時間複雜度的題目、85交大電子

If A is $m \times n$ and B is $n \times p$, how many multiplication operations and how many addition operations are needed to calculate the matrix product AB.

Ans.

假設 $C = AB$, $c_{ij} = \sum_{k=1}^{n} a_{ik} b_{kj}$, $\forall 1 \le i \le m, \forall 1 \le j \le p$.

$\Rightarrow$ 計算 c_{ij} 需 n 個乘法, n-1 個加法, $\forall 1 \le i \le m, \forall 1 \le j \le p$.

$\Rightarrow$ C 共有 mp 個元素, 因 $C = AB$

$\Rightarrow$ 計算出 AB 需 mpn 個乘法, $mp(n-1)$ 個加法。