intellegens

Alchemite™ Analytics

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Alchemite™ machine learning tool to

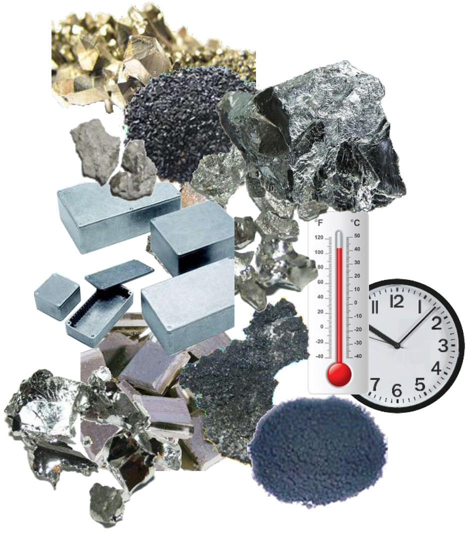
Reduce the need for experiments and accelerate discovery

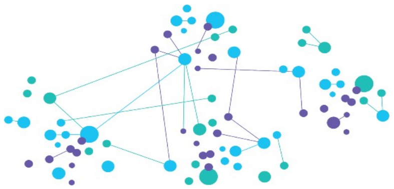
Impute values from sparse data

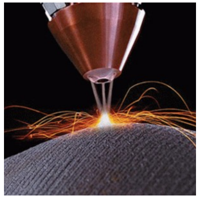
Utilise all available information: computer simulations and real-life measurements

Broadly applicable with proven applications in drug design, industrial chemicals, and materials

