

# Augmenta

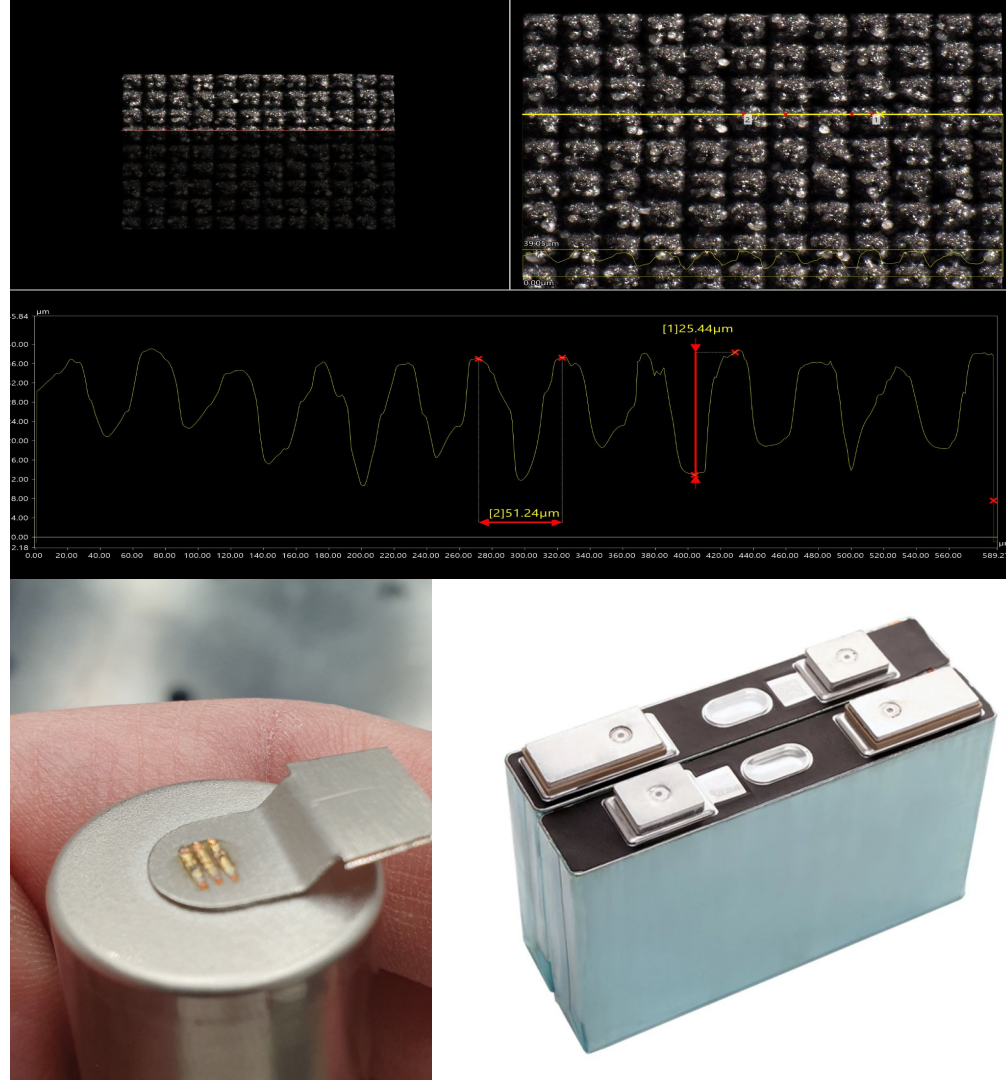
*The combination of advanced sensors and artificial intelligence to unlock batteries production*

Bologna - March, 11 - 2022

STATE of the ART

# Battery Fabrication

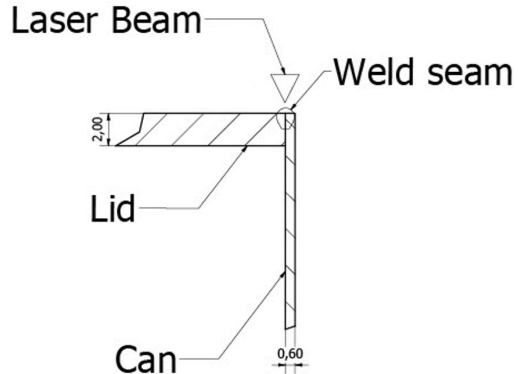
- Laser Welding is a very New Technology in EV-Mobility
- Laser Process is impacted by Several Parameters
- Impossible to scale production due to lack of Smart Process Control
- NO real time monitoring and Learning



