Method 1

$$\mathcal{X}^{N \times 28 \times 28} \approx$$

$$\mathcal{G}^{R_1 \times 28 \times 28} \times_1 \underbrace{A^{N \times R_1}}_{} \times_2 I \times_3 I$$

$$\begin{bmatrix} a_{11} & a_{12} & \dots & a_{1R_1} \\ a_{21} & a_{22} & \dots & a_{2R_1} \\ \vdots & \vdots & \ddots & \vdots \\ a_{N1} & a_{N2} & \dots & a_{NR_1} \end{bmatrix}$$
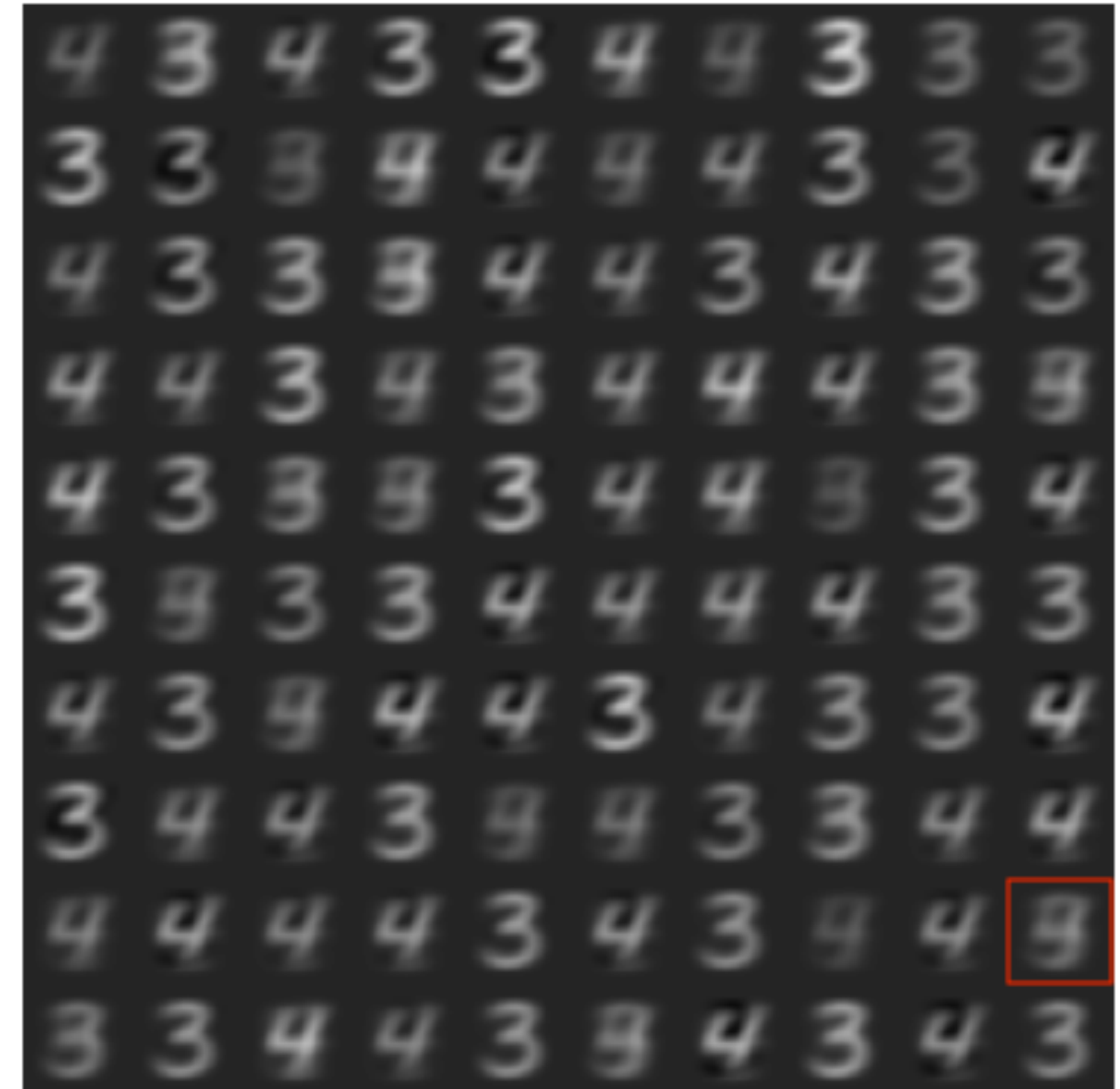
Each row in A is an input

R_1 is the rank of the decomposition

Example using N 28x28
black / white pictures

MNIST 3s and 4s Using a Rank of 2

Original

Approximation