

Non Negative Matrix Factorization

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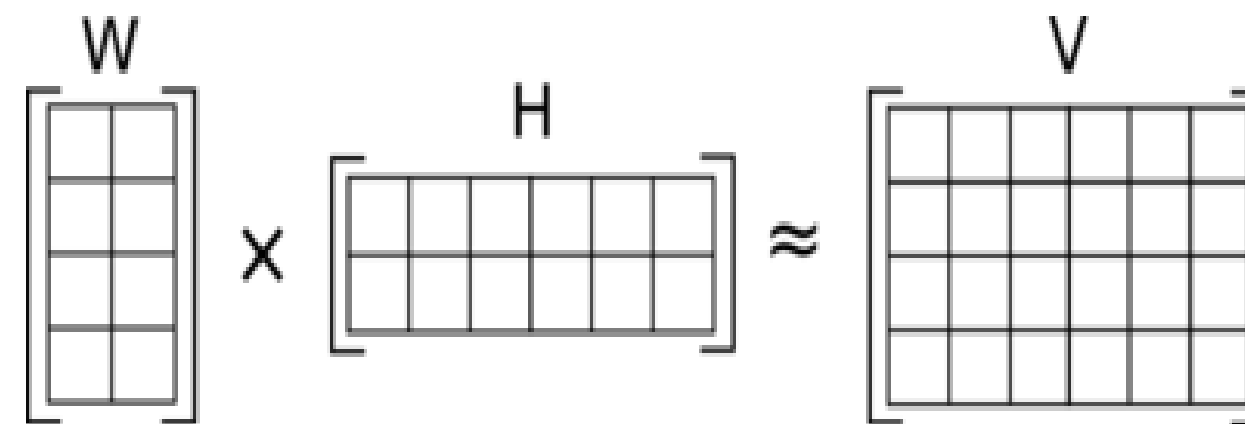
Summery

Non-negative matrix factorization

(NMF or NNMF), also **non-negative matrix** approximation is a group of algorithms in multivariate analysis and linear algebra where a **matrix** V is factorized into (usually) two **matrices** W and H , with the property that all three **matrices** have no **negative** elements.

Approach

There are several ways in which the W and H may be found but multiplicative update rule has been a popular method due to the simplicity of implementation. This algorithm, initialize: W and H non negative. Then optimizing cost function



```
HW = tf.matmul(H,W,name='products')
A_HW = tf.square(A-HW,name='sq')
cost = tf.reduce_sum(A_HW, name='rm')
train_step = tf.train.AdamOptimizer().minimize(cost)
clip_W = W.assign(tf.maximum(tf.zeros_like(W), W))
clip_H = H.assign(tf.maximum(tf.zeros_like(H), H))
clip = tf.group(clip_W, clip_H)
```

Outcome

Finding W and H from the training dataset and reconstructing the test dataset using the MNIST dataset which contains about 55,000 handwriting images for the train set and about 10,000 images for the test set, the model is still getting 96% accuracy. The picture bellow shows how the test data is reconstructed from the Factorization.