Machine learning to predict materials properties

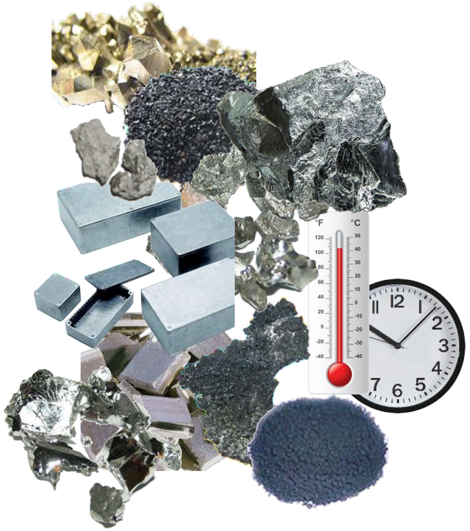


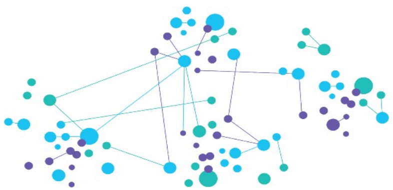




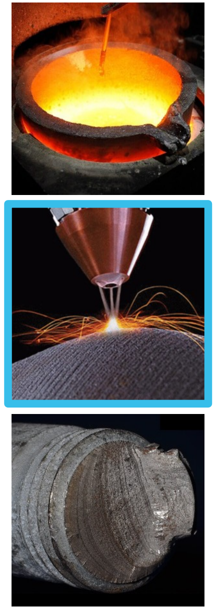
Not enough data to define a model

30 variables

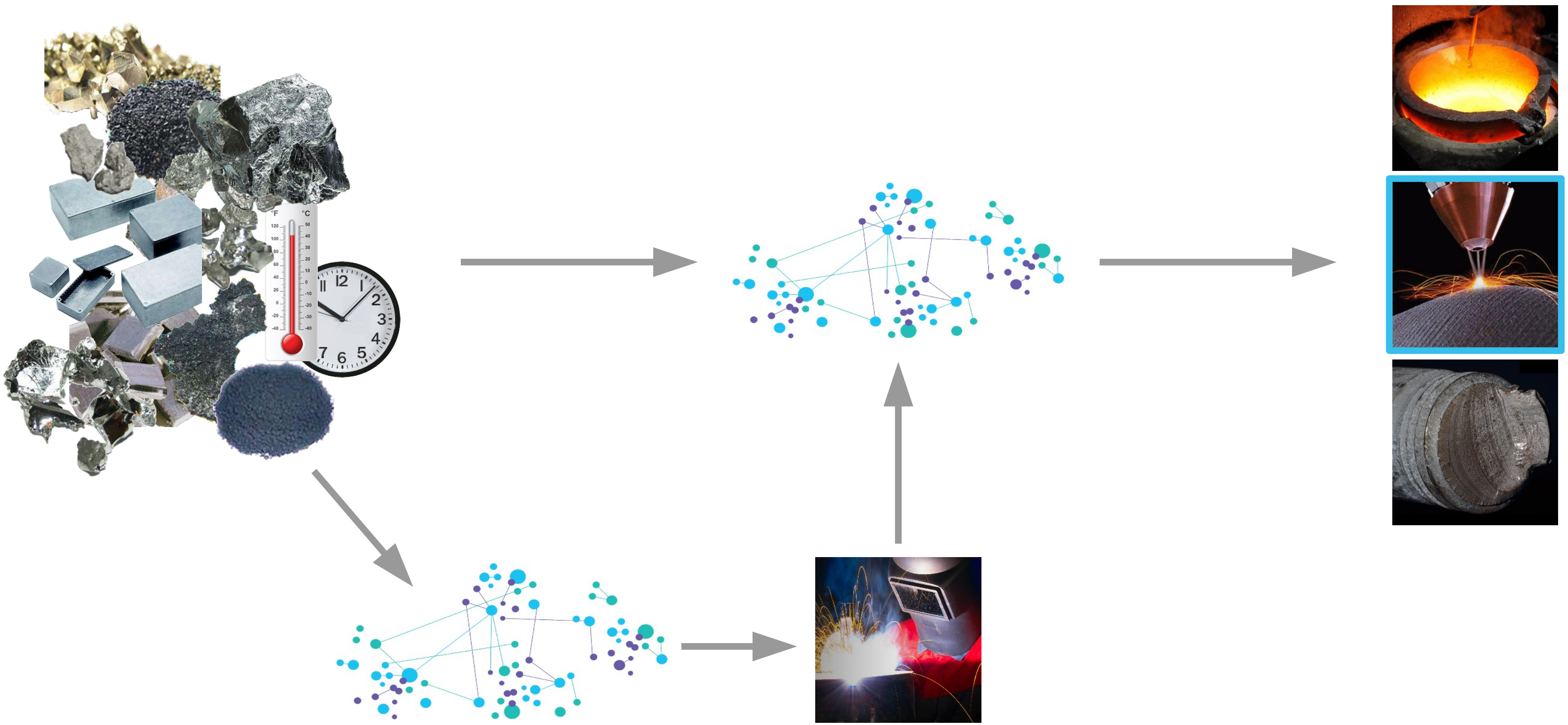




10 database entries



Take advantage of data from analogous properties



Take advantage of data from analogous properties

Cr 19%

