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①

(8) (a) In Step 1, we do the cluster assignment, based on the cluster representation.

⇒ For all x_i for $i \in \{1, 2 \cdots, N\}$
⇒ For all z_j for $j \in \{1, 2 \cdots k\}$
⇒ If $\|x_i - z_j\|_2$ is minimum

$\Rightarrow c_i = j$

∴ Complexity = $N \cdot k \cdot n$.

(b) In Step 2, we update the cluster representatives.

⇒ For c_i for $i \in \{1, 2 \cdots, k\}$

~~⇒ For x_j for $j \in \{1, 2 \cdots$~~

⇒ For all $x_j \in C_i$

⇒ y_i = avg of all x_j

∴ Complexity = $N \cdot n$

(c) If initially clusters are randomly assigned, complexity = $n \cdot k$ for initialisation of k $\mathbb{R}^n$ vectors.

Now, for step 1 & Step 2 Complexity = $Nkn + Nn$.

∴ For 10 iterations, Complexity = $10(Nkn + Nn) + nk$.