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Towards robust and efficient channel-adaptive models for multi-channel imaging

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Abstract: Applications using multi-channel imaging like single cell analysis or satellite imaging using sophisticated and heterogeneous sensor and imaging techniques create noisy and complex data that is challenging to train machine learning models on. Specifically, most machine learning techniques assume they are provided with a standardized data input types with relatively clean data from a single data source. Thus, multi-channel images represent a significant challenge due to having diverse imaging types (e.g., different sensors or stains) and what labels that are available for training often represent significant noise. What's more, even when an imaging channel is purported to contain similar information, differences in sensors or collection procedures can result in a shift in the distribution of the data between training and inference times. In this talk, I will showcase some of the work performed in my lab that aims to train adaptive and robust models for multi-channel imaging. In particular, I will begin with a discussion on training channel-adaptive models, and how we can take advantage of self-supervised techniques. Then I will discuss how we can mitigate the effect of label noise, especially in the high levels of noise often seen in scientific datasets and when domain shifts that already exist in the training dataset make it more challenging to identify noisy samples. Finally, I will close by discussing the significant energy and storage requirements of training machine learning models, and the increasing the need for resource-efficient methods of learning and performing inference.