

$$\begin{aligned}
 c_j &= \frac{2}{N} \sum_{k=0}^{N-1} f(x_k) T_j(x_k) \\
 &= \frac{2}{N} \sum_{k=0}^{N-1} f \left[ \cos \left( \frac{\pi (k + \frac{1}{2})}{N} \right) \right] \cos \left( \frac{\pi j (k + \frac{1}{2})}{N} \right)
 \end{aligned}$$