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AI @Materialise:
It takes more than training a network

Aim-Net

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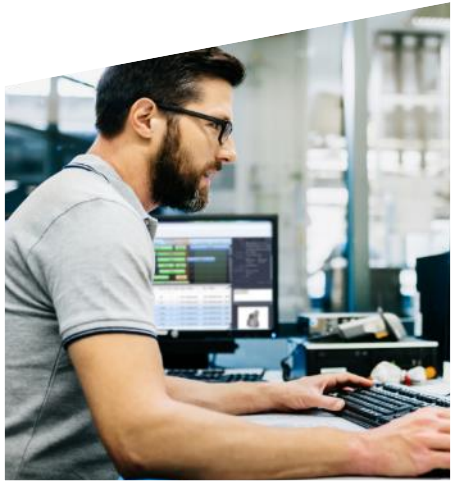
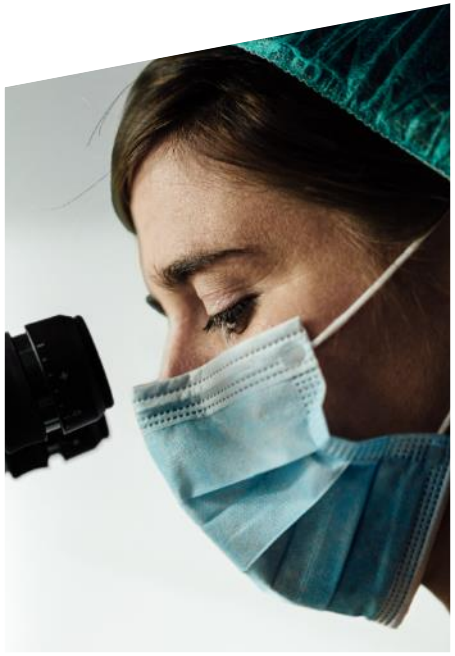
About Materialise



Materialise Software

Materialise Manufacturing



Materialise Medical

>> Delivering premium software, engineering, and 3D printing services

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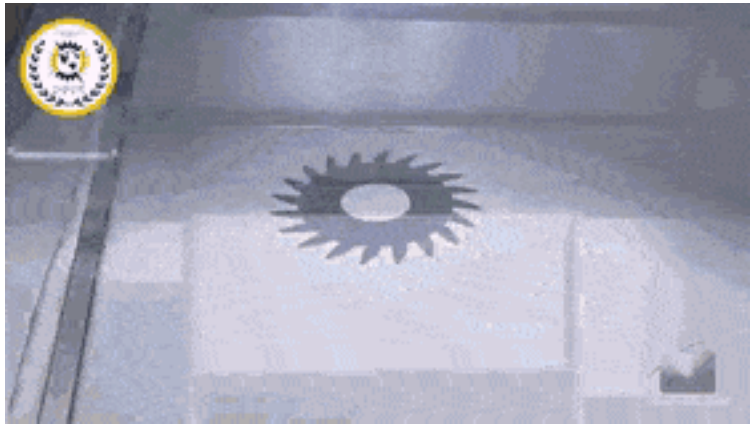
Additive manufacturing

