intellegens

DATA-DRIVEN DISCOVERY

Alchemite™ machine learning

Introducing Intellegens

Applied machine learning

Accelerate innovation for materials, chemicals, manufacturing, and beyond...

Introducing Intellegens

Unique **deep learning** software and expertise

Get value from **sparse, noisy data** to solve complex **high-dimensional** problems

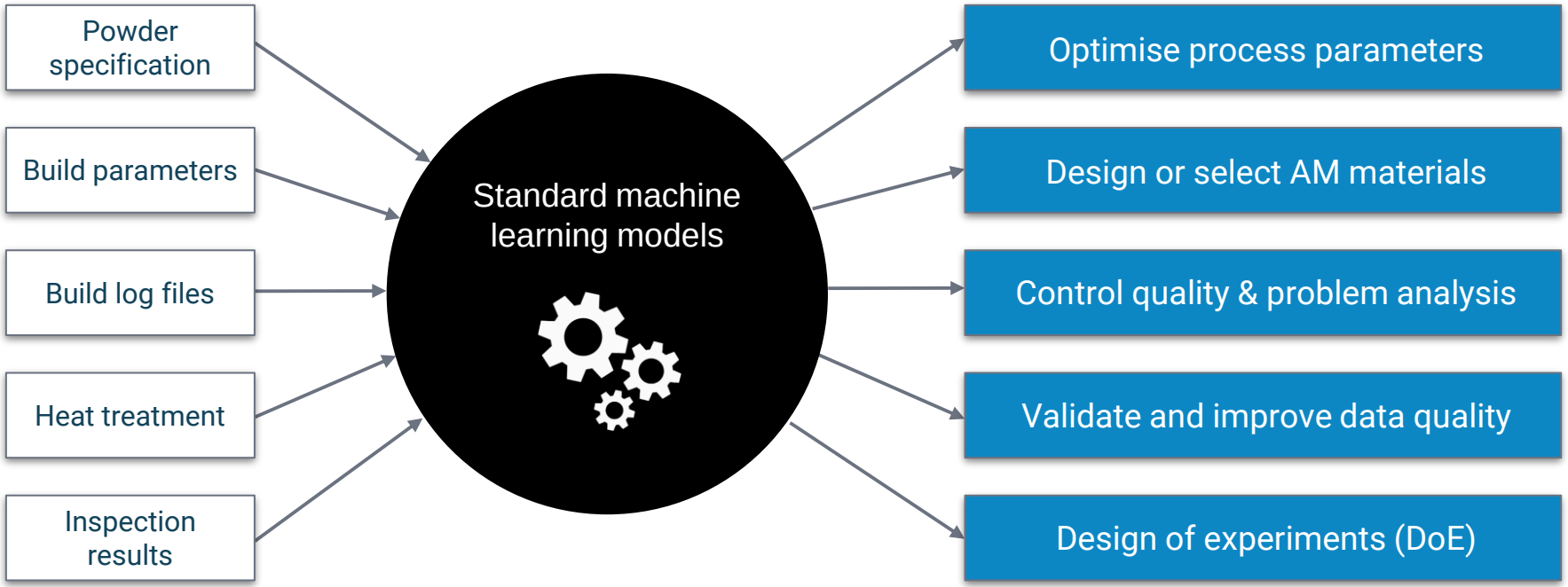
Can be applied to any **numerical dataset**

