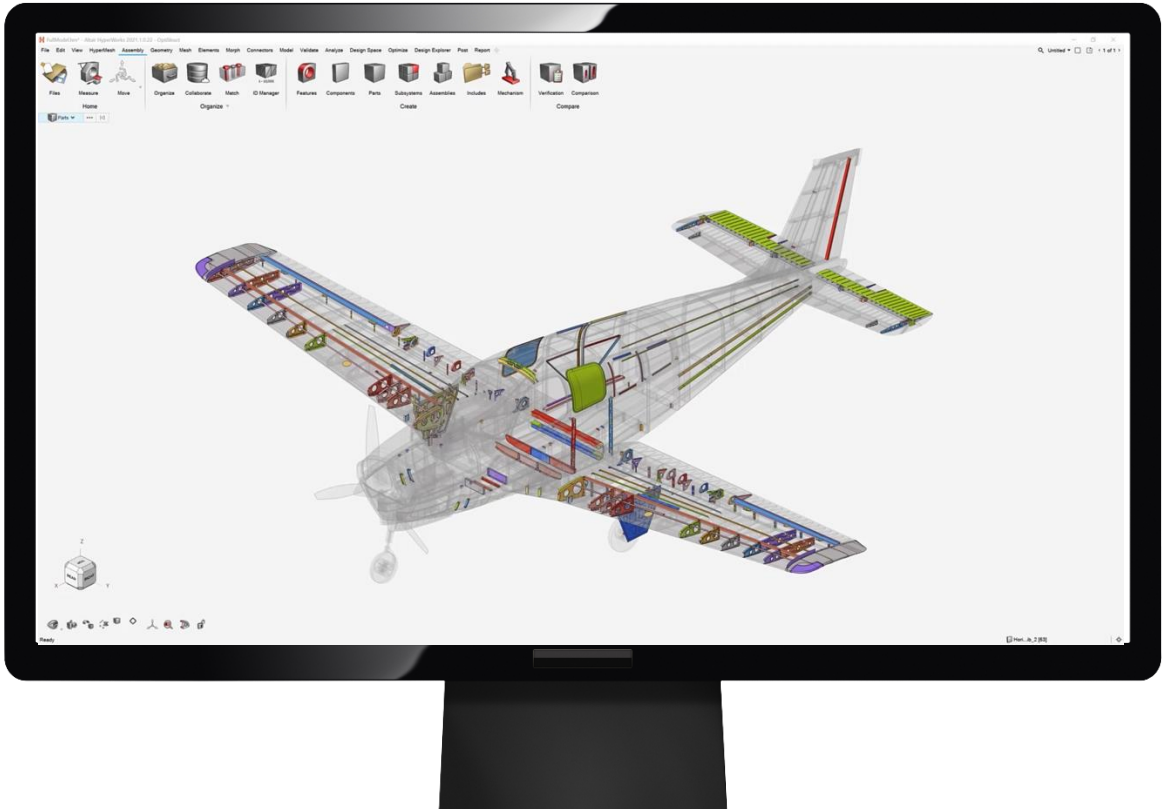
shapeAI: Match – Find And Link Similar Parts