- Layerwise process
- Unique geometries

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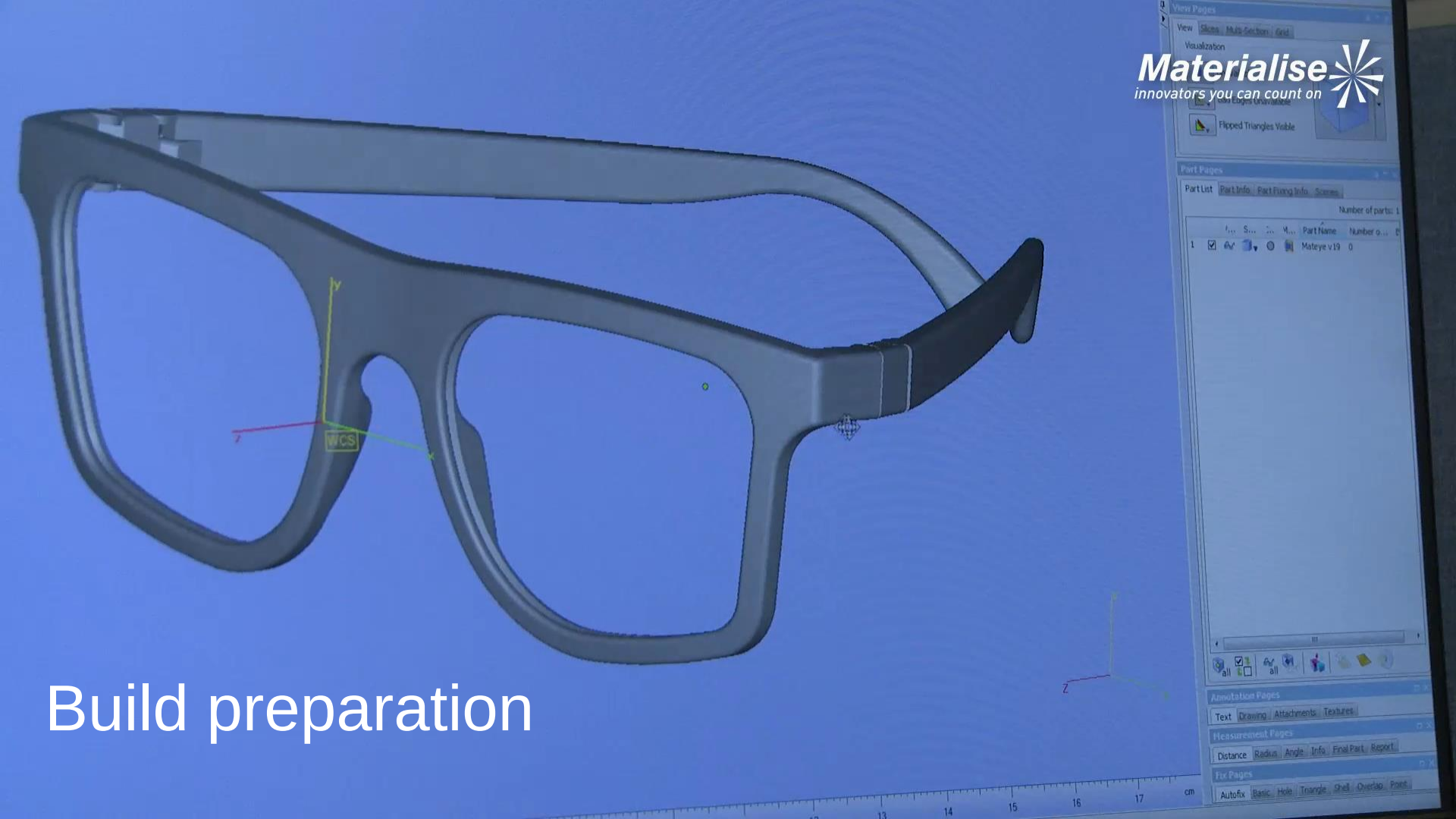
Eyewear

Customization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Build preparation


