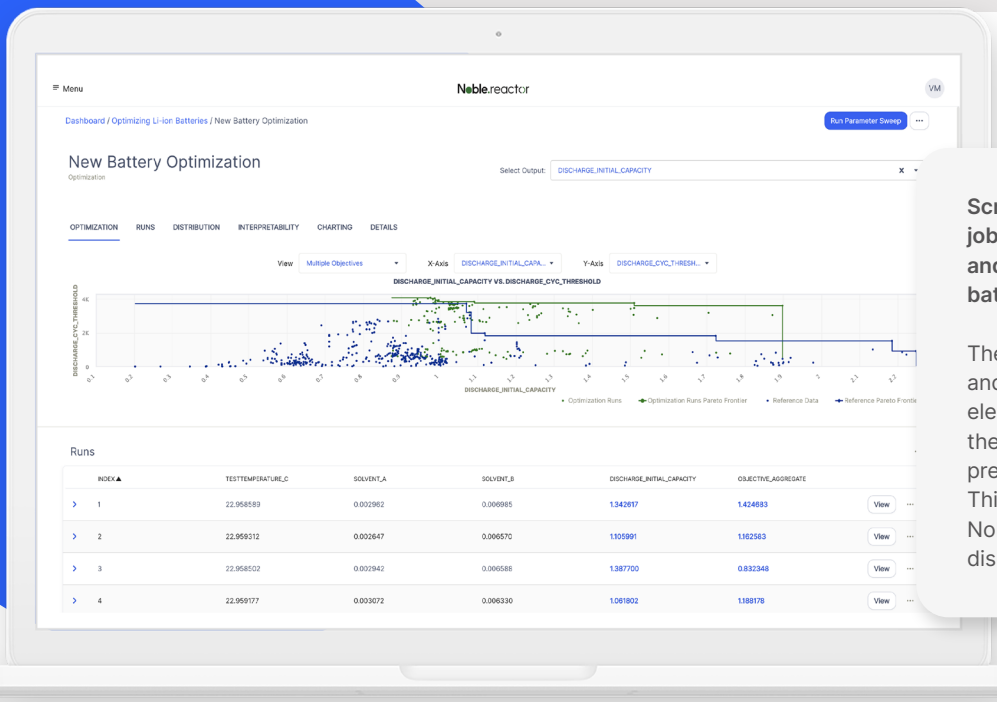
Buyers Guide for Battery Performance Predictions

Designing and developing new batteries is a complex and multidisciplinary process that involves many scientific and engineering challenges. Pushing the boundaries on improved performance, safety, and environmental impact requires the development of new materials and chemistries that address these challenges.



Screenshot showing the result of an Optimization job within NobleReactor to maximize the cycle life and discharge capacity using different Li-ion battery electrolyte configurations.

The blue points indicate experimental training data and the green points represent predictions of new electrolyte systems. The blue and green lines show the Pareto frontiers for both cases with the predictions clearly showing improved performance. This automated workflow allows users to leverage Noble's AI models to automatically and quickly discover new breakthrough designs.

Run Hundreds of Configuration Predictions in Minutes

With Noble.AI users can run better quality and more data efficient predictions when compared with consumer AI.

At Noble.AI, we have extensive experience with battery developers to continuously improve our existing science-driven AI models and capabilities to empower your teams to solve critical battery challenges.

Cost

- Development of new battery chemistries and materials produced at scale and at reasonable cost is essential for making new batteries commercially viable.
- Labor and material costs for running physical battery performance tests can be substantial, it is important for researchers to carefully plan and budget time, and the number of test configurations.

Cycle Life

- Developing new electrode materials and electrolytes that are more stable and less prone to degradation to achieve long cycle life.
- For many battery chemistries, including lithium-ion batteries, cycle life is limited by the degradation of the electrode materials and the formation of unwanted side reactions.

Energy Density

- Development of new materials and chemistries that **store more energy per unit volume or mass is key** to achieving high energy density.
- Energy density refers to the amount of energy that can be stored per unit mass or volume of the battery. Higher energy density means batteries store more energy, which then translates to longer runtimes and/or smaller and lighter batteries.

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Safety

- Developing new battery chemistries and materials that are safe is critical in battery development, particularly for high-energy-density batteries.
- The use of flammable or toxic materials in battery components can lead to safety hazards, including fires, explosions, and environmental damage.

Impact

- Developing new battery chemistries and materials that are more environmentally friendly, including the reduction or elimination of toxic or rare elements.
- The environmental impact of batteries is becoming increasingly important as the demand for electric vehicles and energy storage systems grows.

Noble.AI utilizes Science Infused Neural Networks to accelerate experimentation cycles, reduce time to market for new products and to seek ways to overcome multiple challenges in battery development including:

Optimization of Battery Design

Partner with Noble.AI to optimize the design of batteries, including the selection of materials, electrode geometry, and cell configuration. Our AI algorithms can analyze and model the behavior of different battery components and predict their performance under different conditions. This can help researchers design more efficient and effective batteries with improved performance and longer cycle life.

Predictive Maintenance

Noble.AI's SINN can be used to monitor the performance of batteries and predict when maintenance or replacement is needed. This can help extend the life of batteries and reduce the risk of failure, which is particularly important for safety-critical applications.

Materials Discovery

Use Noble.AI's SINN Platform to screen and identify new materials for use in batteries. Our AI algorithms can analyze data on the properties of different materials and predict their performance in batteries, allowing your researchers to focus their efforts on the most promising candidates. This can accelerate the discovery and development of new battery materials.

Battery Management

Noble.AI algorithms can be used to infer the optimal operation of batteries, including monitoring, and controlling charging and discharging cycles. This can help optimize battery performance and ensure that batteries operate within safe limits.

Simualtion and Modeling

Use Noble.AI's SINN to simulate and model the behavior of batteries under different conditions, including variations in temperature, load, and usage patterns. This can help your researchers understand how different battery chemistries and materials will perform in real-world applications and guide the development of new battery technologies.

Noble.AI can significantly accelerate your development of new battery technologies by enabling faster materials discovery, optimizing battery design, predicting maintenance needs, managing battery operation, and simulating battery behavior.