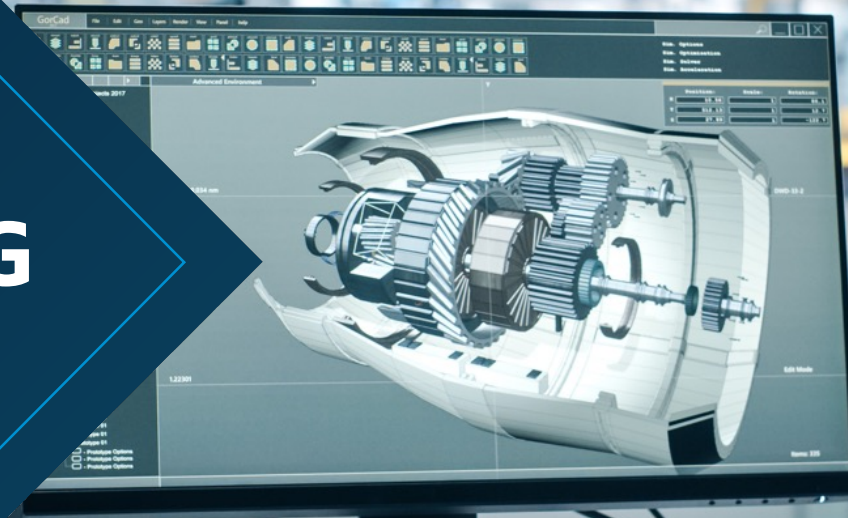


# THE SDK LANDSCAPE OF ENGINEERING SOFTWARE

Jonathan Girroir, Senior Director



# SO, YOU WANT TO BUILD A CAD APPLICATION?

# SO, YOU WANT TO BUILD A ~~CAD~~ APPLICATION? PLM

# SO, YOU WANT TO BUILD A ~~CAD~~ APPLICATION? PLM / PDM

# SO, YOU WANT TO BUILD A ~~CAD~~ APPLICATION? PLM / PDM / CAM

SO, YOU WANT TO BUILD A ~~CAD~~ APPLICATION?  
PLM / PDM / CAM / CMM

SO, YOU WANT TO BUILD A ~~CAD~~ APPLICATION?  
PLM / PDM / CAM / CMM / CAE

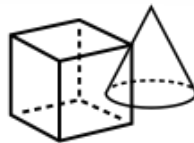
SO, YOU WANT TO BUILD A ~~CAD~~ APPLICATION?  
PLM / PDM / CAM / CMM / CAE / AM

SO, YOU WANT TO BUILD A ~~CAD~~ APPLICATION?  
PLM / PDM / CAM / CMM / CAE / AM / AEC

SO, YOU WANT TO BUILD A ~~CAD~~ APPLICATION?  
PLM / PDM / CAM / CMM / CAE / AM / AEC / ...

SO, YOU WANT TO BUILD A ~~CAD~~ APPLICATION?  
PLM / PDM / CAM / CMM / CAE / AM / AEC / ...

