
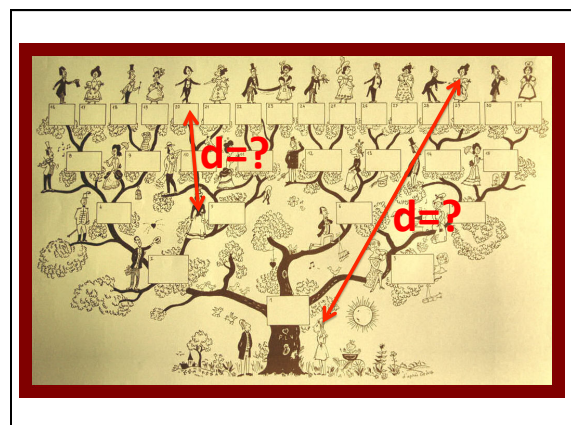


Construction et approximation de l'inverse de sous-matrices de parenté:
Quand la génétique vient en aide au calcul numérique

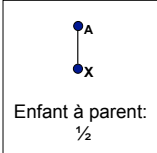
Pierre Faux
 Promoteur: Nicolas Gengler

Quand la génétique vient en aide au calcul numérique
 ≡
 Comment la **connaissance a priori** que nous avons de la **génétique** peut faciliter les **calculs** numériques liés à l'estimation des **valeurs d'élevage**?

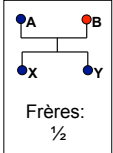
Construction et approximation de l'inverse de sous-matrices de **parenté**




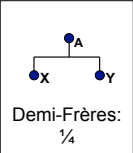
$$a_{XY} = \frac{1}{2} \times (a_{P_XY} + a_{M_XY})$$




Enfant à parent:
1/2

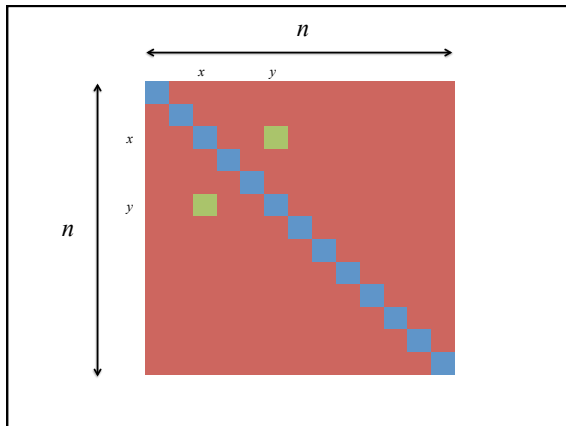


Frères:
1/2



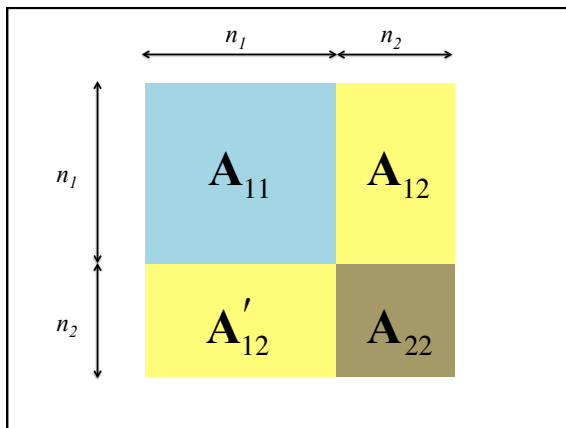
Demi-Frères:
1/4

Construction et approximation de l'inverse de sous-**matrices de parenté**




Construction et approximation de l'inverse de **sous-matrices de parenté**

?



$$p_{ij} = e_j + ve_i + r_{ij}$$

$$\Downarrow$$

$$\mathbf{p} = \mathbf{X} \cdot \mathbf{e} + \mathbf{Z} \cdot \mathbf{ve} + \mathbf{r}$$

$$\text{Var}(\mathbf{ve}) = \mathbf{V} \cdot \sigma_v^2$$

$$p_{ij} = e_j + ve_i + r_{ij}$$

$$\Downarrow$$

$$\mathbf{p} = \mathbf{X} \cdot \mathbf{e} + \mathbf{Z} \cdot \mathbf{ve} + \mathbf{r}$$

$$\begin{bmatrix} \mathbf{X}'\mathbf{R}^{-1}\mathbf{X} & \mathbf{X}'\mathbf{R}^{-1}\mathbf{Z} \\ \mathbf{Z}'\mathbf{R}^{-1}\mathbf{X} & \mathbf{Z}'\mathbf{R}^{-1}\mathbf{Z} + \mathbf{V}^{-1} \cdot \sigma_v^{-2} \end{bmatrix} \begin{bmatrix} \mathbf{e} \\ \mathbf{ve} \end{bmatrix} = \begin{bmatrix} \mathbf{X}'\mathbf{R}^{-1}\mathbf{p} \\ \mathbf{Z}'\mathbf{R}^{-1}\mathbf{p} \end{bmatrix}$$

