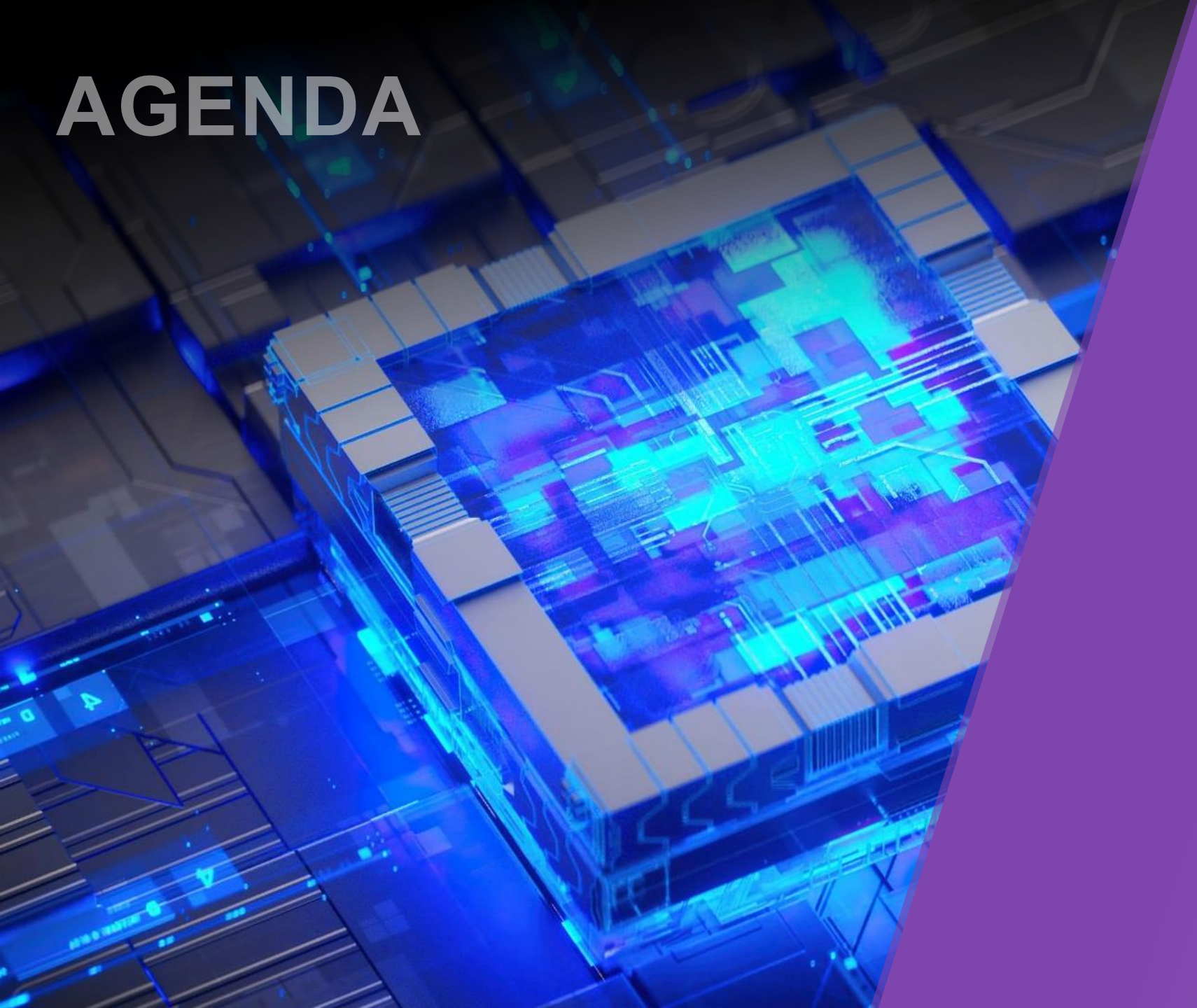
SYNOPSYS®

Use of AI/ML in Intelligent Product Design

Prith Banerjee, SVP Innovation

OzenCon/SimuTech 2026

AGENDA



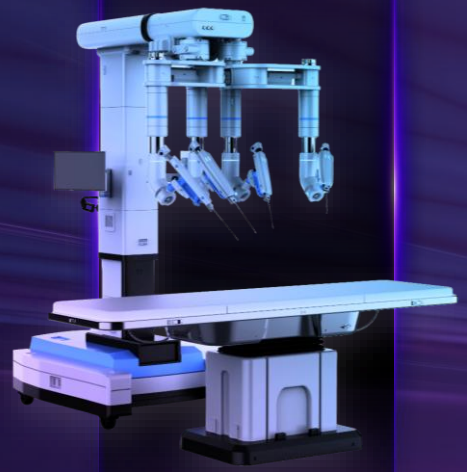
Silicon to Systems

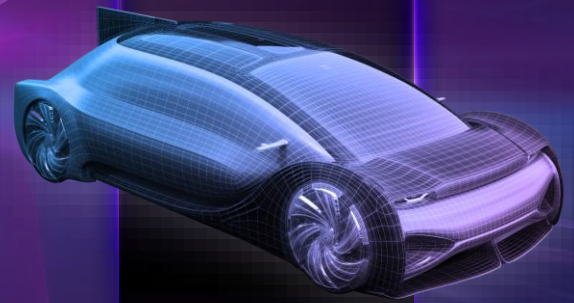
AI/Machine Learning in EDA

AI/Machine Learning in Engineering Simulation

Digital Twins for Different Industries and Physical AI

Intelligent Systems are All Around Us!





Intelligent Systems: Si-Powered, SW-Defined, AI-Enabled

Digital & Mission Engineering
MBSE, Environments, Models, Simulation

Aeronautical Design
Flight characteristics, rotor efficiency

AI Model Development
Object, detection and avoidance

Software Development
Flight planning, motor control, battery management, communication

