



The percentage of people using Apple OS X or the Gnu/Linux operating system is represented by a vector  $\vec{v} = \begin{bmatrix} m \\ l \end{bmatrix}$ . Let  $2/3$  be the percentage of Mac OS X users, who switch to Linux each month and  $1/2$  the percentage of Linux OS users, who switch to Apple each month. What is the distribution Linux/OSX users after 2 years if initially both groups have the same number of users.

The matrix  $A = \begin{bmatrix} 1/3 & 1/2 \\ 2/3 & 1/2 \end{bmatrix}$ . has the property that  $A \begin{bmatrix} m \\ l \end{bmatrix}$  is the distribution a month later. It is called a **stochastic matrix**: the sum in each column is 1. The dynamics  $x(t) \mapsto Ax(t) = x(t+1)$  is called a **Markov chain**.

AIM: COMPUTE  $A^k \begin{bmatrix} 1/2 \\ 1/2 \end{bmatrix}$ , the distribution after  $k$  months for  $k = 1$  and if you want for  $k = 2$ .

COMPUTE THE EIGENVALUES OF A.

COMPUTE THE EIGENVECTORS OF A.

WHAT IS THE MATRIX  $S$  for which  $S^{-1}AS = B$  is diagonal.

WHAT IS  $B^{24}$ , up to 10 digits accuracy?

WHAT IS  $A^{24}$ ?

WHAT IS THE DISTRIBUTION AFTER 24 YEARS?