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K-Nearest Neighbors

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K-Nearest Neighbors

K-Nearest Neighbors (KNN) is a **supervised learning** algorithm used for:

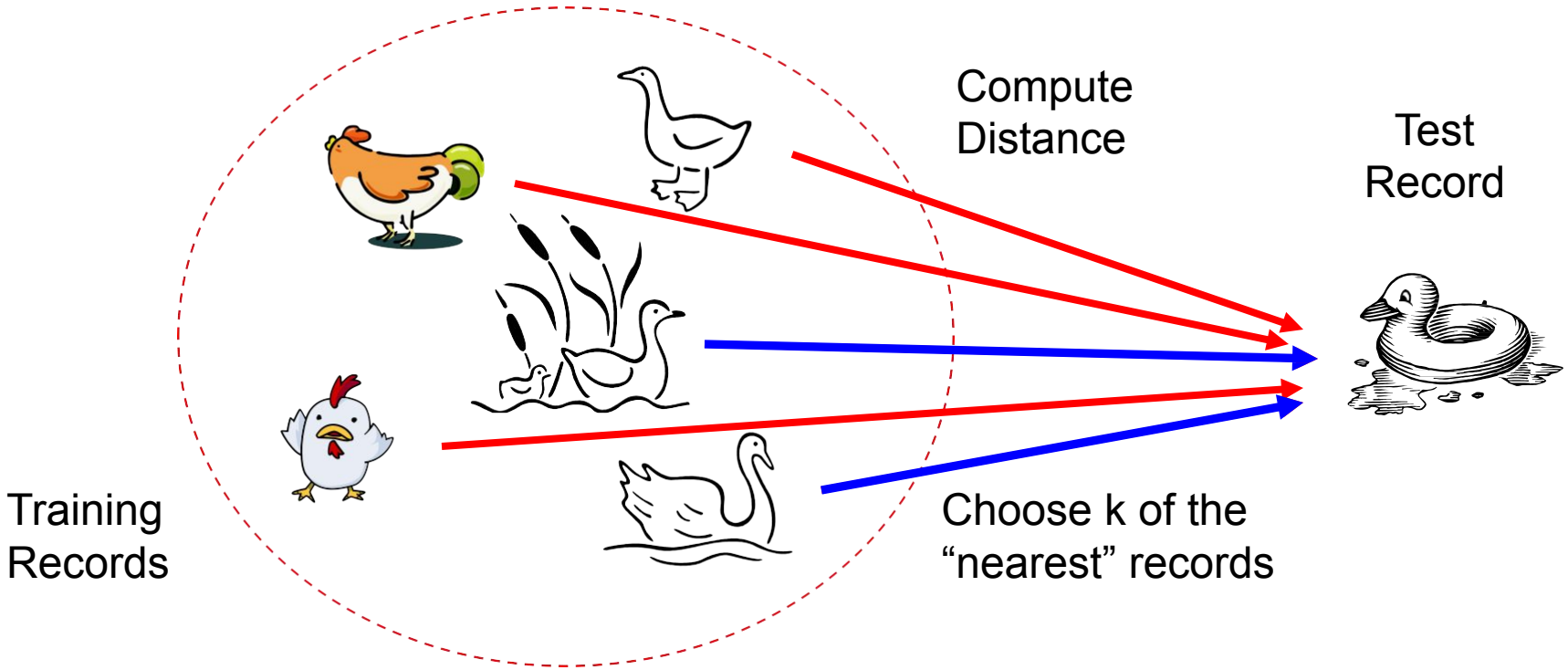
- Classification
- Regression (less common)

Based on the idea:

"Things that are similar close together."

