

# Technical Document: Stock Price Prediction Model with VAE-GAN Architecture

The proposed improvement to the stock price prediction model involves the integration of a Variational Autoencoder (VAE) and a Generative Adversarial Network (GAN) architecture. The VAE-GAN architecture is a powerful combination of two popular deep learning models, VAEs and GANs, which can generate high-quality synthetic data and learn complex data distributions.

## Variational Autoencoder (VAE)

A Variational Autoencoder is a type of autoencoder with added constraints on the encoded representations of the input data. It uses a probabilistic approach to encode the input data into a latent space, and then decodes it back to recreate the input. In this code, the VAE is used to extract latent representations of the stock data. The `VAE()` method defines the VAE components, including the encoder and decoder, and trains the VAE with the stock data.

## Generative Adversarial Network (GAN)

A Generative Adversarial Network consists of two neural networks, a generator and a discriminator, that are trained together. The generator creates synthetic data, and the discriminator tries to distinguish between the real and synthetic data. In this code, the GAN is used to generate synthetic stock price data. The `GAN()` method defines the GAN components, including the generator and discriminator, and trains the GAN with the MNIST dataset.

## Integration of VAE and GAN

The VAE and GAN are integrated in the `getForecastData()` method. First, the VAE is used to extract latent representations of the stock data. Then, the GAN is used to generate synthetic stock price data. The latent representations and synthetic data are combined to create enriched data, which is used to train the Committee Machine. The Committee Machine is a model that combines several regressors, including Gradient Boost, KD Neighbors Regressor, KNN Regressor, Regression Tree, and Extra Tree Regressor, to make the predictions.

## Summary

The integration of a VAE-GAN architecture can improve the stock price prediction model by providing enriched data for training the model. The VAE can extract meaningful features from the stock data, and the GAN can generate high-quality synthetic data. The combination of these two models can help the model learn complex data distributions and improve the accuracy of the predictions.