Key focus areas: materials, chemicals, drug discovery, and manufacturing

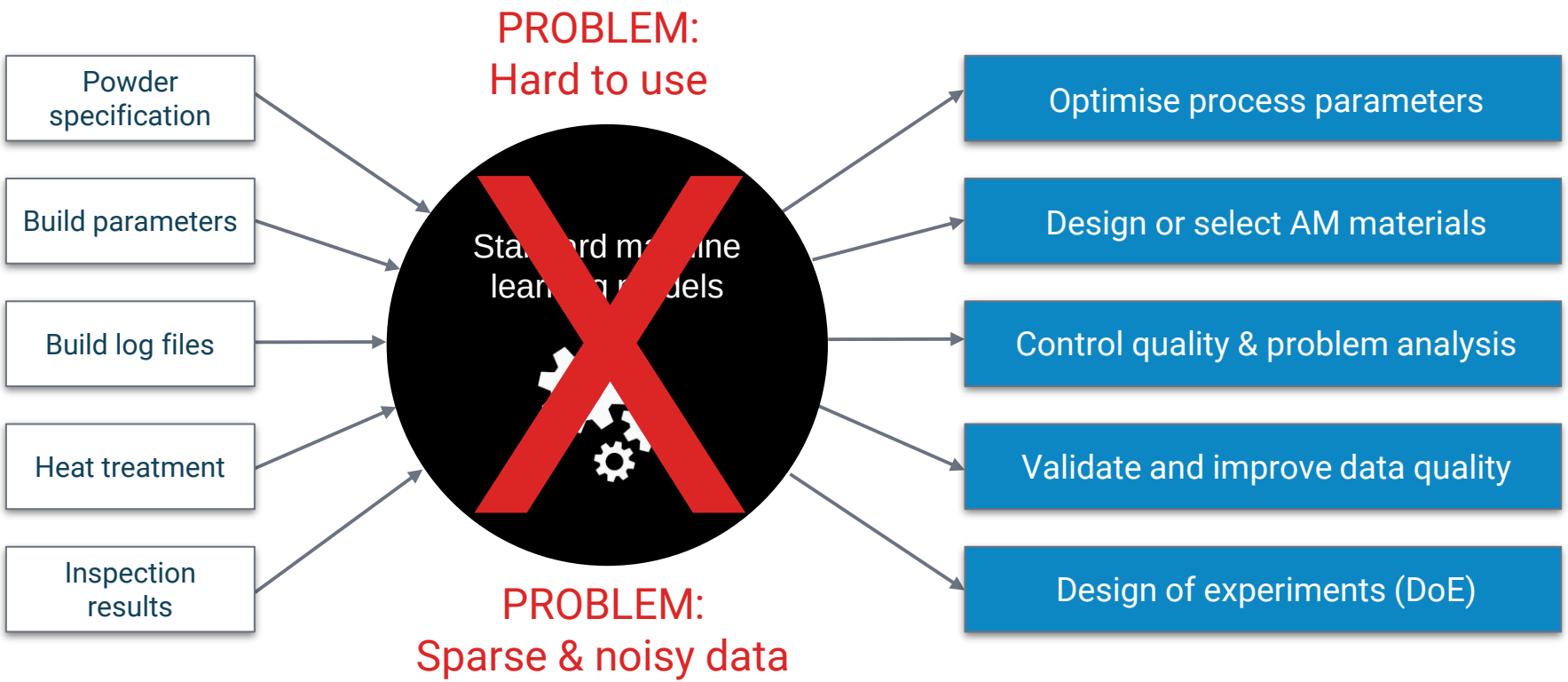
Easily deploy models to deliver **immediate ROI**

Integrate with existing systems and/or applied through a web based platform

Machine learning for additive manufacturing



Can we use machine learning for AM?



Why is AM project data sparse and/or noisy?

- Powder specification
- Build parameters
- Build log files
- Heat treatment
- Inspection results

Because it is real-world data:

Supplier or legacy data is incomplete or inconsistent

You are combining data from different sources or projects

Projects with different goals test different properties

Noisy due to variability of machines / labs / operators...

You cannot test every build for every property

What is Alchemite™?

Unique, proprietary algorithm from the University of Cambridge

Deep, iterative **imputation** method

Novel implementation of a neural network, where all inputs are also outputs

Quantifies **uncertainty** through advanced, non-parametric probability distributions

