**Idaho State University
Physics Colloquium**

**Physics-based Machine Learning: Data Needs and Practices for Failure Mode Classification and Life Prediction**

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Machine learning and other advanced analysis approaches hold promise to reduce the time and effort needed to transition a new battery technology from innovation to deployment. Prediction of life and performance from sparse data is a key part of the technology revolution which will serve as a cornerstone of a reduced carbon energy future. Complimenting the prediction of life is the classification and prediction of specific failure modes and mechanisms to provide sufficient feed back to the R&D process so that key technology gaps can be addressed earlier and to ensure appropriate measures are taken to reduce long-term development costs.

Here we discuss battery use aging and how different approaches such as machine learning can be used to reduce the time needed for performance validation.  Looking at two distinct sets of data for different fast charging applications provides the opportunity to extend differing levels of physicality to predictions. In the first instance a set of Nissan Leaf cells are used for prediction of performance to less than 1.2% mean absolute percent error. In the second instance a combination of experimental and synthetic data are used for failure mode classification and quantification for research cells used for extreme fast charging. The comparison of one set of data using commercial cells and one using research cells provides opportunity to revisit key data acquisition parameters and best practices that will enhance future efforts.

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Via Zoom(**[**https://isu.zoom.us/j/82521704340**](https://isu.zoom.us/j/82521704340)**)
4:00 – 4:50 pm**