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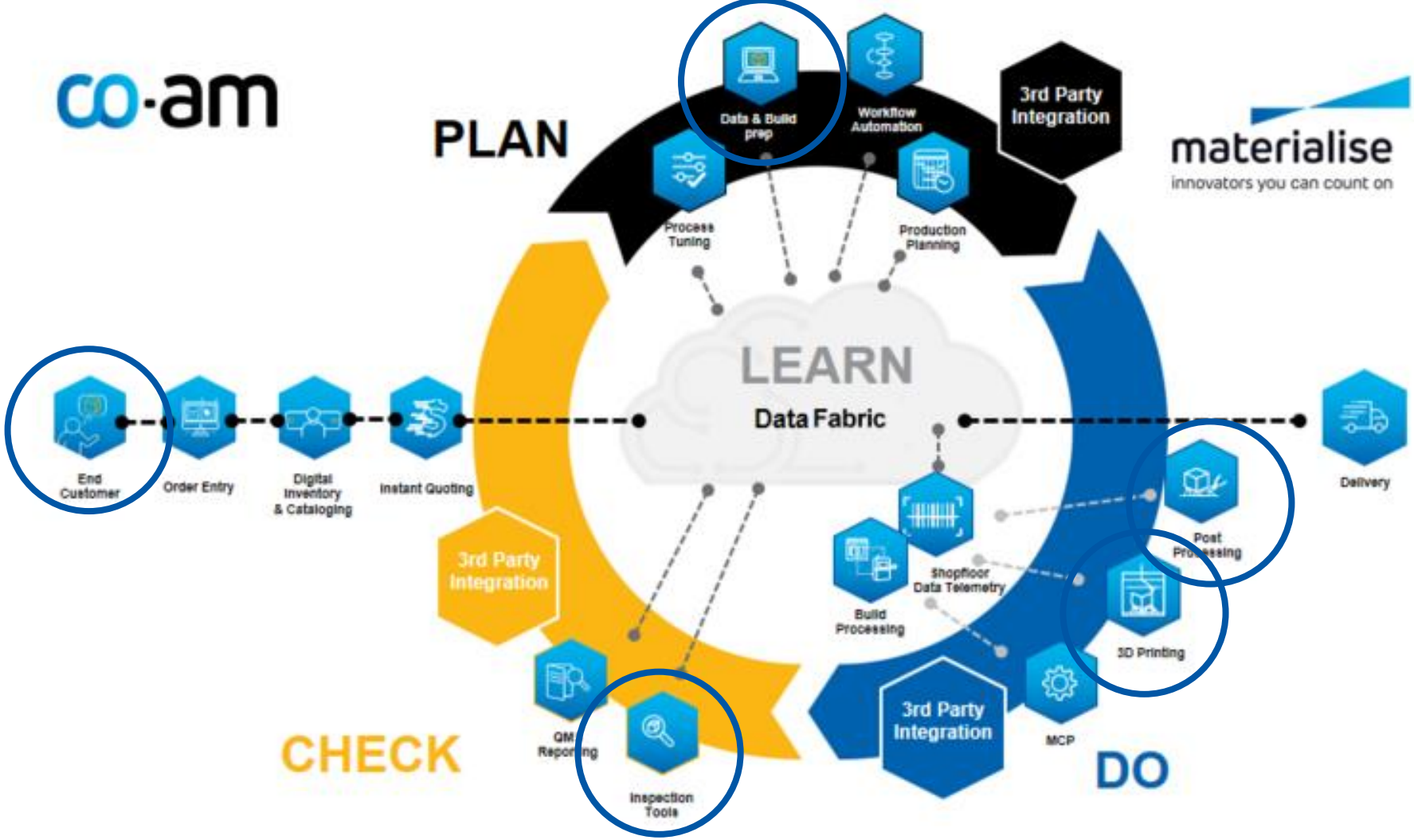
3D Printing