Mechanical Design
Weight, stress forces, crash survivability

Thermal Design
Heating/cooling

Silicon Development
Providing required performance with lowest power usage

Electrical Design
Batteries, PCB, power supply efficiency

CREATING THE LEADER in Engineering Solutions from Silicon to Systems

SYNOPSYS®

Leader in Silicon Design

×

Ansys

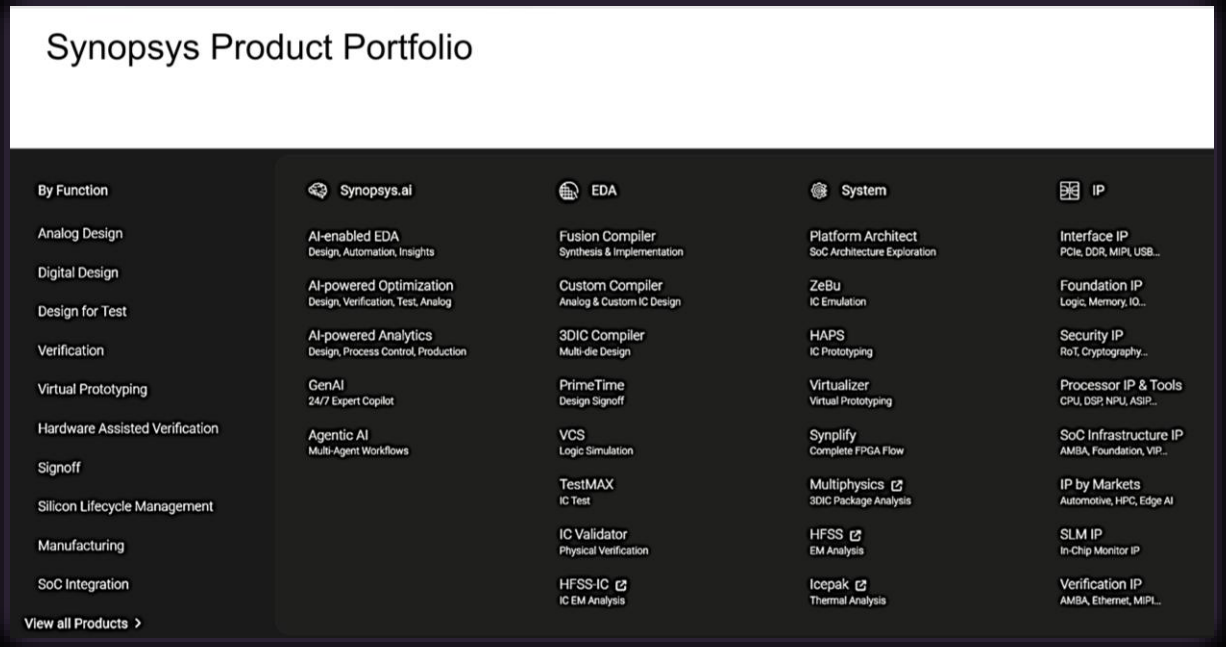
Leader in Simulation & Analysis

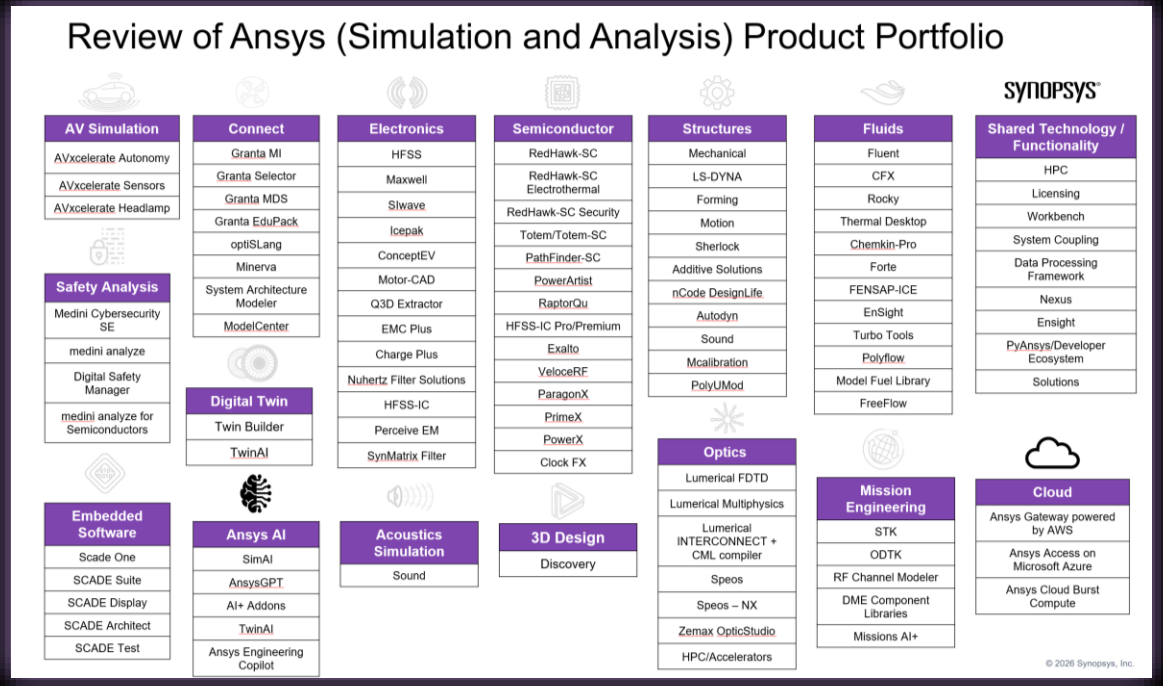
PROVIDES
comprehensive solutions
for the entire silicon design process
including multi-die simulation & analysis

EXTENDS
AI leadership in EDA
and simulation to accelerate
customers' innovation

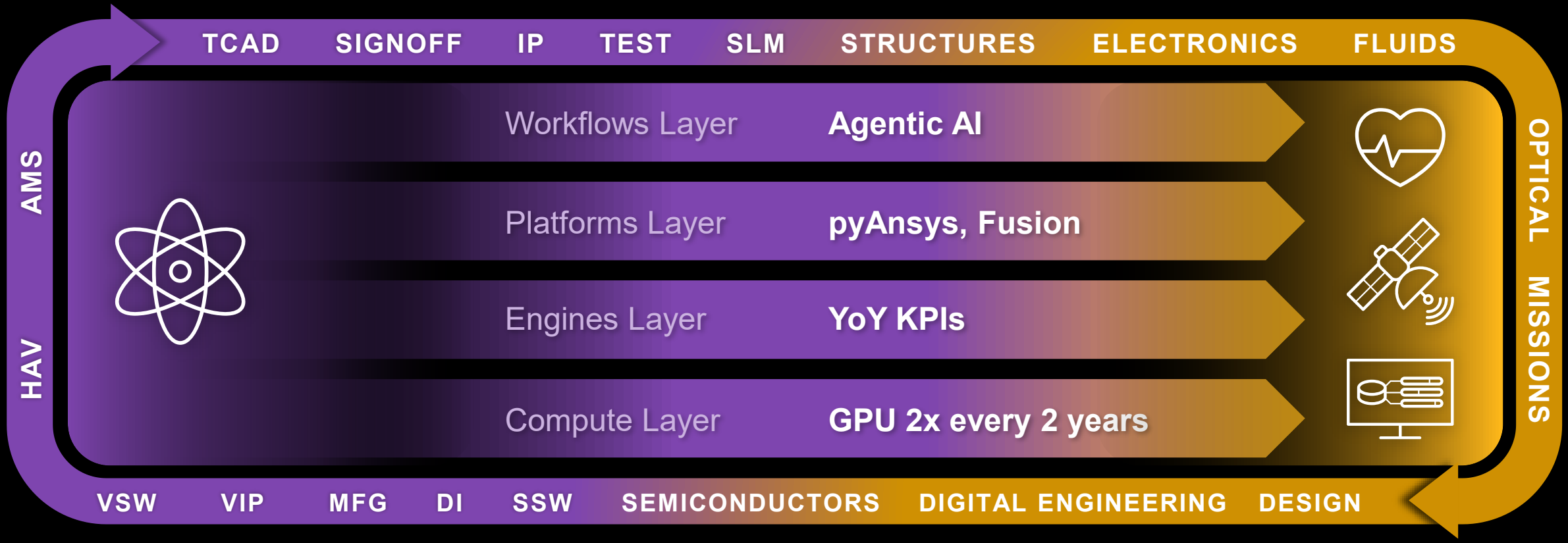
ACCELERATES
creation of intelligent products by
bringing silicon expertise across
systems verticals

EDA and Engineering Simulation Product Portfolio





Synopsys is Now Very Uniquely Positioned for this Chips to Systems Revolution



Drive Need-Moving Innovation at Every Layer, In Every Product, and Every Hyperconvergence Opportunity

Long Term Technology Strategy Pillars

Workflow layer	AI enabled EDA and S&A	AI powered Optimization DSO, ASO, OSL, SimAI	GenAI GeomAI Design Exploration	Agentic AI Engineering Copilot LLM, MCP	MBSE, Digital Engineering, System synthesis	Design of Chips to Systems with AI
Platform layer	Cloud: Public, private Hybrid, burst (EDA and S&A) Cybersecurity	User Interface (UX/UI) Visualization AR/VR Omniverse	Data models, SPDM Fusion NDM	Platforms and Dev Ecosystem pyAnsys Platform Architect	Virtualization, Virtual V&V, Digital Twin SW defined systems	Industry Solutions
Engines layer	Numerical Methods and solvers (FEA, CFD, EM, optics)	Meshing and Geometry (IGA, Oct-tree)	Optimization Methods for EDA RTL Synthesis, P&R, HLS	Functional Safety, Software Test, Verification and signoff	Rom STC Systems Sim Co-Simulation BEE,DME	Multiphysics Multiscale TCAD, DTCO ICME
Compute layer	HPC Multithreading Message passing	GPU (single, multiple) TPU	FPGA HW accelerators (ZEBU, S&A)	Quantum Computing (Design QC Use of QC)	IP for Chips Foundational Interface Security Processors	IP for Systems Auto Aerospace

