
Algorithm 3 $\text{CG}(A, b, x_0, \text{rtol})$

$$r_0 \leftarrow b - Ax_0$$

$$p_0 \leftarrow r_0$$

$$k \leftarrow 0$$

while $\|r_k\|_2 \geq \text{rtol}$ **do**

$$\alpha_k \leftarrow \frac{r_k^T r_k}{p_k^T A p_k}$$

$$x_{k+1} \leftarrow x_k + \alpha_k p_k$$

$$r_{k+1} \leftarrow r_k - \alpha_k A p_k$$

$$\beta_k \leftarrow \frac{r_{k+1}^T r_{k+1}}{r_k^T r_k}$$

$$p_{k+1} \leftarrow r_{k+1} + \beta_k p_k$$

$$k \leftarrow k + 1$$

end while

return x_k