## 3D SOFTWARE COMPONENTS



# ENGINEERING SDK LANDSCAPE

## Open Source



## Commercial Platforms



## Gaming



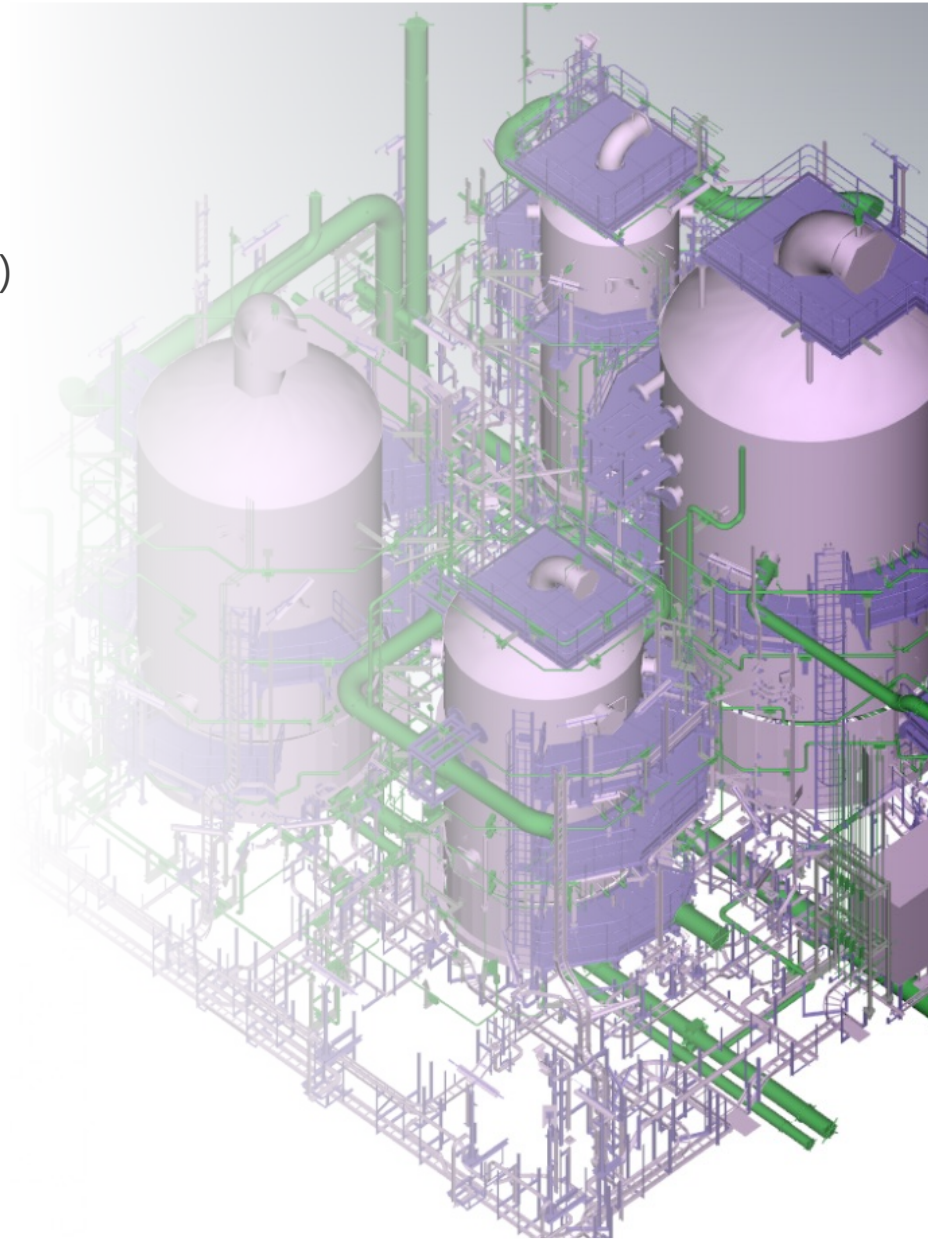
# 3D DATA LANDSCAPE

	MCAD	AEC	CAE
OPEN	IGES STEP STL/3MF XT, JT (Siemens) QIF	IFC/BCF E57/LAZ/XYZ DXF (Autodesk) glTF USD	VTK OpenFOAM CGNS Exodus HDF5/XDMF
CLOSED	Catia, 3DXML, SOLIDWORKS, ACIS (Dassault) Inventor, 3DS (Autodesk) NX, SolidEdge (Siemens) Creo (PTC)	DWG, NWD, RVT, RCP (Autodesk) DGN (Bentley) RVM (Aveva)	LS-DYNA, Fluent, Polyflow, CFX, FIDAP (Ansys) Abaqus (Dassault) NASTRAN, PATRAN, MARC (Hexagon) Hypermesh, Optistruct (Altair) NX NASTRAN, FEMAP (SIEMENS)

# OPEN SOURCE SKDs

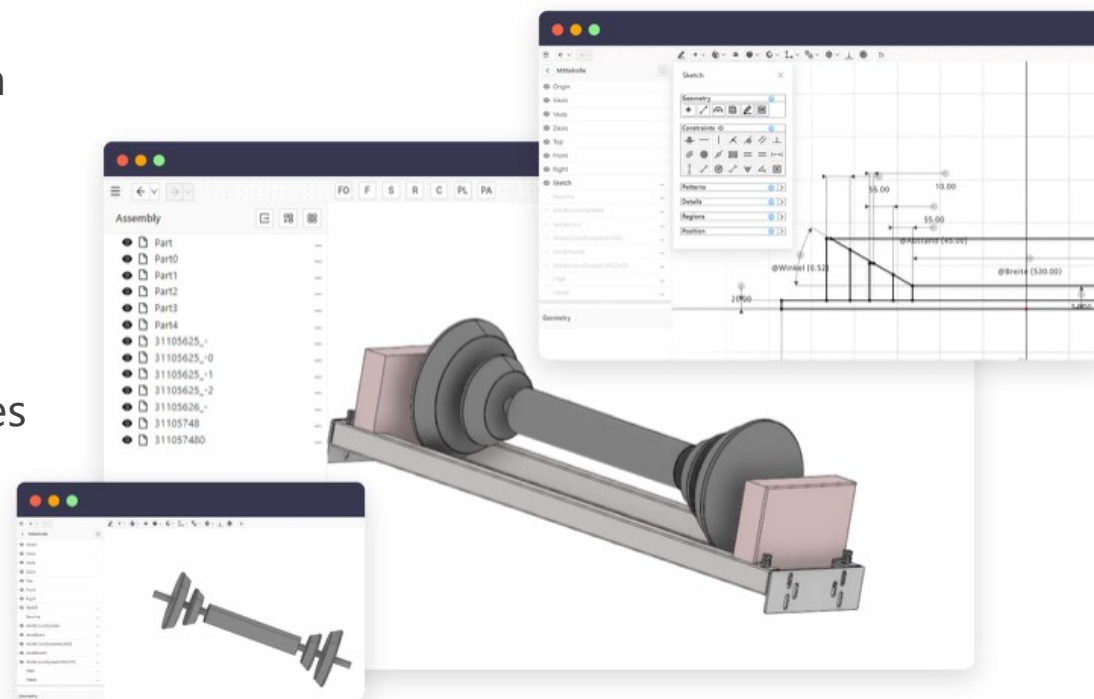
# OPEN CASCADE

- Platform with rudimentary data I/O (STEP & IGES) & simple OpenGL graphics
- Additional data via HOOPS Exchange
- **Modeling Kernel** is its real strength
  - Complex B-Rep modeling
  - Extrusions to make building elements
  - Sweeps for piping
  - Booleans for openings
  - NURBS support
- IfcOpenShell uses Open Cascade to evaluate IFC Geometry