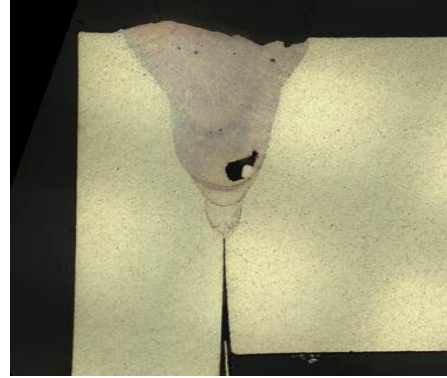
## SCENARIO

# How to automate laser Welding?

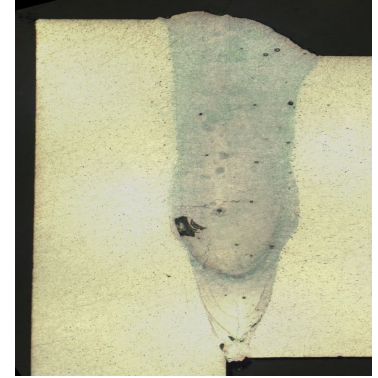
- Raw material batch is not uniform
- Cell position is not fix in space
- Geometries are not uniform
- Many Variables to control



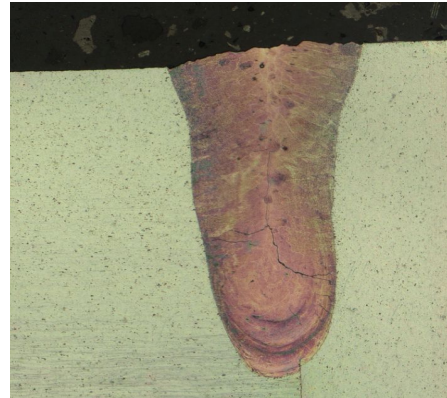
Porosity



Drop out



Crack



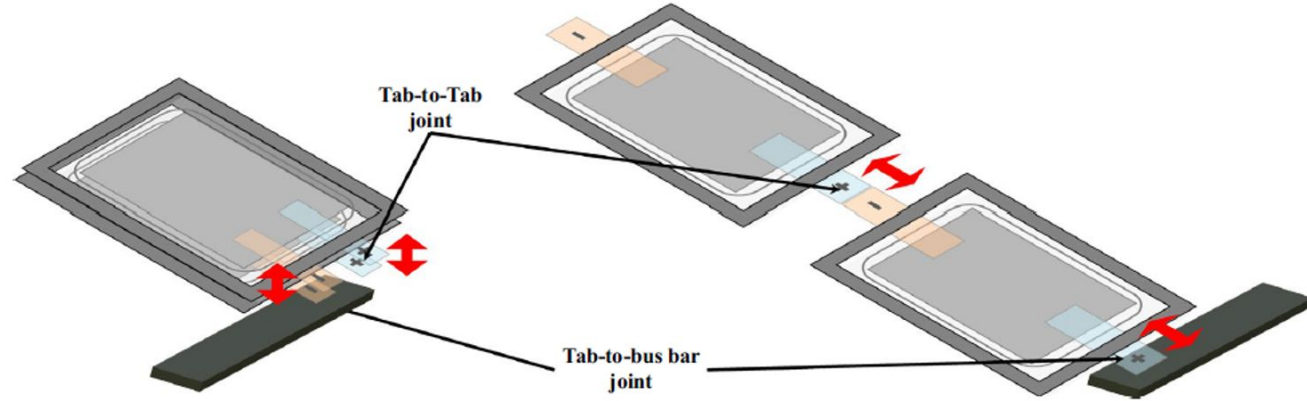
Ripple



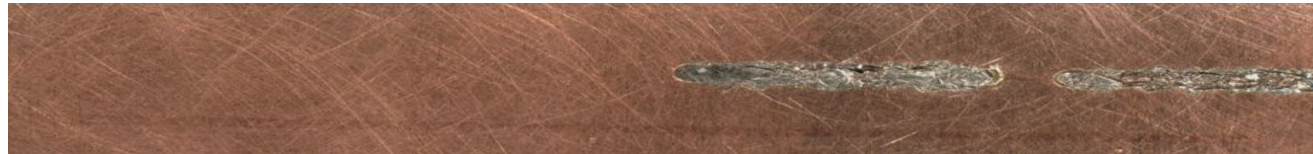
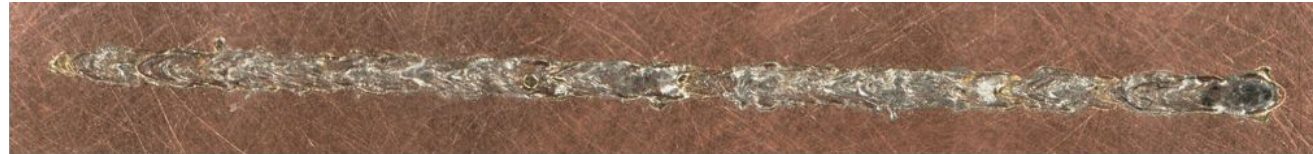
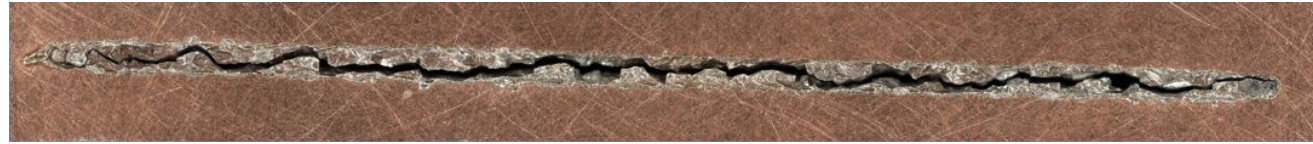