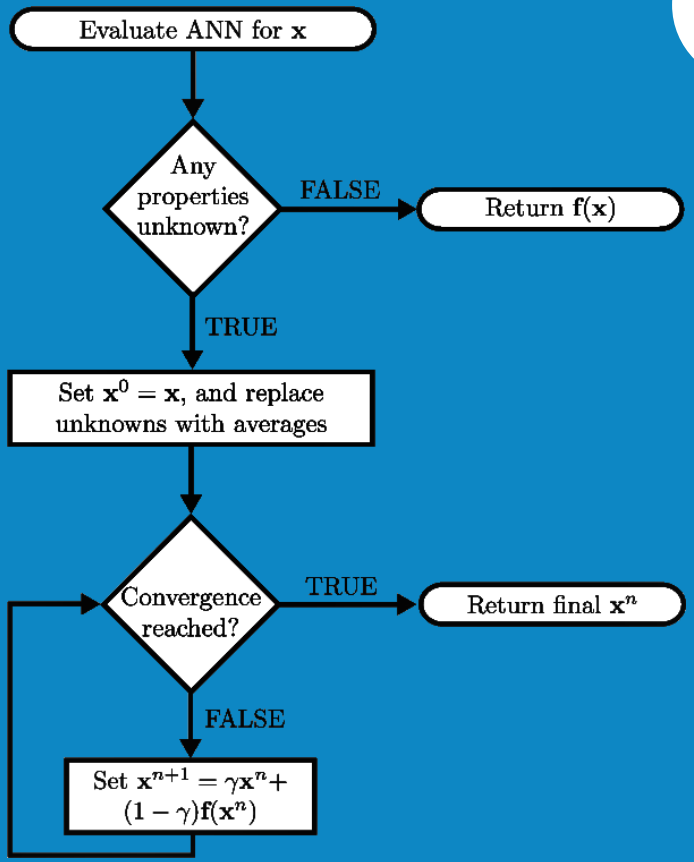
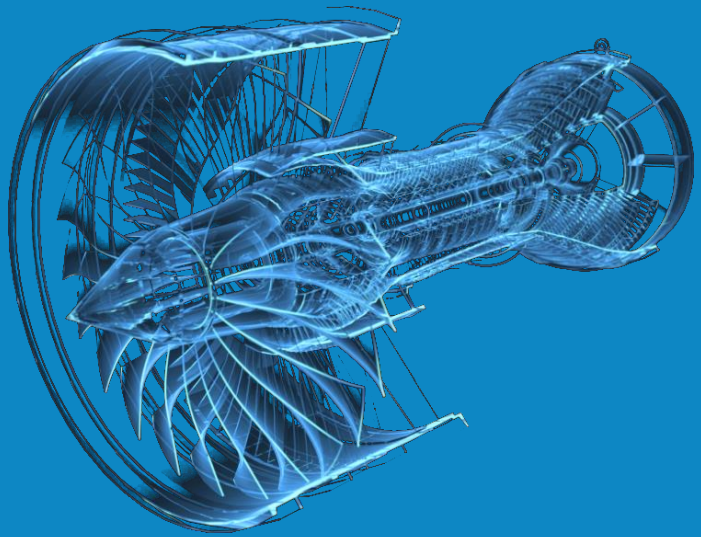


Figure 2 from
*Computational Materials Science **147**, 176 (2018)*

High temperature alloy



Validated a new alloy design for 30 composition/process parameters to satisfy 11 physical criteria

8 data points for processability so highly sparse dataset

Reduced costs by $10 million

Accelerated typical discovery and validation time from 20 to 2 years

intellegens.ai/applications/materials/

*Materials & Design **168**, 107644 (2019)*

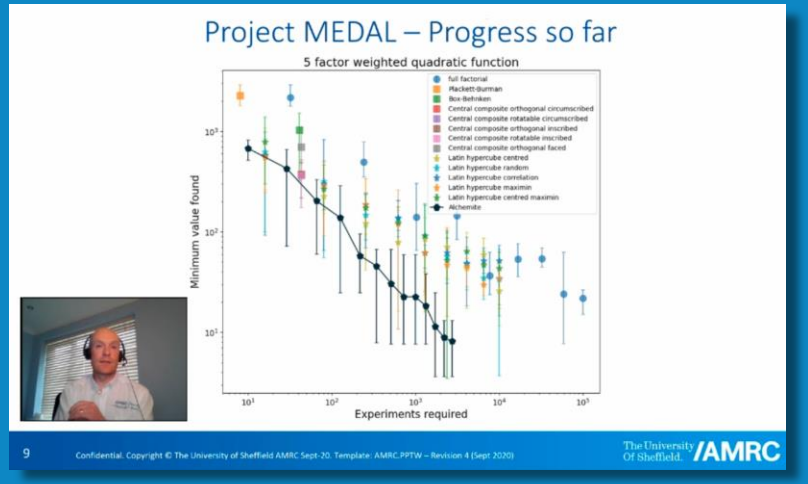
"The Alchemite™ Engine is easy to work with and proved to be a powerful tool for virtual experimentation, unleashing unexplored territory in the search for better metal alloys."