Post-processing

Quality inspection


co-am
PLAN
Data & Build prep
Workflow Automation
3rd Party Integration
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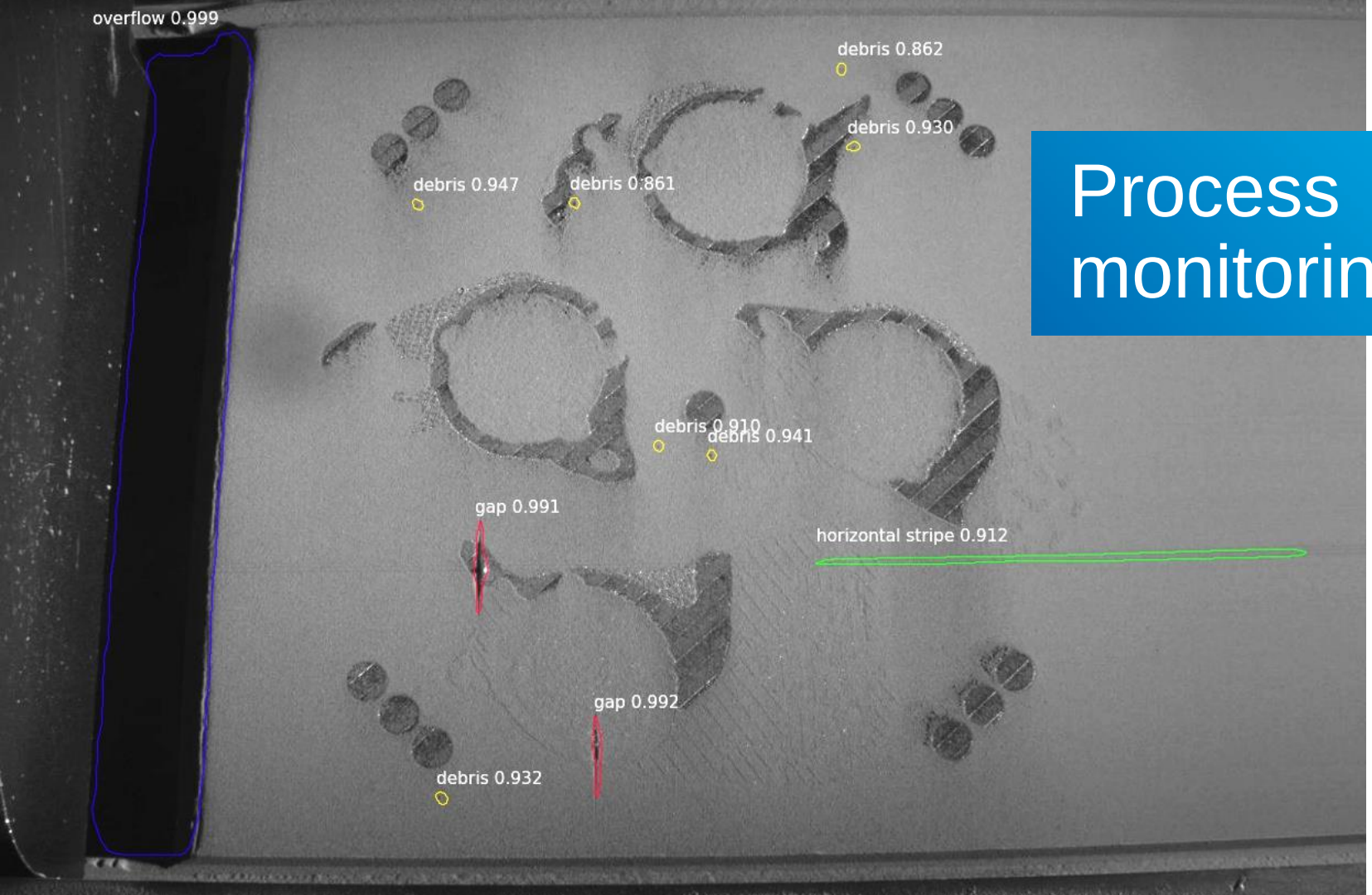
Process Tuning
Production Planning
LEARN
Data Fabric
End Customer
Order Entry
Digital Inventory & Cataloging
Instant Quoting
3rd Party Integration
Delivery
Post Processing
Shopfloor Data Telemetry
Build Processing
3D Printing
3rd Party Integration
MCP
QM Reporting
Inspection Tools
CHECK
DO

