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Machine Learning Noise-Reduction Signal Processing Techniques for DIII-D LLAMA Diagnostic[1] J. C. SPENDLOVE, BYU, F. M. LAGGNER, A. BORTOLON, PPPL — A tokamak is a challenging environment for accurate plasma diagnosis. For example, measurements from plasma diagnostics may be dominated by spurious signal, or noise, due to the strongly varying electric and magnetic fields. In the case of the Lyman-Alpha Measurement Apparatus, or LLAMA, at DIII-D, the measurements are polluted by a large pick-up noise from the poloidal field coils' power supply. This noise prevents accurate measurements of transient plasma phenomena which require sub-millisecond resolution. The projects goal is to apply noise-reduction signal processing techniques based on neural networks to develop a time series prediction of the expected noise for the LLAMA diagnostic. The predicted noise can be subtracted from the raw diagnostic data to yield a signal with the desired resolution. By overcoming the large amplitude of noise due to the tokamak's magnetic coils, this analysis technique has great potential to study the physics of neutral deuterium at the plasmas edge. Specifically, sub-millisecond precision will allow closer study of deuterium ionization at the plasmas edge and how this impacts the behavior of edge localized modes (ELMs).

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