Marko Bosman
Chief Technologist, GKN Aerospace

AM for heat exchangers

Project with **GKN** Aerospace

Proposed a new titanium alloy with the required **combination** of **strength** and **thermal conductivity**



"Alchemite™ was able to converge on the optimum solution with far fewer experiments."

Ian Brooks
Technical Fellow, AMRC

intellegens.ai/webinars/

Project MEDAL

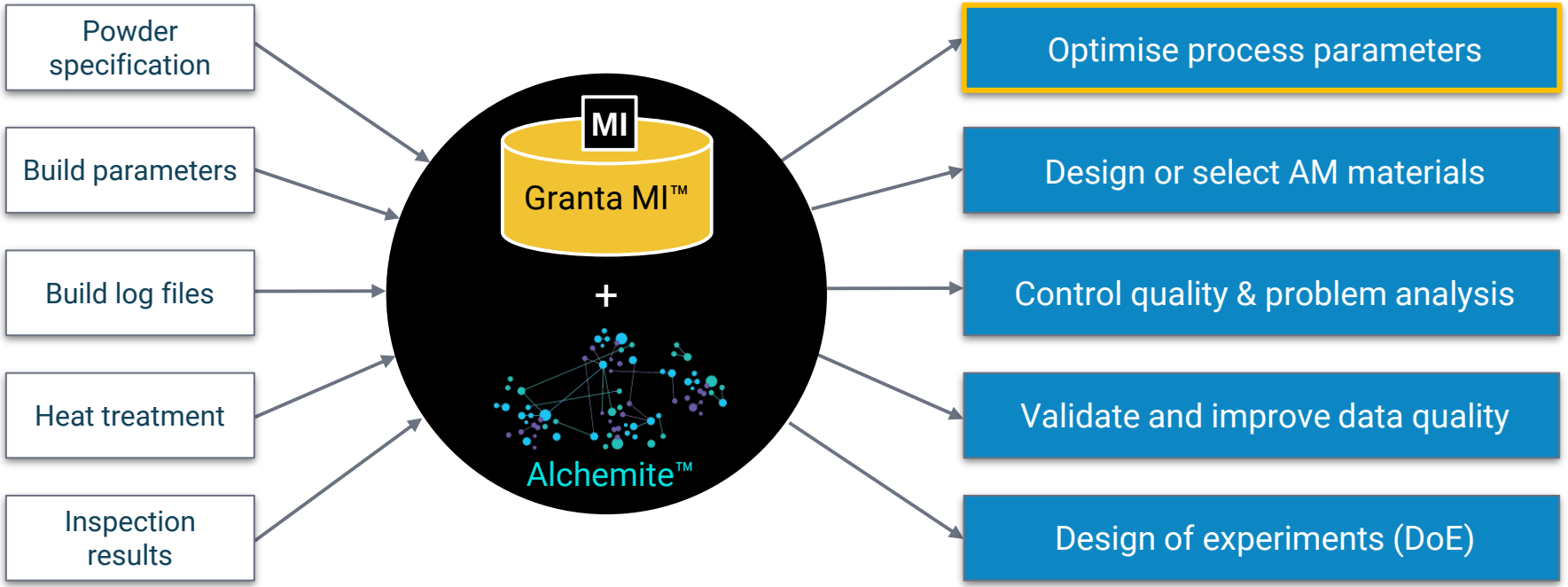
Making the AM process for metallic alloys **cheaper** and **faster**

Reduced the number of experiments needed to find **optimal process parameters** for a new material

The University Of Sheffield. AMRC Advanced Manufacturing Research Centre

BOEING

Granta MI™ plus Alchemite™ to enable ML for AM



Ansys & Intellegens

Improve AM product **performance**

Minimise risk with **reliable, repeatable** processes

Maximise ROI from expensive project data

Reduce (experimental) **cost** and **time** to market