AGENDA

Machine Learning within tools

Reinforcement Learning in Optimization

Generative AI

Agentic AI

Silicon to Systems

AI/Machine Learning in EDA

AI/Machine Learning in Engineering Simulation

Digital Twins for Different Industries and Physical AI

AI Can Accelerate Every Step of the EDA Workflow

Applying AI to Navigate Chip Design Solution Space

TUNABLE INPUTS

- Settings
- Flow
- Constraints
- Hierarchy
- Process
- Library

REWARD

ACTION

- Systems Architecture
- Design Capture
- Verification
- Implementation
- Multiphysics Signoff
- Test & SLM
- Silicon Manufacturing

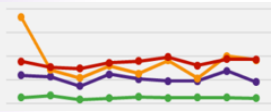
STATE

ALGORITHM

AI Agent

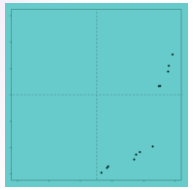
FASTER RESULTS

Target Metrics



Design Trade-offs

Pareto Fronts



Value to Customers and Internal Users

DSO.ai	Up to **12%** Total Power Reduction, **25%** Less DRC, **200MHz** Higher Fmax
VSO.ai	**3X** TAT, **45%** CPU Savings, **12%** Higher Coverage.
TSO.ai	**15% to 35%** Pattern Count Reduction
ASO.ai	**3X** Less Layout ECOs, **16%** Area Savings, **4X** Productivity
Assistants	**>60** Person Time Savings in CSG, **40** Person Time Savings in IPG with Synopsys.ai Copilots

AI Applications in EDA

MACHINE LEARNING	REINFORCEMENT LEARNING	GENERATIVE AI / LLMS	AGENTIC AI

Machine Learning
Better, faster tools

- **ML within tools**
  - ML-enhanced PT
  - ML-enhanced FC
  - ML-enhanced ICV
  - Ansys SimAI

AI as an Optimizer
Optimization of Results

- **DSO.AI**
- **SYNOPSYS.AI**
  - VSO.ai
  - TSO.ai
  - ASO.ai
  - OptiSlang
- **DATA ANALYTICS**
  - Design.da
  - Fab.da
  - Silicon.da

AI as an Assistant
Assistive & Creative Capabilities

- **ASSISTIVE**
  - Run Assistance
  - Workflow Assistance
  - Knowledge Assistance
  - Ansys GPT
- **CREATIVE**
  - RTL Creation
  - Testbench Creation
  - Assertion Creation

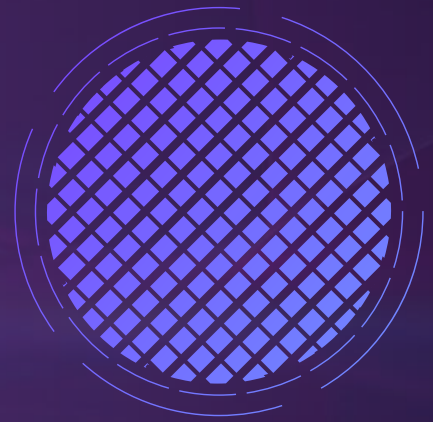
AI as a Colleague
Autonomous Tasks

Next Big Thing!