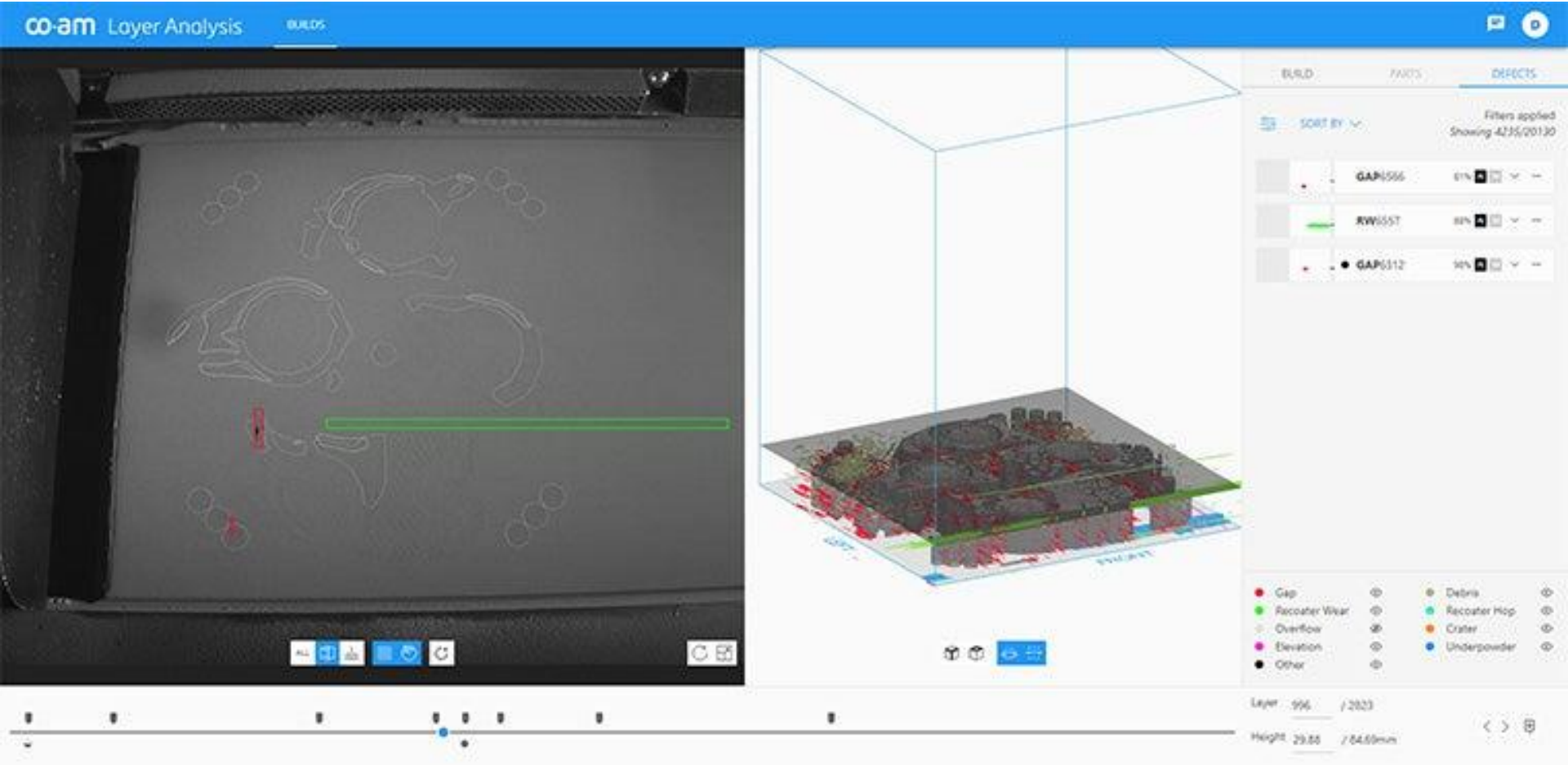
Need for centralised data platform

- Data quality
- Traceability (not always possible)
- Missing data
- Common truth

Process monitoring



Process monitoring


co-am Layer Analysis
BUILDS
BUILD
PARTS
DEFECTS
SORT BY
Filters applied
Showing 4235/20130
GAP6566
61%
RW6557
88%
GAP6312
90%
Gap
Recoater Wear
Overflow
Elevation
Other
Debris
Recoater Hop
Crater
Underpowder
Layer
996
/ 2023
Height
29.88
/ 64.69mm

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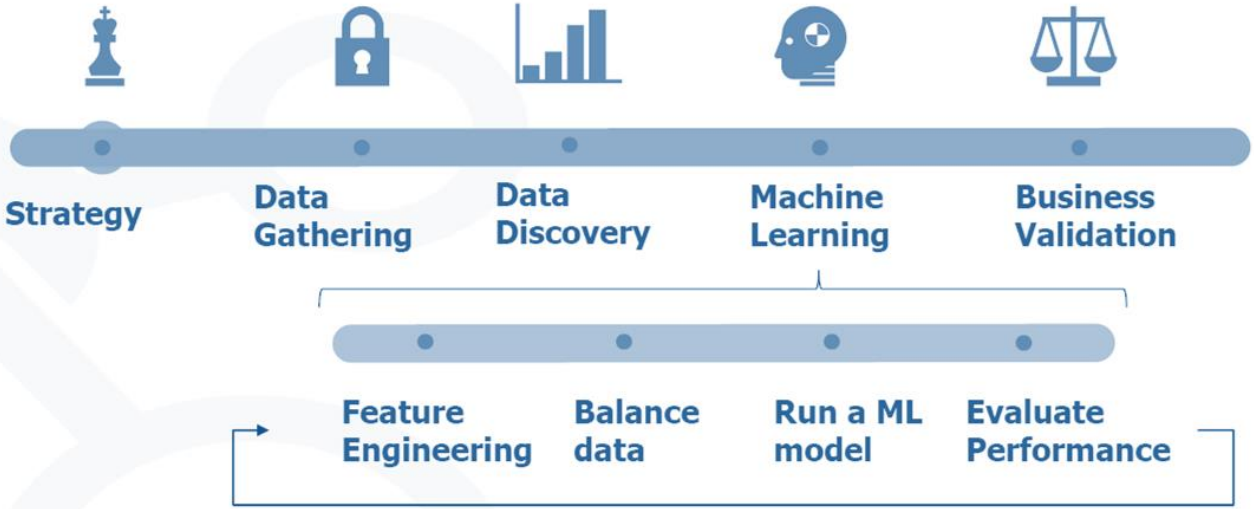