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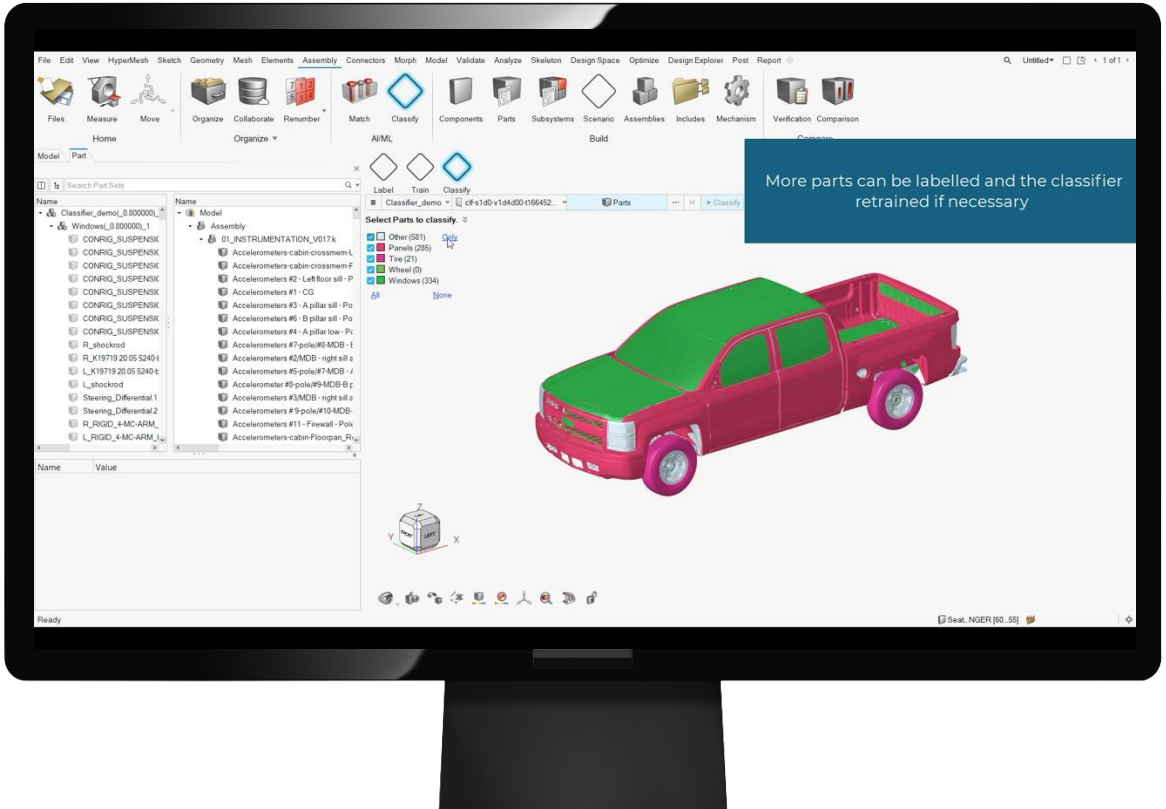
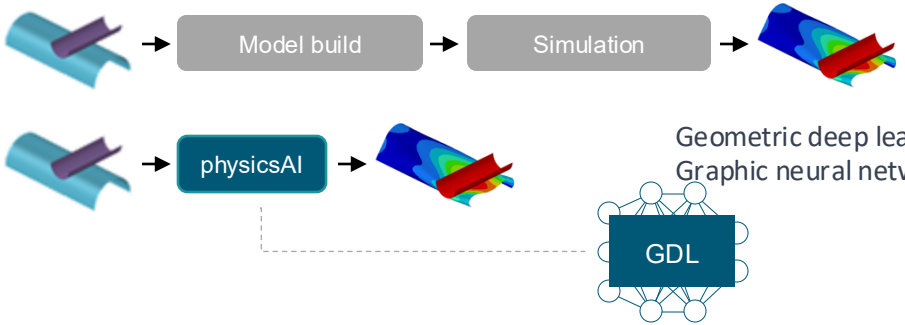
Classify – Train With Your Data

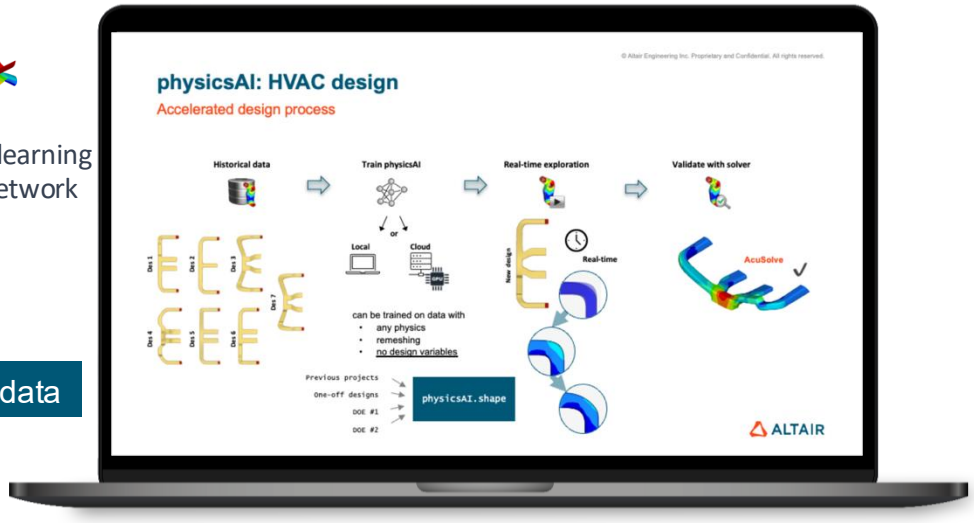


physicsAI

Predicting Simulation Results



Unlike other AI, physicsAI works directly on **meshes** or **CAD**.