THE ERA OF PERVASIVE INTELLIGENCE

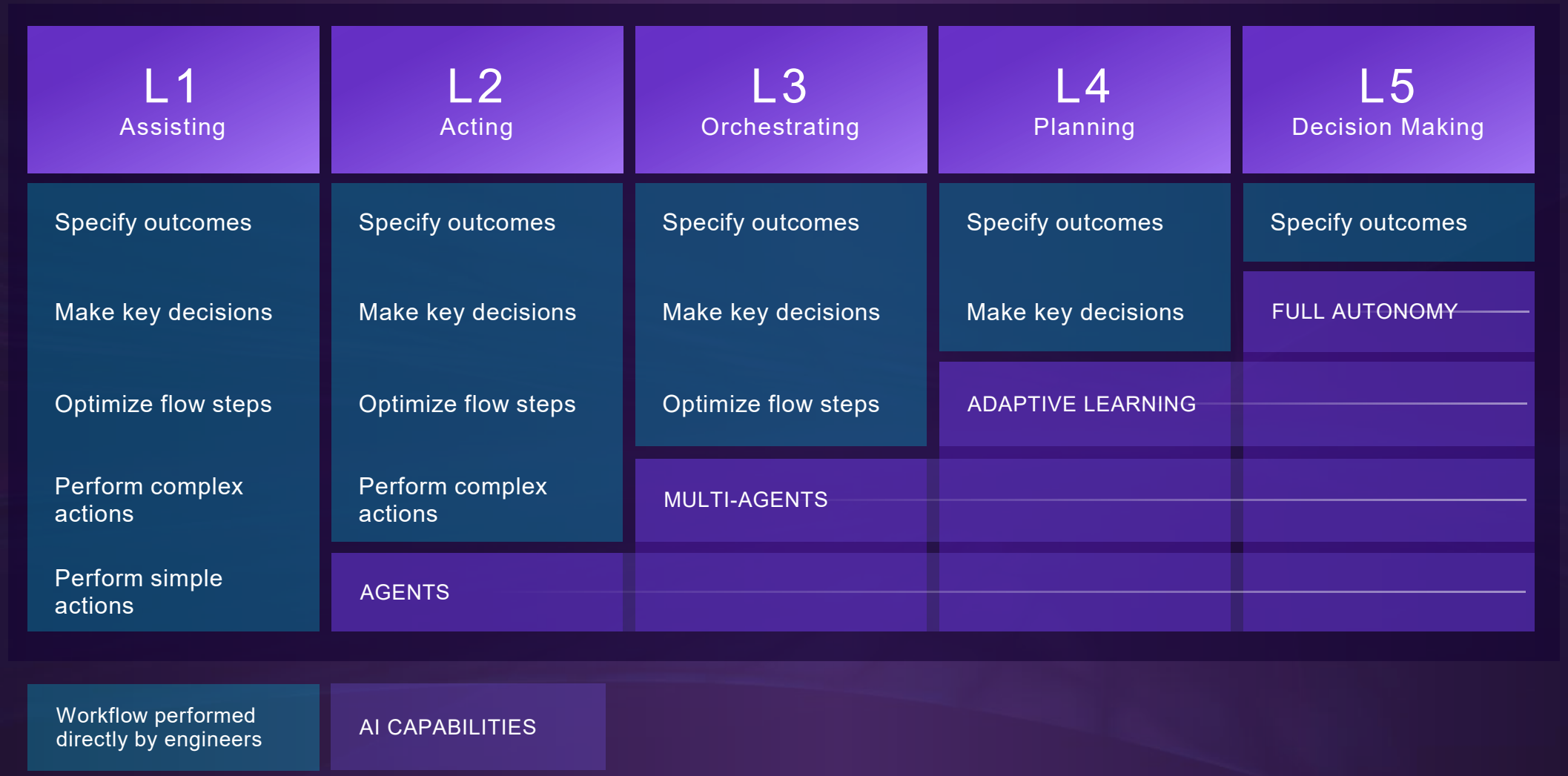
Artificial Intelligence

Software Defined Systems



Silicon Proliferation

Transformation of Workflows



AGENDA

Use solvers to train AI/ML models to speed up simulation

Design space exploration

Generate new models

Hybrid digital twins

Foundational models to speed up simulation

Engineering co-pilots and agents to improve ease of use of simulation

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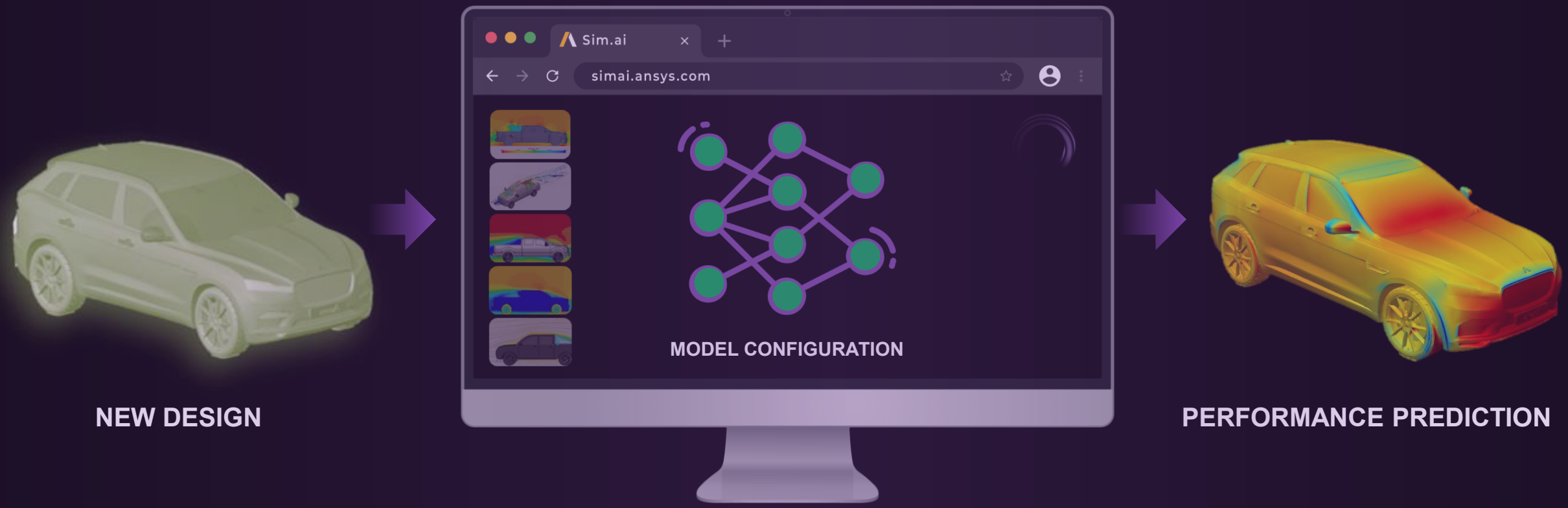
Digital Twins for Different Industries and Physical AI

Predict at the Speed of AI

Ansys SIMAI



1 **UPLOAD**
Your Past Data

2 **TRAIN**
Your AI Model

3 **PREDICT**
In Seconds!

SimAI – Workflow and Applications

Prepare

Data

SimAI training

AM

oSL

Explore

Create Catalogue of trained AI models

Model1

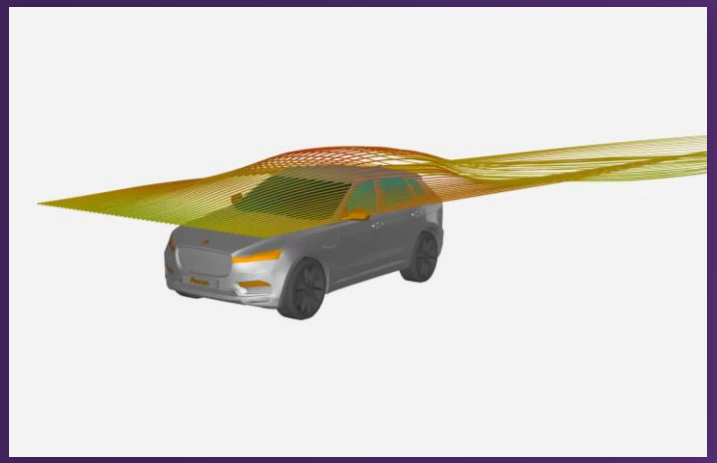
ModelN

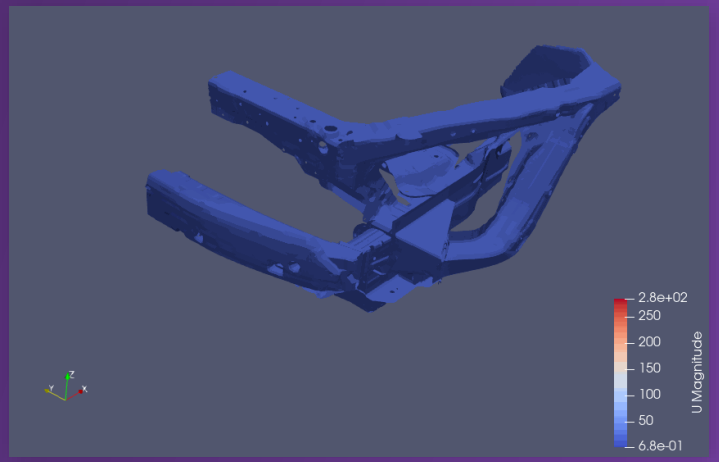
oSL

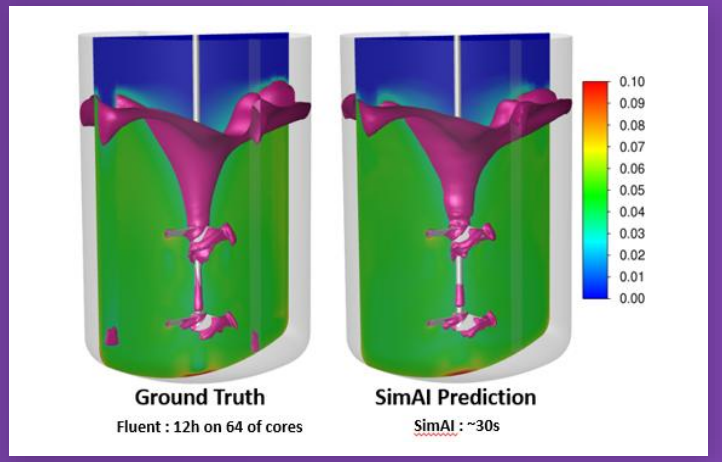
Validate

Validate Selected Best Designs with Full Fidelity Simulation

AM

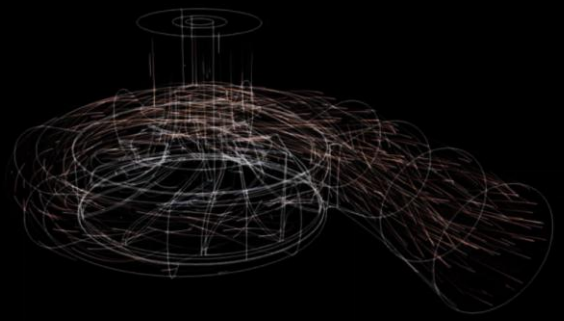






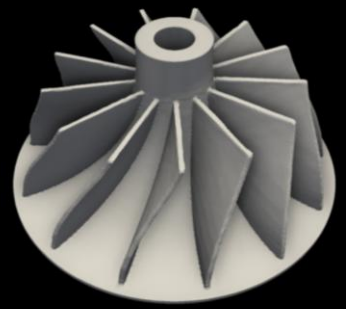
GeomAI to Generate New Shapes

SimAI



give me **a shape**, I will show you the **physics**

GeomAI – *Concept Exploration*



give me **shapes**, I will generate **new shapes**

MotorCAD
Iteration 95

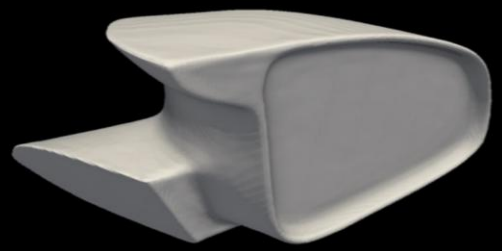
MotorCAD
Iteration 95

E-motor optimization

Enhance e-motor efficiency by optimizing the topology and placement of magnet pockets.