## SCENARIO

# How to automate laser Welding?

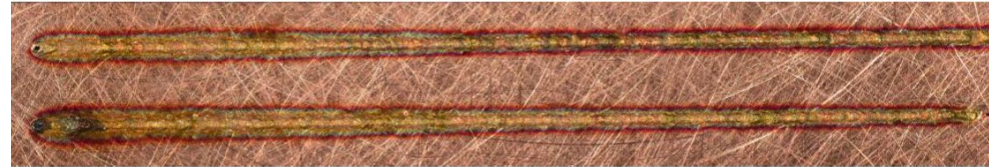
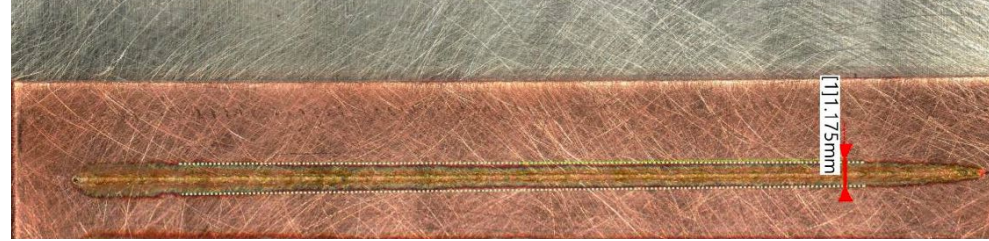
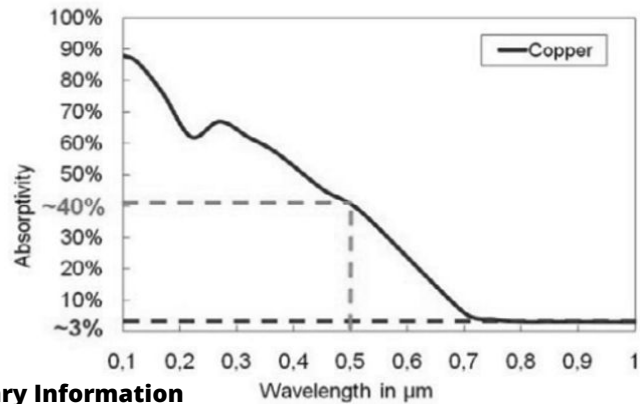
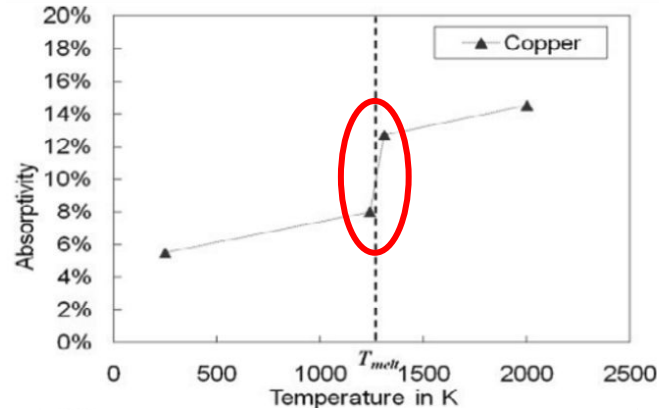


Multi-Material Welding:  
Copper & Aluminium



## SCENARIO

# How to automate laser Welding?





## SCENARIO

# How to automate laser Welding?

- Laser power
- Feed rate
- Focal distance
- Wobble geometry
- Amplitude
- Frequency
- Material thermo-physical properties
- Beam Absorptivity
- Intermetallic \ dissimilar material
- Thickness variation
- Joint type
- Clamp Geometry
- Beam angle
- Beam shape
- Nozzle direction
- Flow rate
- Nature of gas