Fast physics predictions by learning from historical simulation data

Value to designers / analysts

10x-100x faster than a solver

Reduce or eliminate model build time

Accelerated design and better design decisions

Based on deep learning – Performs best on GPUs

HyperWorks-native interface for training and deploying predictive models
First release 2022.3

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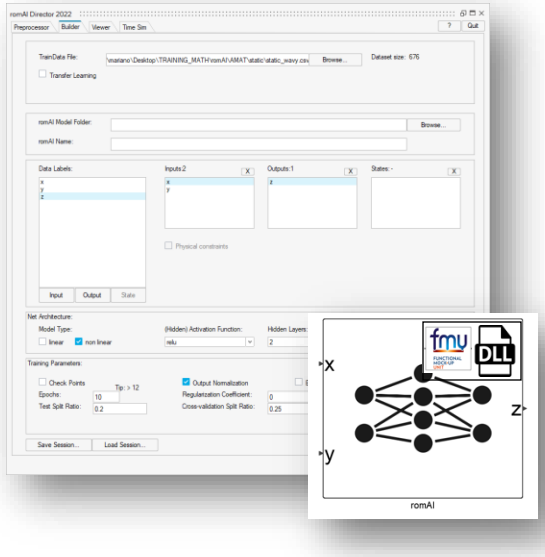
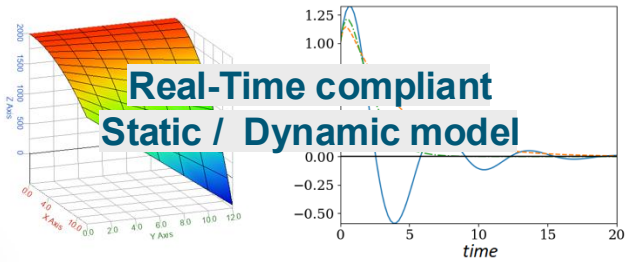
Altair® romAI™

	A	B	C	D	E	F	G	H	I
1	time	Xref_mm	Yref_mm	X_mm	Y_mm	X_dot	Y_dot	TX_deg	TY_deg
2	0	0	0	0.1478	2.29719	0.002035	-5.00691	-0.13154	-0.75129
3	0.005	0	0	0.14781	2.272156	0.001635	-4.02188	-0.1229	-0.64688
4	0.01							18	-0.66437
5	0.015							99	-0.7383
6	0.02							107	-0.83284
7	0.025	0	0	0.147824	2.238788	0.000221	-0.5443	-0.10394	-0.92927
8	0.03	0	0	0.147825	2.236733	0.000134	-3.46057	-0.10162	-1.01857
9	0.035	0	0	0.147825	2.204182	6.809494	-9.0794	-0.09988	-0.74168
10	0.04	0	0	0.21592	2.145939	18.91092	-2.3765	-0.98042	-0.34267

Simulation or test data

Altair® romAI™
democratizes access to AI
for system-level applications





Applications:

- Digital Twin
- Real-Time Simulator
- Optimization
- Multi-disciplinary analysis

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Reduced-Order Model

Value:

Run time reduction:

- Reduction time-to-market, cost and energy
- Room to test more ideas for a better optimization
- Enable real-time applications (Digital Twin, RT Simulator…)

High-Fidelity Model

- All possible information
- Computationally expensive
- High Accuracy

Altair® romAI™

Reduced-Order Model

- Only the needed information
- Real-Time compliant
- Very Good Accuracy ~98%

System Identification

Value:

Efficient reuse of test data:

- Enable predictive and prescriptive analysis
- Model unknown correlations
- Speed-up model generation (automatically performed by AI)

Test Data

- Descriptive, Diagnostic
- High Accuracy

Altair® ro

Identified Model

- Descriptive, Diagnostic, Predictive, Prescriptive
- Very Good Accuracy ~98%

Unlock Insights about your System with Digital Twins

Spyros Mallios
Business Dev Manager

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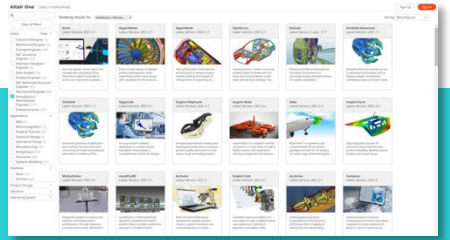
HYPERWORKS

Design & Simulation Platform

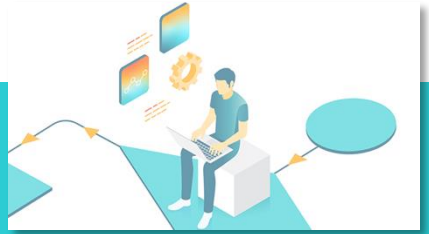
Altair One
Cloud Innovation Gateway

A comprehensive Cloud innovation gateway for engineers, designers and scientists to create, compute, and collaborate.

