

# SUITES DE MATRICES ET MARCHES ALEATOIRES

## I. Suites de matrices colonnes

### 1) Exemples :

a) La suite  $(U_n)$  définie pour tout entier naturel  $n$  par  $U_n = \begin{pmatrix} n^2 \\ 3n+1 \end{pmatrix}$  est une suite de matrices colonnes dont les coefficients sont les suites numériques  $(u_n)$  et  $(v_n)$  définies pour tout entier naturel  $n$  par  $u_n = n^2$  et  $v_n = 3n+1$ .

b) Soit deux suites numériques couplées  $(u_n)$  et  $(v_n)$  définies pour tout entier naturel  $n$  par :  $u_0 = 2$ ,  $v_0 = 4$  et  $\begin{cases} u_{n+1} = 2u_n - 3v_n + 1 \\ v_{n+1} = -u_n + 5v_n - 4 \end{cases}$

On pose pour tout entier naturel  $n$  :  $U_n = \begin{pmatrix} u_n \\ v_n \end{pmatrix}$

On pose encore :  $A = \begin{pmatrix} 2 & -3 \\ -1 & 5 \end{pmatrix}$  et  $B = \begin{pmatrix} 1 \\ -4 \end{pmatrix}$ .

On a alors  $U_n = \begin{pmatrix} 2 \\ 4 \end{pmatrix}$  et pour tout entier naturel  $n$ , la relation matricielle de récurrence :  $U_{n+1} = AU_n + B$ .

En effet :

$$AU_n + B = \begin{pmatrix} 2 & -3 \\ -1 & 5 \end{pmatrix} \begin{pmatrix} u_n \\ v_n \end{pmatrix} + \begin{pmatrix} 1 \\ -4 \end{pmatrix} = \begin{pmatrix} 2u_n - 3v_n + 1 \\ -u_n + 5v_n - 4 \end{pmatrix} = \begin{pmatrix} u_{n+1} \\ v_{n+1} \end{pmatrix} = U_{n+1}$$

c) Soit une suite numérique  $(u_n)$  définie par une relation de récurrence d'ordre 2 :  $u_0 = 2$ ,  $u_1 = -1$  et  $u_{n+2} = 2u_{n+1} + 3u_n$ .

On pose pour tout entier naturel  $n$  :  $U_n = \begin{pmatrix} u_n \\ u_{n+1} \end{pmatrix}$

On pose encore :  $A = \begin{pmatrix} 0 & 1 \\ 3 & 2 \end{pmatrix}$ .

# Matrices Aleatoires

**Christian Drosten**



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