

# **Unleash the Combined Power of Physics and Machine Learning for Advanced Battery Management**

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**Abstract** - Energy storage systems based on lithium-ion batteries are rising as the backbone of numerous industrial and civilian systems, playing a key role in moving the world into a clean energy era. Dynamic modeling is of central importance for the use of lithium-ion batteries to ensure their safety, performance and longevity. However, lithium-ion batteries involve a complex mix of many electrochemical reactions and related phenomena, making it a substantial challenge to develop quality models using only physical principles. Machine learning, with its proven success for various data understanding tasks, holds significant potential to remedy the limitation of physics-based modeling, through making use of increasingly abundant battery data. This talk will discuss our explorations into this subject. The focus will be on developing physics-aware machine learning methods to build battery models with low complexity but high predictive accuracy. We will also discuss data-based battery model identification techniques. The talk will further give an outlook into the future of this emerging field by showing some potential opportunities and challenges.