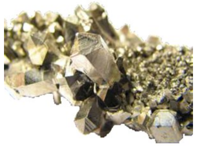
Co 4%

Mo 4.9%

W 1.2%

Zr 0.05%

Nb 3%



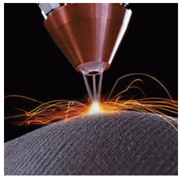
Al 2.9%

C 0.04%

B 0.01%

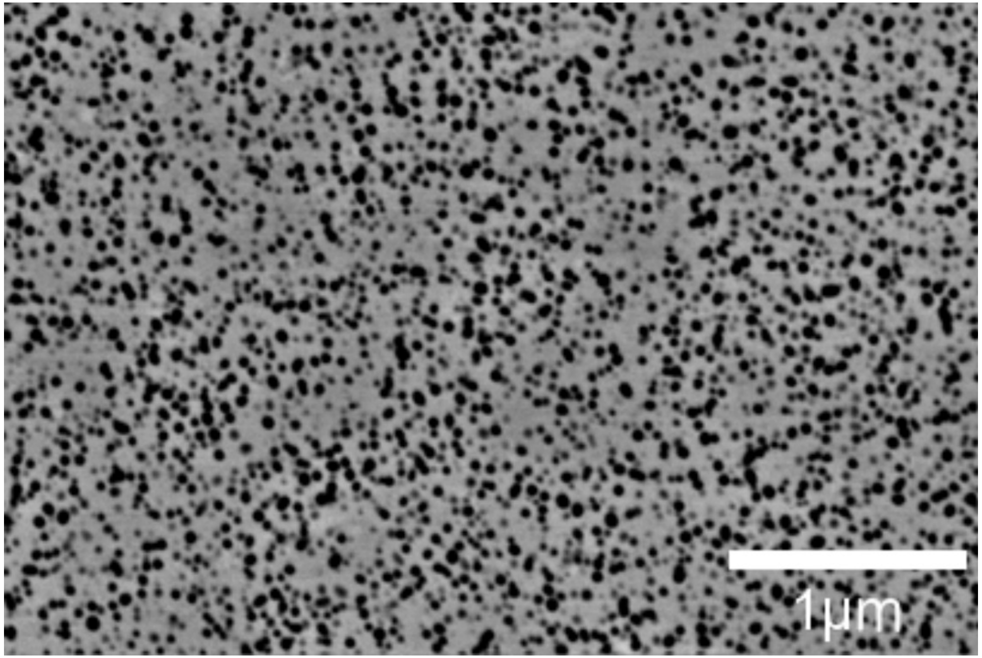
Ni

Expose 0.8



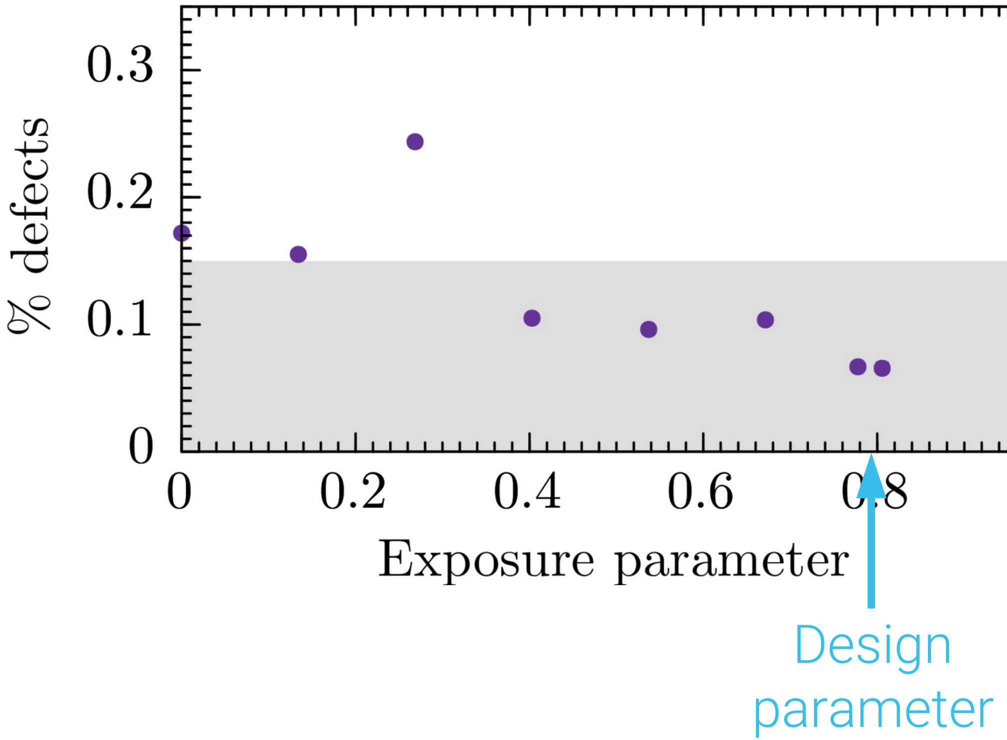
T_{HT} 1300°C

Microstructure



Probabilistic neural network identification of an alloy for direct laser deposition
Materials & Design 168, 107644 (2019)

