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Modeling Challenges and Opportunities with High-Repetition Rate Ultra-Intense Laser Systems[1] CHRIS ORBAN, JOSEPH R. SMITH, Ohio State University, SCOTT FEISTER, University of California Channel Islands, JOSEPH SNYDER, Miami University, JOHN MORRISON, KEVIN GEORGE, Air Force Research Lab / ISSI, ENAM CHOWDHURY, Ohio State University, WILLIAM M. ROQUEMORE, Air Force Research Lab, GREGORY NGIRMANG, National Research Council — Over the next decade, experimental capabilities for high repetition rate (> 1 Hz) ultra-intense laser systems will grow significantly. As a proxy for the kind of science enabled by these capabilities, I briefly review experiments that have been performed on the Extreme Light ultra-intense laser system at Wright-Patterson Air Force base since 2015. I will explain how the ability to operate the laser at a kHz repetition rate played an important role in research from our group on electron and ion acceleration exceeding MeV energies. Looking towards the future, the overabundance of data from high repetition rate experiments can be a challenge to simulate and learn from compared to experiments with only a few shots. A promising new approach that our colleagues in ICF are beginning to use involves training a statistical model using simulations and experimental data. I will describe our efforts to use a similar approach to optimize ultra-intense laser-plasma interactions. These and other statistical methods, such as machine learning, will be very useful in our future work in a few specific ways that I will outline.

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