## SOLUTION

## We use Smart Sensors

Autofocusing

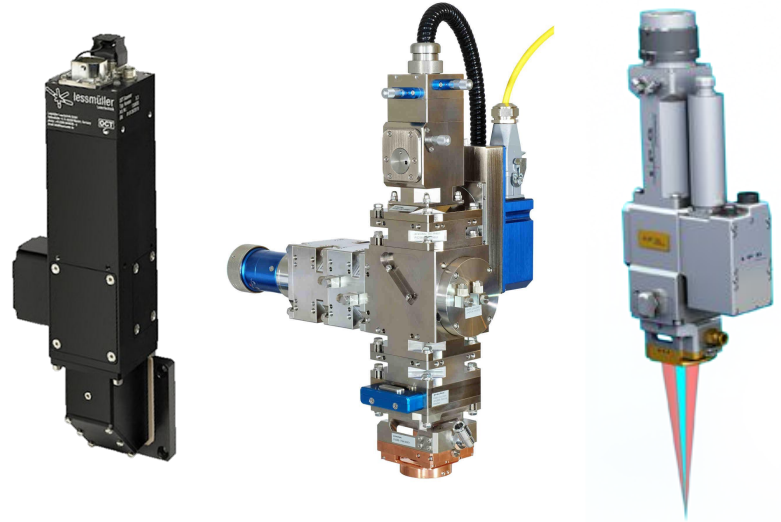


Environmental data



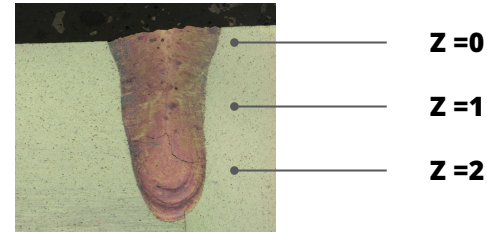
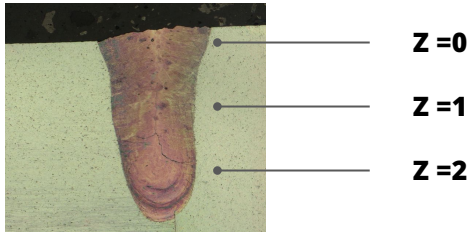
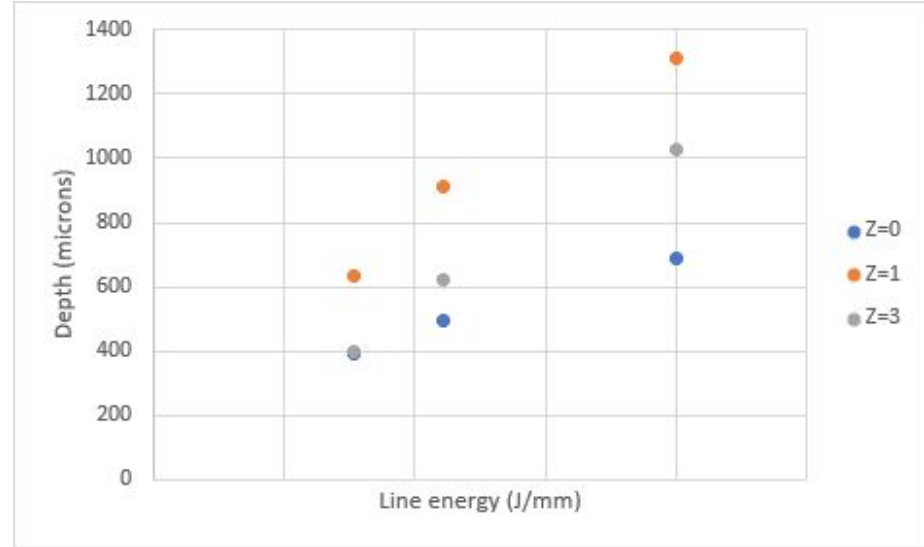
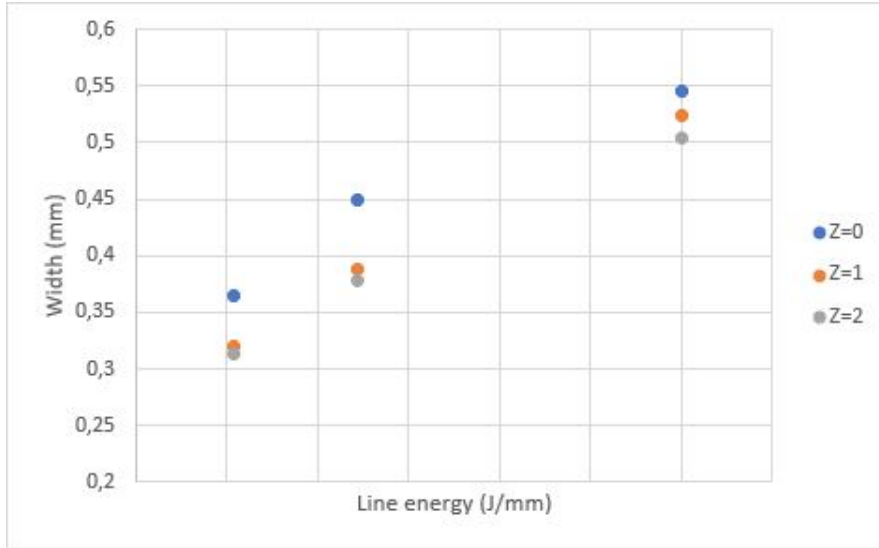
+  
**LiDAR**

