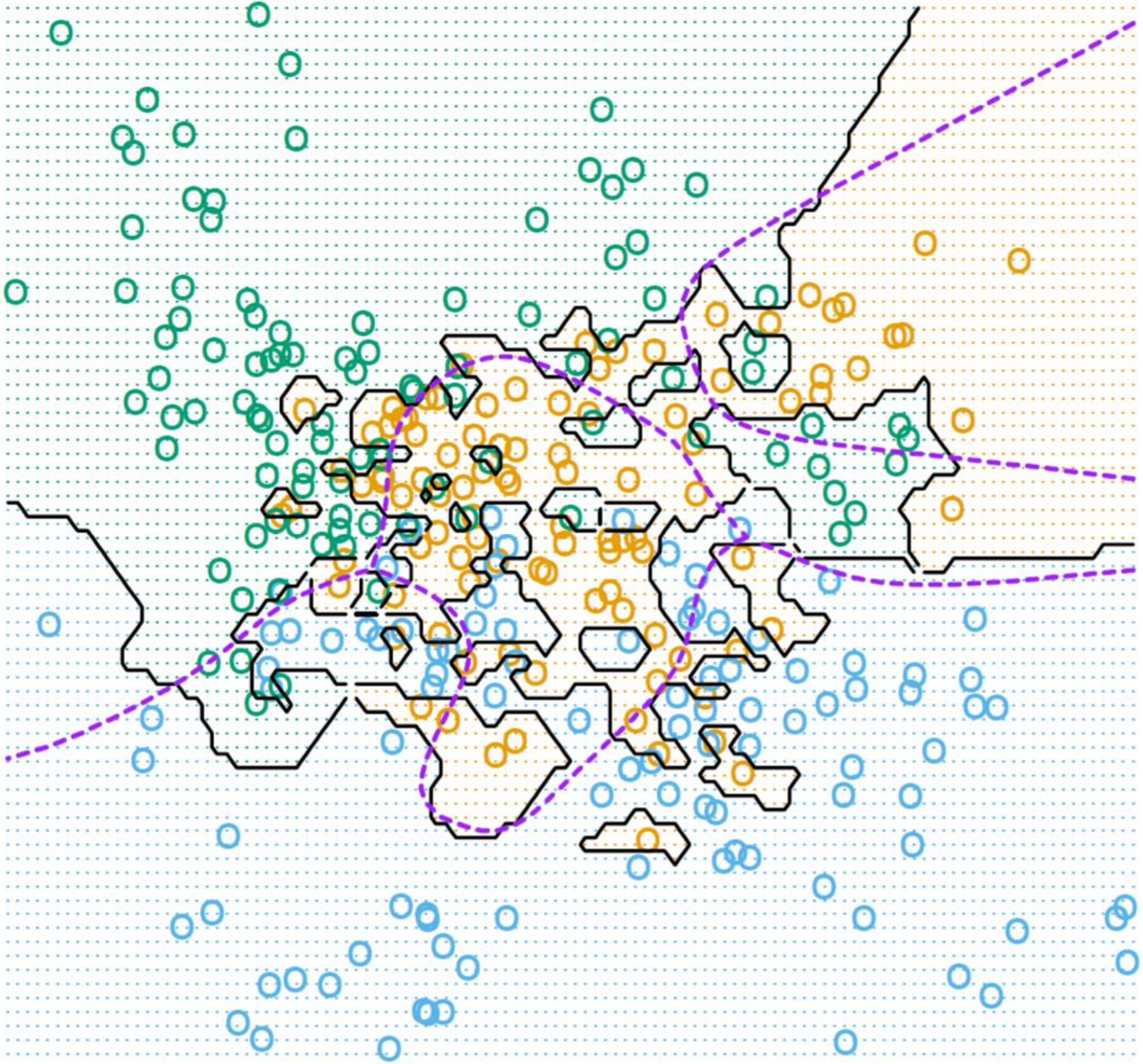
NEAREST NEIGHBOUR CLASSIFIER

Lecture-4



CLASSIFICATION BOUNDARY WITH NNC

- 2-d Euclidean example
- Dirichlet Tesselation or Voronoi Decomposition
- Bayes optimal in purple

