

# How MagNet: Machine Learning Framework for Modeling Power Magnetic Material Characteristics

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**Abstract**—This article applies machine learning to power magnetics modeling. We first introduce an open-source database—MagNet—which hosts a large amount of experimentally measured excitation data for many materials across a variety of operating conditions, consisting of more than 500 000 data points in its current state. The processes for data acquisition and data quality control are explained. We then demonstrate a few neural network-based power magnetics modeling tools for modeling the core losses and  $B$ – $H$  loops. The neural network allows multiple factors that may influence the magnetic characteristics to be modeled in a unified

is applied to the training of neural network models to further reduce the data size requirement while maintaining sufficient model accuracy.

**Index Terms**—Core loss, data-driven method, hysteresis loop, machine learning, neural network, open-source database, power magnetics.