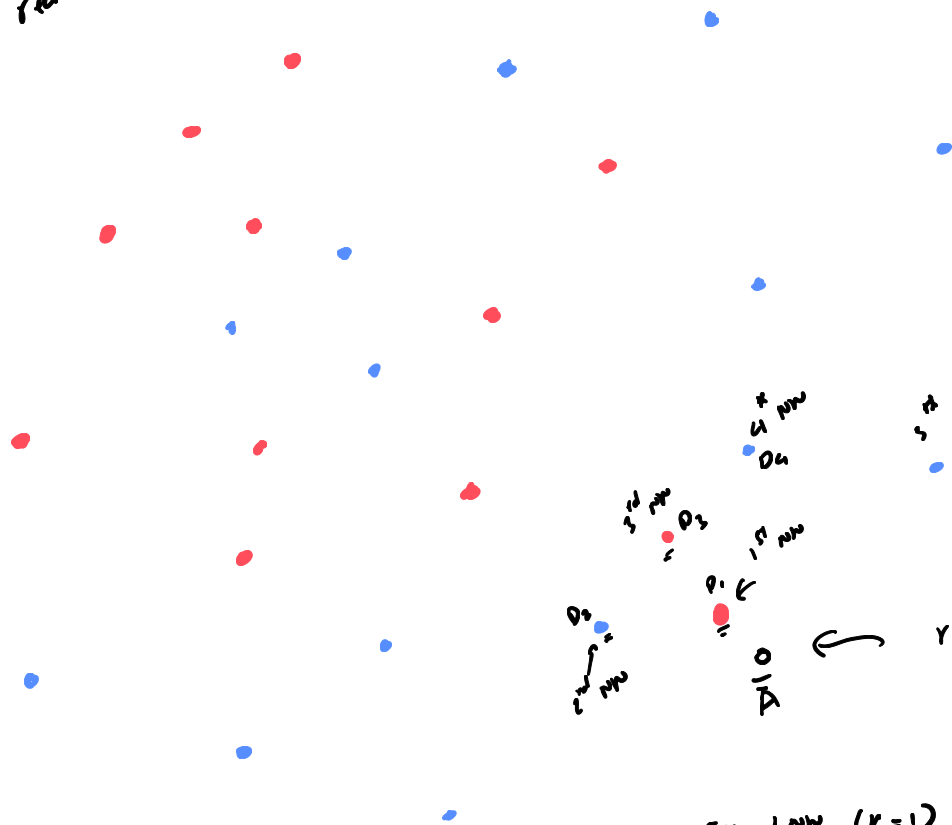


3NN predicts red

↓
0



0 ← predict blue

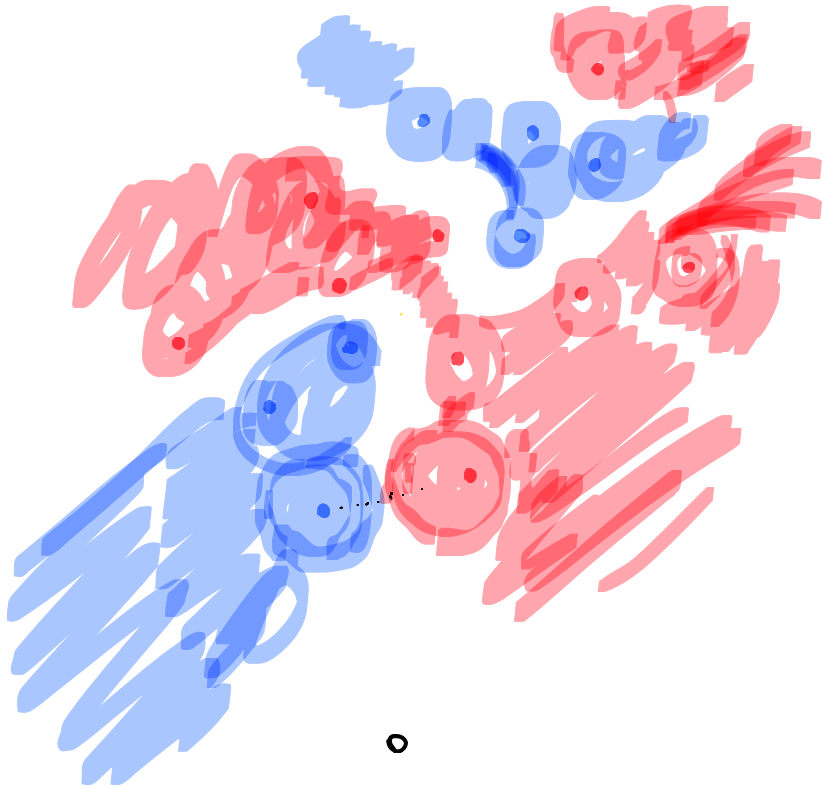


① Let say there are 27 points (11 reds, 16 blues)

27 NN ($k=27$)

- ② For 1NN ($k=1$) \Rightarrow predict A the same as p_1 , red
- ③ For 2NN ($k=2$) \Rightarrow predict A: majority of 2 NN 50% red 50% blue
- ④ For 3NN ($k=3$) predict A: majority of (p_1, p_2, p_3) which is red

\Rightarrow As k increases, the model gets weaker.
If k is small, the KNN tends to be "overfit."



9 reds

7 blues

Weak NN

16 - NN predict everything
is reds

$$\text{Training Accuracy} = \frac{9}{16}$$

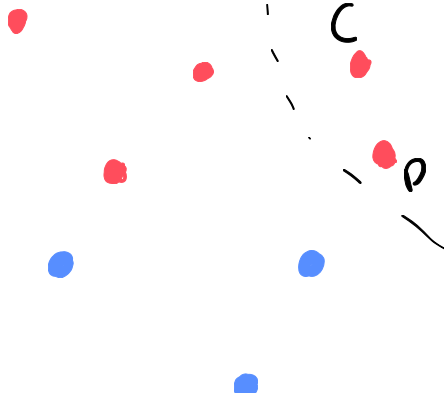
Strongest NN

1 NN

$$\text{Training Accuracy} = \frac{16}{16} = 1$$

10 NN

① Weights in KNN



Distance

weights

$$\begin{aligned} AB = 1 &\rightarrow \frac{1}{1} \\ AC = 4 &\rightarrow \frac{1}{4} \\ AD = 5 &\rightarrow \frac{1}{5} \end{aligned}$$

A
B

red or blue

non-weighted KNN
or the weights
are uniform.

④ If $k = 3$, A is predicted as
red (2/3 is red)

⑤ In weighted KNN, we take
into account the distance to A of
B, C, D when predicting A.

	Age	Gender	GPA
A	21	M	4.0
B	20	M	2.0
C	21	F	4.0
D	18	M	4.0

