

Abstract Submitted  
for the DAMOP20 Meeting of  
The American Physical Society

**Taking advantage of noisy spectra through machine learning** JAN M. ROST, SAJAL K. GIRI, LAZARO ALONSO, ALEXANDER EISFELD, ULF SAALMANN, Max Planck Institute for the Physics of Complex Systems — Traditionally, noise is considered a limiting factor in (experimental) spectra. Here we demonstrate with two rather different examples how noise can be turned into an asset with the help of Machine Learning. In the first example we purify successfully noisy photo electron spectra generated with intense XFEL pulses. The single shot spectra contain in the combination of non-linear light-matter coupling and broadband noise much more information about the target than a clean spectrum. In the second example we construct a system of networks with different levels of noise trained to recognize periodic signals. The system identifies correctly the periodicity as well as the noise level in a spectrum, as demonstrated with intrinsically noisy high harmonic spectra.

Jan Rost  
Max Planck Institute for the Physics of Complex Systems

Date submitted: 29 Jan 2020

Electronic form version 1.4