# three.js

- General Purpose 3D Web Visualization
- Massive community and ecosystem
- Native loading of glTF & OBJ
- DXF & IFC via plug-ins
- Basis for Autodesk Platform Services (APS) viewer
- Wrap in Electron to deploy to desktop



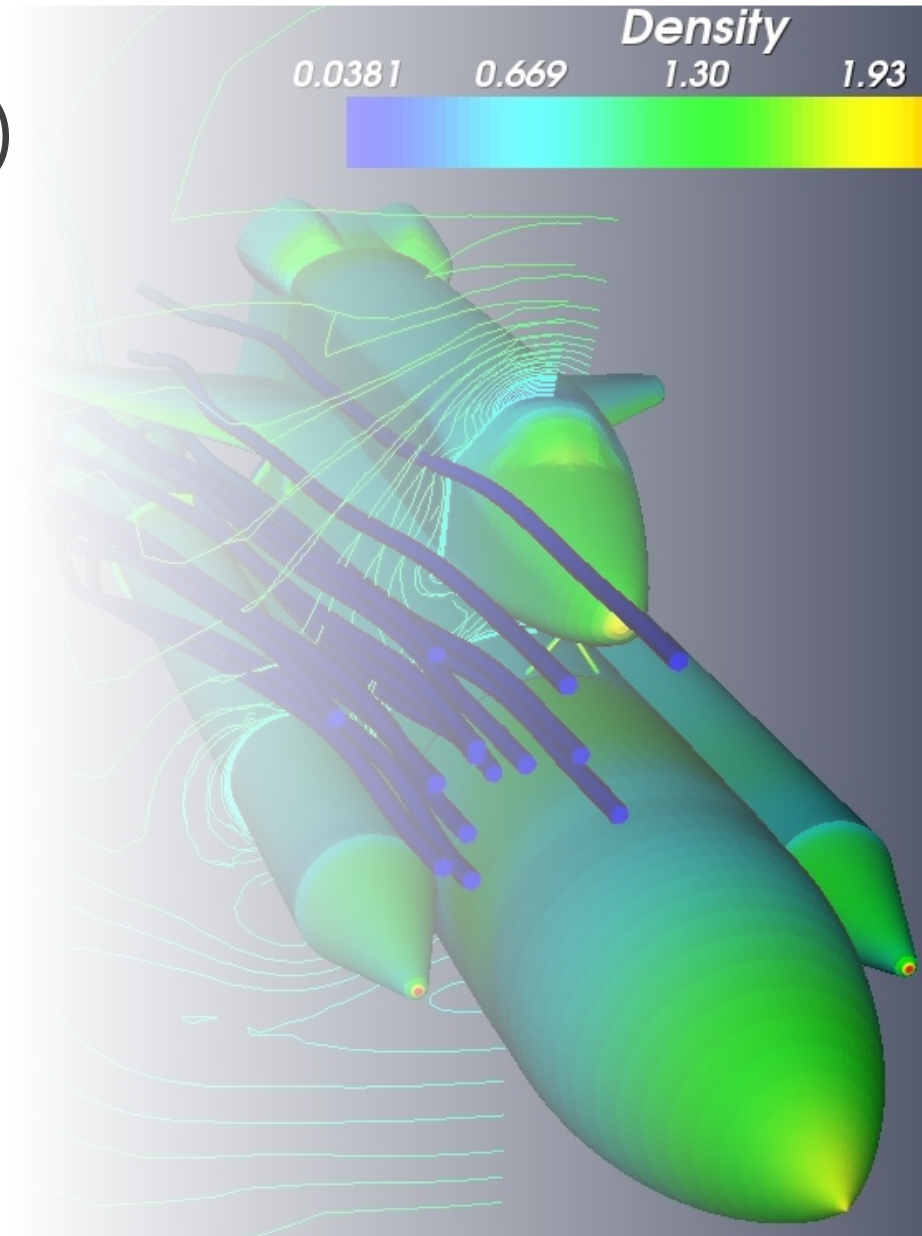
# CREOOX XEOKIT

- Custom web-based graphics engine focused on BIM for precision and accuracy
- Native loading of OBJ, STL, 3DXML through converters
- Must license IFC & glTF readers
- Excellent documentation
- **AEC-specific tools** (tree-view, cutting plane, measurement, annotations, 2D floor plan nav)
- PBR & point cloud support



