# Matrix transposition

$$\text{If } A = \begin{bmatrix} 69 & 81 & 76 \\ 83 & 79 & 65 \\ 75 & 83 & 71 \end{bmatrix}$$

$$A' = \begin{bmatrix} 69 & 83 & 75 \\ 81 & 79 & 83 \\ 76 & 65 & 71 \end{bmatrix}$$

The elements of an $n \times n$ matrix, $A$, are stored *row-wise* on a hard disk:

$$A_{11}, A_{12}, \ldots A_{1n}, A_{21}, A_{22}, \ldots A_{2n}, \ldots, A_{n1}, A_{n2}, \ldots A_{nn}$$

The matrix is so large that only a small part of it can be kept in the main storage.

Design an algorithm that stores the matrix *column-wise* on the hard disk:

$$A_{11}, A_{21}, \ldots A_{n1}, A_{12}, A_{22}, \ldots A_{n2}, \ldots, A_{1n}, A_{2n}, \ldots A_{nn}$$

What is the worst-case Big-Oh running time of your algorithm?