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Probing AGN dynamics through a natural language processor lens

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We employ natural language processing algorithms with attention, repurposed to receive QSO spectra to predict unseen spectra, broad lines, and super massive black hole masses. We find that the trained algorithm is able to reproduce with high significance masked broad lines and/or continua in QSO spectra, highlighting an ability to learn from and leverage physical information imprinted amongst the entire spectrum. A key implication is that this information may help to refine physical properties such as single-epoch black hole masses. We tested the algorithm's ability to directly predict black hole masses, with no spectral fitting or decomposition, finding reasonable success to reproduce single-epoch prescriptions. In the near future, we plan to make this model multi-modal so that QSO spectra and photometric light curves, from multiple bands, can be input for training. We can then test the predicting power when the model is solely fed light curves. We will discuss the attention mechanism, which allows us to peek inside and probe what information is being used to make the above predictions and several broad future applications that we envision.

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