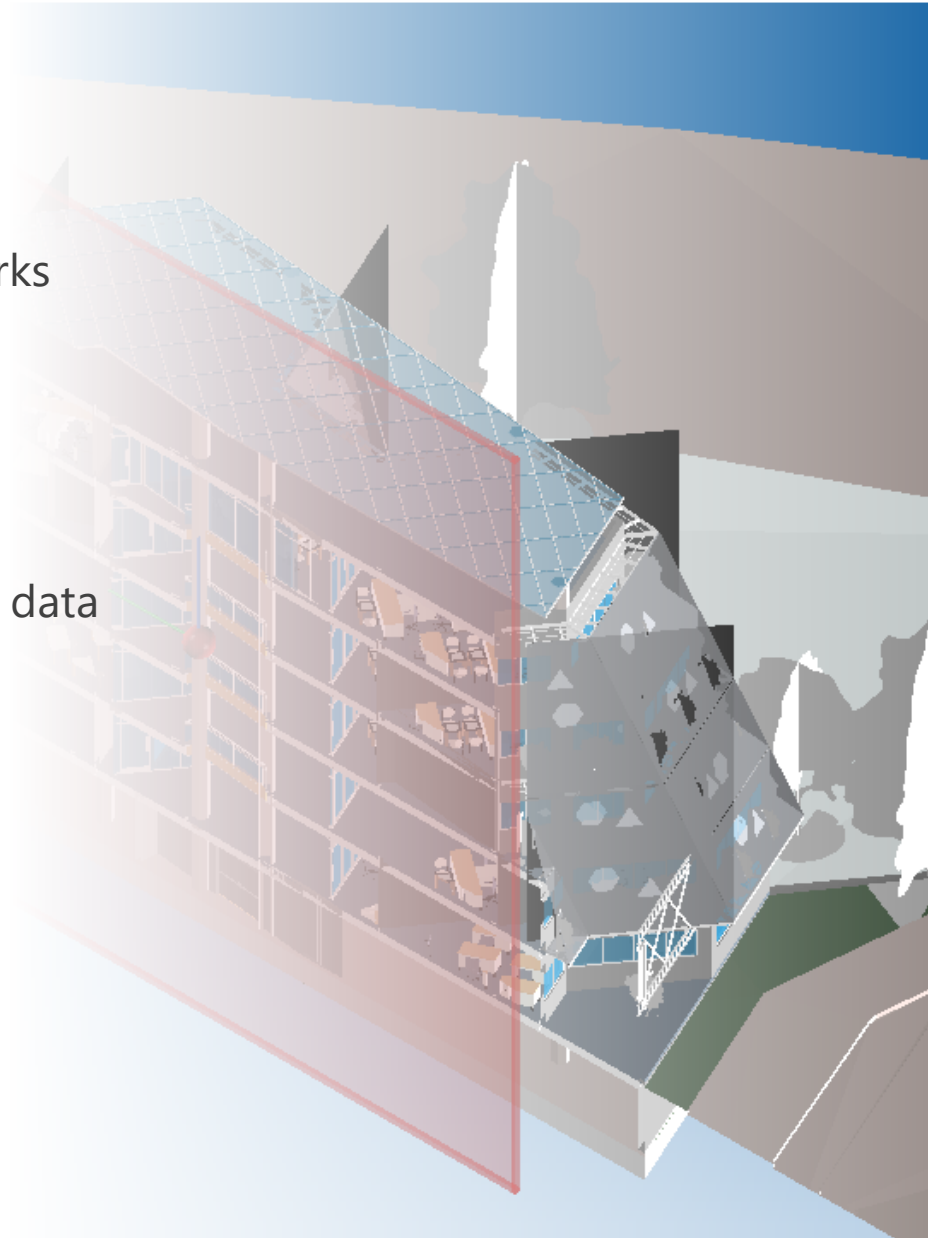
# Visualization Toolkit (VTK)

- CAE & Scientific Simulation Focused
- Heavy Presence in Education & Research
- Data → Filters → Mappers → Rendering
- Data readers
  - CAE – VTK, CGNS, OpenFOAM, Tecplot
  - Open – STL, OBJ, PLY
- Desktop & Web Graphics
- Licensing required for proprietary extensions
- Business Model - Consultation & Customization



# OPEN DESIGN ALLIANCE

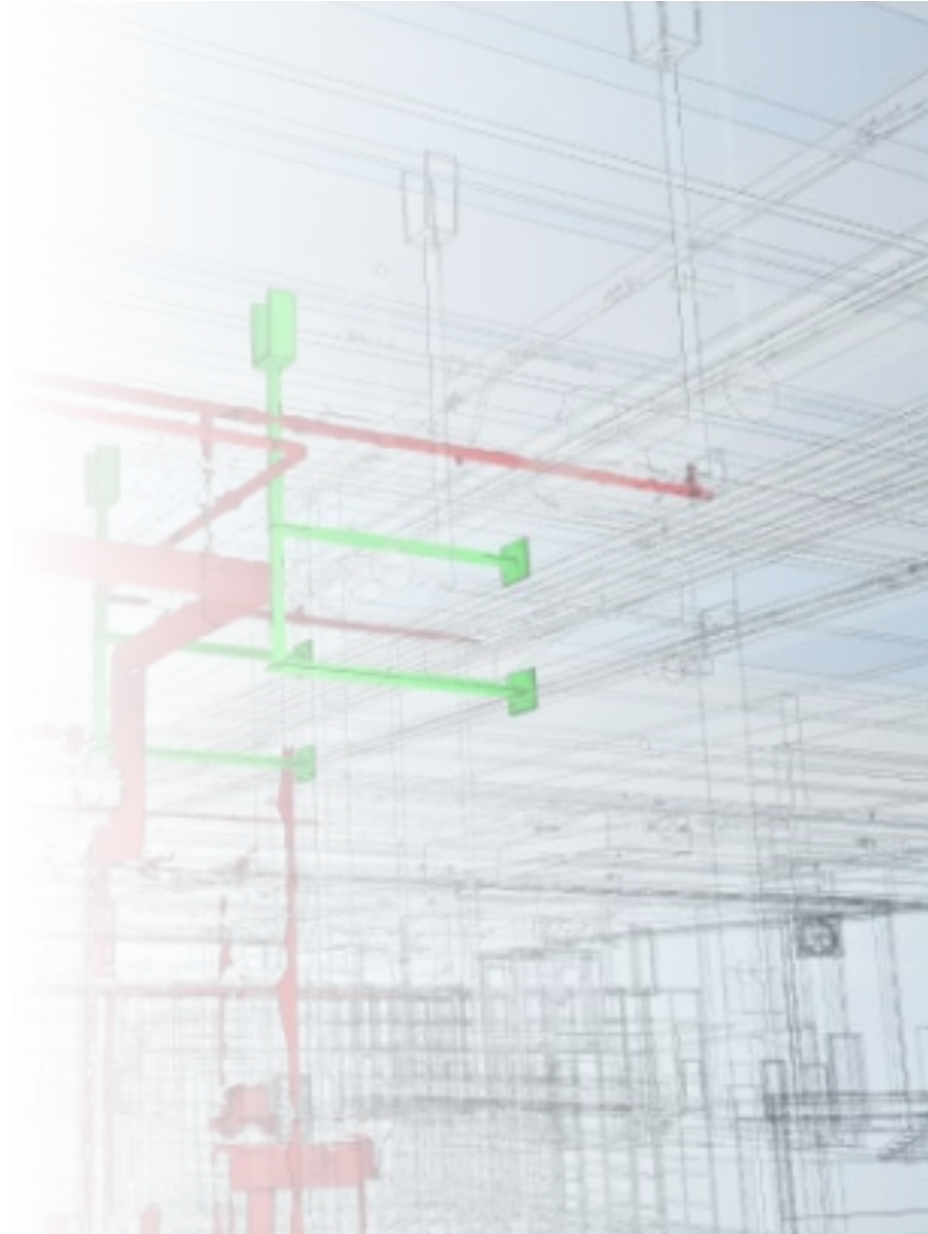
- AEC data Focus - DWG, DGN, Revit, IFC, Navisworks
- Broad market usage
- Responsiveness can be a struggle
- Recent diversification into 3D viewers and MCAD data
- Open-ish – Requires paid membership