element 61
experience & expertise

- Taking/Accessing images
- Finding and annotating defects

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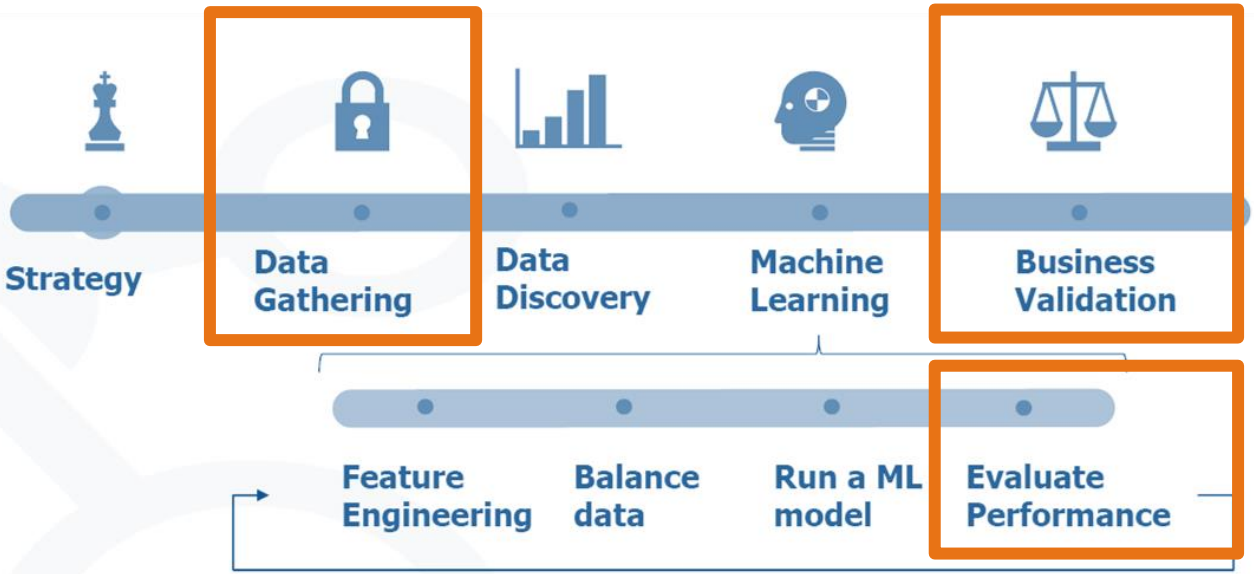


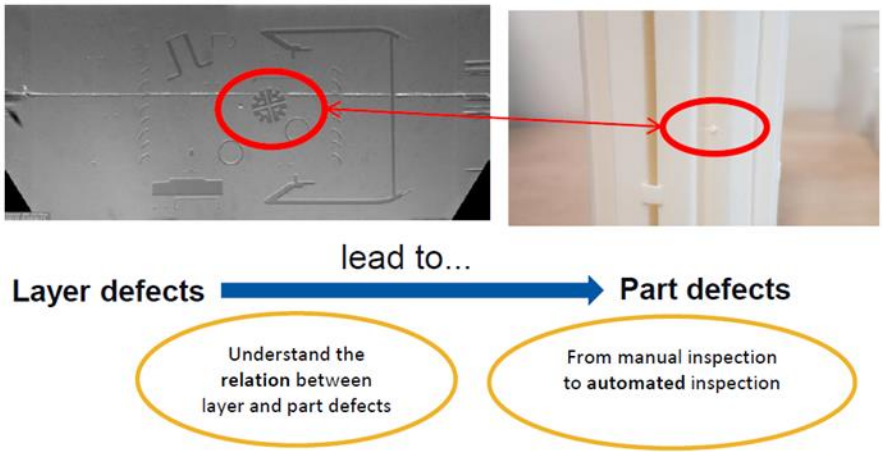
- Framework
- Visualizations
- UI
- Model deployment