Optical coherence tomography



## SOLUTION

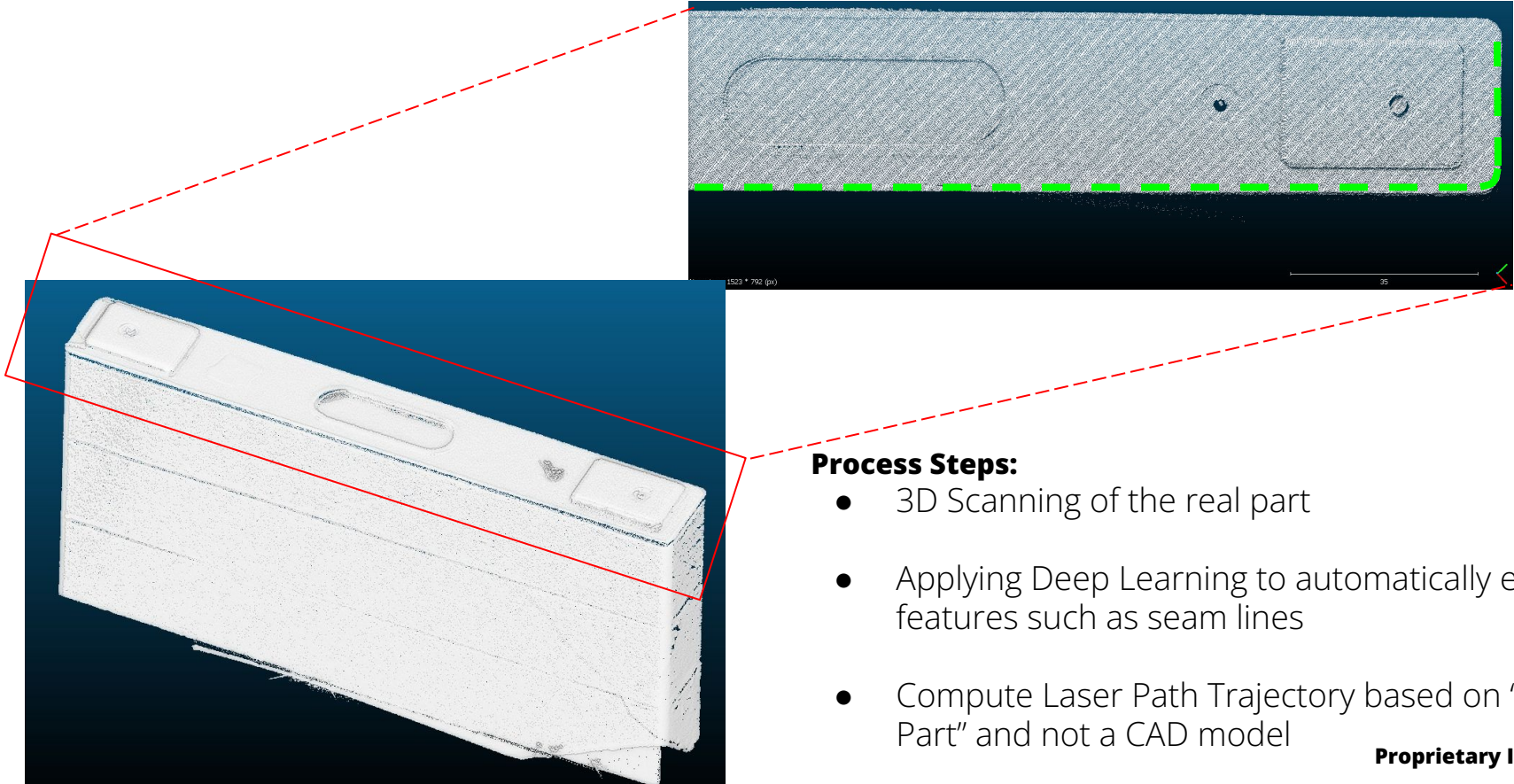
# We Apply In Process Monitoring & Measurement