# COMMERCIAL PLATFORMS

# Autodesk

- RealDWG – Native DWG reading/writing (AEC)
- OEM Platforms (Reskinned Applications)
  - AutoCAD OEM – AEC
  - Inventor OEM – MCAD
  - Desktop only
- Autodesk Platform Services (APS)
  - Expansive data, visualization & navigation tools
  - Web-only
  - Viewer based on three.js
  - Hosted solution



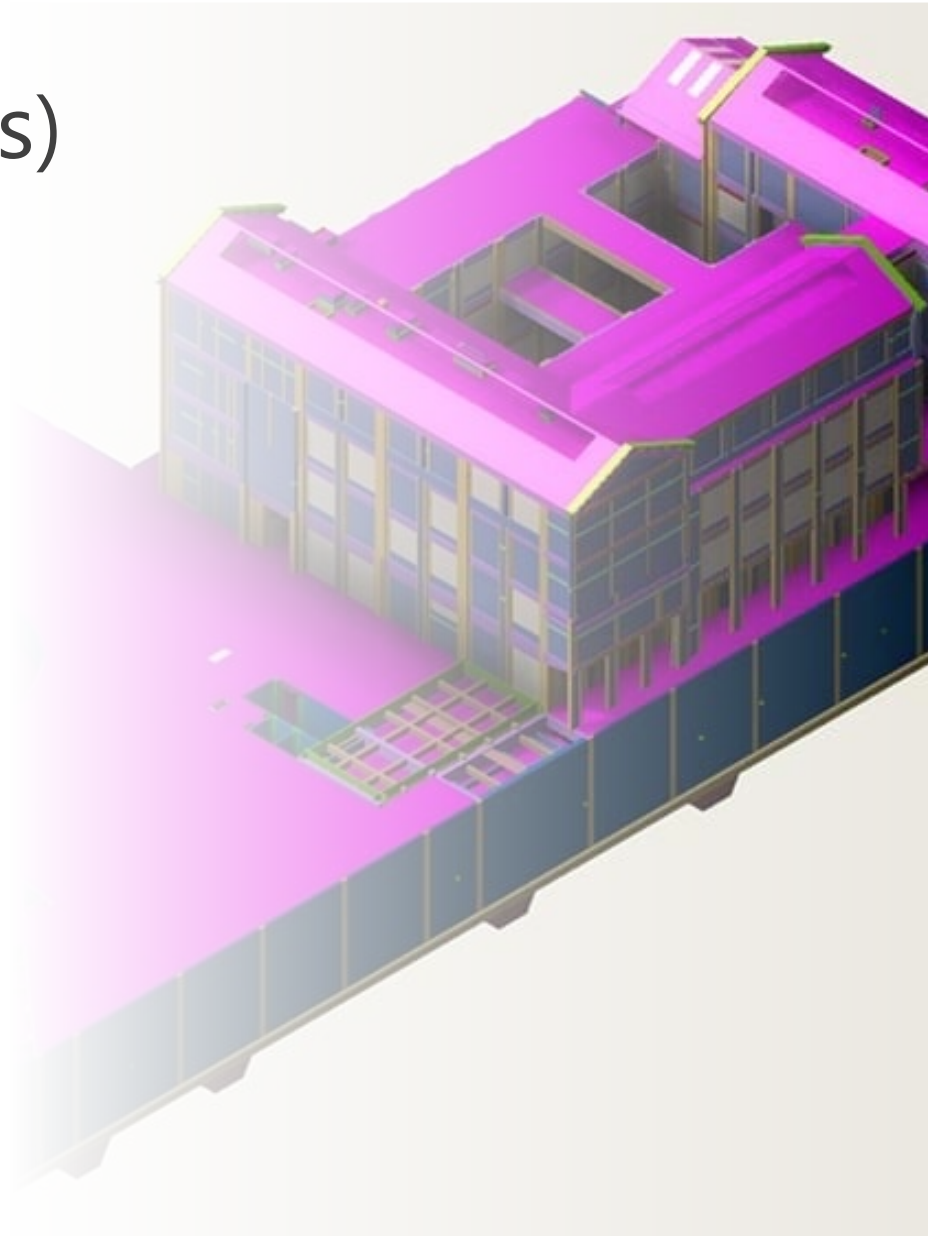
# SIEMENS

- Data
  - JTOpen
  - HOOPS Exchange
- Graphics
  - Desktop - HOOPS Visualize
