**6.12** In the exercise, it seems that the index $U$ refers to all the subsets of $D$, and $D$ has $2^{|D|}$ subsets.

The inner product $\boldsymbol{\phi}(A_1)^T\boldsymbol{\phi}(A_2) = \sum_U \phi(A_1) * \phi(A_2)$

The product inside the summation will only be equal to 1 if both $\phi(A_1)$ and $\phi(A_2)$ are equal to 1. This implies that $U \subseteq A_1$ and $U \subseteq A_2$.

$\sum_U \phi(A_1) * \phi(A_2)$ then gives us the number of subsets of $D$, that are subsets of both $A_1$ and $A_2$.

This is equivalent to the number of subsets of $A_1 \cap A_2$, which is the same as the kernel function given by eqn. 6.27 : $k(A_1, A_2) = 2^{|A_1 \cap A_2|}$