Using Autoencoding Networks For Tramp Metal Detection

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Abstract

Autoencoding (a.k.a. autoassociating) neural networks have had many applications including image compression, concept-learning, and anomaly detection. In this effort we apply autoencoders to fault-monitoring (a.k.a. anomaly detection) of ore crusher operation. The challenges for machine learning in this domain include very imbalanced learning data (i.e., very few abnormal samples), the lack of precise sample labeling, and multidimensional real-time sensor data feeds. The key idea of our approach is to train an autoencoder to reconstruct the sensor readings. If the training is done on the normal crusher operation data then the hope is that any future normal operation sample will be reconstructed well (i.e., with a small reconstruction error) while any abnormal crusher operation sample will lead to a large reconstruction error. Thus, the magnitude of the error can be used for labeling the incoming data samples. In this talk we will discuss the preliminary results obtained, problems encountered, related research (including using Bayesian Networks for the same task), and future research plans.