Calculate probability distribution



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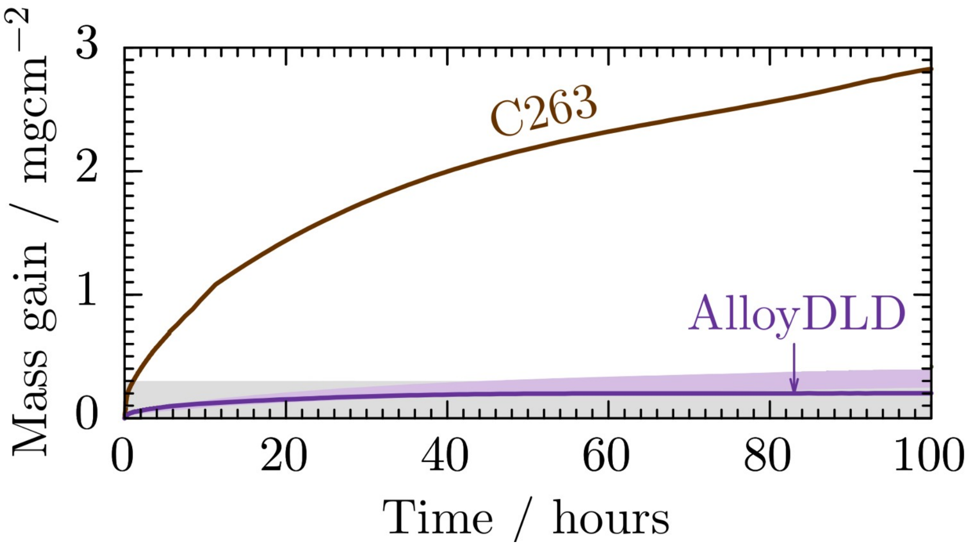
Oxidation resistance



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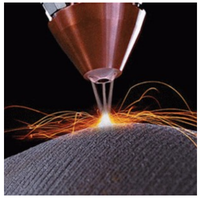
Other materials