  - Web - PLM Vis Web
- **Parasolid Modeling Kernel** – Industrial grade
  - BREP & Convergent Modelling
- Best-in-class support



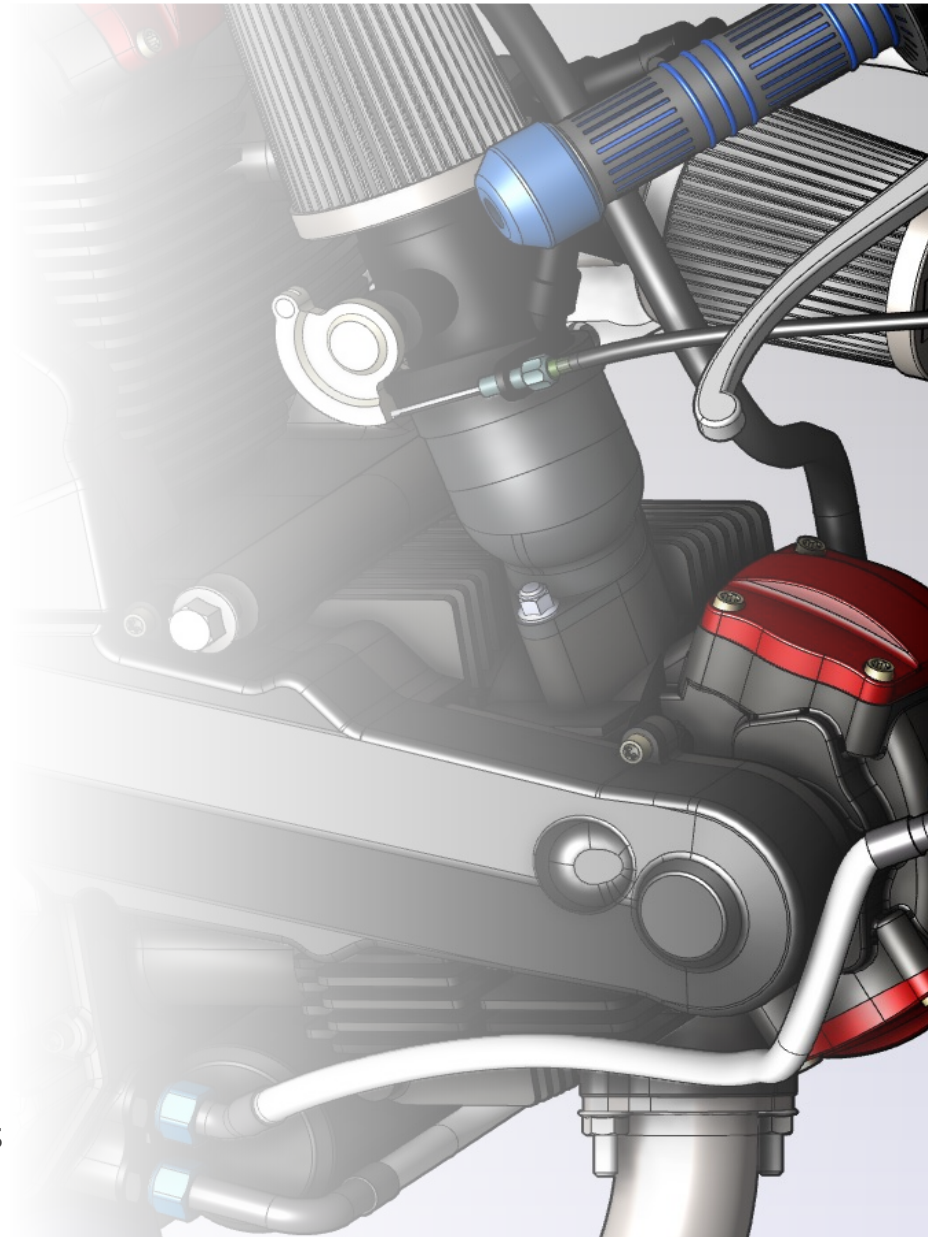
# SPATIAL (Dassault Systems)

- InterOp – Data access
  - MCAD first
  - IFC, DWG, DGN, Revit via ODA
- Modeling
  - ACIS - MCAD focus
    - BREP & Includes “Hybrid” Modeling
    - Basis for AutoCAD
  - CGM – Aerospace focus
- Graphics - HOOPS Visualize for Desktop, Mobile, & Web