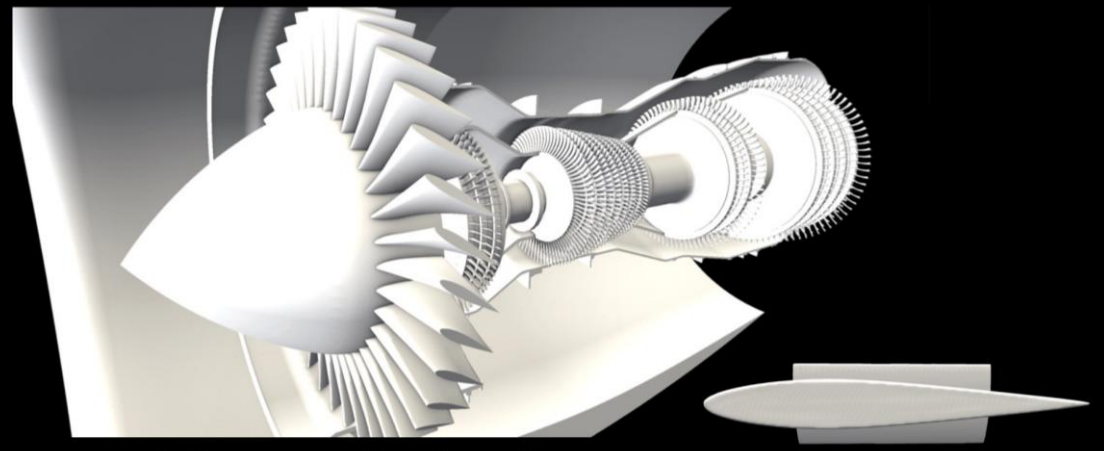
Front
Iteration 0

Iso
Iteration 0



Side mirror optimization

Identify the most stable shape with maximum driver visibility.

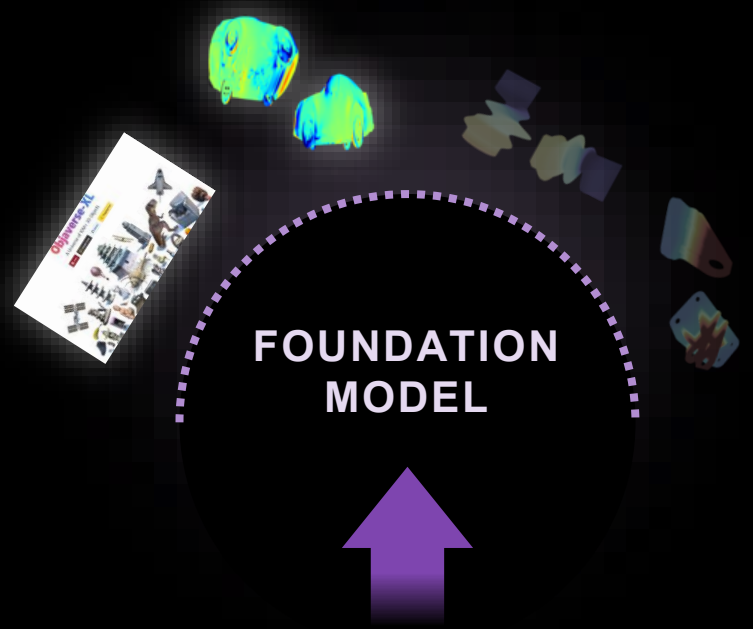


Turbine optimization

Maximize potential through optimized flow physics and energy conversion.

Foundation Models for Physics

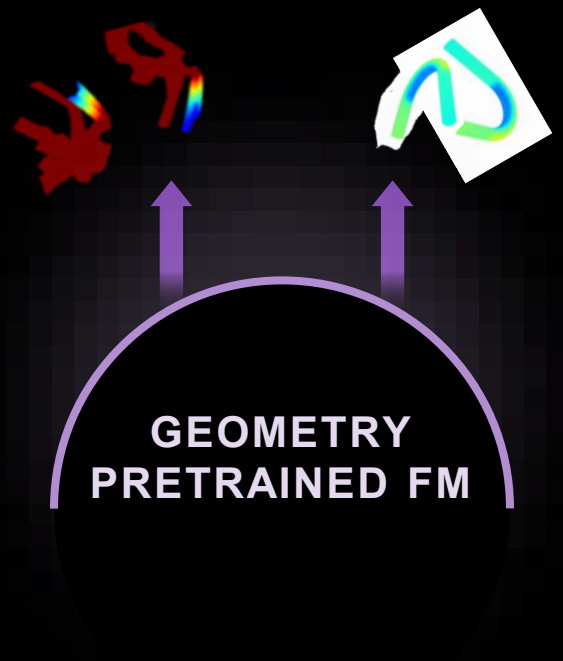
Pre-train on diverse geometries primarily and some common physics use cases



