



# MACHINE LEARNING

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## Autoencoder Asset Pricing Models

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We propose a new latent factor conditional asset pricing model. Like Kelly, Pruitt, and Su (KPS, 2019), our model allows for latent factors and factor exposures that depend on covariates such as asset characteristics. But, unlike the linearity assumption of KPS, we model factor exposures as a flexible nonlinear function of covariates. Our model retrofits the workhorse unsupervised dimension reduction device from the machine learning literature—autoencoder neural networks—to incorporate information from covariates along with returns themselves. This delivers estimates of nonlinear conditional exposures and the associated latent factors. Furthermore, our machine learning framework imposes the economic restriction of no-arbitrage. Our autoencoder asset pricing model delivers out-of-sample pricing errors that are far smaller (and generally insignificant) compared to other leading factor models.

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