Nearest Neighbor Classifiers

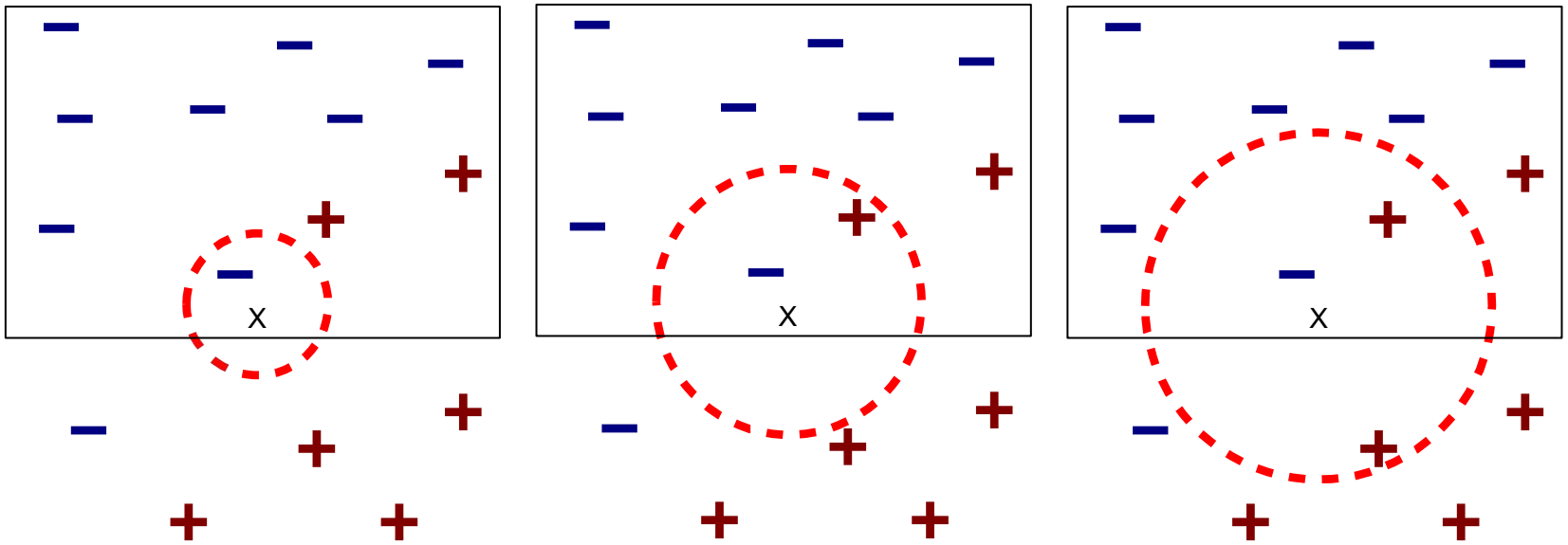
- Basic idea:
  - If it walks like a duck, quacks like a duck, then it's probably a duck



How KNN Works

1. Choose a value for K (number of neighbors).
2. Calculate the distance between the new point and all points in the training set.
3. Pick the K closest neighbors.
4. Use majority voting among the K labels.
5. Assign the most frequent label.

How KNN Works

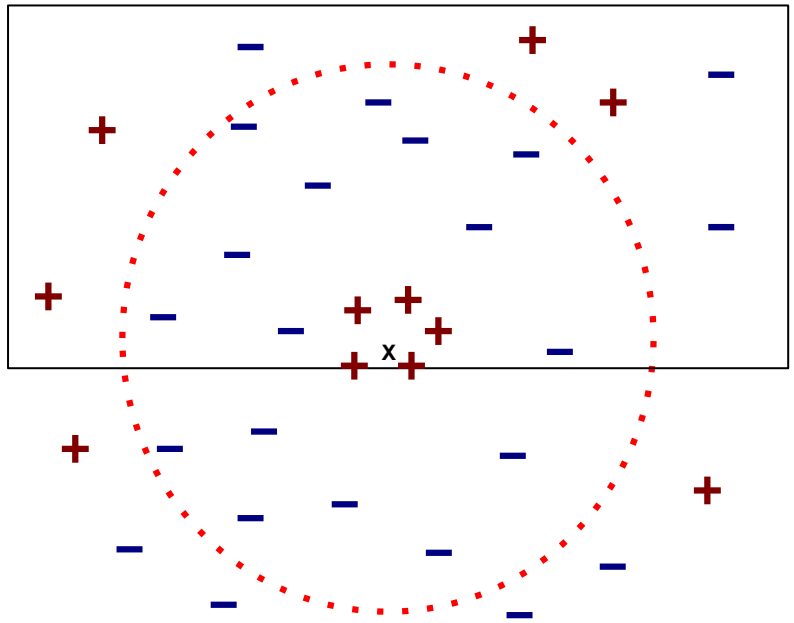


(a) 1-nearest neighbor (b) 2-nearest neighbor (c) 3-nearest neighbor

K-nearest neighbors of a record x are data points that have the k smallest distance to x

Choosing K

- Choosing the value of k:
  - If k is too small, sensitive to noise points
  - If k is too large, neighborhood may include points from other classes



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KNN in Python

```
from sklearn.neighbors import KNeighborsClassifier


# Create model
model = KNeighborsClassifier(n_neighbors=3)


# Fit model
model.fit(X_train, y_train)


# Predict
y_pred = model.predict(X_test)
```

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