Progression : Recherche du point "le plus bas" dans la direction $r^{(p)}$

Minimiser $f(\lambda) = F\left(x^{(p)} + \lambda r^{(p)}\right) - F\left(x^{(p)}\right)$

$$f(\lambda) = \frac{1}{2}\left(x^{(p)} + \lambda r^{(p)}\right)^T A \left(x^{(p)} + \lambda r^{(p)}\right) - \left(x^{(p)} + \lambda r^{(p)}\right)^T b$$

$$- \frac{1}{2} x^{(p)T} A x^{(p)} + x^{(p)T} b$$

$$= \left(\lambda r^{(p)}\right)^T A x^{(p)} + \frac{1}{2} \lambda^2 r^{(p)T} A r^{(p)} - \lambda r^{(p)T} b$$

$$= \frac{1}{2} \lambda^2 r^{(p)T} A r^{(p)} - \lambda r^{(p)T} \underbrace{\left(b - A x^{(p)}\right)}_{= r^{(p)}}$$

$$= \frac{1}{2} \lambda^2 r^{(p)T} A r^{(p)} - \lambda r^{(p)T} r^{(p)}$$

$$f'(\lambda) = \lambda r^{(p)T} A r^{(p)} - r^{(p)T} r^{(p)}$$

f minimal en λ_p $\quad f'(\lambda_p) = 0$

$$f'(\lambda_p) = 0 \Leftrightarrow \lambda_p = \frac{r^{(p)T} r^{(p)}}{r^{(p)T} A r^{(p)}}$$