- Different defects/machines/camera/lighting
- Independent annotations

element 61
experience & expertise

Difficulties

- Cannot control the evironment fully -> low quality datasets
- Annotated datasets are scarse
- Root cause analysis of detected defects



Timeseries analysis

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Detect behavior types

Notify operators

Predictive maintenance

Preventive actions

Timeseries analysis

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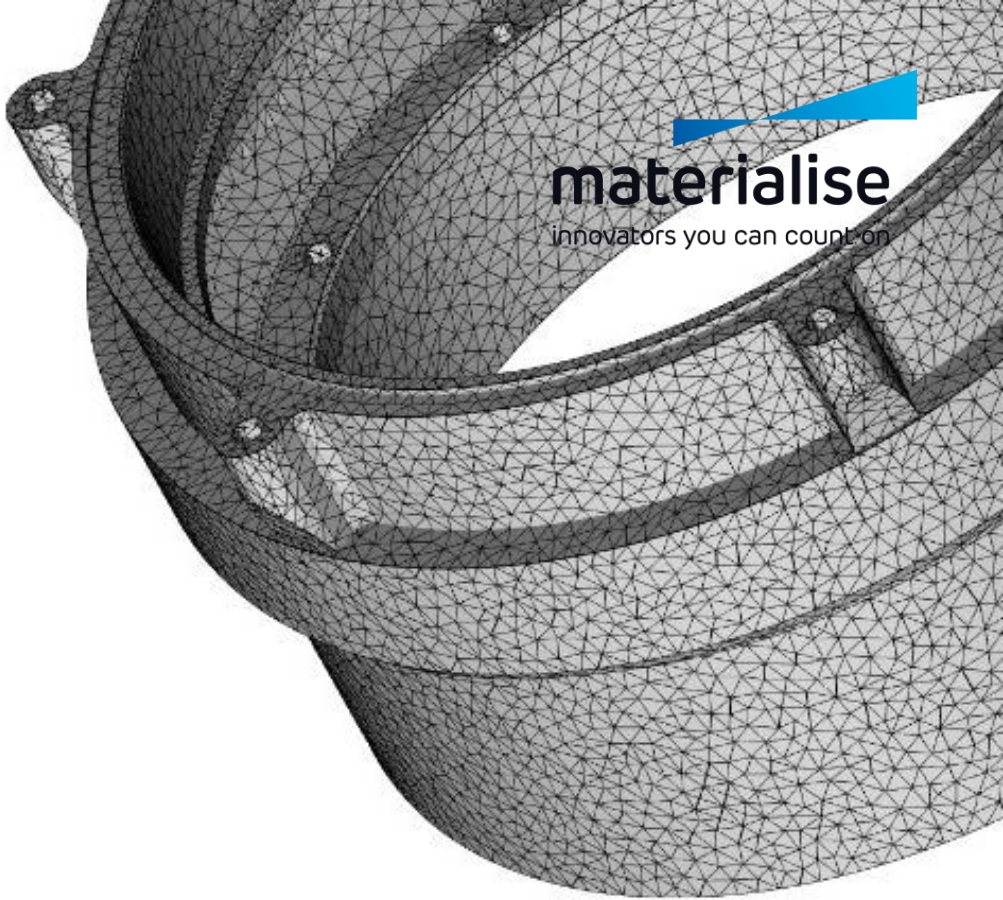
- Unlabeled data
- Non-stationary, layer based
- Large expected variance
  - Build geometry influences:
    - Layer time
    - Energy input
    - ...

Part features

- Find similar parts
- Optimize orientation
- AI for 3d objects
- Number of triangles is not fixed



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It takes more than training a network

- Gathering data is expensive
- Data quality is poor
- Often rely on finetuning pretrained models
- Becoming data-driven requires a company-wide effort

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Academic reseach that can help

- Real-world datasets
  - small, semi-labeled, missing values, large variance
- Lighting conditions
  - Train networks with sub-optimal lighting, create lighting conditions with thight constraints
- Frameworks for traceable and centralised data
- Variable input size for networks (timeseries, meshes)