Large geometry pool

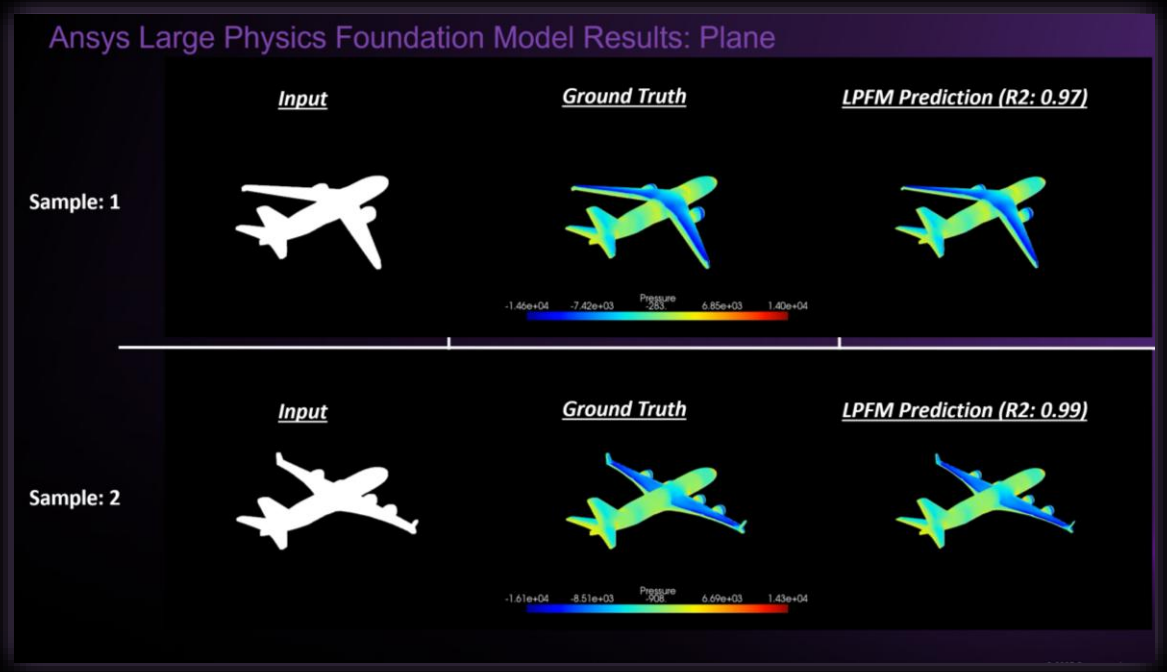
Physics use-cases

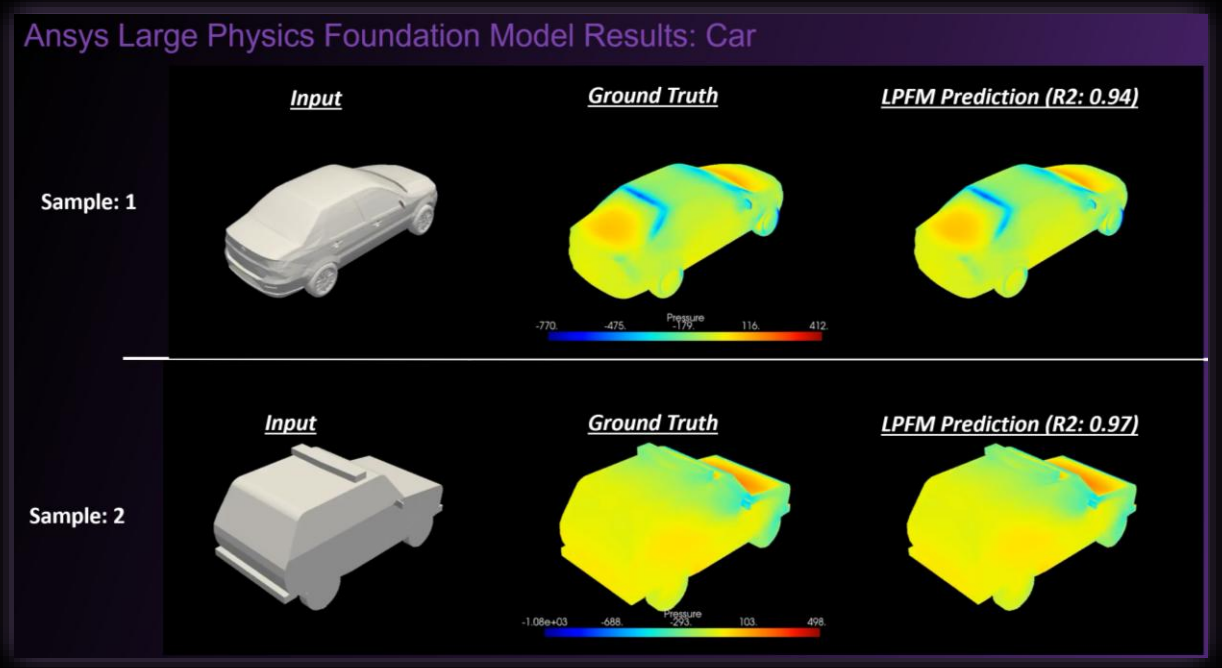
Adapt pre-trained models to different downstream physics use cases



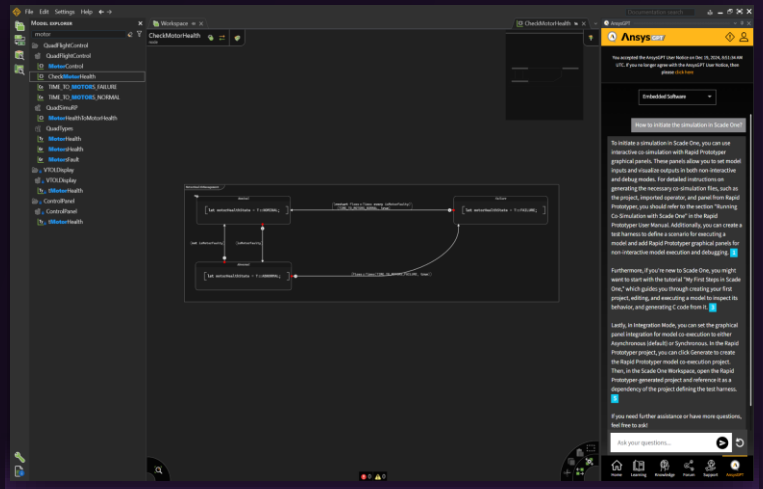
- Large geometry pre-training allows prediction on diverse geometries
- Resolution invariance due to curriculum learning from lower to higher resolution
- One-shot finetuning