Apps & services
Marketplace

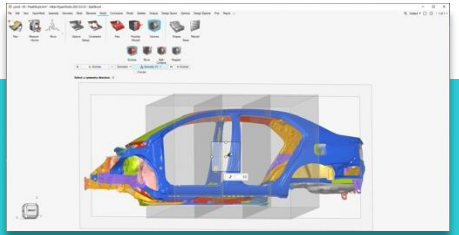


Self-service
Support & training



On-demand
Compute/HPC

End-to-end
Digital thread



Over 500,000 users signed up using the Marketplace, support, and training

https://altairone.com

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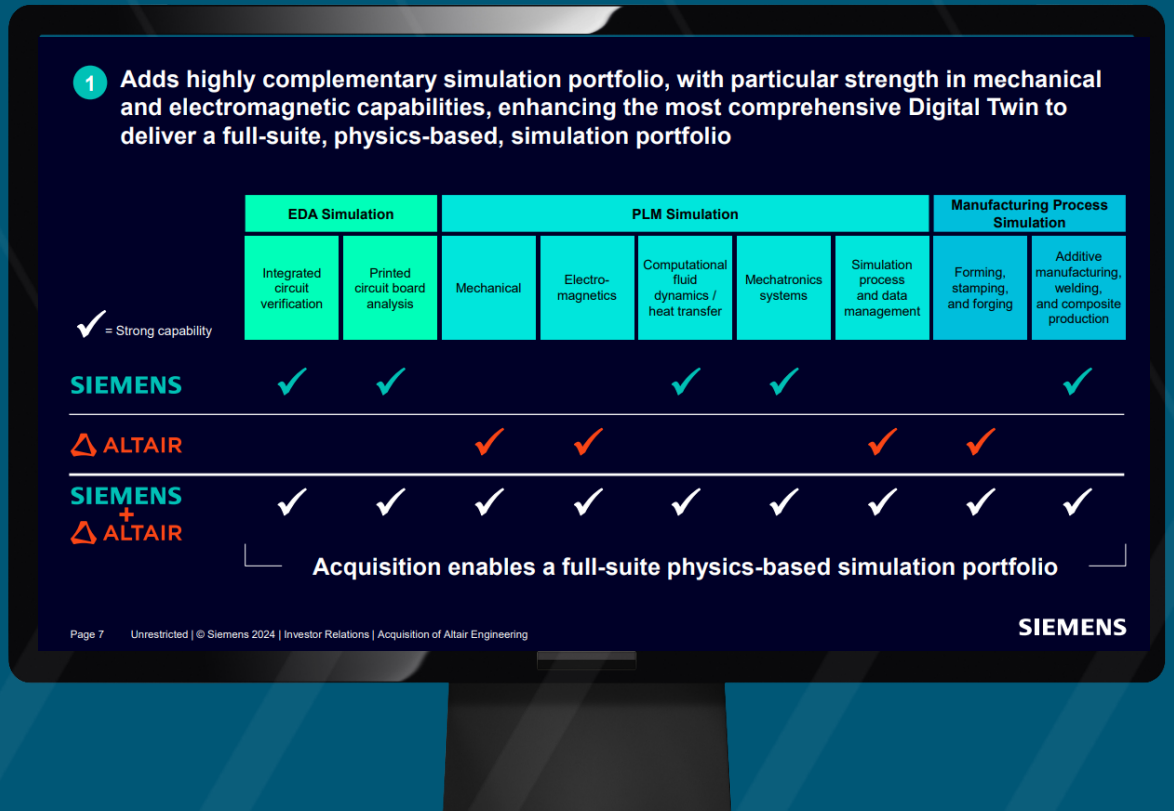
SIEMENS + ALTAIR INTEGRATION



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THANK YOU

DISCOVER CONTINUOUSLY.
ADVANCE INFINITELY.

Visit altair.com to learn more.

#ONLYFORWARD

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