Copied from: Tibshirani book

ASYMPTOTIC BOUND

- **Theorem:** Let R^{NN},and R^*denote the misclassification rates with NNC ($m \to \infty$) and Bayes optimal respectively, then, under mild conditions, we have

$$0 \leq R^* \leq R^{NN} \leq 2R^*$$

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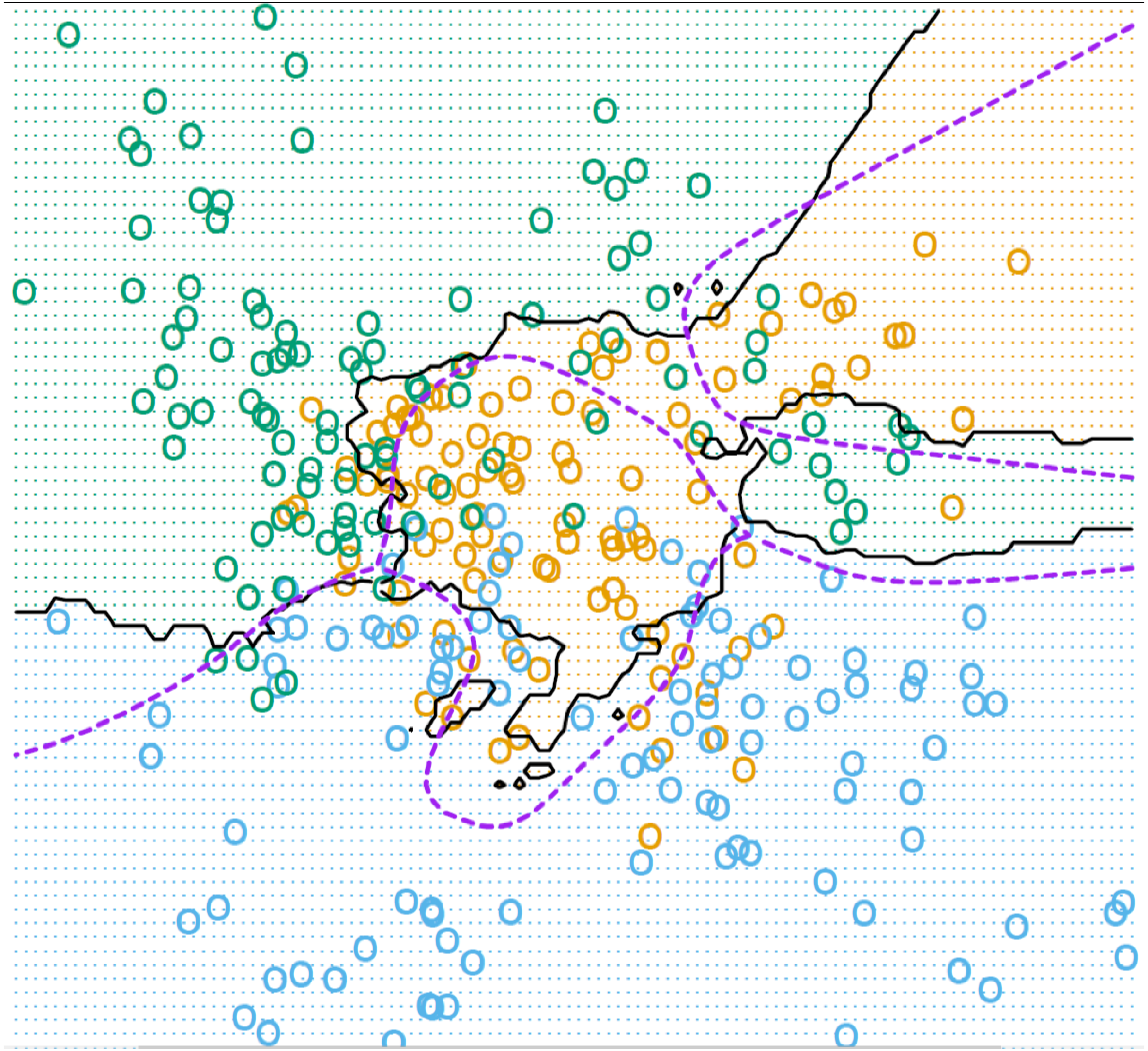

CLASSIFICATION BOUNDARY WITH KNNC

- Smoother boundary
- Closer to Bayes optimal

Copied from: Tibshirani book

ASYMPTOTIC BOUND

- **Theorem:** Let R^{kNN},and R^{*}denote the misclassification rates with NNC ($m \rightarrow \infty$) and Bayes optimal respectively, then, under mild conditions, we have

$$0 \leq R^{*} \leq \cdots \leq R^{3NN} \leq R^{NN} \leq 2R^{*}$$

- Bayes consistency, if $R^{*} = 0$; need not be otherwise

BAYES CONSISTENCY [STONE77]

- **Theorem:** If $m \to \infty. k \to \infty. \frac{k}{m} \to 0$, then with probability atleast $1 - \delta$, we have:

$$R_m^{NN} - R^* \leq \sqrt{\frac{72\gamma^2 \log 2/\delta}{m}}$$

$$\gamma \leq \left(1 + \frac{2}{\sqrt{2 - \sqrt{3}}}\right)^n - 1$$

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Curse of dimensionality!