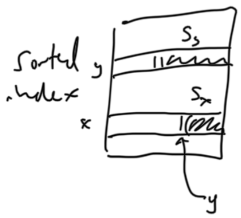
for $x = 1$ to n

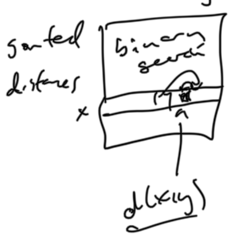
for $y = x+1$ to n

compute these using sorted rows

$$S_x = \{ z \mid d(z,x) < d(y,x) \}$$
$$S_y = \{ z \mid d(z,y) < d(x,y) \}$$

so $U_{x,y} = S_x \cup S_y$





Compute $|U_{x,y}|$ by scanning through S_x and marking indices in bit vector b then scanning through S_y and marking indices in b

for $z \in S_x$

1. update either C_{xz} or C_{yz},
2. set b_z back to zero

if $d(z,x) < d(z,y)$
$C_{xz} \mathrel{+}= \frac{1}{|U_{x,y}|}$
else
$C_{yz} \mathrel{+}= \frac{1}{|U_{x,y}|}$

for $z \in S_y$

if $b_z \neq 0$,

1. update either C_{xz} or C_{yz}
2. set b_z back to zero

$S_x = \{1, 3, 4\}$ $\quad S_y = \{4, 5, 7, 3\}$

$$\vec{b} = \begin{array}{c} \begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix} \\ \begin{array}{ccccccc} 1 & 2 & 3 & 4 & 5 & 6 & 7 \end{array} \end{array}$$

$|U_{x,y}| = \cancel{||||}| = 5$

how does this compare to $O(n^3)$?

$$O(n^3) \rightarrow O\left(n^2 \log n + \sum_{x,y} |U_{x,y}|\right)$$