## SOLUTION

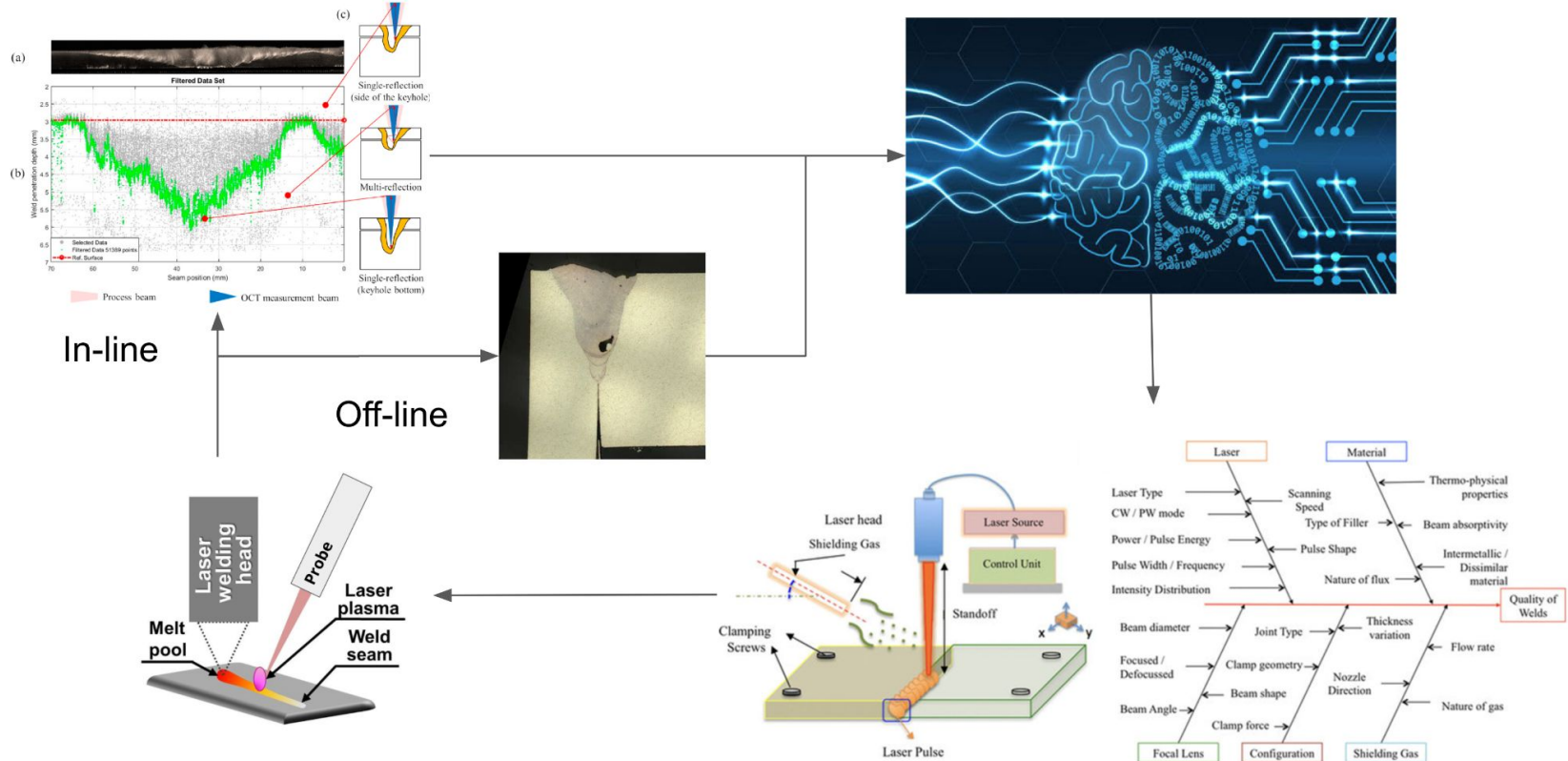
# We use AI to compute Autonomous Path Generation

**Process Steps:**

- 3D Scanning of the real part
- Applying Deep Learning to automatically extract features such as seam lines
- Compute Laser Path Trajectory based on "True Part" and not a CAD model