$$\text{Var}(\mathbf{ve}) = \mathbf{V} \cdot \sigma_v^2$$

$$\text{Var}(\mathbf{r}) = \mathbf{R}$$

$$\begin{bmatrix} \mathbf{X}'\mathbf{R}^{-1}\mathbf{X} & \mathbf{X}'\mathbf{R}^{-1}\mathbf{Z} \\ \mathbf{Z}'\mathbf{R}^{-1}\mathbf{X} & \mathbf{Z}'\mathbf{R}^{-1}\mathbf{Z} + \mathbf{V}^{-1} \cdot \sigma_v^{-2} \end{bmatrix} \begin{bmatrix} \mathbf{e} \\ \mathbf{ve} \end{bmatrix} = \begin{bmatrix} \mathbf{X}'\mathbf{R}^{-1}\mathbf{y} \\ \mathbf{Z}'\mathbf{R}^{-1}\mathbf{y} \end{bmatrix}$$

$$\mathbf{ve}_{1+2} \Rightarrow \mathbf{V} = \mathbf{A}$$

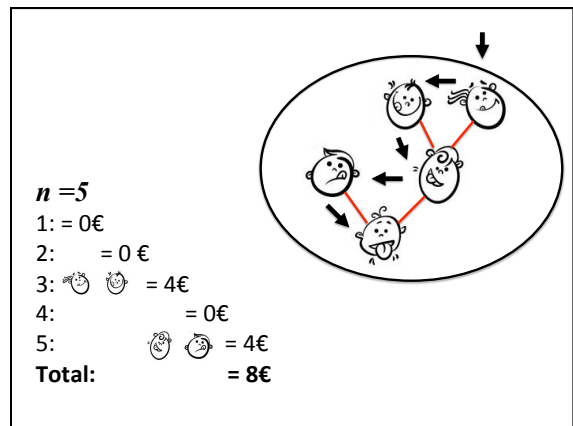
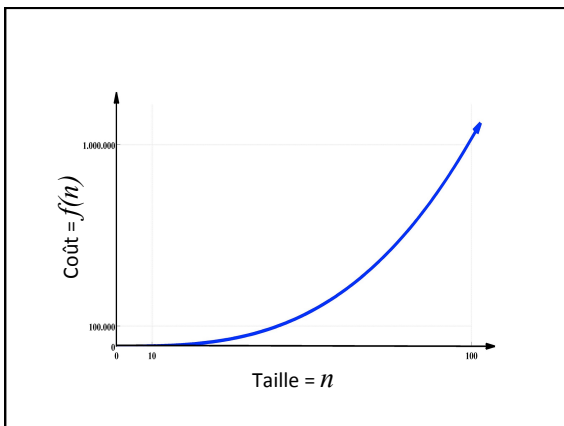
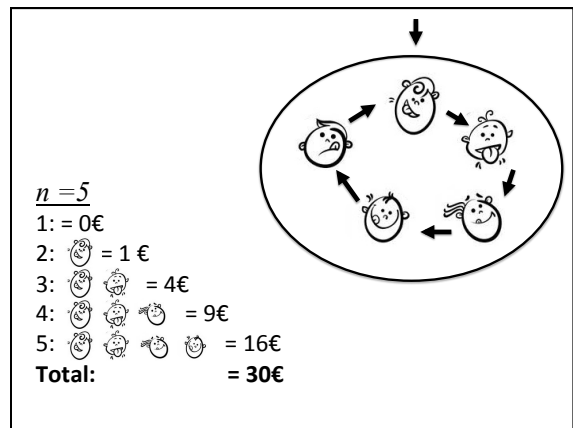
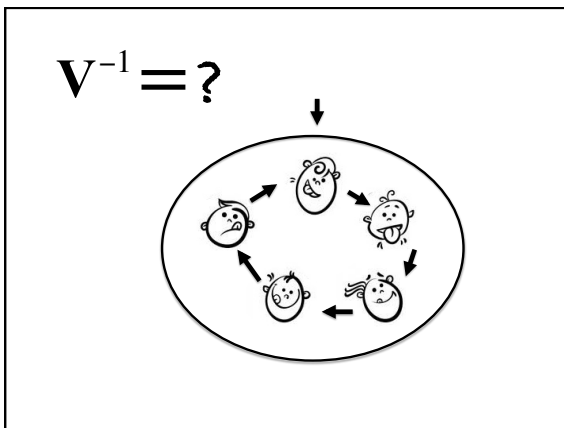
$$\mathbf{ve}_2 \Rightarrow \mathbf{V} = \mathbf{A}_{22}$$