# TECH SOFT 3D (HOOPS)

- Largest independent supplier 3D engineering SDKs
- Data
  - HOOPS Exchange for CAD & AEC
  - HOOPS AI for ML data prep
  - HOOPS Access for CAE
  - DWG & Revit via ODA
  - Tight integration with Siemens Parasolid
- Simulation – HOOPS Mesh & Solve
- Graphics
  - HOOPS Visualize (Desktop, Mobile & Web)
  - HOOPS Envision for CAE data
- Exclusive reseller of RealDWG, AutoCAD OEM, Siemens Parasolid, & Machine



# GAMING GRAPHICS

# UNREAL / UNITY3D / OMNIVERSE

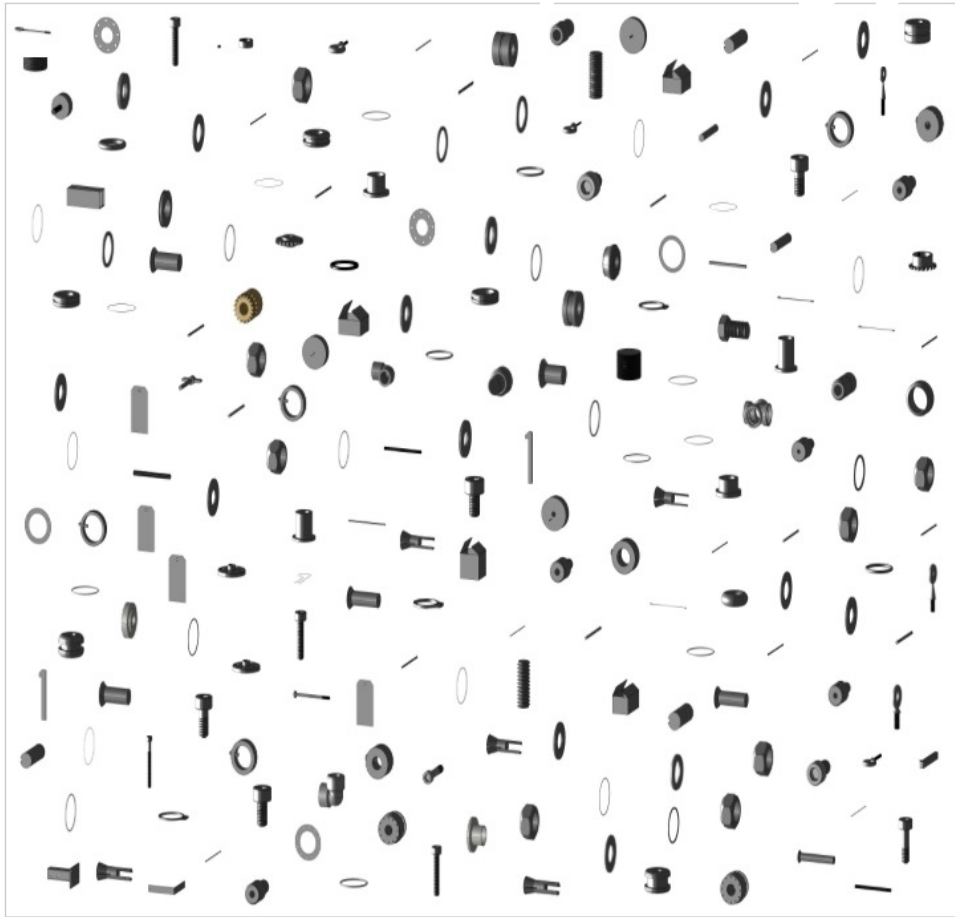
- Best-in-class rendering engines
- Gaming focused
- Physics & simulation, materials libraries, & other integrations
- “Studio” dev environment
- All use HOOPS Exchange for data import



# AI DEMO

DATA ACCESS + VISUALIZATION + ML

CAD Files

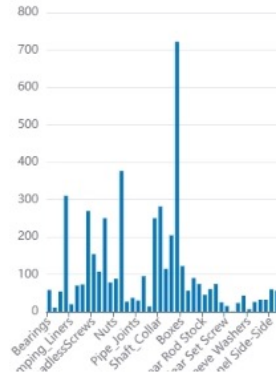


Set Limit:  Remove All Filters

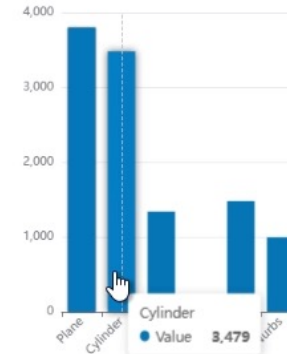
Cad files count (with limit of 400): 400

Entity characterist...