SOLUTION

# How Our "Synthetic Brain" learns Laser Welding Process



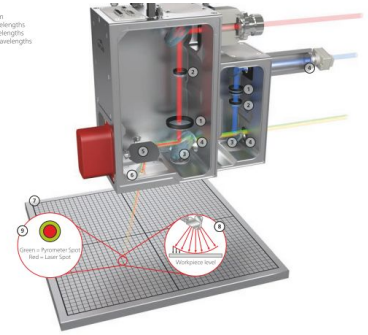
## SOLUTION

# Augmenta Robotics Laser Lab

- 4kW Lumentum laser source
- Raylase 3ax scanning head
- Multiple sensors port



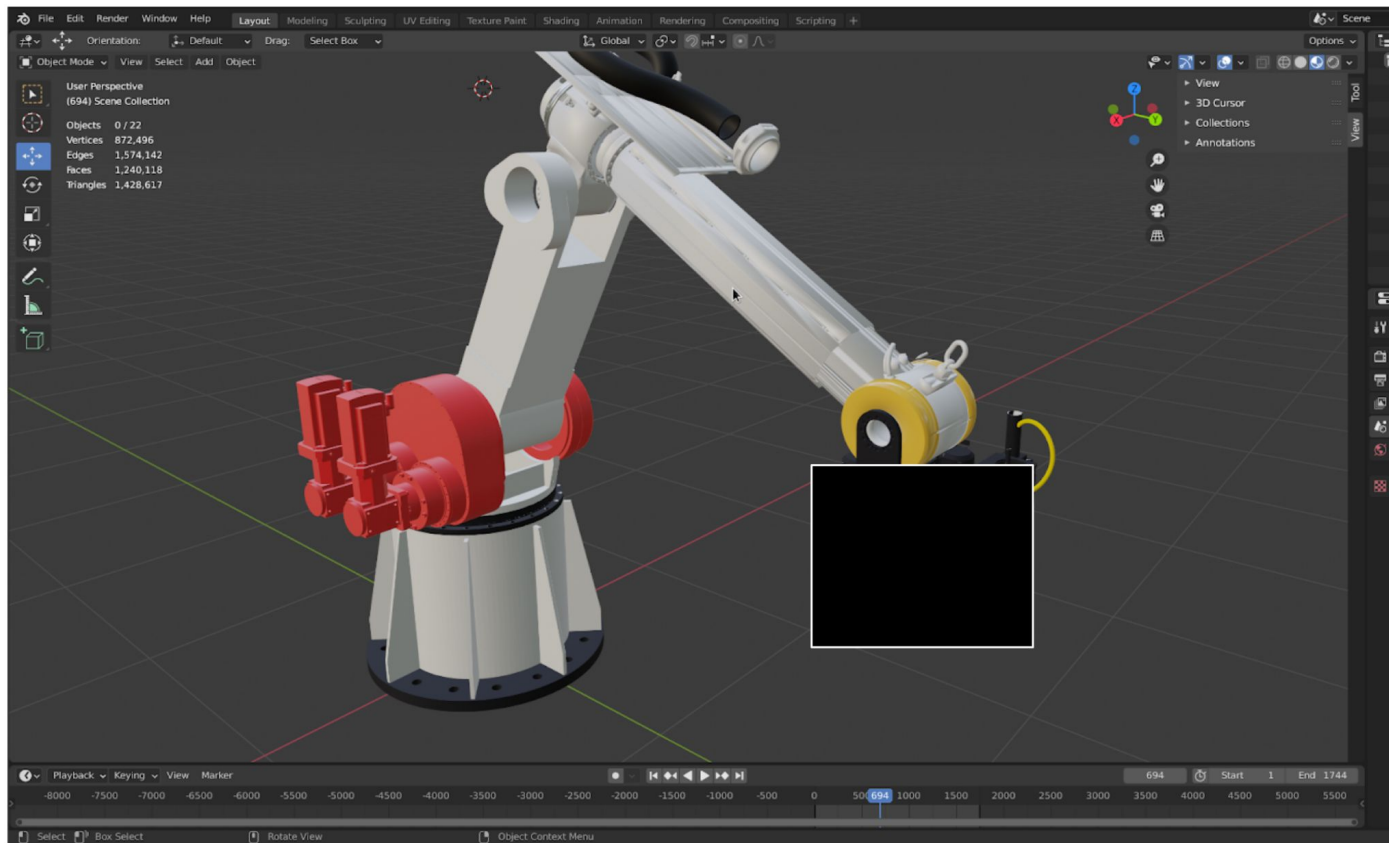
Process light:  
— Laser beam  
— Short wavelengths  
— Long wavelengths  
— Camera wavelengths





## SOLUTION

# Augmenta Web Based Cognitive User Interfaces



## SOLUTION

# Augmenta Robotics & Machines Applications

Michael



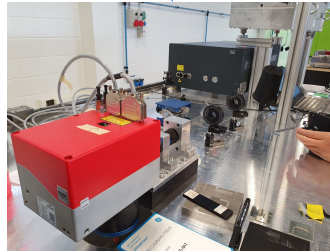
### ABB IRB 4600 retrofit:

- QA tool
- Rivets recognition
- Path planning
- Spindle tool
- Rivet removal
- Process certification and documentation



### Breton - GENESI large area additive manufacturing

- AI Driven 3D Printing
- Large Scale
- Hybrid Manufacturing Additive + Milling
- Net Shape



### Laser electrodes cutting & structuring

- Picosecond and Femtosecond Integration
- Both UV and IR laser sources
- No quality drift with AI control feedback
- Sub modules integration for roll to roll manufacturing

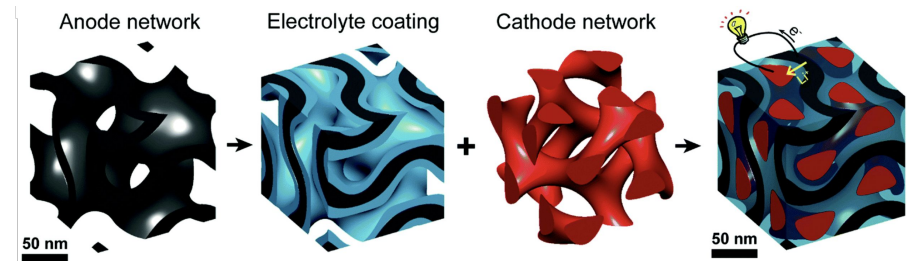
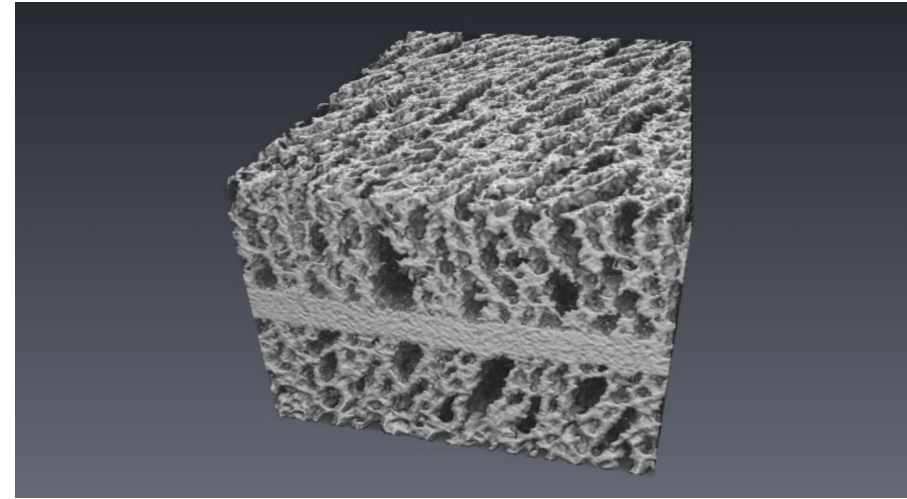