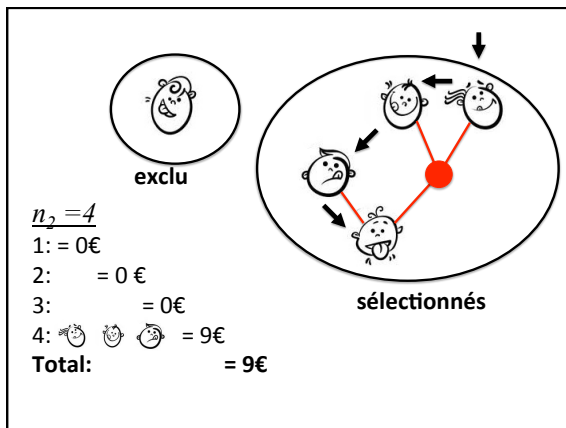
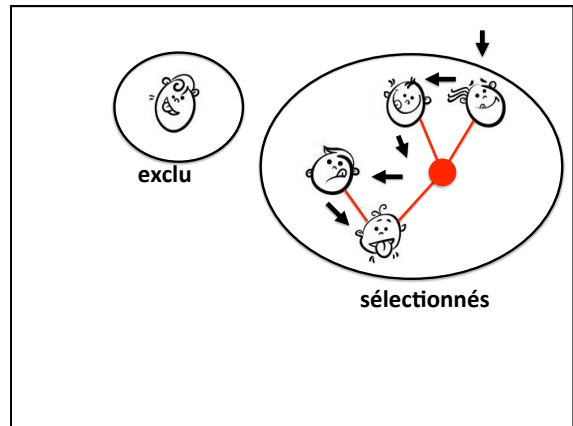
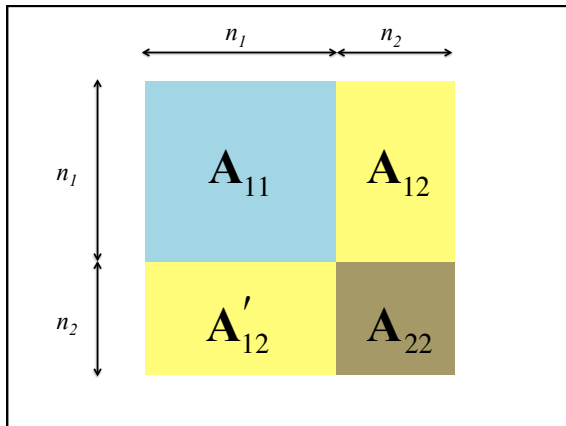
$$\begin{bmatrix} \mathbf{X}'\mathbf{R}^{-1}\mathbf{X} & \mathbf{X}'\mathbf{R}^{-1}\mathbf{Z} \\ \mathbf{Z}'\mathbf{R}^{-1}\mathbf{X} & \mathbf{Z}'\mathbf{R}^{-1}\mathbf{Z} + \mathbf{V}^{-1} \cdot \sigma_v^{-2} \end{bmatrix} \begin{bmatrix} \mathbf{e} \\ \mathbf{v} \end{bmatrix} = \begin{bmatrix} \mathbf{X}'\mathbf{R}^{-1}\mathbf{y} \\ \mathbf{Z}'\mathbf{R}^{-1}\mathbf{y} \end{bmatrix}$$

V⁻¹!

Construction et approximation de **l'inverse**
de sous-matrices de parenté

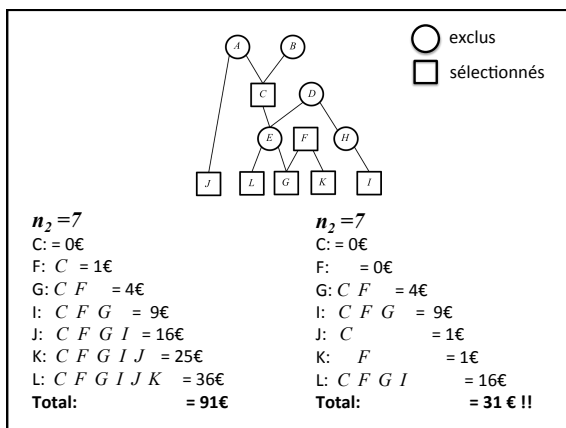
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Construction et approximation de l'inverse de sous-matrices de parenté

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Construction et **approximation** de l'inverse de sous-matrices de parenté

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