Steel welding consumables

Titanium additive manufacturing

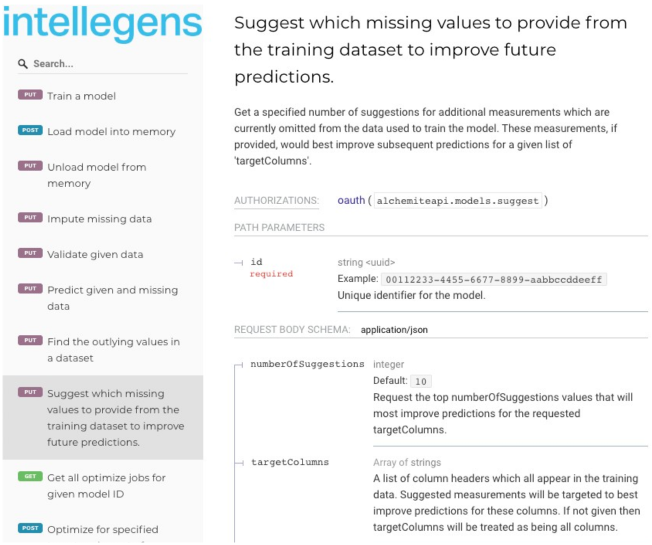


Battery cathodes

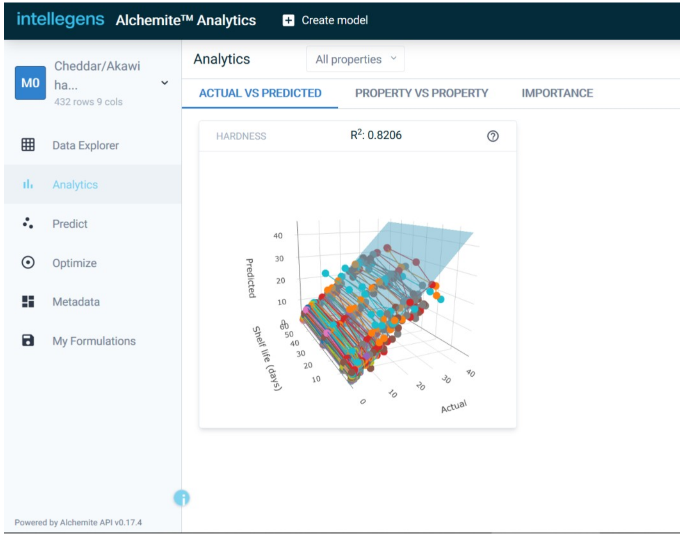
Lubricants

Delivery

API for integration



Within the browser



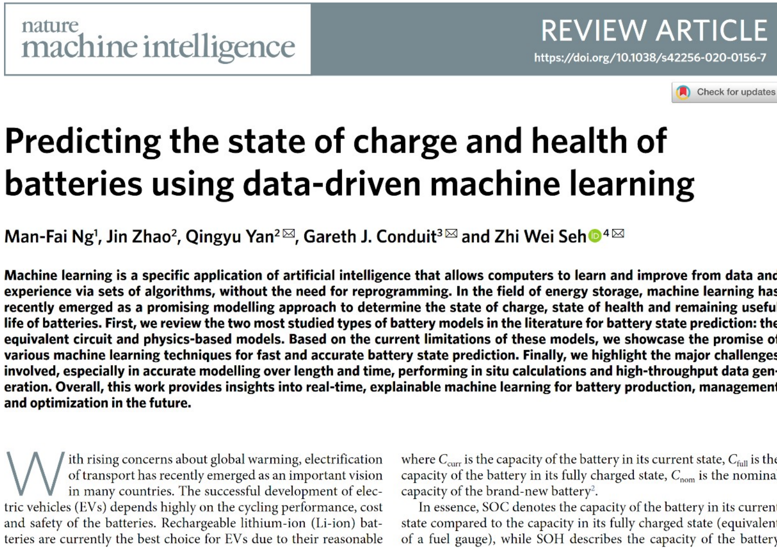
Battery management software

Juxtapose physics-based modelling with machine learning

In-service data from a particular battery and others deployed to make bespoke predictions of remaining useful life

Model that spans time-scales to permit simultaneous state-of-health and state-of-charge predictions

Data from testing in first few cycles to predict long-term battery performance


nature machine intelligence

REVIEW ARTICLE

https://doi.org/10.1038/s42256-020-0156-7

Check for updates

Predicting the state of charge and health of batteries using data-driven machine learning

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Machine learning is a specific application of artificial intelligence that allows computers to learn and improve from data and experience via sets of algorithms, without the need for reprogramming. In the field of energy storage, machine learning has recently emerged as a promising modelling approach to determine the state of charge, state of health and remaining useful life of batteries. First, we review the two most studied types of battery models in the literature for battery state prediction: the equivalent circuit and physics-based models. Based on the current limitations of these models, we showcase the promise of various machine learning techniques for fast and accurate battery state prediction. Finally, we highlight the major challenges involved, especially in accurate modelling over length and time, performing in situ calculations and high-throughput data generation. Overall, this work provides insights into real-time, explainable machine learning for battery production, management and optimization in the future.

With rising concerns about global warming, electrification of transport has recently emerged as an important vision in many countries. The successful development of electric vehicles (EVs) depends highly on the cycling performance, cost and safety of the batteries. Rechargeable lithium-ion (Li-ion) batteries are currently the best choice for EVs due to their reasonable

where C_{curr} is the capacity of the battery in its current state, C_{full} is the capacity of the battery in its fully charged state, C_{nom} is the nominal capacity of the brand-new battery[2].

In essence, SOC denotes the capacity of the battery in its current state compared to the capacity in its fully charged state (equivalent of a fuel gauge), while SOH describes the capacity of the battery

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Nature Machine Intelligence 2, 161 (2020)