### ABB IRB 6700 retrofit

- AI Driven 3D Printing
- Multi-Axis Printing
- Multi-Materials
- Heating & Cooling

**CASE STUDY****Next Generation Battery**

- A proprietary, design & simulation software platform leveraging state-of-the-art computational geometry and machine learning for physics-based surrogate modeling and Generative design of advanced functional metamaterials
- A proprietary intelligent robotics manufacturing system for materials physical properties functionalization
- Next Generation Electrolytes Ceramic & Graphene based





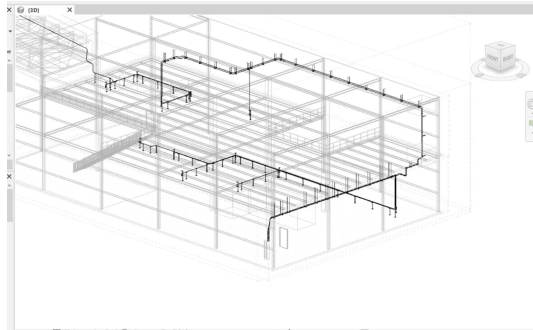
# Products and company overview:

**Augmenta**



Software for artificial intelligence

Digital construction

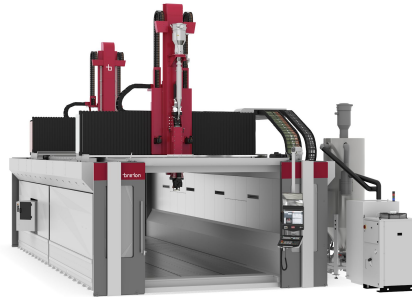


**Augmenta - Applied**



Application of AI on manufacturing systems as service provider and Augmenta product manufacturer

Services



E-manufacturing



**AUGMENTA**

# Leadership team



**Francesco Iorio**  
*CEO & Chief Scientist*

Computational & data science. Simulation & artificial intelligence.

*Director of Computational Science @ Autodesk. Creator of Project Dreamcatcher.*



**Max Moruzzi**  
*Head of Research & Development*

Business strategy & innovation. Deep background in advanced manufacturing.

*Director, Software R&D and Composite Applications @ Ingersoll.*



**Davide Panelli**  
*Head of Software Engineering*

Software architecture and development.

*CEO @ Byte-code. Co-founder & CTO @ HFT Smart Sensors.*



**Aaron Szymanski**  
*Head of Product*

Strategic foresight, human centered research & design.

*Founder @ real/ideal. Led design @ Kinetic Commerce.*

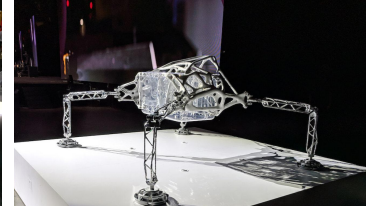


**Joyce Janczyn**  
*COO*

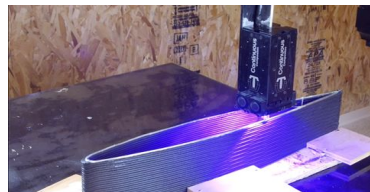
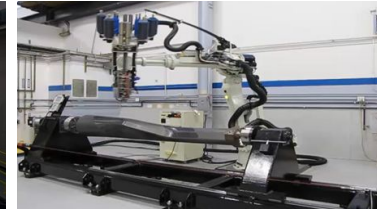
Operations & business strategy. Growth-stage startups.

*COO Fixmo & Datifex.*

## GENERATIVE DESIGN & AI



## ROBOTICS



UTC Aerospace Systems

## TEAM EXPERIENCE

# Computational Science, AI & Advanced Manufacturing

### Highlights

- First AI-designed car chassis and 3D printed parts
- First AI-designed, 3D printed NASA JPL Europa lander spacecraft chassis
- Automated manufacturing of Boeing 787 fuselage
- Automated manufacture of Lockheed single-piece carbon fiber wing drone structure



## NEXT STEPS

## WHY AUGMENTA

- We are the only Company that has developed an *AI Brain* for Laser Processes applied to batteries
- We have a full Laser Lab to perform demos and develop custom Machines
- We deploy complete industrial solutions from Software to Machines

**"MAXWELL" ( AUGMENTA PROPRIETARY COGNITIVE ROBOT)**

# Augmenta

Building the Future of Manufacturing Automation

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