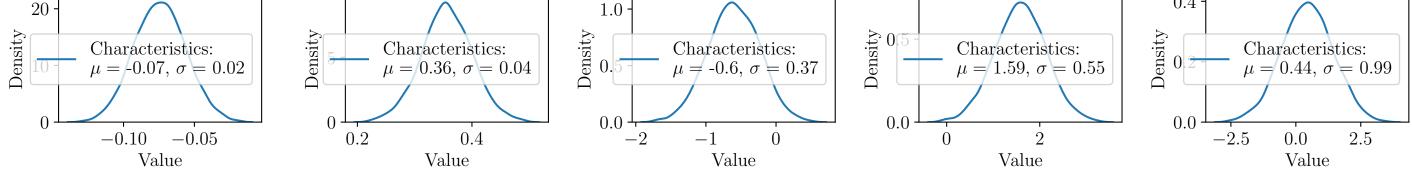$$p_{\phi(\hat{\mathbf{x}},\hat{\mathbf{y}})}(\boldsymbol{x}|\boldsymbol{y}) \sim \boldsymbol{x} = \boldsymbol{f}_{\boldsymbol{y},\phi(\hat{\mathbf{x}},\hat{\mathbf{y}})}^{-1}(\boldsymbol{z})$$