

Exascale Machine Learning Technologies

The **ExaLearn** Co-design Center leverages the revolution in what is variously termed machine learning, statistical learning, computational learning, and artificial intelligence. New machine learning technologies can have profound implications for computational and experimental science and engineering and thus for the exascale computing systems that DOE is developing to support those disciplines.

ExaLearn will identify the fundamental machine learning challenges associated with ECP applications and concentrate efforts on the development of scalable machine learning technologies for the analysis of data generated by exascale applications and DOE user facilities as well as guide the optimal selection and steering of (1) complex computer simulations (e.g., current exascale application projects) and (2) experiments (e.g., light sources, NIF, accelerators). The key to success in this endeavor is a deliberate focus on verification and validation and uncertainty quantification with a solid determination of generalization errors. A unifying principle is that of using exascale machine learning to improve the efficiency and effectiveness both of DOE computing resources and experimental facilities.

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