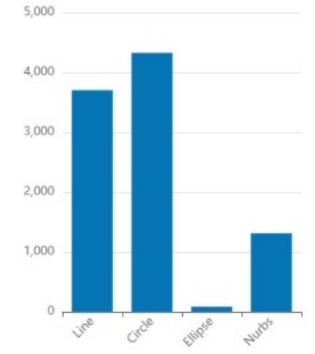
CAD label distribution



Face types

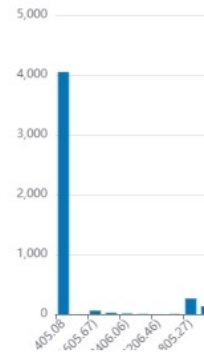


Edge types

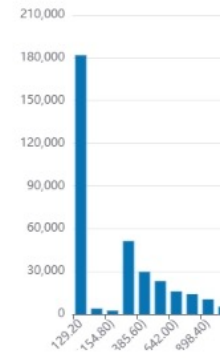


Model Metadata

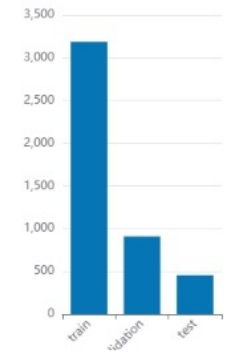
CAD File Size



Brep Face count



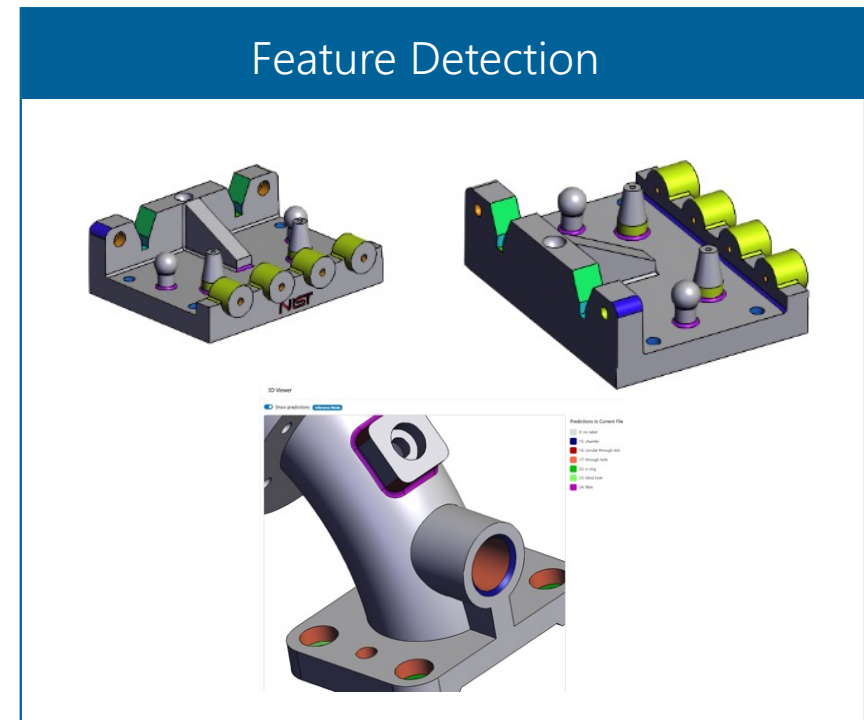
Dataset subsets



# CLASSIFICATION ARCHITECTURE



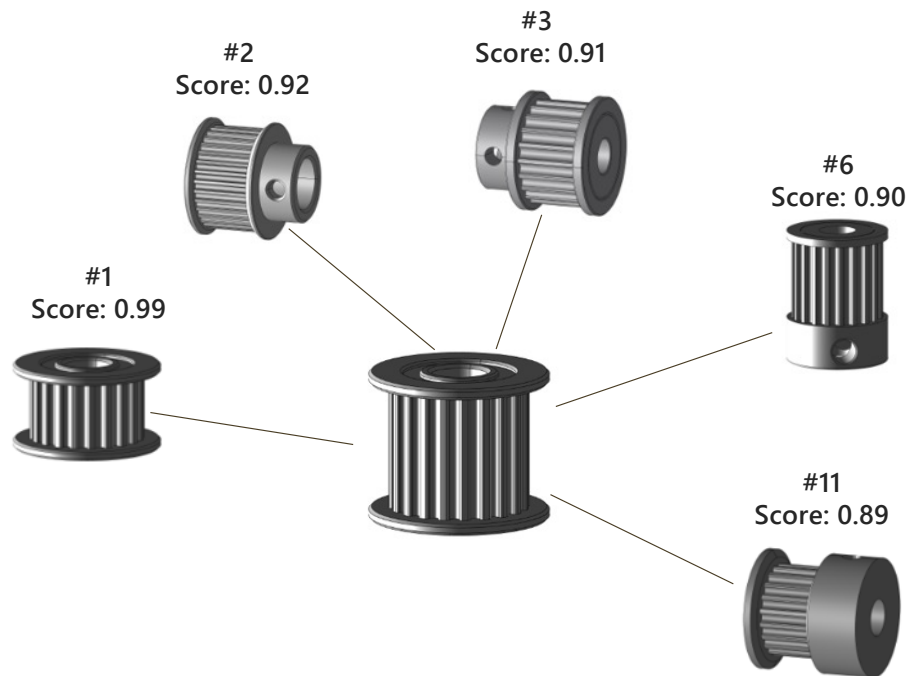
Prebuilt supervised architectures: Part Classification, Feature Detection as seen in the SOTA



**Supervised learning requires labeled data**

# FROM GEOMETRY TO BUSINESS INTELLIGENCE

## Understanding Shape. Enabling Similarity



## Understanding Similarity. Enabling Business Insight



**Manufacturing Process**  
Likely CNC Machining



**Cost Driver**  
Thin wall + Tight tolerance



**Sourcing**  
Similar parts produced in EU  
supply chain

# LICENSING

- Evaluate for 30-90 days
- Free or paid development seats
- Distribution – Flat, per-seat, or revenue share



# WRAP UP

- Shattered technology landscape
- Need for open data APIs for better interoperability
- Align with the vendor in your ecosystem
- Growing presence of video game vendors for building digital twins

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