Large Physics Foundational Models



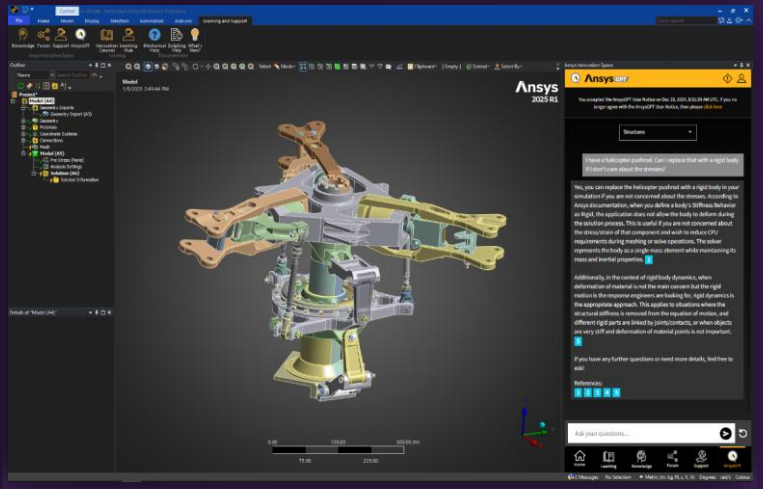


Engineering Copilot In-product Integration



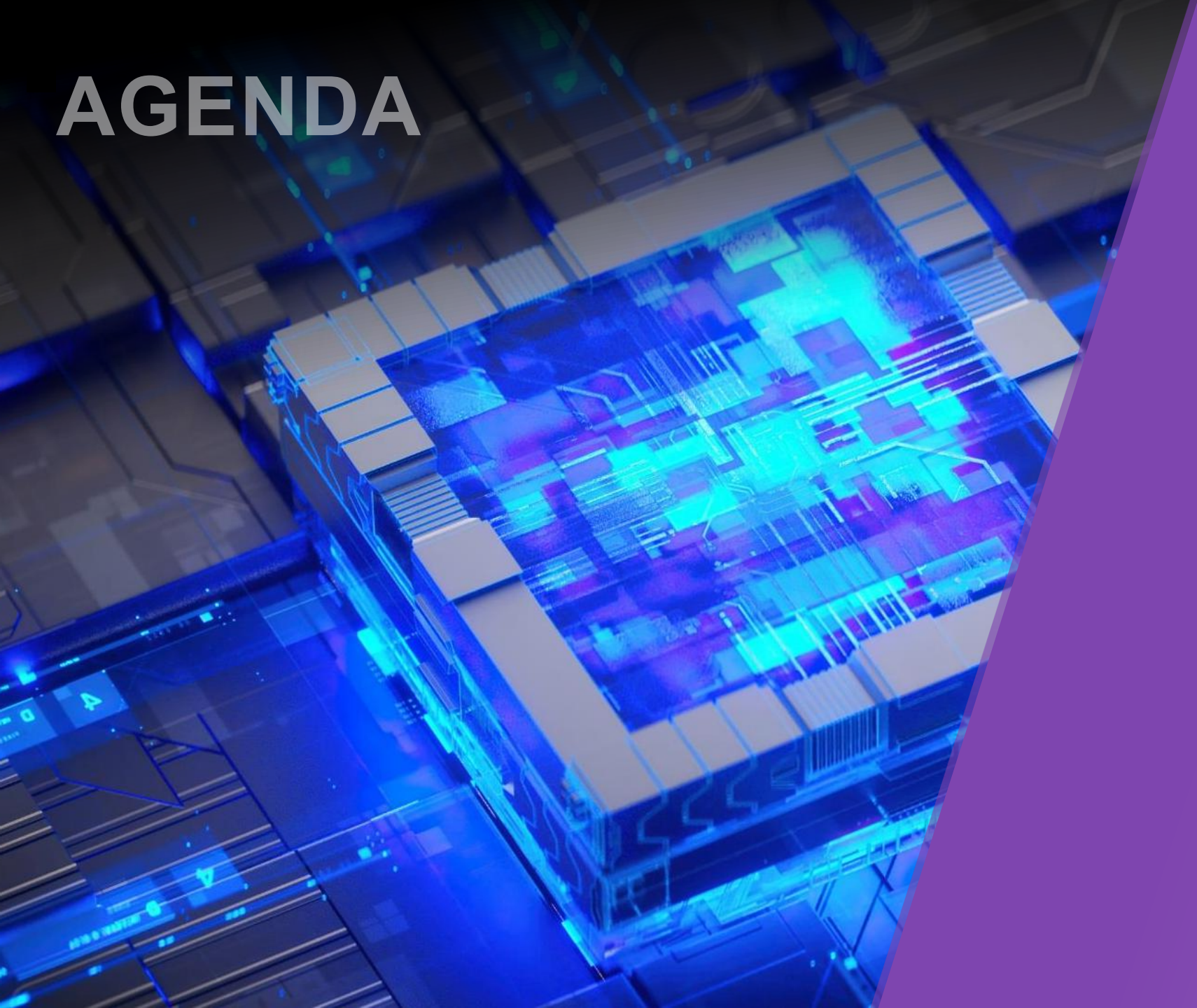
SCADE ONE

FLUENT



MECHANICAL

AGENDA



Silicon to Systems

AI/Machine Learning in EDA

AI/Machine Learning in Engineering Simulation

Digital Twins for Different Industries and Physical AI

Digital Twins in Various Industries

Aerospace

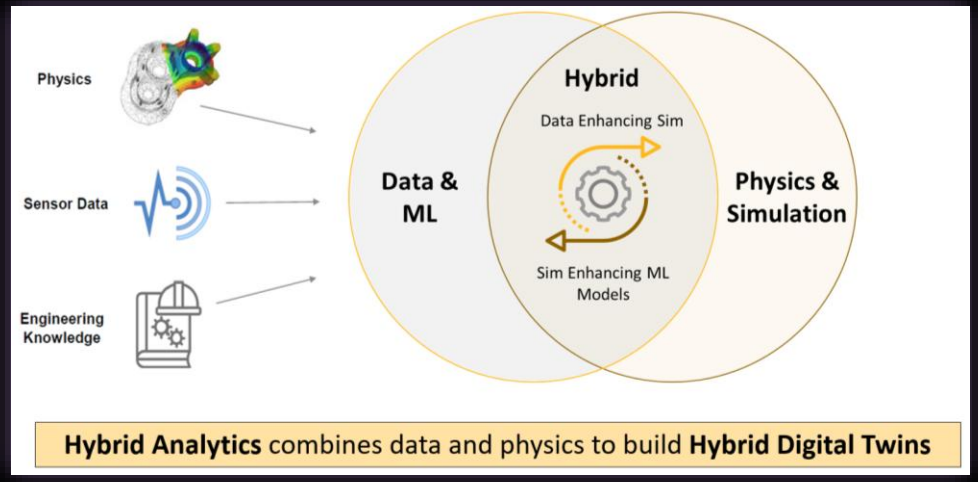
Automotive

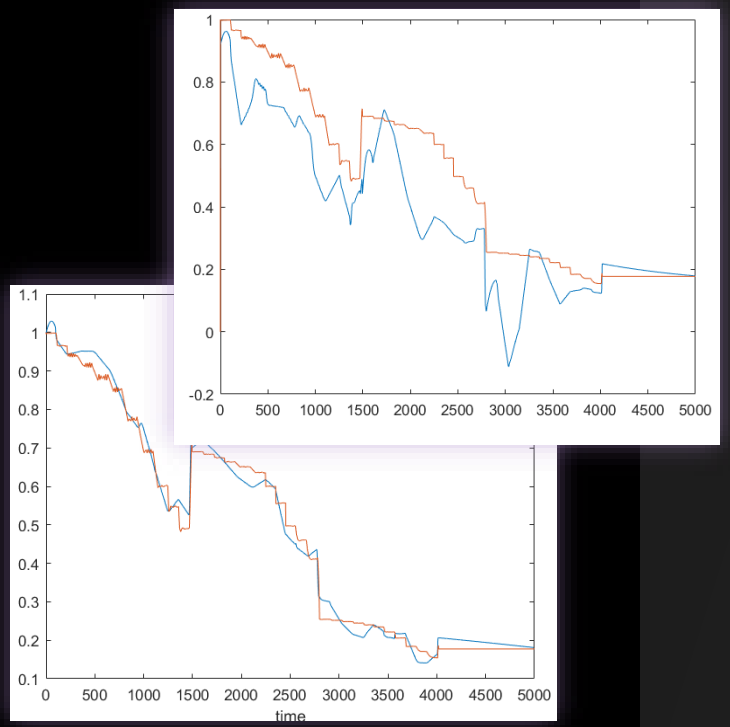
Manufacturing

Buildings & Infrastructure

Oil & Gas

TwinAI: Hybrid Digital Twins Combining Simulation and Data





ACCURACY

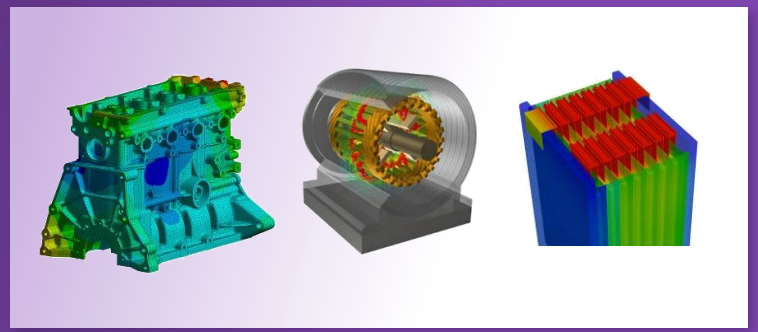
Both: ~98%

Sim: ~90%

Data: ~80%

Synopsys Solution for Digital Twins

Validated Physics



Ansys/Synopsys Twin Builder® & Ansys/Synopsys TwinAI™

System Model

ROM

Solver

Hybrid analytics and deployment services

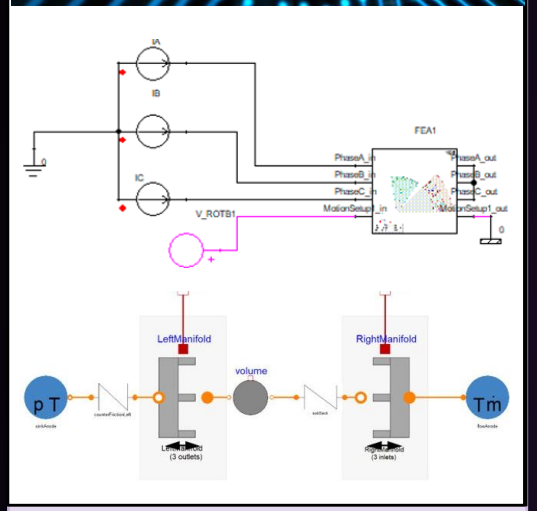
Twin for cloud/edge deployment

1. Best in class **Reduced Order Modeling** capabilities → Reuse
2. **Hybrid Analytics** → Accurate, evolving models
3. Unique **deployment** model and open architecture → Scalability

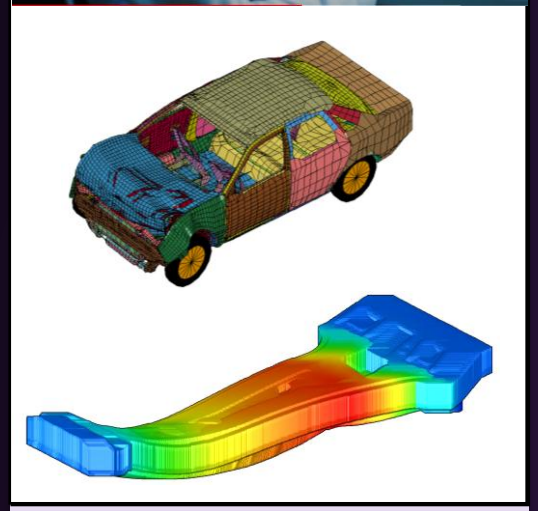
OPEN ECOSYSTEMS AND KEY ANNOUNCED PARTNERS

Microsoft aws NVIDIA ptc Rockwell Automation

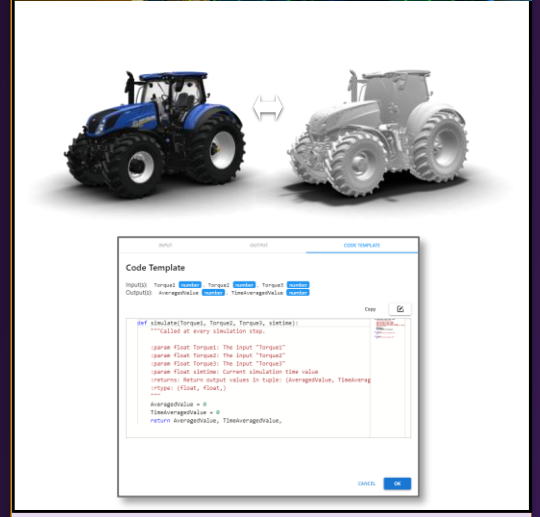
Digital Twins Development Priorities



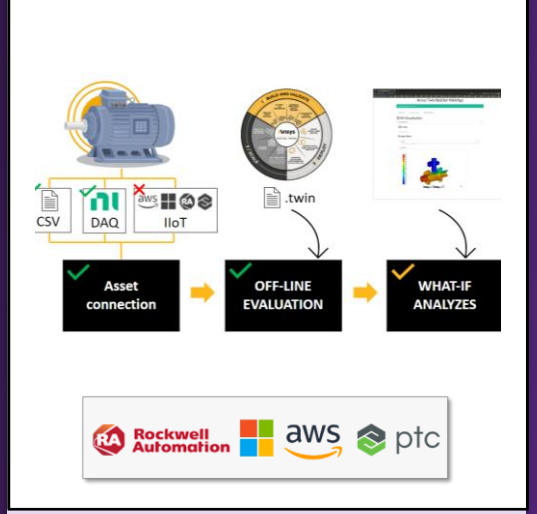
Simplify model building for brown-field applications



Allow re-use of existing simulation models and data through AI/ML



Enabling scaled runtime deployments



Drive our ecosystem and partnerships

Digital Twins in Different Industries with Physical AI

SYNOPSYS® | NVIDIA

Electronic Design Automation

DESIGN	MANUFACTURING	VERIFICATION
PrimeLib	Proteus	PrimeSim
Redhawk-SC	S-Litho	VCS
Totem SC	S-Device	
	Quantum ATK	

= In Production

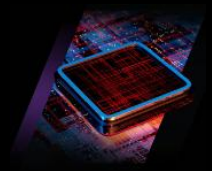
Computer Aided Engineering

STRUCTURES	FLUIDS	ELECTRONICS/ ELECTROMAGNETICS	MANUFACTURING
Mechanical	Fluent	HFSS	SPEOS
LS-Dyna	FreeFlow	Icepak	Zemax
Discovery	Rocky	Maxwell	Lumerical FDTD

= In Production

Synopsys AgentEngineer™ Technology

Physical AI


Semiconductor DT


Industrial DT


Medical DT


Aerospace DT


Robotics DT


Automotive DT

NVIDIA Omniverse

Targeting Availability in Every Cloud and OEM

aws CoreWeave DELL Technologies Google Cloud Hewlett Packard Enterprise Lenovo Microsoft Azure ORACLE CLOUD Infrastructure SUPERMICRO

SUMMARY

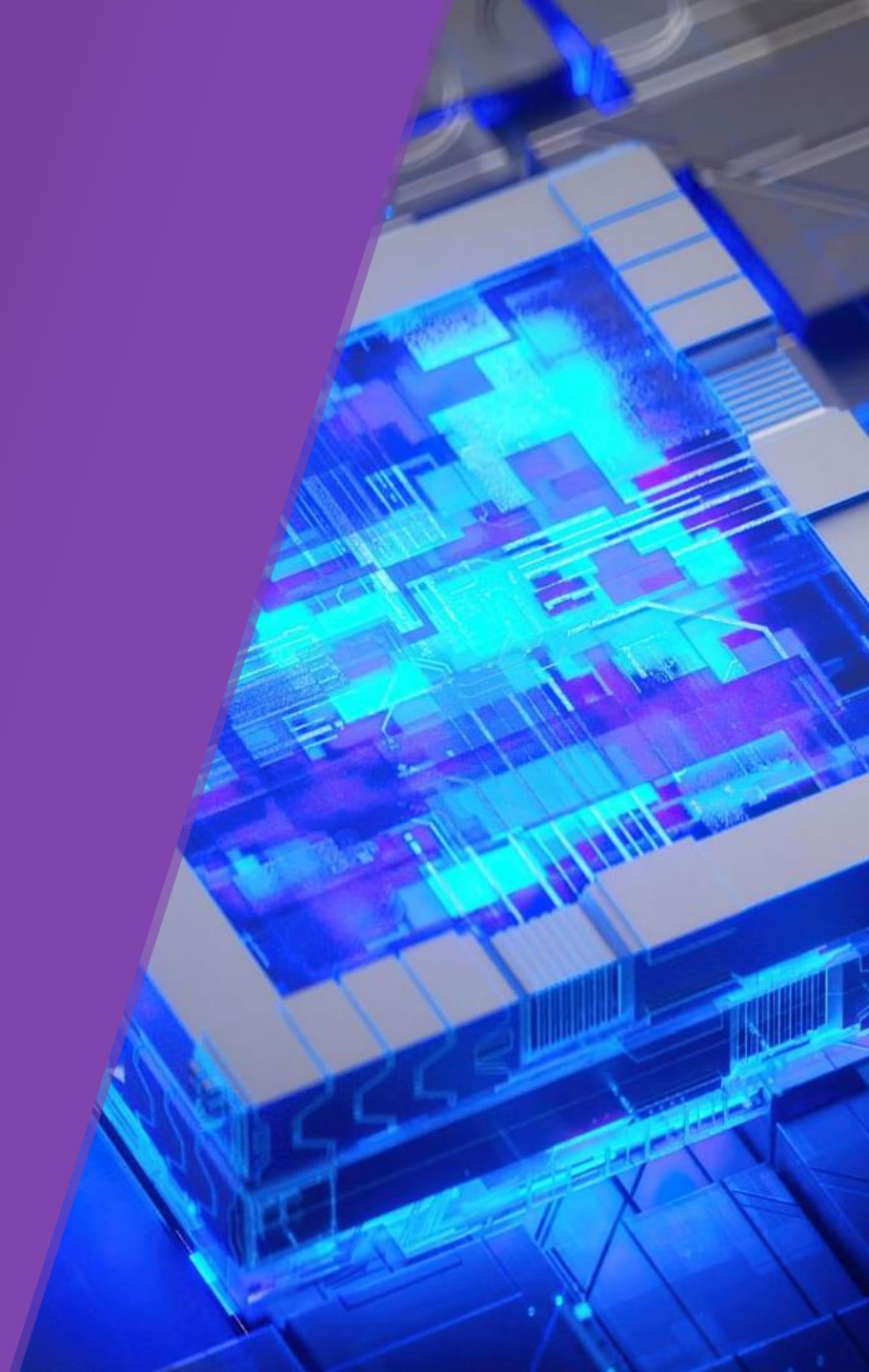
AI/Machine Learning in EDA

- Machine Learning within tools
- Reinforcement Learning in Optimization
- Generative AI
- Agentic AI

AI/Machine Learning in Engineering Simulation

- Use solvers to train the AI/ML models to speed up simulation
- Design space exploration
- Generate new models
- Foundational models to speed up simulation
- Engineering co-pilots and agents to improve ease of use of simulation

Digital Twins in Different Industries powered by Physical AI



SYNOPSYS®

Thank you